

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 SCOPE OF WORK COVERED BY CONTRACT DOCUMENTS

- A. The Scope of Work of this contract includes, but is not necessarily limited to the following items. Where conflicts arise between this Scope of Work narrative and other Contract Documents, other Contract Documents shall supercede.
- B. Sewer Line Installation and Confirmation. The project consists of performing CCTV inspection, Flow Monitoring, confirming as-built survey of the sanitary sewer system to confirm the existing systems configuration and profiles, analysis of flows and sewer system capacity and corrective plans to eliminate spills and overflows. This would include a review of proposed material type, slope, size, depth, cover, slope, flow capacity, etc.
- C. Storm Line Installation and Confirmation
- D. Water Line Installation
- E. Gas Service Line Installation
- F. Stormwater Detention Facilities
- G. Grading and Earthworks
- H. As-building final construction
- I. Asphalt & Concrete Pavement
- J. Erosion Control
- K. Landscaping
- L. Building Construction
- M. Site lighting

1.2 CONTRACT METHOD

- A. Provide work described by contract documents under a unit price contract.

1.3 WORK SEQUENCE

- A. Provide work in stages to accommodate Owner use of premises during construction.
- B. No work shall be done on existing system until Owner release.

1.4 OWNER OCCUPANCY

- A. Various Adjacent Property Owners will occupy their facility and continue normal business operations during construction. These businesses shall remain open at all times & contractor shall perform work to minimize impact to these businesses.

1.5 CONTRACTOR'S DUTIES

- A. Except as specifically noted, provide and pay for:
  - 1. Labor, materials and equipment.
  - 2. Tools, construction equipment and machinery.
  - 3. Other facilities and services necessary for proper execution and completion of work.
- B. Pay legally required sales, consumer and use taxes, except as specifically excluded.
- C. Secure and pay for, as necessary for proper execution and completion of work, and as applicable at time of receipt of bids:
  - 1. Permits.
  - 2. Government fees.
  - 3. Licenses.
- D. Give required notices.
- E. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of work.
- F. Promptly submit written notice to Engineer of observed variance of Contract Documents from legal requirements.

1.6 APPLICABLE CODES

- A. All references to codes, specifications, and standards referred to in the Specification Sections and on the Drawings shall mean, and are intended to be, the latest edition, amendment, and/or revision of such reference standard in effect as of the date of these Contract Documents.

1.7 ABBREVIATIONS & SYMBOLS

- A. Reference to technical society, institution, association, or governmental authority is made in the Specifications in accordance with the following abbreviations:

ASCE	American Society of Civil Engineers
ASTM	American Society of Testing Materials
AWS	American Welding Society
AWWA	American Waterworks Association
CE	Corps of Engineers (Army)

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CRSI	Concrete Reinforcing Steel Institute
CS	U.S. Commercial Standard
CSI	Construction Specifications Institute
FS	Federal Specifications
FSIWA	Federation of Sewage and Industrial Waste Association
JAN	Joint Army-Navy Specifications
MSS	Manufacturers Standardization Society of the Valves and Fittings Industries
NCMA	National Concrete Masonry Association
NRMCA	National Ready Mixed Concrete Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PS	Product Standard, U.S. Department of Commerce
UPC	Uniform Plumbing Code

1.8 UNIT PRICE

- A. Definition: Unit price means a fixed price for materials and installation, including all overhead, profit, and all other costs of whatever nature and character, for a specified unit of work. Unit prices as such will be used for additional work or deducted work. The Owner may at any time order an increase or decrease in the number of units of work. Unit prices in the bid form, when incorporated in the Contract, shall be the same for additional or deducted units, unless otherwise specified.
- B. The Owner, Contractor and Engineer shall jointly develop the list of required unit prices.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.1 PROTECTION

- A. Make such explorations and probes as are necessary to ascertain any required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent any damage to existing construction.
- B. Provide, erect, and maintain barriers, warning signs, and other items as required for proper protection of the workmen engaged in demolition operations, occupants of the facility and the general public.

- C. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal, and new work are being done, connections made, materials handled, or equipment moved.
- D. Take necessary precautions to prevent dust and dirt from rising by wetting demolished masonry, concrete, plaster, and similar debris.
- E. Provide adequate fire protection in accordance with local Fire Department requirements.
- F. Do not close or obstruct driveways, walkways, passageways, or stairways without the authorization of the Owner. Do not store or place materials in driveways, passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.
- G. Be responsible for any damage to the existing structure or contents by reason of the insufficiency of protection provided.

### 3.2 WORKMANSHIP

- A. Cut, remove, alter, temporarily remove and replace, or relocate existing work as required for performance of the work. Perform such work required with due care, including shoring and bracing.
- B. Coordinate patching involving the various trades whether or not specifically mentioned in the respective Specification sections.
- C. Restore all areas remaining in place but damaged or defaced because of demolition or alteration work to condition equal that which existed at beginning of work under this Contract.
- D. Where alteration or removals expose damaged or unfinished surfaces or materials, refinish such surfaces or materials, or remove them and provide new or salvaged materials to make continuous surface uniform.
- E. Perform new work and restore and refinish existing work in conformance with applicable requirements of the Specifications, except as follows:
  - 1. Materials for use in repair of existing surfaces, but not otherwise specified, shall conform to the highest standards of the trade involved, and be in accordance with approved industry standards, and shall be as required to match existing surfaces.
  - 2. Workmanship for repair of existing materials shall, unless otherwise specified, be equal to similar workmanship existing in or adjacent to the space where the work is being done.

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3. Reinstallation of salvaged items where no similar items exist shall be done in accordance with the highest standards of the trade involved in accordance with approved Shop Drawings.
- F. Materials or items demolished shall become the property of the Contractor and shall be removed from the Owner's property.
- G. In general, demolition in small sections. Where necessary to prevent collapse of any construction, install temporary shores, struts, or bracing.
- H. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair.
- I. Where utilities are removed, or abandoned, cap, valve, plug, or by-pass to make complete and working installation.
- J. Upon completion of contract, deliver work complete and undamaged. Damage that may be caused by Contractor or Contractor's workmen to existing structures, grounds, and utilities shall be repaired by Contractor and left in as good condition as existed prior to damaging.
- K. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease and debris before completion of project.

3.3 CLEANING UP

- A. Remove debris as the work progresses. Maintain the premises in a neat and clean condition.

END OF SECTION 011000

SECTION 024100 – DEMOLITION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Building and Site Demolition:

1. Demolition of designated building structures.
2. Demolition of site improvements including paving, curbing, site walls, and utility structures.
3. Demolition of below-grade foundations and site improvements to depth to avoid conflict with new construction or site work.
4. Removal of hollow items or items that could collapse.
5. Protection of site work and adjacent structures.
6. Disconnection, capping, and removal of utilities.
7. Pollution control during building demolition, including noise control.
8. Salvaging items noted to be salvaged.
9. Removal and legal disposal of materials.

B. Selective Demolition:

1. Selective demolition of interior partitions, systems, and building components designated to be removed.
2. Selective demolition of exterior facade, structures, and components designated to be removed.
3. Protection of portions of building adjacent to or affected by selective demolition.
4. Removal of abandoned utilities and wiring systems.
5. Notification to Owner of schedule of the shut off of utilities serving occupied spaces.
6. Pollution control during selective demolition, including noise control.
7. Salvaging items noted to be reused within project only or salvaged.
8. Removal and legal disposal of materials

1.2 RELATED SECTIONS

- A. Section 013000 - Administrative Requirements
- B. Section 311000 - Site Clearing

1.3 SUBMITTALS

- A. See Section 013000 - Administrative Requirements for submittal procedures.
- B. Permit for transport and disposal of debris

- C. Demolition procedures and operation sequences for review and acceptance by Owner or Owner's Representative

#### 1.4 QUALITY ASSURANCE

- A. Comply with governing codes and regulations.
- B. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.
- C. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; current edition.
- D. Demolition Firm Qualifications: Company specializing in the type of work required.
  - 1. Minimum of 5 years of documented experience.
- E. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

#### 1.5 PROJECT CONDITIONS

- A. [Immediate areas next to work will not be occupied during selective demolition.] Adjacent areas may be occupied by Owner's personnel. Do not interrupt Owner's use of adjacent facilities. Refer to drawings for specific site conditions

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Immediately remove from site all demolished material not being reused.

### PART 3 - EXECUTION

#### 3.1 GENERAL PROCEDURES

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
  - 1. Obtain required permits.
  - 2. Comply with applicable requirements of NFPA 241.
  - 3. Take precautions to prevent collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.

- B. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- C. If unidentified hazardous materials are discovered during removal operations, stop work and notify Project Engineer immediately; hazardous materials include, but are not limited to, regulated asbestos-containing materials, lead, PCBs, mercury, and petroleum products.
- D. See Section 311000 – Site Clearing – for additional requirements pertaining to demolition of sitework and vegetation.

### 3.2 EXISTING UTILITIES

- A. Coordinate work with utility companies; notify before starting work and comply with utility company requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from the authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems currently in use without at least seven days' prior written notification to Project Engineer.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs currently in use without at least three days prior written notification to Project Engineer.
- F. Locate and mark all utilities to remain and those to be removed; mark using highly visible tags or flags with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.
- H. Where conduit is to remain and where conductor is to be disconnected, remove all conductors to electrical panel.
- I. Do not interrupt utilities serving occupied or used facilities without the written permission of the Owner and authorities having jurisdiction. If necessary, provide temporary utilities.

### 3.3 DEMOLITION

- A. Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
- B. Verify that utilities have been disconnected and capped before starting demolition activities.
- C. Remove refrigerant from mechanical equipment according to 40 CFR 82 - Protection of Stratospheric Ozone and regulations of authorities having jurisdiction before starting demolition.



- D. Do not damage building elements and improvements indicated to remain. Items of salvage value not included on schedule of salvage items to be returned to Owner shall be removed from structure. Storage or sale of items at project site is prohibited.
- E. Salvaged items to be returned to owner or reused shall be stored in a secure area and protected until reinstalled or returned to owner.
- F. Perform an engineering survey of the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
- G. Do not close or obstruct streets, walks, drives, or other occupied or used spaces or facilities without the written permission of the Owner and the authorities having jurisdiction.
- H. Cease operations if public safety or remaining structures are endangered. Perform temporary corrective measures until operations can be continued properly.
- I. Provide adequate protection against accidental trespassing. Secure project after work hours.
- J. Promptly repair damage to adjacent buildings, and other structure improvement systems caused by demolition operations.
- K. Unless otherwise indicated, demolition waste becomes property of Contractor.
- L. Instructions for special demolition work
- M. Repair demolition performed in excess of that required.
- N. Do not burn materials on site.
- O. Pollution Controls: Comply with governing regulations for environmental protection.
  - 1. Use water sprinkling, temporary enclosures, and other suitable methods to limit amount of dust and dirt rising and scattering in air.
  - 2. Provide hoses and water main or hydrant connections.
  - 3. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
- P. Break up and remove concrete slabs-on-grade, unless otherwise indicated to remain.
- Q. [Filling Basements and Voids:
  - 1. Completely fill below-grade areas and voids resulting from demolition of structures.
  - 2. Use soil materials consisting of stone, gravel, and sand; free from debris, trash, frozen materials, roots and other organic matter, and stones larger than 2 inches.
  - 3. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen material, trash, and debris.
  - 4. Place fill materials in horizontal layers not exceeding 6 inches loose depth.
  - 5. Compact each layer at optimum moisture content of fill material to density equal to original adjacent ground, unless subsequent excavation for new work is required.

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Form-facing material for cast-in-place concrete.
  2. Bracing and anchoring.

1.2 DEFINITIONS

- A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each of the following:
1. Exposed surface form-facing material.
  2. Concealed surface form-facing material.
  3. Form-release agent.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Erect, brace, and maintain formwork in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

2.2 FORM-FACING MATERIALS

- A. As-Cast Surface Form-Facing Material:
1. Provide continuous, true, and smooth concrete surfaces.
  2. Furnish in largest practicable sizes to minimize number of joints.

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3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:
  - a. Plywood or other approved panel materials.
  - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - 1) APA Plyform Class I, B-B or better; mill oiled and edge sealed.
- B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.
  1. Provide lumber dressed on at least two edges and one side for tight fit.

### 2.3 RELATED MATERIALS

- A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
  1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
  2. Surface Finish-3.0: ACI 117 Class B, 1/4 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
  1. Minimize joints.
  2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
  1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.

- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
  - 1. Provide and secure units to support screed strips
  - 2. Use strike-off templates or compacting-type screeds.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- J. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
  - 1. Determine sizes and locations from trades providing such items.
  - 2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.
- K. Construction and Movement Joints:
  - 1. Construct joints true to line with faces perpendicular to surface plane of concrete.
  - 2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 3. Place joints perpendicular to main reinforcement.
- L. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- M. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- N. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.2 INSTALLATION OF 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.
  - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
  - 3. Clean embedded items immediately prior to concrete placement.

3.3 REMOVING AND REUSING FORMS

- A. Formwork that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
- B. Clean and repair surfaces of forms to be reused in the Work.
  - 1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
  - 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
  - 1. Align and secure joints to avoid offsets.
  - 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, and supports for concrete reinforcement.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.2 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
  - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.
- B. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
  - 1. Finish: Plain.

## 2.3 FABRICATING REINFORCEMENT

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

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protection of In-Place Conditions:
  - 1. Do not cut or puncture vapor retarder.
  - 2. 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 reduce bond to concrete.

### 3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
  - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
  - 2. Do not tack weld crossing reinforcing bars.
- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings or in accordance with ACI 318.
- G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
  - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.

H. Lace overlaps with wire.

### 3.3 INSTALLATION TOLERANCES

A. Comply with ACI 117.

END OF SECTION 032000



## SECTION 033000 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
4. Section 321313 "Concrete Paving" for concrete pavement and walks.

#### 1.2 DEFINITIONS

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

- B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site with teleconference option.

1. 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.
- e. Structural Engineer.
- f. Owner's representative.

2. Review the following:

- a. Special inspection and testing and inspecting agency procedures for field quality control.
- b. Construction joints, control joints, isolation joints, and joint-filler strips.

- c. Vapor-retarder installation.
- d. Anchor rod and anchorage device installation tolerances.
- e. Cold and hot weather concreting procedures.
- f. Concrete finishes and finishing.
- g. Curing procedures.
- h. Forms and form-removal limitations.
- i. Steel-reinforcement installation.
- j. Methods for achieving specified floor and slab flatness and levelness.
- k. Floor and slab flatness and levelness measurements.
- l. Concrete repair procedures.
- m. Concrete protection.
- n. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
- o. Protection of field cured field test cylinders.

#### 1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Blended hydraulic cement.
5. Aggregates.
6. Admixtures:
  - a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
7. Vapor retarders.
8. Curing materials.
9. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Slump limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
9. Intended placement method.
10. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

- C. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:
  - 1. Concrete Class designation.
  - 2. Location within Project.
  - 3. Exposure Class designation.
  - 4. Formed Surface Finish designation and final finish.
  - 5. Final finish for floors.
  - 6. Curing process.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For the following:
  - 1. Installer: Include copies of applicable ACI certificates.
  - 2. Ready-mixed concrete manufacturer.
  - 3. Laboratory testing agency.
- B. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Curing compounds.
  - 4. Vapor retarders.
  - 5. Repair materials.
- C. Material Test Reports: For the following, from a qualified testing agency:
  - 1. Portland cement.
  - 2. Fly ash.
  - 3. Slag cement.
  - 4. Blended hydraulic cement.
  - 5. Aggregates.
  - 6. Admixtures.
- D. Research Reports:
  - 1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
- E. Preconstruction Test Reports: For each mix design.
- F. Minutes of preinstallation conference.

#### 1.6 QUALITY ASSURANCE

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

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- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
  - 1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.
  - 1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

### 1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
  - 1. Include the following information in each test report:
    - a. Admixture dosage rates.
    - b. Slump.
    - c. Air content.
    - d. Seven-day compressive strength.
    - e. 28-day compressive strength.

### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

### 1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.
  - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 3. Do not use frozen materials or materials containing ice or snow.
  - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
  - 5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

## PART 2 - PRODUCTS

### 2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

### 2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II.
2. Fly Ash: ASTM C618, Class F.
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C595/C595M; Type IP, portland-pozzolan; or Type IL, portland-limestone cement.
5. Performance-Based Hydraulic Cement: ASTM C1157/C1157M: Type GU, general use.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:
  - a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
  - b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
  - c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

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2. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
  3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- D. Air-Entraining Admixture: ASTM C260/C260M.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
  2. Retarding Admixture: ASTM C494/C494M, Type B.
  3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
  4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
  5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
  6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- F. Water and Water Used to Make Ice: ASTM C94/C94M, potable or complying with ASTM C1602/C1602M, including all limits listed in Table 2 and the requirements of paragraph 5.4.

### 2.3 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A, except with maximum water-vapor permeance of; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

### 2.4 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
1. Color:
    - a. Ambient Temperature Below 50 deg F: Black.
    - b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
    - c. Ambient Temperature Above 85 deg F: White.
- D. Curing Paper: 8-foot-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Fortifiber Building Systems Group.

- E. Water: Potable or complying with ASTM C1602/C1602M.
- F. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.
- G. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

## 2.5 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

## 2.6 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
  - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
  - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
  - 1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
  - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
  - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
  - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

## 2.7 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, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  1. Fly Ash: 25 percent by mass.
  2. Slag Cement: 50 percent by mass.
  3. Total of Fly Ash or Other Pozzolans, and Slag Cement: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.
  1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
  2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

## 2.8 CONCRETE MIXTURES

- A. Class A: Normal-weight concrete used for footings and pier-type post footings.
  1. Exposure Class: ACI 318 – F2; W0; C1.
  2. Minimum Compressive Strength: As indicated at 28 days.
  3. Maximum w/cm: 0.50.
  4. Slump Limit: 4 inches, plus or minus 1 inch.
  5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
  6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- B. Class B: Normal-weight concrete used for interior slabs-on-ground.
  1. Exposure Class: ACI 318 – F0; W0; C1.
  2. Minimum Compressive Strength: As indicated at 28 days.
  3. Maximum w/cm: 0.45.
  4. Minimum Cementitious Materials Content: 540 lb/cu. yd.
  5. Slump Limit: 4 inches, plus or minus 1 inch.
  6. Air Content:
    - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
  7. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.
- C. Class C: Normal-weight concrete used for exterior concrete pedestals.



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1. Exposure Class: ACI 318 – F2; W0; C1.
2. Minimum Compressive Strength: As indicated at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 4 inches, plus or minus 1 inch.
5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

### 2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish batch ticket information.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions:
  1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
  2. Do not proceed until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
  1. Daily access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
  4. Security and protection for test samples and for testing and inspection equipment at Project site.

### 3.3 INSTALLATION OF 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.
  1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.

### 3.4 INSTALLATION OF VAPOR RETARDER

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
  1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
  2. Face laps away from exposed direction of concrete pour.
  3. Lap vapor retarder down onto perimeter masonry walls not less than 6 inches, sealing vapor retarder to concrete.
  4. Lap joints 6 inches and seal with manufacturer's recommended tape.
  5. Terminate vapor retarder as shown at the edge of floor slabs, sealing entire perimeter to foundation walls.
  6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
  7. Protect vapor retarder during placement of reinforcement and concrete.
    - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

### 3.5 JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
  1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
  2. Place joints perpendicular to main reinforcement.
    - a. Continue reinforcement across construction joints unless otherwise indicated.
    - b. Do not continue reinforcement through sides of strip placements of floors.
  3. Form keyed joints as indicated. Embed keys at least 1 1/2 inches into concrete.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints as indicated and as follows:
  1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

### 3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
  - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
  - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and Special Inspector 24 hours prior to commencement of concrete placement.
- C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.
  - 1. If a section cannot be placed continuously, provide construction joints as indicated.
  - 2. Deposit concrete to avoid segregation.
- F. 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. Do not place concrete floors and slabs in a checkerboard sequence.
  - 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 3. Maintain reinforcement in position on chairs during concrete placement.
  - 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 5. Level concrete, cut high areas, and fill low areas.
  - 6. Slope surfaces uniformly to drains or workpoints where required.
  - 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
  - 8. Do not further disturb slab surfaces before starting finishing operations.

### 3.7 FINISHING FORMED SURFACES

- A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
  - a. Patch voids larger than 1 1/2 inches wide or 1/2 inch deep.
  - b. Remove projections larger than 1 inch.
  - c. Tie holes do not require patching.
  - d. Surface Tolerance: ACI 117 Class D.
  - e. Apply to concrete surfaces not exposed to public view.
2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
  - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
  - b. Remove projections larger than 1/4 inch.
  - c. Patch tie holes.
  - d. Surface Tolerance: ACI 117 Class B.

**B. Related Unformed Surfaces:**

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth, and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent surfaces unless otherwise indicated.

**3.8 FINISHING FLOORS AND SLABS**

- A.** Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

**B. Float Finish:**

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish.

**C. Trowel Finish:**

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.

5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to interior slab-on-grade.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
  - a. Slabs on Ground and Suspended Slabs:
    - 1) Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch. Exception: slope slab-on-grade as indicated at regions adjacent to floor drains.

D. Broom Finish: Apply a broom finish to exterior concrete steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

### 3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

### 3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. If forms remain during curing period, moist cure after loosening forms.
3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

- a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
- b. Continuous Sprinkling: Maintain concrete surface continuously wet.
- c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
- d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
- e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
  - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
  - 2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:
  - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
    - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
      - a) Lap edges and ends of absorptive cover not less than 12 inches.
      - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
    - 2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
      - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
      - b) Cure for not less than seven days.
    - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
      - a) Water.
      - b) Continuous water-fog spray.
  - b. Floors to Receive Curing Compound:

- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Maintain continuity of coating, and repair damage during curing period.
- 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

c. Floors to Receive Curing and Sealing Compound:

- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Repeat process 24 hours later and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

### 3.11 TOLERANCES

- A. Conform to ACI 117.

### 3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 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 in any dimension to solid concrete.
  - a. Limit cut depth to 3/4 inch.
  - b. Make edges of cuts perpendicular to concrete surface.
  - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
  - d. Fill and compact with patching mortar before bonding agent has dried.
  - e. 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 matches surrounding color.
  - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
  - b. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
  - a. Correct low and high areas.
  - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
  - a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
  - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  - b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
  - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
  - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
  - a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.



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- b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
  - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
  - d. Place, compact, and finish to blend with adjacent finished concrete.
  - e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
- a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
  - b. Dampen cleaned concrete surfaces and apply bonding agent.
  - c. Place patching mortar before bonding agent has dried.
  - d. Compact patching mortar and finish to match adjacent concrete.
  - e. 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.

3.13 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
  2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
  3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
      - 1) Project name.
      - 2) Name of testing agency.
      - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
      - 4) Name of concrete manufacturer.
      - 5) Date and time of inspection, sampling, and field testing.
      - 6) Date and time of concrete placement.

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- 7) Location in Work of concrete represented by samples.
  - 8) Date and time sample was obtained.
  - 9) Truck and batch ticket numbers.
  - 10) Design compressive strength at 28 days.
  - 11) Concrete mixture designation, proportions, and materials.
  - 12) Field test results.
  - 13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
  - 14) Type of fracture and compressive break strengths at seven days and 28 days.
- C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.
- D. Inspections:
1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
  2. Steel-reinforcement installation.
  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.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:
1. Testing Frequency: Obtain a minimum of three composite samples for each day's pour of each concrete mixture.
  2. Slump: ASTM C143/C143M:
    - a. 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.
    - b. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete.
    - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  4. Concrete Temperature: ASTM C1064/C1064M:
    - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.
  5. Compression Test Specimens: ASTM C31/C31M:

- a. Cast and laboratory cure two sets of three 4-inch by 8-inch cylinder specimens for each composite sample.
  - b. When cold- or hot-weather procedures are used, cast, initial cure, and field cure two companion sets of three cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M.
- a. Test one set of three laboratory-cured specimens at seven days and one set of three specimens at 28 days.
  - b. If used, test one set of three field-cured companion specimens at seven days and one set of three specimens at 28 days.
  - c. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor must inform Owner, evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
8. 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 if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
10. Additional Tests:
- a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
  - b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
    - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

### 3.14 PROTECTION

- A. Protect concrete surfaces as follows:
1. Protect from petroleum stains.
  2. Diaper hydraulic equipment used over concrete surfaces.

3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Lintels.
3. Mortar and grout materials.
4. Reinforcement.
5. Accessories.
6. Mortar and grout mixes.

B. Products Installed but not Furnished under This Section:

1. Steel bearing plates in unit masonry.
2. Cavity wall insulation attached to masonry backup.

C. Related Requirements:

1. Section 042113 "Brick Masonry" for face brick, ties and anchors, accessories, and wall mockup.
2. Section 072100 - "Thermal Insulation" for cavity wall insulation.
3. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashing.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Indicate elevations of reinforced walls.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each type of the following:
1. Masonry units.
    - a. Include data on material properties.
  2. Cementitious materials. Include name of manufacturer, brand name, and type.
  3. Mortar admixtures.
  4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  5. Grout mixes. Include description of type and proportions of ingredients.
  6. Reinforcing bars.
  7. Joint reinforcement.
  8. Anchors, ties, and metal accessories.
- B. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
  2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.6 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

## PART 2 - PRODUCTS

### 2.1 SOURCE LIMITATIONS

- A. Obtain exposed masonry units, cementitious mortar components, and mortar aggregate from single source.
- B. For exposed masonry units and cementitious mortar components, obtain each color and grade from single source with resources to provide materials of consistent quality in appearance and physical properties.

### 2.2 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.

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- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.

### 2.3 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  - 2. Provide bullnose units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C90, lightweight.
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
  - 2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

### 2.4 LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

### 2.5 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, 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.
  - 1. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.
- E. Mortar Cement: ASTM C1329/C1329M.
- F. Preblended Dry Mortar Mix: Packaged blend made from portland cement and hydrated lime, masonry cement, or mortar cement, sand, and admixtures and complying with ASTM C1714/C1714M.



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G. Aggregate for Mortar: ASTM C144.

H. Aggregate for Grout: ASTM C404.

I. Water: Potable.

### 2.6 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.

1. Walls: Hot-dip galvanized carbon steel.
2. Wire Size for Side Rods: 0.148-inch diameter.
3. Wire Size for Cross Rods: 0.148-inch diameter.
4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 ft., with prefabricated corner and tee units.

D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

### 2.7 ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

### 2.8 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime, masonry cement, or mortar cement mortar unless otherwise indicated.

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- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide Type S mortar.
- D. Grout for Unit Masonry: Comply with ASTM C476.
  - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602 for dimensions of grout spaces and pour height.
  - 2. Proportion grout in accordance with ASTM C476, Table 1 or paragraph 4.2.1.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
  - 3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143/C143M.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
  - 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp,

unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

### 3.3 TOLERANCES

#### A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

#### B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

#### C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
  - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
  - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
  - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
  - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
  - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- 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 to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- E. Cut joints flush where indicated to receive waterproofing or cavity wall insulation unless otherwise indicated.

### 3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches o.c.
  - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.

### 3.7 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
  - 1. Install preformed control-joint gaskets designed to fit standard sash block.

### 3.8 LINTELS

- A. Provide masonry or offset angle support lintels where indicated and where openings of more than 12 inches are required.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

### 3.9 REINFORCED UNIT MASONRY

- A. Placing Reinforcement: Comply with requirements in TMS 602.
- B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

### 3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements will be at Contractor's expense.
- B. Inspections: Special inspections in accordance with Level 2 in TMS 402.
  1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Frequency: One set of tests for each 1000 sq. ft. of wall area or portion thereof.
- D. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140/C140M for compressive strength.
- E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.
- F. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

### 3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.

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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 nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  1. Crush masonry waste to less than 4 inches in each dimension.
  2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
  3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

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 Architect and approved in writing.
- B. Material Certificates: For each type and size of the following:
  1. Masonry units.
    - a. Include data on material properties
    - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
    - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
  2. Cementitious materials. Include brand, type, and name of manufacturer.
  3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  4. Grout mixes. Include description of type and proportions of ingredients.
  5. Anchors, ties, and metal accessories.
- C. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

#### 1.5 QUALITY ASSURANCE

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  1. Build mockup of typical wall area as shown on Drawings.
  2. Build mockups for each type of exposed unit masonry construction in sizes approximately **60 inches (1500 mm)** long by 24 **inches (600 mm)** high by full thickness, including accessories.
    - a. Include a sealant-filled joint at least **16 inches (400 mm)** long in mockup.
    - b. Include through-wall flashing.
    - c. Include air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in mockup.
  3. Clean exposed faces of mockups with masonry cleaner as indicated.
  4. Protect accepted mockups from the elements with weather-resistant membrane.



5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
  - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
  - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- C. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.7 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  1. Extend cover a minimum of **24 inches (600 mm)** down both sides of walls 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 (600 mm)** down face next to unconstructed wythe and hold cover in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
  1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F (4 deg C)** and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## PART 2 - PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

### 2.2 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units.
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
  2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
  4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: Facing brick complying with ASTM C 216.
1. Products: Subject to compliance with requirements, **provide the following:**
    - a. Palmetto Brick Company Modular Red Wirecut with Holcim Frosty Mortar
  2. Grade: **SW**.
  3. Type: **FBS**

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4. Initial Rate of Absorption: Less than **30 g/30 sq. in. (30 g/194 sq. cm)** per minute when tested per ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Size (Actual Dimensions): **3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.**
7. Color and Texture: Red, Wirecut

### 2.3 MORTAR MATERIALS

- A. Colored Cement Product: Packaged blend made from **mortar cement** and mortar pigments, all complying with specified requirements, and containing no other ingredients.
  1. Colored Masonry Cement:
    - a. **Products:** Subject to compliance with requirements, **provide the following:**
      - 1) Holcim (US) Inc.; Rainbow Mortamix Custom Color Masonry Cement.
    2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
    3. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
- B. Aggregate for Mortar: ASTM C 144.
  1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
  2. For joints less than **1/4 inch (6 mm)** thick, use aggregate graded with 100 percent passing the **No. 16 (1.18-mm)** sieve.
  3. White-Mortar Aggregates: Natural white sand or crushed white stone.
  4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

### 2.4 REINFORCEMENT

- A. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

### 2.5 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
  1. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
- B. Corrugated Metal Ties: Metal strips not less than **7/8 inch (22 mm)** wide with corrugations having a wavelength of **0.3 to 0.5 inch (7.6 to 12.7 mm)** and an amplitude of **0.06 to 0.10 inch (1.5 to 2.5 mm)** made from **0.060-inch- (1.52-mm-)** thick, steel sheet, galvanized after fabrication.

- C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least **5/8-inch (16-mm)** cover on outside face. Outer ends of wires are bent 90 degrees and extend **2 inches (50 mm)** parallel to face of veneer.

## 2.6 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:
  - 1. Stainless Steel: ASTM A 240/A 240M, Type 304, **0.016 inch (0.40 mm)** thick.
  - 2. Fabricate continuous flashings in sections **96 inches (2400 mm)** long minimum, but not exceeding **12 feet (3.7 m)**. Provide splice plates at joints of formed, smooth metal flashing.
  - 3. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.
  - 4. Fabricate through-wall flashing with drip edge **unless otherwise** indicated. Fabricate by extending flashing **1/2 inch (13 mm)** out from wall, with outer edge bent down 30 degrees and hemmed.
- B. Application: Unless otherwise indicated, use the following:
  - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
  - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
  - 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge
  - 4. Where flashing is fully concealed, use metal flashing.
- C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
- D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

## 2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- C. Weep/Vent Products: Use the following unless otherwise indicated:

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1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth **1/8 inch (3 mm)** less than depth of outer wythe, in color selected from manufacturer's standard.

a. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- 1) [Advanced Building Products Inc.](#); Mortar Maze weep vent.
- 2) [Blok-Lok Limited](#); Cell-Vent.
- 3) [Dayton Superior Corporation, Dur-O-Wal Division](#); Cell Vents.
- 4) [Heckmann Building Products Inc.](#); No. 85 Cell Vent.
- 5) [Hohmann & Barnard, Inc.](#); Quadro-Vent.
- 6) [Wire-Bond](#); Cell Vent.

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

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

- a. [Advanced Building Products Inc.](#);
- b. [Archovations, Inc.](#); CavClear Masonry Mat.
- c. [Dayton Superior Corporation, Dur-O-Wal Division](#); Polytite MortarStop.
- d. [Mortar Net USA, Ltd.](#); Mortar Net.

## 2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

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

- a. [Diedrich Technologies, Inc.](#)
- b. [EaCo Chem, Inc.](#)
- c. [ProSoCo, Inc.](#)

## 2.9 MORTAR MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar.
2. Use mortar cement mortar unless otherwise indicated.

3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
  1. Mix to match Architect's sample.
  2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
    - a. Concrete facing brick.
    - b. Face brick.
    - c. Stone trim units.
    - d. Cast stone trim units.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION, GENERAL

- A. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- B. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- C. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  1. Mix units from several pallets or cubes as they are placed.
- D. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds **30 g/30 sq. in. (30 g/194 sq. cm)** per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

#### 3.3 TOLERANCES

- A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation do not vary by more than plus **1/2 inch (12 mm)** or minus **1/4 inch (6 mm)**.
2. For location of elements in plan do not vary from that indicated by more than plus or minus **1/2 inch (12 mm)**.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus **1/4 inch (6 mm)** in a story height or **1/2 inch (12 mm)** total.

**B. Lines and Levels:**

1. For bed joints and top surfaces of bearing walls do not vary from level by more than **1/4 inch in 10 feet (6 mm in 3 m)**, or **1/2 inch (12 mm)** maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
3. For vertical lines and surfaces do not vary from plumb by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
5. For lines and surfaces do not vary from straight by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than **1/4 inch in 10 feet (6 mm in 3 m)**, or **1/2 inch (12 mm)** maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than **1/16 inch (1.5 mm)** except due to warpage of masonry units within tolerances specified for warpage of units.

**C. Joints:**

1. For bed joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**, with a maximum thickness limited to **1/2 inch (12 mm)**; do not vary from bed-joint thickness of adjacent courses by more than **1/8 inch (3 mm)**.
2. For exposed head joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**. Do not vary from adjacent bed-joint and head-joint thicknesses by more than **1/8 inch (3 mm)**.
3. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than **1/16 inch (1.5 mm)** from one masonry unit to the next.

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal **4-inch (100-mm)** horizontal face dimensions at corners or jambs.

- C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick as follows:
  - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  - 2. With entire units, including areas under cells, fully bedded in mortar at starting course on footings.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

### 3.6 ANCHORING MASONRY VENEERS

- A. Anchor masonry veneers to concrete block backup with masonry-veneer anchors to comply with the following requirements:
  - 1. Fasten screw-attached anchors to concrete block backup with metal fasteners of type indicated. Use two fasteners unless anchor design only uses one fastener.
  - 2. Insert slip-in anchors in metal studs as sheathing is installed. Provide one anchor at each stud in each horizontal joint between sheathing boards.
  - 3. Embed tie sections in masonry joints. Provide not less than **4 inches (50 mm)** of air space between back of masonry veneer and face of sheathing.
  - 4. Space anchors as indicated, but not more than **16 inches (458 mm)** o.c. vertically and **24 inches (610 mm)** o.c. horizontally, with not less than 1 anchor for each **2 sq. ft. (0.2 sq. m)** of wall area. Install additional anchors within **12 inches (305 mm)** of openings and at intervals, not exceeding **8 inches (203 mm)**, around perimeter.

### 3.7 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.



- B. Install flashing as follows unless otherwise indicated:
1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  2. At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of sheathing at least **8 inches (200 mm)**; with upper edge tucked under building paper or building wrap, lapping at least **4 inches (100 mm)**.
  3. At lintels and shelf angles, extend flashing a minimum of **6 inches (150 mm)** into masonry at each end. At heads and sills, extend flashing **6 inches (150 mm)** at ends and turn up not less than **2 inches (50 mm)** to form end dams.
  4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than **1-1/2 inches (38 mm)** or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
  5. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
  6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing **1/2 inch (13 mm)** back from outside face of wall and adhere flexible flashing to top of metal drip edge.
  7. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing **1/2 inch (13 mm)** back from outside face of wall and adhere flexible flashing to top of metal flashing termination.
  8. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
1. Use specified weep/vent products to form weep holes.
  2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
  3. Space weep holes **24 inches (600 mm)** o.c. unless otherwise indicated.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- F. Install vents in head joints in exterior wythes at spacing indicated. Use specified weep/vent products to form vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

### 3.8 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections: Level 1 special inspections according to the "International Building Code."
  - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
- C. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

### 3.9 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 5. Clean brick by bucket-and-brush hand-cleaning method described in "BIA Technical Notes 20."
  - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
  - 7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
  - 8. Clean stone trim to comply with stone supplier's written instructions.

9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

### 3.10 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  1. Crush masonry waste to less than **4 inches (100 mm)** in each dimension.
  2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
  3. Do not dispose of masonry waste as fill within **18 inches (450 mm)** of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042113

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel materials.

B. Related Requirements:

1. Section 099113 "Exterior Painting" for painting requirements.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Threaded rods.
4. Shop primer.
5. Galvanized-steel primer.
6. Etching cleaner.
7. Galvanized repair paint.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, holes, and other pertinent data.
2. Indicate type, size, and length of bolts, distinguishing between shop and field bolts.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- B. Mill test reports for structural-steel materials, including chemical and physical properties.
- C. Product Test Reports: For the following:
  - 1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
  - 1. ANSI/AISC 303.
  - 2. ANSI/AISC 360.
  - 3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

### 2.2 STRUCTURAL-STEEL MATERIALS

- A. Plate and Bar: ASTM A36/A36M.

## 2.3 BOLTS AND CONNECTORS

- A. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
1. Finish: Hot-dip zinc coating.

## 2.4 RODS

- A. Threaded Rods: ASTM A36/A36M.
1. Nuts: ASTM A63 heavy-hex carbon steel.
  2. Washers: ASTM F436 (ASTM F436M), Type 1, hardened carbon steel.
  3. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

## 2.5 PRIMER

- A. Steel Primer:
1. Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanized-Steel Primer: MPI#26, MPI#80, or MPI#134.
1. Etching Cleaner: MPI#25, for galvanized steel.
  2. Galvanizing Repair Paint: ASTM A780/A780M.

## 2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.
1. Mark and match-mark materials for field assembly.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
  2. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
1. Cut, drill, or punch holes perpendicular to steel surfaces.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
  - 1. Galvanize steel connection plates.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces after hot dip galvanizing. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
  - 1. SSPC-SP 2.
  - 2. SSPC-SP 3.
- B. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.
- C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep wooden truss members secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent wooden trusses, connections, and bracing are in place unless otherwise indicated on Drawings.

3.2 ERECTION

- A. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
  - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

- B. Do not use thermal cutting during erection.
- C. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- D. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.

### 3.3 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
  - 1. Joint Type: Snug tightened.

### 3.4 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:
  - 1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
    - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
  - 2. Cleaning and touchup painting are specified in Section 099113 "Exterior Painting."

### 3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
  - 1. Verify structural-steel materials.
  - 2. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
  - 1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

END OF SECTION 051200



1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
1. Steel framing and supports for countertops.
  2. Steel tube reinforcement for low partitions.
  3. Steel framing and supports for mechanical and electrical equipment.
  4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
  5. Loose steel lintels.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

## 2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or **ASTM F 1941 (ASTM F 1941M)**, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
1. Provide stainless-steel fasteners for fastening aluminum.
  2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, **ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6)**; with hex nuts, **ASTM A 563 (ASTM A 563M)**; and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, **ASTM F 593 (ASTM F 738M)**; with hex nuts, **ASTM F 594 (ASTM F 836M)**; and, where indicated, flat washers; Alloy **[Group 1 (A1)] [Group 2 (A4)]**.

## 2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with **Section 099600 "High-Performance Coatings."**
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

- H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

#### 2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 inch (1 mm)** unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, **1/8 by 1-1/2 inches (3.2 by 38 mm)**, with a minimum **6-inch (150-mm)** embedment and **2-inch (50-mm)** hook, not less than **8 inches (200 mm)** from ends and corners of units and **24 inches (600 mm)** o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
  - 1. Fabricate units from slotted channel framing where indicated.
  - 2. Furnish inserts for units installed after concrete is placed.

2.6 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.
- B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
  - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize and prime exterior miscellaneous steel trim.
- D. Prime exterior miscellaneous steel trim with primer specified in Section 099600 "High-Performance Coatings."

2.7 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
- B. Galvanize plates.
- C. Prime plates with zinc-rich primer.

2.8 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than **8 inches (200 mm)** unless otherwise indicated.

- C. Galvanize and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

## 2.9 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

## 2.10 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with universal shop primer unless zinc-rich primer is indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## 2.11 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
  - 1. Cast Aluminum: Heavy coat of bituminous paint.
  - 2. Extruded Aluminum: Two coats of clear lacquer.

#### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.
  1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

### 3.3 INSTALLING BEARING AND LEVELING PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
- B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  1. Apply by brush or spray to provide a minimum **2.0-mil (0.05-mm)** dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting.", Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

## SECTION 061000 - ROUGH CARPENTRY

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Wood-preservative-treated lumber.
3. Dimension lumber framing.
4. Miscellaneous lumber.

B. Related Requirements:

1. Section 061300 "Heavy Timber Construction" for exposed heavy timber trusses.
2. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.
3. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.

#### 1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. Lumber grading agencies, and abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
  2. NLGA: National Lumber Grades Authority.
  3. SPIB: The Southern Pine Inspection Bureau.
  4. WCLIB: West Coast Lumber Inspection Bureau.
  5. WWPA: Western Wood Products Association.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.



2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 WOOD PRODUCTS

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
  3. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content:
  1. Boards: 19 percent.
  2. Dimension Lumber: 19 percent unless otherwise indicated.

#### 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1, Use categories as follows:
  1. UC2: Interior construction not in contact with ground but may be subject to moisture. Include the following items:
    - a. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
  2. UC3B (Commodity Specification A): Uncoated sawn products in exterior construction not in contact with ground, exposed to all weather cycles including intermittent wetting but with sufficient air circulation for wood to dry. Excludes sawn products not in contact with ground but with ground contact-type hazards. Include the following items:

- a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  3. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

## 2.3 DIMENSION LUMBER FRAMING

- A. Joists, Rafters, and Other Framing by Grade: No. 2 grade.
1. Species:
    - a. Southern pine; SPIB.

## 2.4 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
  2. Nailers.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of the following species:
1. Mixed southern pine or southern pine; SPIB.

## 2.5 FASTENERS

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.

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1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, ICC-ES AC58, ICC-ES AC193, or ICC-ES AC308 as appropriate for the substrate.

### 2.6 METAL FRAMING ANCHORS

- A. Basis of Design products are indicated on Drawings. Provide products indicated or submit substitutions applicable for the same condition demonstrating equal or greater allowable design loads.
  1. Allowable design loads, as published by manufacturer, are to comply with or exceed those of Basis of Design products indicated. Manufacturer's published values must be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors must be punched for fasteners adequate to withstand same loads as framing anchors.
  2. Truss Tie-Downs (Hurricane Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below.
  3. Rafter or Joist Hangers: Brackets for face-mounting framing to supporting member.
  4. Miscellaneous Other Framing Anchors: As indicated in Drawings.
- B. Materials: Unless otherwise indicated, fabricate from the following materials:
  1. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 coating designation.
    - a. Use for interior locations unless otherwise indicated.
  2. Heavy-Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
    - a. Use for anchors in contact with wood-preservative-treated lumber and where indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- F. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWWA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. Table 2304.10.2, "Fastening Schedule," in ICC's International Building Code (IBC).
  - 2. ICC-ES evaluation report for fastener.
- J. Securely attach roofing nailers to substrates by anchoring and fastening to withstand bending, shear, or other stresses imparted by Project wind loads and fastener-resistance loads as designed in accordance with ASCE/SEI 7.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials.

Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

### 3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.

### 3.3 INSTALLATION OF RAFTER FRAMING

- A. Rafters and Outlookers: Notch to fit exterior wall plates and use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers.
- B. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.
- C. Provide solid blocking between rafters over supporting trusses or walls.
- D. Provide solid blocking of 2-inch nominal thickness at ends of rafters as indicated.
- E. Do not notch rafters without approval of the Architect.

### 3.4 PROTECTION

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

END OF SECTION 061000

## SECTION 061300 - HEAVY TIMBER CONSTRUCTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Timber.
2. Timber connectors.
3. Miscellaneous materials.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for dimensional lumber items associated with heavy timber framing.
2. Section 061753 "Shop-Fabricated Wood Trusses."

#### 1.2 DEFINITIONS

A. Timbers: Lumber of 5 inches nominal or greater in least dimension.

B. Inspection agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NHLA: National Hardwood Lumber Association.
3. NLGA: National Lumber Grades Authority.
4. SPIB: Southern Pine Inspection Bureau (The).
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

#### 1.3 ACTION SUBMITTALS

A. Product Data:

1. For timber connectors. Include installation instructions.

B. Shop Drawings: For heavy timber framing. Show layout, dimensions of each member, and details of connections.

#### 1.4 INFORMATIONAL SUBMITTALS

A. Certificates of Inspection: Issued by lumber-grading agency for exposed timber not marked with grade stamp.

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### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Schedule delivery of materials to avoid extended on-site storage and to avoid delaying the Work.
- B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings.

## PART 2 - PRODUCTS

### 2.1 TIMBER

- A. Comply with DOC PS 20 and with grading rules of lumber-grading agencies certified by ALSC's Board of Review as applicable.
  - 1. Factory mark each item of timber with grade stamp of grading agency.
  - 2. For exposed timber indicated to receive a stained or natural finish, apply grade stamps to surfaces that are not exposed to view, or omit grade stamps and provide certificates of grade compliance issued by grading agency.
- B. Timber Species and Grade:
  - 1. Southern pine; No. 2, SPIB.
- C. Moisture Content: Provide timber with 19 percent maximum moisture content at time of dressing.
- D. Dressing: Provide dressed timber (S4S) unless otherwise indicated.

### 2.2 TIMBER CONNECTORS

- A. For metal framing hangers and metal connection plates, see Section 061753 "Shop-Fabricated Wood Trusses."
- B. Provide bolts as indicated, complying with ASTM A307, Grade A; provide nuts complying with ASTM A563; and, where indicated, provide flat washers.
- C. Materials: Unless otherwise indicated, fabricate from the following materials:
  - 1. Structural-steel shapes, plates, and flat bars complying with ASTM A36/A36M.
- D. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A123/A123M or ASTM A153/A153M.

## 2.3 MISCELLANEOUS MATERIALS

- A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.
- B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

## 2.4 FABRICATION

- A. Camber: Fabricate horizontal members and inclined members with a slope of less than 1:1, with natural convex bow (crown) up, to provide camber.
- B. Shop fabricate members by cutting and restoring exposed surfaces to match specified surfacing. Finish exposed surfaces to remove planing or surfacing marks, and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
- C. Predrill for fasteners and assembly of units.
- D. Coat crosscuts with end sealer.
- E. Seal Coat: After fabricating and surfacing each unit, apply a saturation coat of penetrating sealer on surfaces of each unit except for treated wood where the treatment included a water repellent.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Erect heavy timber framing true and plumb. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
  - 1. Install horizontal and sloping members with crown edge up, and provide not less than 4 inches of bearing on supports. Provide continuous members unless otherwise indicated; tie together over supports with metal strap ties if not continuous.
  - 2. Handle and temporarily support heavy timber framing to prevent surface damage, compression, and other effects that might interfere with indicated finish.
- B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
- C. Fitting: Fit members by cutting and restoring exposed surfaces to match specified surfacing.
  - 1. Predrill for fasteners using timber connectors as templates.
  - 2. Finish exposed surfaces to remove planing or surfacing marks, and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
  - 3. Coat crosscuts with end sealer.



- D. Install timber connectors as indicated.
  - 1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
  - 2. Install bolts with orientation as indicated or, if not indicated, as directed by Architect.

### 3.2 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged heavy timber framing if repairs are not approved by Architect.

END OF SECTION 061300

## SECTION 061600 - SHEATHING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Roof sheathing.

#### 1.2 ACTION SUBMITTALS

A. Product Data:

1. Wall sheathing.
2. Roof sheathing.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

### PART 2 - PRODUCTS

#### 2.1 WOOD PANEL PRODUCTS

- A. Factory mark panels to indicate compliance with applicable standard.

#### 2.2 WALL SHEATHING

- A. Plywood Sheathing, Walls: DOC PS 1 Exterior sheathing.

1. Span Rating: Not less than 32/16.
2. Nominal Thickness: Not less than 15/32 inch.

#### 2.3 ROOF SHEATHING

- A. Plywood Sheathing, Roofs: DOC PS 1 Exterior sheathing.

1. Span Rating: Not less than 40/20.

2. Nominal Thickness: Not less than 19/32 inch.

#### 2.4 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  1. Table 2304.10.2, "Fastening Schedule," in the ICC's International Building Code.
  2. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 INSTALLATION OF WOOD STRUCTURAL PANEL

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:

Wall and Roof Sheathing:

- a. Nail to wood framing.
- b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 061600

## SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Wood products.

B. Related Requirements:

1. Section 061300 "Heavy Timber Construction" for exposed heavy timber trusses.

#### 1.2 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

- B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6. Show splice details and bearing details.

- C. Delegated Design Submittals: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For metal connector-plate manufacturer and fabricator.

- B. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss-fabricating firm.
- C. Evaluation Reports: For the following, from ICC-ES:
  - 1. Metal-plate connectors.
  - 2. Metal truss accessories.

## 1.5 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
  - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
  - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
  - 1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
  - 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
  - 3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Metal-plate-connected wood trusses are to be capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

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1. Design Loads: As indicated.
2. Maximum Deflection under Design Loads:
  - a. Roof Trusses: Vertical deflection of 1/240 of span.

- C. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

### 2.2 WOOD PRODUCTS

- A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
  1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. Provide dressed lumber, S4S.
  3. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
  4. For exposed lumber indicated to receive a stained finish, refer to Section 061300 "Heavy Timber Construction."
- B. Minimum Chord Size for Roof Trusses: 2 by 6 inches nominal for both top and bottom chords, unless otherwise noted.
- C. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

### 2.3 METAL CONNECTOR PLATES

- A. Fabricate connector plates to comply with TPI 1.
- B. Hot-Dip Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.
  1. Use for interior locations unless otherwise indicated.

### 2.4 FASTENERS

- A. Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
  1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
  2. Provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

- B. Nails, Brads, and Staples: ASTM F1667.

## 2.5 METAL FRAMING ANCHORS AND ACCESSORIES

- A. Basis of Design products are indicated on Drawings. Provide products indicated or submit substitutions applicable for the same condition demonstrating equal or greater allowable design loads.
  - 1. Allowable design loads, as published by manufacturer, are to comply with or exceed those of basis-of-design products indicated. Manufacturer's published values are to be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency. Framing anchors are to be punched for fasteners adequate to withstand same loads as framing anchors.
  - 2. Truss Tie-Downs (Hurricane Ties): Bent strap tie for fastening roof trusses to wall framing below.
  - 3. Miscellaneous Other Framing Anchors: As indicated in Drawings.
- B. Materials: Unless otherwise indicated, fabricate from the following materials:
  - 1. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A653/A653M, G60 (Z180) coating designation.
    - a. Use for interior locations unless otherwise indicated.
  - 2. Hot-Dip Heavy-Galvanized-Steel Sheet: ASTM A653/A653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.
    - a. Use for metal framing anchors contacting wood-preserved-treated lumber, and where indicated.

## 2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 92 percent zinc dust by weight.

## 2.7 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.



1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## 2.8 SOURCE QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.
  1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
  2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.
- B. Correct deficiencies in Work that special inspections indicate do not comply with the Contract Documents.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; use metal truss tie-downs. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.
- H. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
  1. Install bracing to comply with Section 061000 "Rough Carpentry."
- I. Install wood trusses within installation tolerances in TPI 1.

- J. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- K. Replace wood trusses that are damaged or do not comply with requirements.
  - 1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.

### 3.2 REPAIRS AND PROTECTION

- A. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Repair damaged galvanized coatings on exposed surfaces in accordance with ASTM A780/A780M and manufacturer's written instructions.

### 3.3 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections to verify that temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the approved truss submittal package.

END OF SECTION 061753

## SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Plastic-laminate cabinets.
  - 2. Solid-surfacing-material countertops.
  - 3. Closet and utility shelving.
- B. Related Sections include the following:
  - 1. Division 06 Section "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
  - 2. Division 06 Section "Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.

#### 1.3 DEFINITIONS

- A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.
- B. Rough carriages for stairs are a part of interior architectural woodwork. Platform framing, headers, partition framing, and other rough framing associated with stairwork are specified in Division 06 Section "Rough Carpentry."

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, including cabinet hardware and accessories finishing materials and processes.
- B. Product Data: For high-pressure decorative laminate, adhesive for bonding plastic laminate, solid-surfacing material, fire-retardant-treated materials, cabinet hardware and accessories, finishing materials and processes.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
  1. Show details full size.
  2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
- D. Samples for Initial Selection:
  1. Shop-applied transparent finishes.
  2. Shop-applied opaque finishes.
  3. Plastic laminates.
  4. PVC edge material.
  5. Solid-surfacing materials.
- E. Samples for Verification:
  1. Plastic laminates, 8 by 10 inches (200 by 250 mm), for each type, color, pattern, and surface finish, with 1 sample applied to core material and specified edge material applied to 1 edge.
  2. Solid-surfacing materials, 6 inches (150 mm) square.
  3. Corner pieces as follows:
    - a. Cabinet-front frame joints between stiles and rails, as well as exposed end pieces, 18 inches (450 mm) high by 18 inches (450 mm) wide by 6 inches (150 mm) deep.
    - b. Miter joints for standing trim.
  4. Exposed cabinet hardware and accessories, one unit for each type and finish.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and fabricator
- B. Product Certificates: For each type of product, signed by product manufacturer.

## 1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between **60 and 90 deg F (16 and 32 deg C)** and relative humidity between 25 and 55 during the remainder of the construction period.
- C. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.9 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.
- B. Hardware Coordination: Distribute copies of approved hardware schedule specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)" to fabricator of architectural woodwork; coordinate Shop Drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Provide materials that comply with requirements of AWT's quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
- B. Wood Species for Opaque Finish: Any closed-grain hardwood

- C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated into the Work include, but are not limited to, the following:
    - a. Abet Laminati, Inc.
    - b. Arborite; Division of ITW Canada, Inc.
    - c. Formica Corporation.
    - d. Lamin-Art, Inc.
    - e. Nevamar Company, LLC; Decorative Products Div.
    - f. Panolam Industries International Incorporated.
    - g. Westinghouse Electric Corp.; Specialty Products Div.
    - h. Wilsonart International; Div. of Premark International, Inc.
- D. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. ABA Industries.
    - b. Avonite, Inc.
    - c. E. I. du Pont de Nemours and Company.
    - d. Formica Corporation.
    - e. LG Chemical, Ltd.
    - f. Meganite Inc.; a division of the Pyrochem Group.
    - g. Nevamar Company, LLC; Decorative Products Div.
    - h. Samsung; Cheil Industries Inc.
    - i. Swan Corporation (The).
    - j. Transolid, Inc.
    - k. Wilsonart International; Div. of Premark International, Inc.
  2. Type: Standard type unless Special Purpose type is indicated.
  3. Colors and Patterns: As selected by Architect from manufacturer's full range

## 2.2 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this Article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified.
1. Do not use treated materials that do not comply with requirements of referenced woodworking standard or that are warped, discolored, or otherwise defective.
  2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.

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3. Identify fire-retardant-treated materials with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with performance requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Use the following treatment type:
1. Exterior Type: Organic-resin-based formulation thermally set in wood by kiln drying.
  2. Mill lumber before treatment and implement special procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of treated woodwork.
  3. Kiln-dry materials before and after treatment to levels required for untreated materials.

### 2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening, self-closing.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter
- E. Catches: Magnetic catches, BHMA A156.9, B03141
- F. Shelf Rests: BHMA A156.9, B04013; metal, two-pin type with shelf hold-down clip.
- G. Drawer Slides: BHMA A156.9, B05091.
1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
- H. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Dark, Oxidized, Satin Bronze, Oil Rubbed: BHMA 613 for bronze base; BHMA 640 for steel base; match Architect's sample.
  2. Bright Brass, Clear Coated: BHMA 605 for brass base; BHMA 632 for steel base.
  3. Satin Brass, Blackened, Bright Relieved, Clear Coated: BHMA 610 for brass base; BHMA 636 for steel base.
  4. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
  5. Bright Chromium Plated: BHMA 625 for brass or bronze base; BHMA 651 for steel base.
  6. Satin Stainless Steel: BHMA 630.

- I. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Furring, Blocking, Shims, and Hanging Strips: Fire-retardant-treated softwood lumber, kiln dried to less than 15 percent moisture content.
- C. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

#### 2.5 FABRICATION, GENERAL

- A. Interior Woodwork Grade: Unless otherwise indicated, provide Custom grade interior woodwork complying with referenced quality standard.
- B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.
- C. Sand fire-retardant-treated wood lightly to remove raised grain on exposed surfaces before fabrication.
- D. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
  1. Corners of Cabinets and Edges of Solid-Wood (Lumber) Members **3/4 Inch (19 mm)** Thick or Less: **1/16 inch (1.5 mm)**.
  2. Edges of Rails and Similar Members More Than **3/4 Inch (19 mm)** Thick: **1/8 inch (3 mm)**.
- E. Complete fabrication, including assembly finishing and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- F. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
  1. Seal edges of openings in countertops with a coat of varnish.



2.6 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Wood Species: Any closed-grain hardwood
- B. Backout or groove backs of flat trim members and kerf backs of other wide, flat members, except for members with ends exposed in finished work.
- C. Assemble casings in plant except where limitations of access to place of installation require field assembly.
- D. Assemble moldings in plant to maximum extent possible. Miter corners in plant and prepare for field assembly with bolted fittings designed to pull connections together.
  - 1. risers.

2.7 PLASTIC-LAMINATE CABINETS

- A. AWI Type of Cabinet Construction: As indicated.
- B. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:
  - 1. Horizontal Surfaces Other Than Tops: Grade HGL.
  - 2. Postformed Surfaces: Grade HGP.
  - 3. Vertical Surfaces: Grade HGS
  - 4. Edges: PVC edge banding, **0.12 inch (3 mm)** thick, matching laminate in color, pattern, and finish.
- C. Materials for Semiexposed Surfaces:
  - 1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS
    - a. Edges of Plastic-Laminate Shelves: PVC edge banding, **0.12 inch (3 mm)** thick, matching laminate in color, pattern, and finish
    - b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, Grade VGS
  - 2. Drawer Sides and Backs: **Thermoset decorative panels**
  - 3. Drawer Bottoms: **Thermoset decorative panels.**
- D. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
  - 1. As selected by Architect from laminate manufacturer's full range in the following categories:
    - a. Solid colors, matte finish.

- F. Provide dust panels of **1/4-inch (6.4-mm)** plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

## 2.8 SOLID-SURFACING-MATERIAL COUNTERTOPS

- A. Grade: Custom
- B. Solid-Surfacing-Material Thickness: **3/4 inch (19 mm)**
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors of solid-surfacing material complying with the following requirements:
  - 1. As selected by Architect from manufacturer's full range.
- D. Fabricate tops in one piece, unless otherwise indicated. Comply with solid-surfacing-material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.
  - 1. Fabricate tops with shop-applied backsplashes

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.
- B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

### 3.2 INSTALLATION

- A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.
- C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of **1/8 inch in 96 inches (3 mm in 2400 mm)**.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Fire-Retardant-Treated Wood: Handle, store, and install fire-retardant-treated wood to comply with chemical treatment manufacturer's written instructions, including those for adhesives used to install woodwork.

- F. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
1. Install cabinets with no more than **1/8 inch in 96-inch (3 mm in 2400-mm)** sag, bow, or other variation from a straight line.
  2. Maintain veneer sequence matching of cabinets with transparent finish.
  3. Fasten wall cabinets through back, near top and bottom, at ends and not more than **16 inches (400 mm)** o.c. with No. 10 wafer-head screws sized for **1-inch (25-mm)** penetration into wood framing, blocking, or hanging strips
- H. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
  2. Install countertops with no more than **1/8 inch in 96-inch (3 mm in 2400-mm)** sag, bow, or other variation from a straight line.
  3. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."
- I. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

### 3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware.
- C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Mineral-wool blanket insulation.
3. Spray-applied cellulosic insulation.

B. Related Sections:

1. Section 042000 "Unit Masonry" for insulation installed in cavity walls and masonry cells.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

- B. Protect foam-plastic board insulation as follows:
1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
  2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
  3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

## PART 2 - PRODUCTS

### 2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
1. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [DiversiFoam Products.](#)
    - b. [Dow Chemical Company \(The\).](#)
    - c. [Owens Corning.](#)
    - d. [Pactiv Building Products.](#)
  2. Type IV, 25 psi (173 kPa).

### 2.2 GLASS-FIBER BLANKET INSULATION

- A. **Manufacturers:** Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. [CertainTeed Corporation.](#)
  2. [Guardian Building Products, Inc.](#)
  3. [Johns Manville.](#)
  4. [Knauf Insulation.](#)
  5. [Owens Corning.](#)
- B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

### 2.3 SPRAY-APPLIED CELLULOSIC INSULATION

- A. Self-Supported, Spray-Applied Cellulosic Insulation: ASTM C 1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications, Type III (materials

containing an adhesive mixed with water during application; intended for application on attic floors), chemically treated for flame-resistance, processing, and handling characteristics.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation[ **or vapor retarders, including removing projections capable of puncturing vapor retarders,**] or that interfere with insulation attachment.

#### 3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

#### 3.3 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
  - 1. If not otherwise indicated, extend insulation a minimum of **24 inches (610 mm)** below exterior grade line.

#### 3.4 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately **24 inches (610 mm)** o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.
  - 1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

### 3.5 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain **3-inch (76-mm)** clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
  - 5. For metal-framed wall cavities where cavity heights exceed **96 inches (2438 mm)**, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
  - 6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
    - a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
    - b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- D. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
  - 1. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2, "Standard Practice for Installing Cellulose Insulation."
- E. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.
- F. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately **2.5 lb/cu. ft. (40 kg/cu. m)**.
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

### 3.6 INSTALLATION OF INSULATION IN CEILINGS FOR SOUND ATTENUATION

- A. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install blanket insulation over entire ceiling area in thicknesses indicated. Extend insulation **48 inches (1219 mm)** up either side of partitions.

### 3.7 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

- A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:
  1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
  2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
  3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
  4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

### 3.8 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
  1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners **16 inches (406 mm) o.c.**
  2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
  3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.



- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.9 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.10 INSULATION SCHEDULE END OF SECTION 072100

## SECTION 074113 - METAL ROOF PANELS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Standing-seam metal roof panels.
- B. Related Sections:
  - 1. Section 076200 "Sheet Metal Flashing and Trim" for field-formed fasciae, copings, flashings, roof drainage systems, and other sheet metal work not part of metal roof panel assemblies.
  - 2. Section 079200 "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

#### 1.3 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Air Infiltration: Air leakage through assembly of not more than **0.06 cfm/sq. ft. (0.3 L/s per sq. m)** of roof area when tested according to ASTM E 1680 at the following test-pressure difference:
  - 1. Test-Pressure Difference: Negative **1.57 lbf/sq. ft. (75 Pa)**
  - 2. Positive Preload Test-Pressure Difference: **Greater than or equal to 15.0 lbf/sq. ft. (720 Pa) and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference**

3. Negative Preload Test-Pressure Difference: **50 percent of design wind-uplift-pressure difference**
- D. Water Penetration: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
1. Test-Pressure Difference: **2.86 lbf/sq. ft. (137 Pa)**.
  2. Positive Preload Test-Pressure Difference: **Greater than or equal to 15.0 lbf/sq. ft. (720 Pa) and the greater of 75 percent of building live load or 50 percent of building design positive wind-pressure difference**
  3. Negative Preload Test-Pressure Difference: **50 percent of design wind-uplift-pressure difference**
- E. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:
1. Wind Loads: Determine loads based on the following minimum design wind pressures:
    - a. Uniform pressure as indicated on Drawings.
  2. Snow Loads: **25 lbf/sq. ft. (1197 Pa)**
  3. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than **1/180** of the span.
- F. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): **120 deg F (67 deg C), ambient; 180 deg F (100 deg C)**], material surfaces.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.
1. Accessories: Include details of the following items, at a scale of not less than **1-1/2 inches per 12 inches (1:10)**:
    - a. Flashing and trim.
    - b. Gutters.
    - c. Downspouts.
    - d. Roof curbs.

- e. Snow guards.
- C. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.
  - 1. Include similar Samples of trim and accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
  - 1. Metal **Roof** Panels: **12 inches (300 mm)** long by actual panel width. Include fasteners, closures, and other metal roof panel accessories.
  - 2. Trim and Closures: **12 inches (300 mm)** long. Include fasteners and other exposed accessories.
  - 3. Accessories: **12-inch- (300-mm-)** long Samples for each type of accessory.
- E. Delegated-Design Submittal: For metal roof panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Snow Retention System Calculations: Include calculation of number and location of snow guards based on snow load, roof slope, panel length and finish, and seam type and spacing.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Roof panels and attachments.
  - 2. Purlins and rafters.
  - 3. Roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, snow guards, and items mounted on roof curbs.
- B. Manufacturer Certificates: Signed by manufacturer certifying that roof panels comply with energy performance requirements specified in "Performance Requirements" Article.
  - 1. Submit evidence of meeting performance requirements.
- C. Qualification Data: For qualified **Installer, professional engineer and testing agency**.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.
- E. Field quality-control reports.
- F. Warranties: Samples of special warranties.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal roof panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
- B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- C. Source Limitations: Obtain each type of metal roof panels from single source from single manufacturer.
- D. Surface-Burning Characteristics: Provide metal roof panels having insulation core material with the following surface-burning characteristics as determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: **25** or less.
  2. Smoke-Developed Index: **450** or less.
- E. Fire-Resistance Ratings: Where indicated, provide metal roof panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
  2. Combustion Characteristics: ASTM E 136.
- F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical roof eave, **including fascia**, as shown on Drawings; approximately **four panels wide** by full eave width, including, **underlayment**, attachments, and accessories.
  2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.

- B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.
- E. Protect foam-plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

#### 1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

#### 1.11 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of **decks**, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

#### 1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Structural failures including rupturing, cracking, or puncturing.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: **Two** years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: **20** years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
  1. Weathertight Warranty Period: **10** years from date of Substantial Completion.
- D. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
  1. Warranty Period: **20** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
  1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, **Class AZ50 coating designation, Grade 50**; structural quality.
  2. Surface: **Smooth, flat** finish.
  3. Exposed Coil-Coated Finish:
    - a. Metallic Fluoropolymer: AAMA 621. 3-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
- B. Panel Sealants:
  1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape **1/2 inch (13 mm)** wide and **1/8 inch (3 mm)** thick.

2. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal roof panels and remain weathertight; and as recommended in writing by metal roof panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: 30 to 40 mils (0.76 to 1.0 mm) thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
  1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
  2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
  3. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.](#); CCW WIP 300HT.
    - b. [Grace Construction Products; a unit of Grace, W. R. & Co.](#); Ultra.
    - c. [Henry Company](#); Blueskin PE200 HT.
    - d. [Metal-Fab Manufacturing, LLC](#); MetShield.
    - e. [Owens Corning](#); WeatherLock Metal High Temperature Underlayment.
- B. Felts: ASTM D 226, asphalt-saturated organic felts.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

## 2.3 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.4 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.



## DALTON PICKLEBALL COMPLEX

DALTON, GA

PROJECT NO. 2024-0283

Prime Engineering, Inc.

February 28, 2025

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
  2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.
- B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels : Formed with vertical ribs at panel edges and **flat pan** between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and snapping panels together.
1. Basis-of-Design Product: Subject to compliance with requirements, provide MBCI LokSeam, 24-Gauge, 16" Panels in silver Metallic, or comparable product.
    - a.
  2. Material: Aluminum-zinc alloy-coated steel sheet, 24-gauge nominal thickness.
    - a. Exterior Finish: **Metallic fluoropolymer**
    - b. Color: Silver Metallic
  3. Panel Coverage: **16 inches (406 mm)**

### 2.5 ACCESSORIES

- A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
  2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum **1-inch- (25-mm-)** thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
  3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum **0.018 inch (0.45 mm)** thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.
- C. Gutters: Formed from same material roof panels. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum **96-inch- (2400-mm-)** long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of **36 inches (900 mm)** o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match **metal roof panels**

- D. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match gutters.
- E. Roof Curbs: Fabricated from same material as roof panels, minimum 0.048 inch (1.2 mm) thick; with bottom of skirt profiled to match roof panel profiles, and welded top box and integral full-length cricket. Fabricate curb subframing of minimum 0.0598-inch- (1.5-mm-) thick, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads, of size and height indicated. Finish roof curbs to match metal roof panels.

## 2.6 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.
  - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
  - 2. End Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
  - 3. End Seams for Other Than Aluminum: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
  - 4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
  - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
  - 6. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

## 2.7 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.
- B. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
- C. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
- D. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.
- E. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
- B. Substrate Board: Install substrate boards over roof [deck] [sheathing] on entire roof surface. Attach with substrate-board fasteners.
  - 1. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.
  - 2. Comply with [UL] [FMG] requirements for fire-rated construction.
- C. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

1. Soffit Framing: Wire tie[ **or clip**] furring channels to supports[, **as required to comply with requirements for assemblies indicated**].

### 3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated **below**, wrinkle free, in shingle fashion to shed water, and with end laps of not less than **6 inches (150 mm)** staggered **24 inches (600 mm)** between courses. Overlap side edges not less than **3-1/2 inches (90 mm)**. **Extend underlayment into gutter trough**. Roll laps with roller. Cover underlayment within 14 days.
  1. Roof perimeter for a distance up from eaves of **36 inches (914 mm)** interior wall line.
  2. Rake edges for a distance of **18 inches (460 mm)**
  3. Hips and ridges for a distance on each side of **12 inches (300 mm)**
  4. Roof to wall intersections for a distance from wall of **18 inches (460 mm)**
  5. Around dormers, chimneys, skylights, and other penetrating elements for a distance from element of **18 inches (460 mm)**
- B. Felt Underlayment: Apply at locations indicated **below** in shingle fashion to shed water, and with lapped joints of not less than **2 inches (50 mm)**.
  1. Apply over entire roof surface.
- C. Apply slip sheet over underlayment before installing metal roof panels.
- D. Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

### 3.4 METAL ROOF PANEL INSTALLATION, GENERAL

- A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.
- B. Install metal roof panels as follows:
  1. Field cutting of metal panels by torch is not permitted.
  2. Locate and space fastenings in uniform vertical and horizontal alignment.
  3. Provide metal closures at **rake edges and** each side of ridge caps.
  4. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
  5. Install ridge caps as metal roof panel work proceeds.
  6. End Splices: Locate panel end splices over, but not attached to, structural supports. Stagger panel end splices to avoid a four-panel splice condition.
  7. Install metal flashing to allow moisture to run over and off metal roof panels.
- C. Fasteners:

1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.
  2. Aluminum Roof Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
  3. Copper Roof Panels: Use copper, stainless-steel, or hardware-bronze fasteners.
- D. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.
- E. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.
1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.
- F. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
  2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

### 3.5 METAL ROOF PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.
1. Install clips to supports with self-tapping fasteners.
  2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.

### 3.6 METAL SOFFIT PANEL INSTALLATION

- A. In addition to complying with requirements in "Metal Roof Panel Installation, General" Article, install metal soffit panels to comply with requirements in this article.
- B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.

1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.
- C. Metal Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

### 3.7 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
  1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
  1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
  2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of **10 feet (3 m)** with no joints allowed within **24 inches (600 mm)** of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with mastic sealant (concealed within joints).
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than **36 inches (914 mm)** o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely **1 inch (25 mm)** away from walls; locate fasteners at top and bottom and at approximately **60 inches (1500 mm)** o.c. in between.
  1. Provide elbows at base of downspouts to direct water away from building.
  2. Connect downspouts to underground drainage system indicated.
- E. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.
- F. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.8 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of **1/4 inch in 20 feet (6 mm in 6 m)** on slope and location lines as indicated and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.

3.9 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.
- C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

SECTION 074600 - SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. **Fiber-cement** siding.
- 2. **Fiber-cement** soffit.

- B. Related Sections:

- 1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified vinyl siding Installer.
- B. Product Certificates: For each type of siding and soffit, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
- D. Research/Evaluation Reports: For each type of siding required, from the ICC.
- E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of siding and soffit and related accessories to include in maintenance manuals.



1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish full lengths of siding and soffit including related accessories, in a quantity equal to 2 percent of amount installed.

1.7 QUALITY ASSURANCE

- A. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- B. Vinyl Siding Installer Qualifications: A qualified installer who employs a VSI-Certified Installer on Project.
- C. Vinyl Siding Certification Program: Provide vinyl siding products that are listed in VSI's list of certified products.
- D. Source Limitations: Obtain each type, color, texture, and pattern of siding and soffit, including related accessories, from single source from single manufacturer.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockups for siding and soffit including accessories.
    - a. Size: **48 inches (1200 mm) long by 60 inches (1800 mm) high**
    - b. Include outside corner on one end of mockup.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials in a dry, well-ventilated, weathertight place.

1.9 COORDINATION

- A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.10 WARRANTY

- A. Special Warranty: Standard form in which manufacturer agrees to repair or replace siding and soffit that fail(s) in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
    - a. Structural failures including cracking, deforming.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. [Cemplank.](#)
    - b. [CertainTeed Corp.](#)
    - c. [James Hardie.](#)
    - d. [MaxiTile, Inc; a California corporation.](#)
    - e. [Nichiha Fiber Cement.](#)
  2. Horizontal Pattern: Boards **6-1/4 to 6-1/2 inches (159 to 165 mm)** wide in **plain** style.
    - a. Texture: Smooth.
  3. Factory Priming: Manufacturer's standard acrylic primer.

2.2 FIBER-CEMENT SOFFIT

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. [Cemplank.](#)
    - b. [CertainTeed Corp.](#)
    - c. [GAF Materials Corporation.](#)
    - d. [James Hardie.](#)

- B. Pattern: 48-inch- (1200-mm-) wide sheets with smooth wood-grain texture.
- C. Ventilation: Provide unperforated soffit.
- D. Factory Priming: Manufacturer's standard acrylic primer.

### 2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
  - 1. Provide accessories made from same material as adjacent siding unless otherwise indicated.
- B. Decorative Accessories: Provide the following [aluminum] [fiber-cement] [vinyl] decorative accessories as indicated:
  - 1. Door and window casings.
  - 2. Fasciae.
  - 3. Moldings and trim.
- C. Colors for Decorative Accessories: Match adjacent siding.
- D. Flashing: Provide flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
- E. Fasteners:
  - 1. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch (6 mm), or three screw-threads, into substrate.
  - 2. For fastening fiber cement, use hot-dip galvanized fasteners.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and soffit and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

### 3.3 INSTALLATION

- A. General: Comply with siding and soffit manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
  - 1. Do not install damaged components.
  - 2. Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- B. Install fiber-cement siding and soffit and related accessories.
  - 1. Install fasteners no more than **24 inches (600 mm)** o.c.
- C. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

### 3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074600

## SECTION 076200 - SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Formed wall sheet metal fabrications.
- B. Related Requirements:
  - 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
  - 2. Section 074113 "Metal Roof Panels" for materials and installation of sheet metal flashing and trim integral with roofing.

#### 1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
  - 1. Include plans, elevations, sections, and attachment details.
  - 2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
  - 3. Include identification of material, thickness, weight, and finish for each item and location in Project.
  - 4. Include details for forming, including profiles, shapes, seams, and dimensions.
  - 5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.

6. Include details of termination points and assemblies.
7. Include details of roof-penetration flashing.
8. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
9. Include details of special conditions.
10. Include details of connections to adjoining work.

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: **12 inches (300 mm)** long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: **12 inches (300 mm)** long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
  1. For copings and roof edge flashings that are **SPRI ES-1 tested**, shop shall be listed as able to fabricate required details as tested and approved.
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
  1. Build mockup of typical roof **edge**, including **built-in gutter** and **fascia** approximately **10 feet (3.0 m)** long, including supporting construction cleats, seams, attachments[, **underlayment**,] and accessories.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

#### 1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: **20** years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with **SMACNA's "Architectural Sheet Metal Manual"** requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint

sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: **120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces**

## 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: **ASTM B 209 (ASTM B 209M)**, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with **smooth, flat** surface.
  1. Factory Prime Coating: Where painting after installation is required, pretreat metal with white or light-colored, factory-applied, baked-on epoxy primer coat; minimum dry film thickness of **0.2 mil (0.005 mm)**.

## 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum **30 mils (0.76 mm)** thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
  1. **Products:** Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following:**
    - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
    - b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; **Grace Ice and Water Shield HT**
    - c. Henry Company; Blueskin PE200 HT.
    - d. Kirsch Building Products, LLC; Sharkskin Ultra SA.
    - e. Metal-Fab Manufacturing, LLC; MetShield.
    - f. Owens Corning; WeatherLock Specialty Tile & Metal Underlayment.
    - g. Polyguard Products, Inc.; Deck Guard HT.
    - h. Protecto Wrap Company; Protecto Jiffy Seal Ice & Water Guard HT.
    - i. SDP Advanced Polymer Products Inc; Palisade SA-HT.
  2. Thermal Stability: ASTM D 1970; stable after testing at **240 deg F (116 deg C)** or higher.
  3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus **20 deg F (29 deg C)** or lower.
- B. Slip Sheet: Rosin-sized building paper, **3 lb/100 sq. ft. (0.16 kg/sq. m)** minimum.



## 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners[, **solder**], protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal[ **or manufactured item**] unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal[ **or manufactured item**].
  - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape **1/2 inch (13 mm)** wide and **1/8 inch (3 mm)** thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
  - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  - 2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of **1/4 inch in 20 feet (6 mm in 6 m)** on slope and location lines indicated on Drawings and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with butyl sealant concealed within joints.
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use
- I. Do not use graphite pencils to mark metal surfaces.

## 2.6 WALL SHEET METAL FABRICATIONS

- A. Through-Wall Flashing: Fabricate continuous flashings in minimum **96-inch- (2400-mm-)** long, but not exceeding **12-foot- (3.6-m-)** long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend **6 inches (150 mm)** beyond each side of wall openings; and form with **2-inch- (50-mm-)** high, end dams. Fabricate from the following materials:
1. Stainless Steel: [**0.016 inch (0.40 mm)**] thick.

## 2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
1. Aluminum-Zinc Alloy-Coated Steel: **0.028 inch (0.71 mm)** thick.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
  - 1. Verify compliance with requirements for installation tolerances of substrates.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
  - 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 UNDERLAYMENT INSTALLATION

- A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than **2 inches (50 mm)**.
- B. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.
- C. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than **6 inches (150 mm)** staggered **24 inches (600 mm)** between courses. Overlap side edges not less than **3-1/2 inches (90 mm)**. Roll laps and edges with roller. Cover underlayment within 14 days.
- D. Apply slip sheet, wrinkle free, **over underlayment** before installing sheet metal flashing and trim.

#### 3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners[, **solder**], protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.

2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3. Space cleats not more than **12 inches (300 mm)** apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  5. Torch cutting of sheet metal flashing and trim is not permitted.
  6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of [**uncoated-aluminum**] [**and**] [**stainless-steel**] sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of [**10 feet (3 m)**] <Insert dimension> with no joints within **24 inches (600 mm)** of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than **1 inch (25 mm)** deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than **1 inch (25 mm)** into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between **40 and 70 deg F (4 and 21 deg C)**, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below **40 deg F (4 deg C)**.
  2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of **1-1/2 inches (38 mm)**; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.
2. Do not pre-tin zinc-tin alloy-coated stainless steel and zinc-tin alloy-coated copper.
3. Do not use torches for soldering.
4. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
5. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
6. Copper Soldering: Tin edges of uncoated sheets, using solder for copper.
7. Copper-Clad Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for copper-clad stainless steel.

H. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

I.

### 3.4 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at **staggered 3-inch (75-mm)** centers.
- C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of **4 inches (100 mm)** over base flashing. Install stainless-steel draw band and tighten.
- D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing **4 inches (100 mm)** over base flashing. Lap counterflashing joints minimum of **4 inches (100 mm)**. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.
- E. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

### 3.5 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

### 3.6 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.
- B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

### 3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of **1/4 inch in 20 feet (6 mm in 6 m)** on slope and location lines indicated on Drawings and within **1/8-inch (3-mm)** offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

### 3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

## SECTION 07 9200 – JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Related work specified elsewhere:

1. Window framing internal sealants.
2. Glazing sealants.
3. Roofing and flashing sealants.
4. Firestopping.

B. Definitions:

1. Joint sealant:

- a. A weatherproof elastomer used in filling and sealing joints, having properties of adhesion, cohesion, extensibility under tension, compressibility and recovery; designed to make joints air and watertight.
- b. Material is designed generally for application in exterior joints and for joints subject to movement.

2. Joint sealant compound:

- a. A material used in filling joints and seams, having properties of adhesion and cohesion; not required to have extensibility and recovery properties.
- b. Material is designed generally for application in interior joints not subject to movement.

3. Caulk: The process of filling joints, without regard to type of material.

4. Joint failure: A caulked joint exhibiting one or more of the following characteristics:

- a. Air and/or water leakage.
- b. Migration and/or reversion.
- c. Loss of adhesion.
- d. Loss of cohesion.
- e. Failure to cure.
- f. Discoloration.
- g. Staining of adjacent work.
- h. Development of bubbles, air pockets or voids.

1.2 SUBMITTALS:

- A. Product data: Submit manufacturer's product description, indicating conformance with specified requirements and installation instructions for each type of sealant. Indicate preparation and priming requirements for each substrate condition.
- B. Color samples:
  - 1. Samples for initial selection: Samples shall be actual materials or literature depicting actual colors of standard color materials showing full range of colors available for each product exposed to view.
  - 2. Samples for verification: For each kind and color of joint sealant required, provide samples with joint sealants in 1/2" wide joints formed between two 6" long strips of material matching appearance of exposed surfaces adjacent to joint sealants.
- C. Adhesion compatibility test results: Submit a letter from sealant manufacturer indicating adhesion and compatibility testing has been performed and that materials are compatible and that adhesion is acceptable. Indicate requirements for primers or special preparation.
- D. Joint sealant schedule: Include the following information:
  - 1. Joint sealant applications, joint locations, and designations.
  - 2. Joint sealant manufacturers and product names.
  - 3. Joint sealant formulations.
  - 4. Joint sealant colors.

1.3 QUALITY ASSURANCE:

- A. Applicable standards as referenced herein:
  - 1. ASTM International (ASTM).
- B. Adhesion compatibility tests: Perform tests on actual samples of aluminum framing system, synthetic stucco, and cast stone components, to determine that materials are compatible and that adhesion is acceptable. Identify requirements for primers or special preparation.
  - 1. Test structural sealants in accord with ASTM C1135-00(2011).
  - 2. Test sealants used in conjunction with synthetic stucco in accord with ASTM C1382-11.
- C. Architect reserves the right to reject work not in conformance with selected colors, based upon verification samples.
- D. Mock-up:
  - 1. Prepare, caulk and finish one mock-up sample of each joint condition.



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2. Sample joints shall be approved by Architect prior to beginning work. Approved, undamaged mock-up joints shall serve as a standard of quality for the remainder of the work.

1.4 PROJECT/SITE CONDITIONS:

A. Weather conditions:

1. Install no materials under adverse weather conditions or when temperatures are below or above those recommended by manufacturer's product data or when substrate moisture content is above manufacturer's recommended level.
2. Proceed with work only when forecasted weather conditions are favorable for joint cure and development of high early bond strength.
3. Wherever joint width is affected by ambient temperature variations, install materials only when temperatures are in lower third of manufacturer's recommended installation temperature range.

B. Protection of adjacent surfaces:

1. Protect by applying masking material or manipulating application equipment to keep materials in joint. If masking materials are used, allow no tape to touch cleaned surfaces to receive sealant. Remove tape immediately after sealant application, before surface skin begins to form.
2. Remove misapplied materials from surfaces by using solvents and methods recommended by manufacturer.
3. At surfaces from which materials have been removed, restore to original condition and appearance.

1.5 WARRANTIES:

- A. Installer's warranty: Warrant work to be watertight and free from defects in materials and workmanship, including joint failure, for a period of five years. Form of warranty shall be as included in Division 00.
- B. Exterior silicone sealant material warranty: Warrant exterior silicone sealants to be free from defects in materials and to provide structural adhesion, watertight weather seal and non-staining of adjacent materials for a period of twenty years.
- C. Warranties shall begin at Date of Substantial Completion.

## **PART 2 - PRODUCTS**

### 2.1 JOINT SEALANTS, GENERAL:

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. All wall panel joints on exterior and interior shall have backer rod and caulk with an elastomeric sealant.
- C. Exterior Tilt-Up Concrete wall panel joints shall be silicone, equal to Sikaflex-2c NS, applied after Tilt-Up Concrete panels have been coated. Install backer rod half way into joint prior to coating panels; remove backer rod and rotate 180 degrees and reinsert prior to installing sealant.
- D. Interior Tilt-Up Concrete wall panel joints shall be polyurethane, equal to Sonneborn Sonolastic SL-2, a multi-component, self-leveling, elastomeric polyurethane sealant that is mixed and poured in place. It must be installed prior to painting walls; sealant is required behind applied wall insulation.
- E. Provide sealant at interior joint where wall panels abut slab on grade. Provide sealant at all interior slab on grade penetrations and exterior wall penetrations.
- F. VOC Content: Sealants and sealant primers shall comply with the following:
  - 1. Architectural sealants shall have a VOC content of 250 g/L or less.
  - 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
  - 3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.
- G. Provide sealant at all exterior concrete walks and paving, where paving abuts a vertical surface, and at concrete and asphalt joints. Material shall be a permanent non-water soluble , flexible, exterior use sealant, impervious to effects of ultraviolet light and petroleum products.
- H. All joints in the sort floor shall be filled with semi-rigid epoxy joint filler equal to Metzger McGuire MM-80, full depth. Provide backer rod at all construction joints. Backer rod at control joints is not required. Delay filling as long as possible. Utilize stain preventing film (SPF) at all joints. Construction joints shall be re-sawn prior to joint fill operation.
- I. All floor expansion joints shall be CS Group SGP-600, Gasket Color #136 Gray.
- J. Exterior Wall Expansion Joints shall be CS Group AFWC-200X, Finish: Anodized to match.

- K. Interior Wall Expansion Joint shall be CS Group AFW-600, Finish: Clear Anodized
  - L. Aluminum in contact with concrete/ masonry shall have a 2 mil heavy metal free high solids primer.
- 2.2 SILICONE SEALANTS:
- A. Low modulus silicone sealant:
    - 1. Acceptable products; subject to compliance with specified requirements:
      - a. Dow Corning Corp., #790 or as approved by the Architect.
    - 2. Type: One-part, low modulus silicone rubber; meeting ASTM C920-14a, Type S, Grade NS, Class 50, for use NT.
    - 3. Colors: Standard colors as selected by the Architect.
  - B. Medium modulus silicone sealant:
    - 1. Acceptable products; subject to compliance with specified requirements:
      - a. Dow Corning Corp., #795 or as approved by the Architect.
    - 2. Type: One-part silicone rubber; meeting ASTM C920-14a, Type S, Grade NS, Class 50, for use NT.
    - 3. Colors: Standard colors as selected by the Architect.
- 2.3 TWO-PART POLYURETHANE SEALANT FOR HORIZONTAL TRAFFIC-BEARING PAVEMENTS:
- A. Acceptable products:
    - 1. BASF Building Systems, MasterSeal SL 2.
    - 2. Pecora Corp., Urexpan NR-200.
    - 3. Tremco, Inc., an RPM Company, 45 SSL.
  - B. Characteristics:
    - 1. Type: Two-component polyurethane sealant for horizontal traffic-bearing surfaces meeting ASTM C920-14a, Type M, Grade P or NS, minimum Class 25, for use T; self-leveling for flat surfaces and non-sag for sloped surfaces.
    - 2. Colors: Standard colors as selected by Architect.
- 2.4 SILICONE BATH SEALANT FOR WET AREAS:
- A. Acceptable products:

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1. Dow Corning Corp., 786 Mildew-Resistant Silicone Sealant or as approved by the Architect.

B. Characteristics:

1. Type: One-part silicone rubber, mildew- and stain-resistant, acid-curing silicone sealant; meeting ASTM C920-14a, Type S, Grade NS, Class 25, for use NT.
2. Color: Clear, white or off-white, as selected by the Architect.

2.5 SOLVENT-RELEASE-CURING ACRYLIC SEALANT:

A. Acceptable products:

1. Franklin International, Titebond Painters Plus Caulk.
2. Schnee-Morehead, Inc., Acryl-R Acrylic Sealant.
3. Tremco, Inc., an RPM Company, Mono 555.

B. Characteristics:

1. Type: One-part, acrylic polymer sealant, meeting ASTM C1311-14.
2. Colors: Standard colors as selected by Architect.

2.6 PAINTABLE ACRYLIC-LATEX JOINT SEALANT:

A. Acceptable products:

1. Bostik, Chem-Calk 600.
2. Franklin International, Titebond Painters Caulk.
3. Momentive Performance Materials, Inc., GE RCS20.
4. Pecora Corp., AC-20 Acrylic Latex.
5. Tremco, Inc., an RPM Company, Tremflex 834.

B. Characteristics: Flexible, paintable, non-staining, non-bleeding acrylic latex or siliconized acrylic emulsion, meeting ASTM C834-14, Type OP, Grade NF.

2.7 ACCESSORY MATERIALS:

- A. Joint cleaner: Type recommended by material manufacturer for substrates indicated.
- B. Joint primer/sealer: Type recommended by material manufacturer for substrates, conditions and exposures indicated.
- C. Bond breaker tape: Plastic tape applied to contact surfaces where bond to substrate or joint filler must be avoided for material performance.

- D. Sealant backer rod: Compressible rod stock as recommended by sealant manufacturer for compatibility with sealant. Provide size and shape of rod to control joint depth.
- E. Tooling agent: Agent recommended by material manufacturer to ensure contact of material with inner joint faces.

### **PART 3 - EXECUTION**

#### 3.1 JOINT SURFACE PREPARATION:

- A. Clean joints of debris and projections including shims.
- B. Clean joint surfaces immediately before caulking joints. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond.
- C. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless material manufacturer's product data indicates that alkalinity does not interfere with bond and performance. Etch with 5% solution of muriatic acid; neutralize with dilute ammonia solution; rinse with clean water and allow to dry before caulking.
- D. Roughen joint surfaces of non-porous materials, unless material manufacturer's product data indicates equal bond strength as porous surfaces. Rub with fine abrasive cloth or wool to produce dull sheen.

#### 3.2 APPLICATION:

- A. Comply with joint sealant material manufacturer's product data and ASTM C1193-13 except where more stringent requirements are specified.
- B. Prime joint surfaces where recommended by material manufacturer. Do not allow primer/sealer to spill or migrate onto adjacent surfaces.
- C. Install backer rod for joint sealant materials, except where recommended by material manufacturer to be omitted for application indicated.
  - 1. Place backer rod to maintain recommended sealant thickness and profile.
  - 2. Place rod at depth to provide sealant manufacturer's recommended sealant depth.
  - 3. Do not twist rod during installation.
  - 4. Place rod to minimize possibility of extrusion when joint is compressed.
  - 5. Install bond breaker tape in lieu of backer rod for shallow, closed joints and as recommended by manufacturer's product data.
- D. Employ installation techniques which will ensure that materials are deposited in uniform, continuous ribbons without gaps or air pockets, with complete wetting

of joint bond surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form slight cove so that joint will not trap moisture and debris.

- E. Do not allow materials to overflow onto adjacent surfaces. Prevent staining of adjacent surfaces.
- F. Remove excess and misplaced materials as work progresses. Clean the adjoining surfaces to remove misplaced materials, without damage to adjacent surfaces or finishes.
- G. Interior joints: At interior joints and seams at abutting and adjacent materials, recess joint sealant 3/16" in joints wider than 1/4". At joints 1/4" or less in width, tool joint sealant flush.
- H. Tool joints of non-sag sealant to concave profile and smooth, uniform surface, flush with edges of substrate. Maintain sealant depth-to-width ratio in accord with manufacturer's product data.
- I. Cure joint sealants and joint sealant compounds in accord with manufacturer's product data to obtain high early bond strength, internal cohesive strength and surface durability. Protect uncured surfaces from contamination and physical damage.

### 3.3 JOINT SEALANT SCHEDULE:

- A. Exterior vertical expansion joints: Low modulus silicone sealant.
- B. Exterior and interior joints in masonry, including control joints: Low modulus silicone sealant.
- C. Exterior and interior joints at perimeter of aluminum framing systems: Medium modulus silicone sealant.
- D. Exterior and interior joints at perimeter of hollow metal framing: Medium modulus silicone sealant.
- E. Exterior joints between wall finish and conduit and pipe penetrations, base plates of light fixtures, signage supports, and other items applied to exterior wall surface: Medium modulus silicone sealant.
- F. Interior concealed bedding joints and thresholds: Acrylic sealant. Solventrelease- curing acrylic sealant.
- G. Exterior and interior horizontal traffic-bearing joints, excluding tile floor joints: Two-part polyurethane sealant.
- H. Tile expansion and control joint sealant: Refer to Tiling section.

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- I. Firestopped joints: Firestop sealant as specified in Firestopping section.
- J. Typical interior joints and seams at abutting and adjacent materials except as specified herein: Paintable acrylic-latex joint sealant.
- K. Interior joints in conjunction with vanities, fixtures and tile finishes: Silicone bath sealant.

**END OF SECTION 07 9200**

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
  - 1. Section 087100 "Finish Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

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

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door type.
  - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  - 4. Locations of reinforcement and preparations for hardware.



5. Details of each different wall opening condition.
  6. Details of anchorages, joints, field splices, and connections.
  7. Details of accessories.
  8. Details of moldings, removable stops, and glazing.
  9. Details of conduit and preparations for power, signal, and control systems.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

#### 1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.
- B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
  1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum **4-inch- (102-mm-)** high wood blocking. Provide minimum **1/4-inch (6-mm)** space between each stacked door to permit air circulation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. **Manufacturers:** Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  1. [Amweld International, LLC.](#)
  2. [Apex Industries, Inc.](#)
  3. [Ceco Door Products](#); an Assa Abloy Group company.
  4. [Commercial Door & Hardware Inc.](#)
  5. [Concept Frames, Inc.](#)
  6. [Curries Company](#); an Assa Abloy Group company.
  7. [Custom Metal Products.](#)

8. [Daybar.](#)
9. [Deansteel.](#)
10. [de La Fontaine Industries.](#)
11. [DKS Steel Door & Frame Sys. Inc.](#)
12. [Door Components, Inc.](#)
13. [Fleming-Baron Door Products.](#)
14. [Gensteel Doors Inc.](#)
15. [Greensteel Industries, Ltd.](#)
16. [HMF Express.](#)
17. [Hollow Metal Inc.](#)
18. [Hollow Metal Xpress.](#)
19. [J/R Metal Frames Manufacturing, Inc.](#)
20. [Karpen Steel Custom Doors & Frames.](#)
21. [L.I.F. Industries, Inc.](#)
22. [LaForce, Inc.](#)
23. [Megamet Industries, Inc.](#)
24. [Mesker Door Inc.](#)
25. [Michbi Doors Inc.](#)
26. [MPI Group, LLC \(The\).](#)
27. [National Custom Hollow Metal.](#)
28. [North American Door Corp.](#)
29. [Philipp Manufacturing Co \(The\).](#)
30. [Pioneer Industries, Inc.](#)
31. [Premier Products, Inc.](#)
32. [Republic Doors and Frames.](#)
33. [Rocky Mountain Metals, Inc.](#)
34. [Security Metal Products Corp.](#)
35. [Shanhans Manufacturing Ltd.](#)
36. [Steelcraft; an Ingersoll-Rand company.](#)
37. [Steward Steel; Door Division.](#)
38. [Stiles Custom Metal, Inc.](#)
39. [Titan Metal Products, Inc.](#)
40. [Trillium Steel Doors Limited.](#)
41. [West Central Mfg. Inc.](#)

- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

## 2.2 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Commercial Doors and Frames: NAAMM-HMMA 861. **At locations indicated in the Door and Frame Schedule**
1. Physical Performance: Level A according to SDI A250.4.
  2. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
  - b. Thickness: 1-3/4 inches (44.5 mm.)
  - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.30 mm), with minimum G60 (Z180 or)A60 (ZF180) coating.
  - d. Edge Construction: Continuously welded with no visible seam.
  - e. Core: Steel stiffened.
- 1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu (0.370 K x sq. m/W) when tested according to ASTM C 1363.

3. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (1.7 mm), with minimum G60 (Z180 or)A60 (ZF180) coating.
- b. Construction: **Full profile** welded.

4. Exposed Finish: Prime.

## 2.3 FRAME ANCHORS

### A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

### B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

## 2.4 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

## 2.5 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch (0.66 mm), steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches (152 mm) apart. Spot weld to face sheets no more than 5 inches (127 mm) o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
  2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches (3.2 mm in 51 mm)
  3. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
  4. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
  5. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

6. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum **3/4 inch (19 mm)** beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
1. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
  5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than **16 inches (406 mm)** from top and bottom of frame. Space anchors not more than **32 inches (813 mm)** o.c., to match coursing, and as follows:
      - 1) Two anchors per jamb up to **60 inches (1524 mm)** high.
      - 2) Three anchors per jamb from **60 to 90 inches (1524 to 2286 mm)** high.
      - 3) Four anchors per jamb from **90 to 120 inches (2286 to 3048 mm)** high.
      - 4) Four anchors per jamb plus one additional anchor per jamb for each **24 inches (610 mm)** or fraction thereof above **120 inches (3048 mm)** high.
    - b. Postinstalled Expansion Type: Locate anchors not more than **6 inches (152 mm)** from top and bottom of frame. Space anchors not more than **26 inches (660 mm)** o.c.
  6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
  - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
  - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
  - 4. Provide loose stops and moldings on inside of hollow-metal work.
  - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

## 2.6 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

### 3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  - 4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  - 5. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus **1/16 inch (1.6 mm)**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus **1/16 inch (1.6 mm)**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus **1/16 inch (1.6 mm)**, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
  - 1. Non-Fire-Rated Steel Doors:

- a. Between Door and Frame Jambs and Head: **1/8 inch (3.2 mm)** plus or minus **1/32 inch (0.8 mm)**.
  - b. Between Edges of Pairs of Doors: **1/8 inch (3.2 mm)** to **1/4 inch (6.3 mm)** plus or minus **1/32 inch (0.8 mm)**.
  - c. At Bottom of Door: [**3/4 inch (19.1 mm)**] [**5/8 inch (15.8 mm)**] plus or minus **1/32 inch (0.8 mm)**.
  - d. Between Door Face and Stop: **1/16 inch (1.6 mm)** to **1/8 inch (3.2 mm)** plus or minus **1/32 inch (0.8 mm)**.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than **9 inches (230 mm)** o.c. and not more than **2 inches (51 mm)** o.c. from each corner.

#### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113



## SECTION 083313 - COILING COUNTER DOORS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

- 1. Counter doors.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling counter door and accessory.

- 1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
- 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- 3. Include description of automatic closing device and testing and resetting instructions.

- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

- 1. Include plans, elevations, sections, and mounting details.
- 2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
- 3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
- 4. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
- 5. Include diagrams for power, signal, and control wiring.

- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

- 1. Include similar Samples of accessories involving color selection.

- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:

- 1. Curtain slats

2. Bottom bar
3. Guides.
4. Brackets.
5. Hood.
6. Laminate-clad counter panel product for each type, color, pattern, and surface finish; laminated to core.
7. Locking device(s).
8. Include similar Samples of accessories involving color selection.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.

#### 1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For coiling counter doors to include in maintenance manuals.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS, GENERAL

- A. Source Limitations: Obtain coiling counter doors from single source from single manufacturer.
  1. Obtain operators and controls from coiling counter door manufacturer.

#### 2.2 COUNTER DOOR ASSEMBLY

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
  1. Basis-of-Design Product: Subject to compliance with requirements, provide C.H.I. Overhead Doors Counter Shutter 6544 or comparable product by one of the following:
    - a. ACME Rolling Doors.
    - b. Alpine Overhead Doors, Inc.
    - c. Alumatec Pacific Products.
    - d. Amarr Garage Doors.
    - e. C.H.I. Overhead Doors.

- f. [City-Gates.](#)
- g. [Clipay Building Products.](#)
- h. [Cookson Company.](#)
- i. [Cornell Iron Works, Inc.](#)
- j. [Lawrence Roll-Up Doors, Inc.](#)
- k. [McKeon Rolling Steel Door Company, Inc.](#)
- l. [Metro Door.](#)
- m. [Overhead Door Corporation.](#)
- n. [QMI Security Solutions.](#)
- o. [Raynor.](#)
- p. [Wayne-Dalton Corp.](#)

- B. Operation Cycles: Door components and operators capable of operating for not less than **20,000**. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- C. Door Curtain Material: **Aluminum.**
- D. Door Curtain Slats: **Flat** slats of **1-1/2-inch (38-mm)** center-to-center height.
- E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated **aluminum extrusion** and finished to **match door**.
- F. Curtain Jamb Guides: **Aluminum** with exposed finish matching curtain slats. **Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.**
- G. Hood: **Match curtain material and finish**
  - 1. Shape: **Square**
  - 2. Mounting: **Face of wall.**
- H. Sill Configuration: **Integral metal sill.**
- I. Locking Devices: Equip door with **locking device assembly and chain lock keeper.**
  - 1. Locking Device Assembly: **Cremone type, both jamb sides** locking bars, operable from **with thumb turn**
- J. Manual Door Operator: **Manufacturer's standard crank operator**
  - 1. Provide operator with manufacturer's standard removable operating arm.
- K. Curtain Accessories: Equip door with **weatherseals**
- L. Door Finish:
  - 1. Aluminum Finish: **Clear anodized**

2.3 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install coiling counter doors, hoods, controls, and operators at the mounting locations indicated for each door.

3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Perform installation and startup checks according to manufacturer's written instructions.
  - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain coiling counter doors.

END OF SECTION 083313

## **SECTION 08 7100 – FINISH DOOR HARDWARE**

### **PART 1 - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Refer to the Drawings for Hardware Schedule and Hardware Sets.
- B. All door hardware shall be fully accessible per the provisions of IBC 1010.1.9 and ANSI A117.1.
- C. All door hardware shall meet the requirements for fire egress per the Authorities Having Jurisdiction (AHJ) and IBC requirements.

#### 1.2 PROCUREMENT

- A. Vendors
  - 1. Items covered in this section shall be provided and installed by the General Contractor, unless noted otherwise on the drawings.
  - 2. All items in this section shall be purchased by the general contractor.

#### 1.3 SUMMARY

- A. This Section includes commercial door hardware for the following:
  - 1. Swinging doors.
- B. Door hardware includes, but is not necessarily limited to, the following:
  - 1. Mechanical door hardware.
  - 2. Electromechanical door hardware.
  - 3. Automatic operators.
  - 4. Cylinders specified for doors in other sections.
- C. Related Sections:
  - 1. Division 08 Section "Hollow Metal Doors and Frames".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
  - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
  - 2. ICC/IBC - International Building Code.
  - 3. NFPA 70 - National Electrical Code.
  - 4. NFPA 80 - Fire Doors and Windows.
  - 5. NFPA 101 - Life Safety Code.
  - 6. NFPA 105 – Installation of Smoke Door Assemblies
  - 7. UL/ULC and CSA C22.2 – Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
  - 8. State Building Codes, Local Amendments.

- E. Standards: All hardware specified herein shall comply with the following industry standards:
  - 1. ANSI/BHMA Certified Product Standards - A156 Series
  - 2. UL10C – Positive Pressure Fire Tests of Door Assemblies

#### 1.4 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets included in the Drawings. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following, if requested:
  - 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    - b. Complete (risers, point-to-point) access control system block wiring diagrams.
    - c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware.
- D. Automatic Operator Supplier Qualifications: Power operator products and accessories are required to be supplied and installed through current members of the manufacturer's "Power Operator Preferred Installer" program. Suppliers are to be factory trained, certified, and a direct purchaser of the specified power operators and be responsible for the installation and maintenance of the units and accessories indicated for the Project.
- E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third-party source will not be accepted.
  2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.



- G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  - 3. Review sequence of operation narratives for each unique access-controlled opening.
  - 4. Review and finalize construction schedule and verify availability of materials.
  - 5. Review the required inspecting, testing, commissioning, and demonstration procedures
- H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. General Contractor to inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule and include basic installation instructions with each item or package.

#### 1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and

access control system hardware without additional in-field modifications.

- D. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

#### 1.8 WARRANTY

- A. General Warranty: Special warranties specified in this Section shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Special Warranty Periods:
  - 1. Seven years for heavy duty cylindrical (bored) locks and latches.
  - 2. Five years for exit hardware.
  - 3. Twenty-five years for manual surface door closer bodies.
  - 4. Five years for motorized electric latch retraction exit devices.
  - 5. Two years for electromechanical door hardware.

#### 1.9 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

#### 1.10 DEFINITIONS

- A. The following is a general list of terms included in the specification that may require additional definitions.
  - 1. "RX" – Request to Exit
  - 2. "EPT" – Electronic Power Transfer
  - 3. "DPS" – Door Position Switch
  - 4. "SFIC" – Small Format Interchangeable Core
  - 5. "ELR" – Electric Latch Retraction
  - 6. "NL" – Nigh Latch

7. "ELEC" – Electrified
8. "CLSRM" – Classroom
9. "LDW" – Less Door Width

## **PART 2 - PRODUCTS**

### **2.1 SCHEDULED DOOR HARDWARE**

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets shown on the Drawings and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets on the Drawings.
- C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

### **2.2 HANGING DEVICES**

- A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
  1. Quantity: Provide the following hinge quantity:
    - a. Two Hinges: For doors with heights up to 60 inches (1.52m).
    - b. Three Hinges: For doors with heights 61 to 90 inches (1.55 to 2.29m).
    - c. Four Hinges: For doors with heights 91 to 120 inches (2.31 to 3.05m).
    - d. For doors with heights more than 120 inches (3.05m), provide 4 hinges, plus 1 hinge for every 30 inches (0.76m) of door height greater than 120 inches (3.05m).
  2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3 feet 0 inches (0.91m): 4-1/2-inch (114.3mm) standard or heavy weight as specified.
    - b. Sizes from 3 feet 1 inch to 4 feet 0 inches (0.94 to 1.22m): 5-inch standard or heavy weight as specified.

3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
  4. Hinge Options: Comply with the following:
    - a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out- swinging lockable doors.
  5. Manufacturers:
    - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - TA Series.
- B. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 certified continuous geared hinge with minimum 0.120 inch (3mm) thick extruded 6060 T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches (101.6mm). Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
1. Manufacturers:
    - a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE).

## 2.3 POWER TRANSFER DEVICES

- A. Electrified Quick Connect Transfer Hinges: Provide electrified transfer hinges where scheduled with Molex standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
  1. Acceptable Manufacturers:
    - a. McKinney Products (MK) - QC (# wires) Option.
- B. Concealed Power Transfers: Provide concealed electric power transfers where scheduled with Molex standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies.
  1. Manufacturers:

- a. Pemko Products; ASSA ABLOY Architectural Door Accessories (PE) – EL- CEPT Series.
  - b. Securitron (SU) - EL-CEPT Series.
- C. Door Cord: Provide surface applied door cord power transfers where scheduled with Molex standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable. 18” cord will be standard unless scheduled otherwise.
1. Acceptable Manufacturers:
    - a. Securitron (SU) – TSB-C
- D. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.
1. Provide one each of the following tools as part of the base bid contract:
    - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Electrical Connecting Kit: QC-R001.
    - b. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) - Connector Hand Tool: QC-R003.
  2. Manufacturers:
    - a. McKinney Products; ASSA ABLOY Architectural Door Accessories (MK) – QC-C Series.
- E. Door Cord: Provide surface applied door cord power transfers where scheduled with Molex standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable. 18 inch (0.46m) cord will be standard unless scheduled otherwise.
1. Manufacturers:
    - a. Keedex (KX) –Part No. K-DL38A.

## 2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
  2. Furnish dust proof strikes for bottom bolts.
  3. Surface bolts to be minimum 8 inches (203.2mm) in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
  4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
  5. Manufacturers:
    - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- B. Door Armor, Kick, Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum 0.050 inch (1.27mm) thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
  2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2-1/2 inches (63.5mm) from face of door unless otherwise indicated.
  3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2-1/2 inches (63.5mm) from face of door and offset of 90 degrees unless otherwise indicated.
  4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
  5. Manufacturers:
    - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.5 CYLINDERS AND KEYING

- A. All key structures and final keying/installation of final keying will be purchased by the Contractor and installed / coordinated by the owner directly.
- B. Construction Keying: Provide temporary green SFIC keyed cores. Include 2 control keys and 15 operating keys. Installer shall confirm functionality of lock and core as part of installation.
- C. All locking devices shall accommodate 7 pin Small Format Interchangeable Cores (SFIC).
  1. Acceptable Manufacturer:
    - a. Best Patented – KABA-Peaks SFIC 7-pin key system. No substitutions are allowed.
- D. Key Control Cabinet: Provide a high security key control box system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
  1. Acceptable Manufacturers:
    - a. Lund Equipment (LU).

- b. MMF Industries (MM).
- c. Telkee (TK).

## 2.6 MECHANICAL LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.13, Series 1000, Operational Grade 1 certified. Locksets are to be manufactured with a corrosion resistant steel case and be field-reversible for handing without disassembly of the lock body.
  - 1. Acceptable Manufacturers:
    - a. Sargent Manufacturing (SA) – 8200 Series. (no substitution)
- B. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Grade 1 certified cylindrical (bored) locksets furnished in the functions as specified in the Hardware Sets. Lock chassis fabricated of heavy gauge steel, zinc dichromate plated, with through-bolted application. Furnish with solid cast levers, standard 2 3/4" backset, and 1/2" (3/4" at rated paired openings) throw brass or stainless steel latchbolt. Locks are to be non-handed and fully field reversible.
  - 1. Acceptable Manufacturers:
    - a. Sargent Manufacturing (SA) – 10 Line. (no substitution)
- C. Lock Trim Design: As specified in Hardware Sets.

## 2.7 ELECTROMECHANICAL LOCKING DEVICES

- A. Electromechanical Mortise Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical mortise locksets, electrified locksets to be of type and design as specified below.
  - 1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, and request-to-exit signaling. Unless otherwise indicated, provide electrified locksets standard as fail secure.
  - 2. Acceptable Manufacturers:
    - a. Sargent Manufacturing (SA) - 8200 Series. (no substitution)
- B. Electromechanical Cylindrical Locksets, Grade 1 (Heavy Duty): Subject to same compliance standards and requirements as mechanical cylindrical locksets, electrified locksets to be of type and design as specified below.
  - 1. Electrified Lock Options: Where indicated in the Hardware Sets, provide electrified options including: outside door lock/unlock trim control, latchbolt and lock/unlock status monitoring, and request-to-exit signaling. Unless otherwise indicated, provide electrified locksets standard as fail secure.
  - 2. Acceptable Manufacturers:
    - a. Sargent Manufacturing (SA) - 10G70/71 Series. (no substitution)

## 2.8 STAND ALONE ACCESS CONTROL LOCKING DEVICES

- A. Stand Alone Locksets: ANSI A156.2, Series 4000, Grade 1 locking mechanism complete with integrated touchscreen or keypad as specified for access and programming. Voice-guided programming with 12-digit PIN code selection and up to 1000 user option. Locks to accept standard, small format interchangeable core, security and patented cylinders. Battery-operated, with low power indicator, or hard-wired (9 Volt external power supply) option.
  - 1. Manufacturers:
    - a. Yale Commercial(YA) - nexTouch Series.
    - b. Simplex (SI) - L1000 Series.

## 2.9 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
  - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
  - 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
- B. Standards: Comply with the following:
  - 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
  - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
  - 4. Dustproof Strikes: BHMA A156.16.

## 2.10 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
  - 1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL 305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
  - 2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
  - 3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar



- and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
  5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
  6. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.
  7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
  8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
  9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2 inch (50.8mm) wide stiles.
  10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
    - a. Sargent Manufacturing (SA) - 80 Series.
    - b. Detex Corporation (DE) - Advantex.
    - c. No substitution.

## 2.11 ELECTRIC STRIKES

- A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Provide

latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike where specified.

1. Manufacturers:
  - a. Folger Adam EDC (FO).
  - b. HES (HS).

- B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five-year warranty.

## 2.12 CONVENTIONAL EXIT DEVICES

- A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL 305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
6. Electromechanical Options: Subject to same compliance standards and requirements as mechanical exit devices, electrified devices to be of type and design as specified in hardware sets. Include any specific controllers when conventional power supplies are not sufficient to provide the proper inrush current.
7. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
  - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
  - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.

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Prime Engineering, Inc.

February 28, 2025

8. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
  9. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2 inch (50.8mm) wide stiles.
  10. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  11. Rail Sizing: Provide exit device rails factory sized for proper door width application.
  12. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.
- B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.
1. Manufacturers:
    - a. Sargent Manufacturing (SA) - 80 Series.
    - b. Detex Corporation (DE) - Advantex.
    - c. No substitution.
- C. Tube Steel Removable Mullions: ANSI/BHMA A156.3 removable steel mullions with malleable- iron top and bottom retainers and a primed paint finish.
1. Provide keyed removable feature where specified in the Hardware Sets.
  2. Provide stabilizers and mounting brackets as required.
  3. Provide electrical quick connection wiring options as specified in the hardware sets.
  4. Manufacturers:
    - a. Sargent Manufacturing (SA) - 980S Series.
    - b. No substitution.

### 2.13 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
  2. Standards: Closers to comply with UL-10C and UBC 7-2 for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
  4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.

5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
    - a. Where closers are indicated to have mechanical dead-stop, provide heavy duty arms and brackets with an integral positive stop.
    - b. Where closers are indicated to have mechanical hold open, provide heavy duty units with an additional built-in mechanical holder assembly designed to hold open against normal wind and traffic conditions. Holder to be manually selectable to on-off position.
    - c. Where closers are indicated to have a cushion-type stop, provide heavy duty arms and brackets with spring stop mechanism to cushion door when opened to maximum degree.
    - d. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics. Provide drop plates or other accessories as required for proper mounting.
  6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt or security type fasteners as specified in the door Hardware Sets.
  7. Closers on Gates: Gate manufacturer to prepare gates with proper reinforcements and mounting surfaces for installation of closers where scheduled. Templates for proper reinforcements shall be provided by hardware supplier for reference upon request
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Acceptable Manufacturers:
    - a. Sargent Manufacturing (SA) - 351 Series.
    - b. Norton Door Controls (NO) - 7500 Series.
- C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA 156.4, Grade 1 certified surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Unitrol arms to have door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.
1. Acceptable Manufacturers:
    - a. Norton Door Controls (NO) - Unitrol 7500 Series
    - b. No substitution.

## 2.14 ELECTROHYDRAULIC DOOR OPERATORS

- A. General: Provide low energy operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for compliance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation devices.
  1. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.

- B. Standard: Certified ANSI/BHMA A156.19.
- C. Performance Requirements:
  - 1. Opening Force if Power Fails: Not more than 15 lbf (66.72 N) required to release a latch if provided, not more than 30 lbf (133.45 N) required to manually set door in motion, and not more than 15 lbf (66.72 N) required to fully open door.
  - 2. Entrapment Protection: Not more than 15 lbf (66.72 N) required to prevent stopped door from closing or opening.
- D. Configuration: Surface mounted or in-ground as required. Door operators to control single swinging and pair of swinging doors.
- E. Operation: Power opening and spring closing operation capable of meeting ANSI A117.1 accessibility guideline. Provide time delay for door to remain open before initiating closing cycle as required by ANSI/BHMA A156.19. When not in automatic mode, door operator to function as manual door closer with fully adjustable opening and closing forces, with or without electrical power.
- F. Features: Operator units to have full feature adjustments for door opening and closing force and speed, backcheck, motor assist acceleration from 0 to 30 seconds, time delay, vestibule interface delay, obstruction recycle, and hold open time from 0 up to 30 seconds.
- G. Provide outputs and relays on board the operator to allow for coordination of exit device latch retraction, electric strikes, magnetic locks, card readers, safety and motion sensors and specified auxiliary contacts.
- H. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonferrous shims for aligning system components.
- I. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Norton Door Controls (NO) - 6000 Series.

## 2.15 SURFACE MOUNTED CLOSER HOLDERS

- A. Electromagnetic Door Holders: Certified ANSI A156.15 electromagnetic door holder/releases with a minimum 20 to 40 pounds holding power and single coil construction able to accommodate 12VDC, 24VAC, 24VDC and 120VAC. Coils to be independently wound, employing an integral fuse and armatures to include a positive release button.
  - 1. Acceptable Manufacturers:
    - a. Rixson (RF) - 980/990 Series.
    - b. Sargent Manufacturing (SA) - 1560 Series.

## 2.16 ARCHITECTURAL TRIM

### A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2 inches (50.80mm) less than door width (LDW) on stop side of single doors and 1 inch (25.4mm) LDW on stop side of pairs of doors, and not more than 1 inch (25.4mm) less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16 inches (0.41m) above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Metal Protection Plates: ANSI/BHMA A156.6 certified metal protection plates (kick, armor, or mop), fabricated from the following:
  - a. Stainless Steel: 300 series, 050-inchthick.
5. Fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets.
6. Acceptable Manufacturers:
  - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).

## 2.17 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
  1. Acceptable Manufacturers:
    - a. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.
  1. Acceptable Manufacturers:
    - a. Rixson Door Controls (RF).
    - b. Rockwood Products; ASSA ABLOY Architectural Door Accessories (RO).
    - c. Sargent Manufacturing (SA).

## 2.18 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  - 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  - 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Acceptable Manufacturers:
  - 1. Pemko Manufacturing (PE).

## 2.19 ELECTRONIC ACCESSORIES

- A. Key Switches: Key switches furnished standard with stainless steel single gang face plate with a 12/24VDC bi-color LED indicator. Integral backing bracket permits integration with any 1 1/4" or 1 1/2" mortise type cylinder. Key switches available as momentary or maintained action and in narrow face plate options.
  - 1. Acceptable Manufacturers:
    - a. Alarm Controls (AK) - MCK Series.
    - b. Securitron (SU) - MK Series.
- B. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
  - 1. Acceptable Manufacturers:
    - a. Securitron (SU) - AQD Series.
    - b. Altronix (AX) – Waypoint Series.

- C. Push-Button Switches: Industrial grade momentary or alternate contact, back-lighted push buttons with stainless-steel switch enclosures. 12/24 VDC bi-color illumination suitable for either flush or surface mounting.

- 1. Manufacturers:

- a. Securitron (SU) - EEB Series.

## 2.20 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.
- B. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

## 2.21 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. General Contractor to examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

### 3.2 PREPARATION



- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

### 3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
  - 2. Locks shall be equipped with temporary cores as specified and shall be confirmed to be functional and operational. Temporary keys shall be provided to owner upon completion of installation and verification of functionality.
- B. Electrified Hardware: All electrified hardware is to be connected and electrically sound by the hardware installer, to include connections to local power supply, transfer hinge, power transfer, or door loop and installation of harness from power transfer to security junction box above door. All connections beyond the security junction box above door or associated local power supply are the responsibility of the security contractor.
- C. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
  - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- D. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

### 3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

### 3.5 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

### 3.6 DOOR HARDWARE SETS (GENERAL)

- A. The hardware sets represent the design intent and direction of the Owner and Architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the Architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.

### 3.7 HARDWARE SETS

#### A. Set 1

- 1. Doors:
- 2. Description: EXTERIOR DOOR
- 3. Function: ELECTRIFIED TRIM EXIT DEVICE WITH EXTERIOR LEVER, FAIL OPEN, INTEGRATED REQUEST TO EXIT, STOREROOM FUNCTION

- 3 Hinge (Heavy Weight)
- 1 Electric Exit Device
- 1 Electrified Strike
- 1 Door Closer
- 1 Armor Plate
- 1 Threshold
- 1 Gasketing
- 1 Sweep

### 3.8 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

**END OF SECTION 08 7100**

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

- 1. Windows.

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
  - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
    - a. Wind Design Data: As indicated on Drawings.
  - 2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
  - 3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch (25 mm), whichever is less.
  - 4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

- 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

#### 1.5 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of **glass product other than clear monolithic vision glass**; 12 inches (300 mm) square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For glass and glazing products, from manufacturer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for **insulating glass**
  - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- C. Preconstruction adhesion and compatibility test report.
- D. Warranties: Sample of special warranties.

#### 1.7 QUALITY ASSURANCE

- A. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

#### 1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
  - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below **40 deg F (4.4 deg C)**.

#### 1.10 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
  - 1. Warranty Period: **10** years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
  - 1. Warranty Period: **10** years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
  - 1. Minimum Glass Thickness for Exterior Lites: Not less than **6.0** mm.
  - 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
  2. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as  $\text{Btu/sq. ft.} \times \text{h} \times \text{deg F}$  ( $\text{W/sq. m} \times \text{K}$ ).
  3. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
  4. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

## 2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
  2. For uncoated glass, comply with requirements for Condition A.
  3. For coated vision glass, comply with requirements for Condition C (other coated glass).

## 2.3 INSULATING GLASS

- A. 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. Vitro, Solarban 70
  2. Guardian, SNX62/67
  3. Viracon, VNE-53
  4. Cardinal, 366
- B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Sealing System: Dual seal, with **manufacturer's standard** primary and secondary.
  2. Spacer: **Manufacturer's standard spacer material and construction**
  3. Desiccant: Molecular sieve or silica gel, or blend of both.
- C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

## 2.4 GLAZING GASKETS

- A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned **neoprene EPDM silicone or thermoplastic polyolefin rubber** gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
  - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.
- B. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

## 2.5 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
  - 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

## 2.6 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
  - 1. AAMA 804.3 tape, where indicated.
  - 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
  - 3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.
- B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
  - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.



## 2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

## 2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

## 2.9 INSULATING-GLASS TYPES

- A. Glass Type [GL-1]: Low-e-coated, clear insulating glass.
  - 1. Overall Unit Thickness: **1 inch (25 mm)**
  - 2. Thickness of Each Glass Lite: **6.0 mm**
  - 3. Outdoor Lite: **Float glass**
  - 4. Interspace Content: **Argon.**
  - 5. Indoor Lite: **Float glass**
  - 6. Low-E Coating: **Pyrolytic on second**
  - 7. Visible Light Transmittance: 62 percent minimum.
  - 8. Winter Nighttime U-Factor: .237 maximum.

**DALTON PICKLEBALL COMPLEX**

**DALTON, GA**

PROJECT NO. 2024-0283

Prime Engineering, Inc.

February 28, 2025

9. Solar Heat Gain Coefficient: .28 maximum.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  2. Presence and functioning of weep systems.
  3. Minimum required face and edge clearances.
  4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION**

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

**3.3 GLAZING, GENERAL**

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than **50 inches (1270 mm)**.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide **1/8-inch (3-mm)** minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

### 3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until right before each glazing unit is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.5 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

### 3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

### 3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Fixed, **extruded-aluminum** louvers.
  - 2. Fixed, formed-metal acoustical louvers.
- B. Related Requirements:
  - 1. Section 099113 "Exterior Painting" for field painting louvers.

1.3 DEFINITIONS

- A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
- B. Horizontal Louver: Louver with horizontal blades (i.e., the axes of the blades are horizontal).
- C. Vertical Louver: Louver with vertical blades (i.e., the axes of the blades are vertical).
- D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

C. Samples: For each type of metal finish required.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.
- B. Windborne-debris-impact-resistance test reports.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
  3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

#### 1.7 FIELD CONDITIONS

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

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
  1. Wind Loads: Determine loads based on pressures as indicated on Drawings.

- B. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

## 2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Drainable-Blade Louver :

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

- a. [Air Balance Inc.; a Mestek company.](#)
- b. [Air Flow Company, Inc.](#)
- c. [Airolite Company, LLC \(The\).](#)
- d. [All-Lite Architectural Products.](#)
- e. [American Warming and Ventilating; a Mestek company.](#)
- f. [Architectural Louvers; Harray, LLC.](#)
- g. [Arrow United Industries; a division of Mestek, Inc.](#)
- h. [Carnes Company, Inc.](#)
- i. [Cesco Products; a division of Mestek, Inc.](#)
- j. [Construction Specialties, Inc.](#)
- k. [Dowco Products Group; Safe Air of Illinois.](#)
- l. [Greenheck Fan Corporation.](#)
- m. [Industrial Louvers, Inc.](#)
- n. [Louvers & Dampers; a division of Mestek, Inc.](#)
- o. [Metal Form Manufacturing, Inc.](#)
- p. [NCA Manufacturing, Inc.](#)
- q. [Nystrom, Inc.](#)
- r. [Pottorff.](#)
- s. [Reliable Products, Inc.](#)
- t. [Ruskin Company; Tomkins PLC.](#)
- u. [United Enertech.](#)
- v. [Vent Products Co., Inc.](#)

## 2.4 LOUVER SCREENS

- A. General: Provide screen at **each exterior louver.**

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird & Insect screening.

- B. Secure screen frames to louver frames with **machine screws with heads finished to match louver**, spaced a maximum of **6 inches (150 mm)** from each corner and at **12 inches (300 mm)** o.c.

- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.



1. Metal: Same type and form of metal as indicated for louver to which screens are attached.
2. Finish: Same finish as louver frames to which louver screens are attached
3. Type: Rewirable frames with a driven spline or insert, Non-rewirable, U-shaped frames.

D. Louver Screening for Aluminum Louvers:

1. Bird Screening: Aluminum, **1/2-inch- (13-mm-)** square mesh, **0.063-inch (1.60-mm)** wire.
2. Insect Screening: Aluminum, **18-by-16 (1.4-by-1.6-mm)** mesh, **0.012-inch (0.30-mm)** wire.

## 2.5 MATERIALS

A. Aluminum Extrusions: **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T5, T-52, or T6.

B. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use **tamper-resistant** screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
4. For fastening stainless steel, use 300 series stainless-steel fasteners.
5. For color-finished louvers, use fasteners with heads that match color of louvers.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

## 2.6 FABRICATION

A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: **Channel** unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

- E. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or **72 inches (1830 mm)** o.c., whichever is less.
  - 1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
  - 2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
  - 3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

## 2.7 ALUMINUM FINISHES

- A. Finish louvers after assembly.
  - 1. Color: As selected by Architect from full range of industry colors and color densities

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

### 3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

- E. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

#### 3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.
  - 1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089119

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Suspension systems for interior ceilings, soffits, and grid systems.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.062-inch- (1.59-mm-)** diameter wire, or double strand of **0.048-inch- (1.21-mm-)** diameter wire.
- B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, **0.16 inch (4.12 mm)** in diameter.
- C. Flat Hangers: Steel sheet **1 by 3/16 inch (25 by 5 mm) by length indicated**
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of **0.053 inch (1.34 mm)** and minimum **1/2-inch- (13-mm-)** wide flanges.
  - 1. Depth: **1-1/2 inches (38 mm)**.
- E. Furring Channels (Furring Members):
  - 1. Cold-Rolled Channels: **0.053-inch (1.34-mm)** uncoated-steel thickness, with minimum **1/2-inch- (13-mm-)** wide flanges, **3/4 inch (19 mm)** deep.
  - 2. Steel Studs and Runners: ASTM C 645.
    - a. Minimum Base-Metal Thickness: As indicated on Drawings
    - b. Depth: As indicated on Drawings

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, **7/8 inch (22 mm)** deep.
    - a. Minimum Base-Metal Thickness: As indicated on Drawings
  4. Resilient Furring Channels: **1/2-inch- (13-mm-)** deep members designed to reduce sound transmission.
    - a. Configuration: Asymmetrical or hat shaped
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Armstrong World Industries, Inc.;](#)
    - b. [Chicago Metallic Corporation.](#)
    - c. [USG Corporation.](#)

## 2.2 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, **1/8 inch (3.2 mm)** thick, in width to suit steel stud size.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

### 3.3 INSTALLATION, GENERAL

- A. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- B. Install bracing at terminations in assemblies.
- C. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

### 3.4 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
  - 1. Hangers: 24 **inches (1219 mm)** o.c.
  - 2. Carrying Channels (Main Runners): **24 inches (1219 mm)** o.c.
  - 3. Furring Channels (Furring Members): **16 inches (406 mm)** o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
    - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
    - a. Size supplemental suspension members and hangers to support ceiling loads within **performance limits established by referenced installation standards.**
  - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 5. Do not connect or suspend steel framing from ducts, pipes, or conduit.

- D. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- E. Installation Tolerances: Install suspension systems that are level to within **1/8 inch in 12 feet (3 mm in 3.6 m)** measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

## **SECTION 09 9000 - PAINTING AND COATING**

### **PART 1 - GENERAL**

#### 1.1 SUMMARY

- A. Section Includes
  - 1. Surface preparation.
  - 2. Field application of paints, stains, and other coatings.
  - 3. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
    - a. Exterior face of concealed CMU block exterior wall to be painted with block filler per IECC requirements for air and weather barrier.
- B. Paint exposed surfaces whether or not colors are designated in Finish Schedule, except where a surface or material is specifically indicated not to be painted or is to remain natural. If color or finish is not designated, the Architect will select from standard colors or finishes available.
- C. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.
  - 1. Prefinished items not to be painted include the following factory-finished components:
    - a. Acoustic materials.
    - b. Finished mechanical and electrical equipment.
    - c. Light fixtures.
    - d. Switchgear.
    - e. Distribution cabinets.
  - 2. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:
    - a. Foundation spaces.
    - b. Furred areas.
    - c. Pipe spaces.
    - d. Duct shafts.
  - 3. Finished metal surfaces not to be painted include:
    - a. Anodized or mill finished aluminum.
    - b. Stainless steel.
    - c. Chromium plate.
    - d. Copper.
    - e. Bronze.
    - f. Brass.
  - 4. Operating parts not to be painted include moving parts of operating equipment such as the following:
    - a. Valve and damper operators.
    - b. Linkages.



- c. Sensing devices.
- d. Motor and fan shafts.
- 5. Other Items:
  - a. Pipes, ducts, valves, fittings, conduits, fans, and insulation, in areas above suspended ceilings.
  - b. Striping of exterior pavements.
- 6. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- 7. Extra and excess materials indicated.

## 1.2 REFERENCE STANDARDS

- A. 49 CFR 59, Subpart D – National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental protection Agency; current edition.

## 1.3 SUBMITTALS

- A. Product Data: Provide data on all finishing products, including VOC content.
- B. Samples: Submit two painted samples, illustrating selected colors for each color and system selected. Submit on durable sheet material, 8 x 11 inch in size.
- C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Paint and Coatings: 2 gallons of each color; store where directed.
  - 2. Label each container with color in addition to the manufacturer's label.

## 1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
- B. Installation: Installation by skilled commercial painters with not less than five (5) years of continuous experience with materials equal in quality on projects of comparable scope. A satisfactory crew of qualified painters shall be maintained throughout the duration of the work.
- C. MPI Standards:
  - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List".
  - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.
- D. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

- 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.

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- a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
  - b. Other Items: Architect will designate items or areas required.
  2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
  3. Final approval of color selections will be based on benchmark samples.
    - a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.
- E. Materials:
1. Provide ready-mixed paints and stains. Job mixing and tinting is not acceptable.
  2. Provide lead free materials with mildew and mold resistant top coatings.
  3. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer's testing and field experience.
  4. Minimum dry film thickness (dft) for each coat is listed in millimeters (mils) in the Material Schedule within this Section.
- F. Material Quality: Provide manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
1. Product name or title of material.
  2. Product description (generic classification or binder type).
  3. Federal Specification number, if applicable.
  4. Manufacturer's stock number and date of manufacture.
  5. Contents by volume, for pigment and vehicle constituents.
  6. Thinning instructions.
  7. Application instructions.
  8. Color name and number.
  9. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 degrees F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

### 1.6 PROJECT CONDITIONS

- A. Storage: Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain stored containers in a clean condition, free of foreign materials and residue. Protect from freezing.
1. Deliver painting materials in sealed, original labeled containers bearing manufacturer's name,

- brand name, type of paint or coating, color designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.
2. Take necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect environment from hazard spills. Store all materials that constitute a fire hazard (paints, solvents, drop cloths, etc.) in suitable closed and rated containers. Post adequate warnings (e.g. no smoking) as required.
  3. Keep storage areas neat and orderly. Remove oily rags and waste daily, and dispose of off-site in a manner approved by authorities having jurisdiction.
- B. Environmental Conditions:
1. Apply waterborne paints and finishes only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
  2. Apply solvent-thinned paints and finishes only when temperatures of surfaces to be painted and surrounding air are between 45 F.
  3. Do not apply paint or finish material in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Work Conditions:
1. Coordinate with other trades to ensure adequate illumination, ventilation and dust-free environment during paint and finish application and drying. Maintain temperature and humidity within manufacturer's recommended tolerances throughout the work.
  2. Before commencing work on any surface type, carefully inspect same and verify they are clean, dry and in all other respects suitable to receive specified treatment. Use cleaning materials and methods appropriate for substrate and field conditions.
  3. Protection and Cleaning: Provide clean drop cloths, and other protection as approved, to protect floors, doors, windows and other parts from damage. Where any work is splattered, clean promptly and leave in satisfactory condition.
  4. Use no plumbing fixtures, open waste or vent pipe, or pipe of any kind to dispose of paint, used rags, waste or other materials.
  5. Water closets, tubs, and other fixtures, cabinets, furniture, etc., shall not be used as supports for planking, and shall be thoroughly protected from damage at all times.
  6. Mixed species of wood occurring within the same room or adjacent to one another shall be finished to match the selected species and finish.
- D. Concrete Slab Curing Materials and Methods: Review concrete slab curing and sealing material submittals provided by General Contractor for compatibility with floor coating materials provided under this Section. Notify General Contractor, in writing, of materials' compatibility or non-compatibility with floor coating materials provided under this Section. Proceed with installation only after compatible materials and/or curing methods have been approved, or non-compatible curing or sealing materials have been removed by the General Contractor.
- E. Waste Management and Disposal:
1. Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and subject to regulations for disposal. Obtain information on required controls from applicable authorities having jurisdiction.
  2. Collect, separate and recycle waste materials where recycling is available. Treat materials that cannot be reused as hazardous waste and disposed of in an appropriate manner.

3. Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated on-site for hazardous waste.
  4. The following procedures shall be strictly adhered to:
    - a. Retain cleaning water for water based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
    - b. Retain cleaners, thinners, solvents and excess paint, and place in designated containers and ensure proper disposal.
    - c. Return solvent and oil soaked rags for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
    - d. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
    - e. Empty paint cans are to be dry prior to disposal or recycling (where available).
    - f. Close and seal tightly partly used cans of materials, including sealant and adhesive containers, and store in ventilated, fire safe areas at moderate temperatures.
  5. Set Aside and protect surplus and uncontaminated finish materials not required by Owner, and arrange collection for verifiable reuse or remanufacturing.
- F. Unless specifically noted, do not paint or finish prefinished items and surfaces, concealed surfaces, operating parts and the following:
1. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating or nomenclature plates.
  2. Architectural Features: Aluminum doors, frames and windows, finish hardware, and copper, stainless steel or aluminum fabrications.

#### 1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied, and that are packaged for storage and identified with labels describing contents. Deliver extra materials to Owner.
  1. Quantity: Furnish an additional 3 percent, but not less than 1 gal. of each material and color applied.
- B. Excess Materials: In addition to extra materials noted above, turn over unused paint and finish materials to the Owner's representative. Package materials with protective covers for storage and identify with labels describing contents and color.
- C. Provide a typed list of extra and excess materials and turn over to the Owner's representative.

### **PART 2 - PRODUCTS**

#### 2.1 ACCEPTABLE MANUFACTURERS

- A. Materials selected for coating systems for each type surface shall be the product of a single manufacturer. The Basis of Design is Sherwin Williams unless otherwise specified. Except as otherwise specified, materials shall be the products of the following manufacturers, and as indicated on the Drawings:

1. Sherwin Williams
2. Benjamin Moore
3. PPG
4. Glidden

- B. Note: All coatings must comply with current VOC regulations.
- C. Paints and coatings must comply with one or more of the certifications for VOC emissions verification: either GREENGUARD GOLD Certification Program for Chemical Emissions for Building Materials, Finishes and Furnishings, or are CDPH v1.1-2010 (LEED v4) Emission Certified by the California Department of Public Health (CDPH) Standard Method, and meet the VOC limits per CARB.

## 2.2 GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  2. Supply each coating material in quantity required to complete entire project's work from a single production run.
  3. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
1. Provide coatings that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D – National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. Architectural coatings VOC limits of State in which the project is located.
  2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Coating Material Compatibility: Provide block fillers, primers, under-coaters, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- E. Material Compatibility:
1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- F. Chemical Components of Field-Applied Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions; these requirements do not apply to primers or finishes that are applied in a fabrication or finishing shop:

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1. Flat Paints and Coatings: VOC content of not more than 100 g/L.
2. Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.
3. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
4. Restricted Components: Paints and coatings shall not contain any of the following:
  - a. Acrolein.
  - b. Acrylonitrile.
  - c. Antimony.
  - d. Benzene.
  - e. Butyl benzyl phthalate.
  - f. Cadmium.
  - g. Di (2-ethylhexyl) phthalate.
  - h. Di-n-butyl phthalate.
  - i. Di-n-octyl phthalate.
  - j. 1,2-dichlorobenzene.
  - k. Diethyl phthalate.
  - l. Dimethyl phthalate.
  - m. Ethylbenzene.
  - n. Formaldehyde.
  - o. Hexavalent chromium.
  - p. Isophorone.
  - q. Lead.
  - r. Mercury.
  - s. Methyl ethyl ketone.
  - t. Methyl isobutyl ketone.
  - u. Methylene chloride.
  - v. Naphthalene.
  - w. Toluene (methylbenzene).
  - x. 1,1,1-trichloroethane.
  - y. Vinyl chloride.

### 2.3 PAINT SYSTEMS – EXTERIOR

- A. Ferrous Metals, Primed, Alkyd, 2 Coat:
  1. Touch up factory primer with rust-inhibitive primer recommended by top coat manufacturer.
  2. Gloss: Two coats of low-VOC advanced thermoset solution fluoropolymer semi-gloss enamel;
    - a. Basis of Design: TNEMEC Low VOC “Hydroflon” series 701 or equal by PPG.
- B. Galvanized Metals, Alkyd, 3 Coat:
  1. One coat Galvanize primer.
    - a. Benjamin Moore: MO7 I.M.C. Universal Alkyd Metal Primer.
    - b. Devco: 4160 Tank and Structural Primer.
    - c. PPG: 90-712 Pitt-Tech Acrylic Metal Primer
    - d. Sherwin Williams: B50WZ3 Galvite Galvanized Metal Primer.
  2. Gloss: Two coats of alkyd enamel:
    - a. Benjamin Moore: 133 Impervo Alkyd High Gloss Enamel.
    - b. Devco: 4160 Tank and Structural Primer.
    - c. PPG: 7-282 Pittsburgh Paints Industrial Oil Gloss
    - d. Sherwin Williams: B54Z Industrial Alkyd Gloss Enamel.

- C. Masonry, Opaque, Latex, 1 Coat: (Low VOC)
  - 1. One coat of block filler.
    - a. Benjamin Moore: Eco Spec Interior Latex Primer Sealer 231 (0 g/L VOC).
    - b. Glidden: 3010-1200 Blockfiller (<100 g/L VOC).
    - c. PPG: PPG 6-7 Speedhide Acrylic Latex Block Filler (14 g/L VOC).
    - d. Sherwin Williams: S-W Loxon Acrylic Masonry Primer, A24W8300.

## 2.4 PAINT SYSTEMS – INTERIOR – LOW VOC

- A. Masonry, Opaque, Latex, 3 Coat: (Low VOC)
  - 1. One coat of block filler.
    - a. Benjamin Moore: Eco Spec Interior Latex Primer Sealer 231 (0 g/L VOC).
    - b. Glidden: 3010-1200 Blockfiller (<100 g/L VOC).
    - c. PPG: PPG 6-7 Speedhide Acrylic Latex Block Filler (14 g/L VOC).
    - d. Sherwin Williams: S-W Loxon Acrylic Masonry Primer, A24W8300.
  - 2. Semi-gloss: Two coats of latex enamel;
    - a. Benjamin Moore: Eco Spec Interior Semi-Gloss Enamel 224 (11 g/L VOC).
    - b. Glidden: 9200 Lifemaster No VOC Semi-Gloss Interior (0 g/L VOC).
    - c. PPG: PP6139 Pro Master 2000 Latex Semi-Gloss Enamel (108 g/L VOC).
    - d. Sherwin Williams: S-W ProMar 200 Zero VOC Latex Semi-Gloss.
- B. Ferrous and Galvanized Metals, Primed, Acrylic Enamel, 2 Coat: (Low VOC)
  - 1. Touch up with acrylic primer.
    - a. Benjamin Moore: Super Spec HP, Acrylic Metal Primer
    - b. Glidden: 4020-1000 Devflex DTM primer (91 g/L VOC).
    - c. PPG: 90-712 Pitt Tech DTM Acrylic Metal Primer (123 g/L VOC).
    - d. Sherwin Williams: B66-310 Series Pro Industrial ProCryl Universal Primer.
  - 2. Semi-gloss: Two coats of acrylic enamel;
    - a. Benjamin Moore: M29 I.M>C> DTM 100% Acrylic Semi-Gloss Enamel
    - b. Glidden: 9200 Lifemaster No VOC Semi-gloss Interior (0 g/L VOC)
    - c. PPG: 7-374 Pittsburgh Paints Semi Gloss Acrylic Metal Finish (82 g/L VOC).
    - d. Sherwin Williams: B42 Series Metalatex Semi-Gloss

- C. Epoxy Floor Finish at Concrete Floor at Janitor Closets, Office, Concession, Restrooms, Storage and Maintenance Rooms.
  - 1. Basis of Design: Dura-Cote, Inc. Dur-A-Quartz system. Refer to the Drawings for additional information.
  - 2. Or as approved by the Architect.

## 2.5 ACCESSORY MATERIALS

- A. Accessory Materials: Provide all primers, sealers cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head cover Material: Latex Filler.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application. Application of primers, paints, stains or finishes represents acceptance by the contractor that the surfaces were properly prepared and suitable for application.
- C. Test shop-applied primer for compatibility with subsequent cover materials.
- D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Gypsum Wallboard: 12 percent.
  - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
    - a. Concrete floors and Traffic Surfaces: 8 percent.

#### 3.2 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
- E. Seal surfaces that might cause bleed through or staining of topcoat.
- F. Remove mildew from impervious surfaces by scrubbing with solution of tetra- sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- G. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.



- J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
- K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
- L. Metal Doors to be painted: Prime metal door top and bottom edge surfaces.
- M. Note: Concrete wall panels are to be backerolled with each coat. panels are to be pressure washed prior to painting to remove all contaminants.

### 3.3 APPLICATION

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance.
- D. Dark Colors and Deep Clear colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- E. Apply paint, enamel, stain and varnish with suitable brushes, rollers or spraying equipment.
  - 1. Rate of application shall not exceed that as recommended by paint manufacturer for the surface involved.
  - 2. Keep brushes and rollers and spraying equipment clean, dry, free from contaminates and suitable for the finish required.
  - 3. Apply stain by brush.
- F. Finish coats shall be smooth, free of brush marks, streaks, laps or pile up of paints and skipped or missed areas.
- G. Leave all parts of moldings and ornaments clean and true to details with no undue amount of paint in corners and depressions.
- H. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
- I. Change colors at corner of stop where colors differ between adjoining spaces or rooms and where door frames match wall colors.
- J. Where portion of finish or drywall partition is damaged or unacceptable, refinish entire surface of partition.

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- K. Back-prime exterior carpentry and millwork with material specified for prime coat, without runs on face. Finish cut edges just prior to installation.
- L. Finish all edges of exterior doors same as faces.
- M. The number of coats specified are minimum. The Contractor shall provide at no additional cost to the Owner, as many coats as necessary for color coverage conformity and uniform appearance. See 3.6 below for specific application requirements
- N. Sand metal surfaces lightly between coats to achieve required finish.
- O. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

**3.4 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

**3.5 PROTECTION**

- A. Protect finished coatings until completion of project.
- B. Touch up and restore finish where damaged. Remove spilled, splashed or splattered paint from all surfaces.
- C. Do not mar surface finish of item being cleaned.

**3.6 SCHEDULE – SURFACES TO BE FINISHED**

- A. Do Not Paint or Finish the Following Items:
  - 1. Items fully factory-finished unless specifically noted.
  - 2. Fire rating labels, equipment serial number and capacity labels.
  - 3. Stainless steel items.
- B. Exterior Surfaces to be painted:
  - 1. All hollow metal doors and frames.
  - 2. CMU walls with block filler per IECC requirements for AWB.
  - 3. All bollards.
  - 4. All exposed piping.
  - 5. Gas piping on roof.
  - 6. Downspout guards.
  - 7. Structural Steel
  - 8. Piping, conduit, and ductwork unless specifically noted.
  - 9. All other exposed metal except prefinished items.

- C. Interior Surfaces to be painted:
  - 1. All walls scheduled for paint.
  - 2. All hollow metal doors and frames.
  - 3. Floors where noted scheduled or indicated.
  
- D. Interior Floors to be Coated:
  - 1. All
  
- E. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment. Leave documentation/ proof of rating stamp for inspection if painting occurs prior to inspection.

**END OF SECTION 09 9000**

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and application of wood finishes[.][ **on the following substrates:**]
  - 1. Exterior Substrates:
    - a. Exposed wood panel products.
- B. Related Requirements:
  - 1. Section 099113 "Exterior Painting" for standard paint systems on exterior substrates.
  - 2. Section 099123 "Interior Painting" for stains and transparent finishes on concrete floors.
  - 3. Section 099600 "High-Performance Coatings" for transparent high-performance coatings on concrete floors and clay masonry.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- D. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. LEED Submittals:

1. Product Data for Credit EQ 4.2: For interior stains and coatings, documentation including printed statement of VOC content.
  2. Laboratory Test Reports for Credit EQ 4: For interior stains and coatings, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of finish system and in each color and gloss of finish indicated.
1. Submit Samples on representative samples of actual wood substrates, **8 inches (200 mm) long**.
  2. Label each Sample for location and application area.
- E. Product List: For each product indicated, include the following:
1. Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules.
  2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.
  3. VOC content.

#### 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Stains and Transparent Finishes: **5 percent**, but not less than **1 gal. (3.8 L)** of each material and color applied.

#### 1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each finish system indicated and each color selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least **100 sq. ft. (9 sq. m)**.
    - b. Other Items: Architect will designate items or areas required.
  2. Final approval of stain color selections will be based on mockups.
    - a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
1. Maintain containers in clean condition, free of foreign materials and residue.
  2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply finishes when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Behr Process Corporation.
  2. Benjamin Moore & Co.
  3. Benjamin Moore & Co. (Canada).
  4. Bennette Paint Mfg. Co., Inc.
  5. BLP Mobile Paint Manufacturing.
  6. California Paints.
  7. Cloverdale Paint.
  8. Color Wheel Paints & Coatings.
  9. Columbia Paint & Coatings.
  10. Conco Paints.
  11. Coronado Paint.
  12. Davis Paint Company.
  13. Diamond Vogel Paints.
  14. Dunn-Edwards Corporation.
  15. Durant Paints Inc.
  16. Duron, Inc.
  17. Euclid Chemical Company.
  18. Farrell-Calhoun.
  19. Frazer Paint.
  20. General Paint.

21. [Hallman Lindsay Paints.](#)
22. [Hirshfield's, Inc.](#)
23. [ICI Paints.](#)
24. [ICI Paints \(Canada\).](#)
25. [Insl-x.](#)
26. [Kelly-Moore Paints.](#)
27. [Kwal Paint.](#)
28. [Life Paint Corp.](#)
29. [M.A.B. Paints.](#)
30. [McCormick Paints.](#)
31. [Miller Paint.](#)
32. [Mills Paint.](#)
33. [PARA Paints.](#)
34. [Parex LaHabra Inc.](#)
35. [Parker Paint Mfg. Co. Inc.](#)
36. [PPG Architectural Finishes, Inc.](#)
37. [Pratt & Lambert.](#)
38. [Rodda Paint Co.](#)
39. [SaverSystems.](#)
40. [Sherwin-Williams Company \(The\).](#)
41. [Sico, Inc.](#)
42. [Target Coatings.](#)
43. [Vista Paint.](#)
44. [Zinsser.](#)
- 45.

## 2.2 MATERIALS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
  1. Provide materials for use within each finish system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction[ **and, for interior stains and finishes applied at project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).**
  1. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
  2. Shellacs, Clear: VOC not more than 730 g/L.
  3. Stains: VOC not more than 250 g/L.
  4. Primers, Sealers, and Undercoaters: 200 g/L.

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- D. Low-Emitting Materials: Interior stains and finishes shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. Stain Colors: As selected by Architect from manufacturer's full range

### 2.3 SOURCE QUALITY CONTROL

- A. Testing of Materials: Owner reserves the right to invoke the following procedure:
  - 1. Owner will engage the services of a qualified testing agency to sample wood finishing materials. Contractor will be notified in advance and may be present when samples are taken. If materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
  - 2. Testing agency will perform tests for compliance with product requirements.
  - 3. Owner may direct Contractor to stop applying wood finishes if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying materials from Project site, pay for testing, and refinish surfaces finished with rejected materials. Contractor will be required to remove rejected materials from previously finished surfaces before refinishing with complying materials if the two finishes are incompatible or produce results that, in the opinion of the Architect, are aesthetically unacceptable.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- C. Maximum Moisture Content of Interior Wood Substrates: 15 percent, when measured with an electronic moisture meter.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with finish application only after unsatisfactory conditions have been corrected.
  - 1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.



### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.
  - 1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
  - 2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.
- D. Exterior Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Prime edges, ends, faces, undersides, and backsides of wood.
    - a. For solid hide stained wood, stain edges and ends after priming.
    - b. For varnish coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.
  - 3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.
- E. Interior Wood Substrates:
  - 1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
  - 2. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.
  - 3. Sand surfaces that will be exposed to view and dust off.
  - 4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

### 3.3 APPLICATION

- A. Apply finishes according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
  - 1. Use applicators and techniques suited for finish and substrate indicated.

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2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

- B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

- A. Wood substrates, nontraffic surfaces, including exposed T&G roof decking
  1. Solid Hide, Solvent-Based Stain System:
    - a. Prime Coat: Primer, alkyd for exterior wood, MPI #5.
    - b. Prime Coat: Primer, oil for exterior wood, MPI #7.
    - c. Intermediate Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
    - d. Topcoat: Stain, exterior, solvent based, solid hide, MPI #14.

END OF SECTION 099300

## SECTION 102113 - TOILET COMPARTMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Phenolic-core toilet compartments configured as **toilet enclosures and urinal screens**.
- B. Related Sections:
  - 1. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Show locations of cutouts for compartment-mounted toilet accessories.
  - 2. Show locations of reinforcements for compartment-mounted grab bars.
  - 3. Show locations of centerlines of toilet fixtures.
- C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
  - 1. Each type of material, color, and finish required for units, prepared on **6-inch- (152-mm-)** square Samples of same thickness and material indicated for Work.
  - 2. Each type of hardware and accessory.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: **25** or less.
  - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M.
- B. Aluminum Extrusions: **ASTM B 221** (ASTM B 221M).
- C. Brass Castings: ASTM B 584.
- D. Brass Extrusions: ASTM B 455.
- E. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.
  - 1. Electrolytically Zinc Coated: ASTM A 879/A 879M, **01Z** (03G).
  - 2. Hot-Dip Galvanized: ASTM A 653/A 653M, either hot-dip galvanized or galvanized.
- F. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.
- G. Stainless-Steel Castings: ASTM A 743/A 743M.
- H. Zamac: ASTM B 86, commercial zinc-alloy die castings.

- I. Plastic Laminate: NEMA LD 3, general-purpose HGS grade, 0.048-inch (1.2-mm) nominal thickness.
- J. Adhesives: Manufacturer's standard product that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

## 2.2 PHENOLIC-CORE UNITS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. [Accurate Partitions Corporation.](#)
  - 2. [American Sanitary Partition Corporation.](#)
  - 3. [Ameco, Inc.](#)
  - 4. [Bobrick Washroom Equipment, Inc.](#)
  - 5. [Bradley Corporation; Mills Partitions.](#)
  - 6. [Flush Metal Partition Corp.](#)
  - 7. [General Partitions Mfg. Corp.](#)
  - 8. [Global Steel Products Corp.](#)
  - 9. [Knickerbocker Partition Corporation.](#)
  - 10. [Metpar Corp.](#)
  - 11. [Partition Systems Incorporated of South Carolina.](#)
  - 12. [Rockville Partitions Incorporated.](#)
  - 13. [Sanymetal; a Crane Plumbing company.](#)
  - 14. [Shanahan's Limited.](#)
  - 15. [Tex-Lam Manufacturing, Inc.](#)
  - 16. [Weis-Robart Partitions, Inc.](#)
  - 17. [Young Group Ltd. \(The\); Fabricated Products Division; DesignRite Partitions.](#)
- B. Toilet-Enclosure Style: Overhead braced, Floor anchored
- C. Urinal-Screen Style: Wall hung
- D. Door, Panel, Screen, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges and no-sightline system. Provide minimum 3/4-inch- (19-mm-) thick doors and pilasters and minimum 1/2-inch- (13-mm-) thick panels.
- E. Pilaster Shoes and Sleeves (Caps): Fabricated from stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.
- F. Brackets (Fittings):
  - 1. Stirrup Type: Ear or U-brackets, stainless steel.
- G. Phenolic-Panel Finish:

1. Facing Sheet Finish: One color and pattern in each room.
2. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard dark color core.

## 2.3 ACCESSORIES

- A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
1. Material: Stainless steel
  2. Hinges: Manufacturer's standard paired, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees
  3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
  4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
  5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
  6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

## 2.4 FABRICATION

- A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
1. Maximum Clearances:
    - a. Pilasters and Panels: 1/2 inch (13 mm).
    - b. Panels and Walls: 1 inch (25 mm).
  2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel.
    - a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
    - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than **1-3/4 inches (44 mm)** into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

### 3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Public-use washroom accessories.
  - 2. Public-use shower room accessories.
  - 3. Warm-air dryers.
  - 4. Custodial accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
  - 5. Manufacturer's warranty.
  - 6. Identify locations using room designations indicated.
  - 7. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.



1.6 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **15** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, **0.031-inch (0.8-mm)** minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), **0.036-inch (0.9-mm)** minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with **G60 (Z180)** hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- I. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

## 2.2 PUBLIC-USE WASHROOM ACCESSORIES

- A. **Basis-of-Design Product:** Reference Sheet A-401 for schedule. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. [A & J Washroom Accessories, Inc.](#)
  - 2. [American Specialties, Inc.](#)
  - 3. [Bobrick Washroom Equipment, Inc.](#)
  - 4. [Bradley Corporation.](#)
  - 5. [GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.](#)
  - 6. [Tubular Specialties Manufacturing, Inc.](#)
  - 7. Tork Matic
  - 8. Saniguard

## 2.3 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of **six** keys to Owner's representative.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least **250 lbf (1112 N)**, when tested according to ASTM F 446.

### 3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

**DALTON PICKLEBALL COMPLEX**  
**DALTON, GA**  
PROJECT NO. 2024-0283

Prime Engineering, Inc.  
February 28, 2025

END OF SECTION 102800

## SECTION 21 5250

### FIRE PROTECTION

#### PART 1 – GENERAL

##### 1.01 DESCRIPTION

- A. Provide a complete, hydraulically calculated, sprinkler system including connection to water main on the site, riser, alarm valve with trim, piping, heads, fire department connection, water alarm gong, air compressor, electric motor driven fire pump and electric flow switch for connection to fire alarm system.
- B. Any portion of the system serving, or routed through, unheated space shall be “dry” type, charged with compressed air.
- C. Where required by local utility, provide backflow preventer in supply service to fire protection system. Backflow preventer assembly shall be outside the building prior to any other valves or take-offs. Double check valve assemblies shall be the same size as the incoming water service. Double check valve assemblies shall include a shut-off valve immediately upstream and downstream of the double check valve. Shut-off valves may be supplied as part of the check valve package. Backflow preventer to be located on site in a ground box.
- D. Refer to specification 230100 for additional general requirements.

##### 1.02 QUALIFICATIONS

- A. The fire protection system shall be designed by a licensed fire protection designer.
- B. The fire protection work shall be accomplished by workmen experienced in the installation of fire protection sprinkler systems.
- C. The organization selected to design & install the systems shall have a minimum of five (5) years continuous practice in the exclusive business of design and installation of sprinkler systems. Submit qualifications prior to submittal of shop drawings.

##### 1.04 SHOP DRAWINGS

- A. Prepare shop drawings including hydraulic calculations for the sprinkler system in accordance with NFPA-13. Protect all spaces of the building, including concealed ceiling and truss spaces.
- B. Connect the system to the fire alarm system if one is present.
- C. The drawings issued with these specifications are for bid purposes only and are generally diagrammatic, not showing hangers, offsets, etc. required. Coordinate the design of the system closely with the HVAC, Plumbing and Electrical systems to avoid interference with other systems. Review drawings to ensure that the fire protection system will be concealed above ceilings.
- D. Shop drawings and calculations shall show details of the sprinkler system installation as they pertain to the specific building, NFPA-13, 20,24 and 25 and the local governing authority. Submit

copies of shop drawings and calculations to the local governing authorities for review before submitting to the Architect. Submit six (6) copies of shop drawings to Architect for review. One copy of the shop drawing shall have stamp and comments from the local governing authority.

### **1.05 INSPECTION AND TESTS**

- A. Conduct approval tests as listed in NFPA-13. Submit reports of tests to the Architect. The Architect or his representative may inspect the equipment, piping, etc. at any time during installation.

## **PART 2 – MATERIALS**

### **2.01 MATERIALS AND INSTALLATION**

- A. Use only materials, sprinkler devices, pipe, fittings, valves, hangers, etc. which are new and on the approved or acceptable list of the current issue of inspected fire protection equipment and materials as published by the FIA, FM or U.L.
- B. Install system in accordance with NFPA-13, NFPA 20, NFPA-24 and NFPA 25.

### **2.02 SPRINKLER HEADS**

- A. Rating: 165°F.
- B. Sprinklers in lay-in ceilings:
  - 1. Semi-recessed, pendant type.
  - 2. Chrome plated finish with matching escutcheon.
  - 3. Locate heads in center of tile or on quarter points in the long direction of tiles.
- C. Sprinklers in hard ceilings:
  - 1. Fully recessed, pendant type.
  - 2. Provide with cover matching the color of the ceiling.
- D. Sprinklers in areas without ceilings:
  - 1. Standard upright type.
  - 2. Chrome plated finish.
- E. Sidewall type sprinklers:
  - 1. Standard horizontal sidewall type.
  - 2. Chrome plated finish with matching escutcheon.
- F. ESFR sprinklers in STORAGE areas:

1. Bronze finish
2. Coordinate temperature ratings of sprinklers with heat sources overhead.

### **2.03 EXTRA SPRINKLERS AND CABINETS**

- A. Provide an approved cabinet containing not less than twelve (12) extra sprinkler heads including at least three of each type of head, and one (1) sprinkler wrench near the sprinkler riser.

### **2.04 PIPE AND FITTINGS**

- A. Above ground piping inside of buildings shall conform to the requirements of NFPA 13. Piping shall be metal; no plastic piping is acceptable. Indicate on the shop drawings the type of pipe and jointing selected for use, and submit catalog cuts or letters from manufacturers of all pipe and fittings, certifying compliance with the standards defined in NFPA 13.
- B. Piping 2" and larger shall be schedule 10 black steel with roll-grooved Victaulic or equal joints. The use of light wall piping such as "Allied XL/BLT" is not acceptable.
- C. Piping smaller than 2" shall be schedule 40 steel with threaded joints and malleable iron fittings.
- D. All pipe and fittings used for dry sprinkler systems shall be galvanized.

### **2.05 VALVES**

- A. Gate valves: OS&Y flanged iron body, bronze mounted, Underwriters approved for 175 PSIG WWP, Kennedy Fig. 68.
- B. Check valves: flanged iron body swing or wafer type, bronze mounted with bronze face disk, Underwriters approved for 175 PSIG WWP, Kennedy Fig. 126 or Fig. 706.
- C. Jenkins, Kennedy, Crane, Stockham or Walworth.
- D. All control valves shall be equipped with supervisory switches rated at 120 volts.

### **2.06 INSPECTOR'S TEST CONNECTIONS**

- A. Provide test connections. Inspector's test connections shall pass through the building walls approximately one foot above the building floor or outside grade or shall extend to floor drain.

### **2.07 FIRE DEPARTMENT CONNECTION**

- A. Provide a wall Siamese connection to the riser complete with check valve, ball drip, wall plat, etc. as required by NFPA 13. Siamese connection shall have clapper and plugs and chains. Threads shall conform to local fire department standards.

### **2.08 SPRINKLER PIPING SPECIALTIES**

- A. Wet and Dry Pipe Sprinkler Alarm Valve: Check type valve with electrically or hydraulically operated alarms, with pressure retard chamber and variable pressure trim. The flow switch for

each alarm valve shall have double pole, single throw contact which shall be normally open. The contact shall be rated for 120-volt operation.

- B. Horizontal tank mounted (5) HP reciprocating air compressor for Dry Pipe system(s) at canopy.
- C. Water Motor Alarm: Hydraulically operated impeller type alarm gong, red enameled.
- D. Water Flow Switch: Vane type switch with two contacts.

## **2.09 SIGNS**

- A. Provide and place suitable signs indicating the purpose of each control valve, test connection, main and auxiliary drain, etc. as required. Name plates as required for hydraulically designed systems by NFPA 13 shall be installed.

## **2.10 CUTTING, PATCHING, CARPENTRY AND MASONRY WORK**

- A. Do all cutting, patching, carpentry, and masonry work required for the installation, conforming to the surrounding surfaces in every respect, including painting, tiling, etc. No cutting or patching shall be performed without first obtaining approval of the Architect and cutting or patching of new concrete or masonry will not be permitted unless absolutely necessary.

## **2.11 PIPE HANGERS, SLEEVES, AND WALL & CEILING PLATES**

- A. Support piping in accordance with the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standard Practice SP-58, SP-69, latest edition, and NFPA requirements.
- B. Hangers and supports shall be capable of vertical adjustment under load. All rods shall have double locknuts. Hangers and supports shall be carbon steel, malleable iron, or cast iron; copper plated or insulated with rubber, neoprene, or sheet lead gaskets for copper pipe and tubing. Hangers and supports of chain, strap, gray cast iron, or wire will not be accepted.
- C. Hanger rings:
  - 1. Pipe 3" and smaller: adjustable, Grinnell Figure No. 101.
  - 2. Pipe 3-1/2" and larger: adjustable, Grinnell Figure No. 101 or 260.
- D. Beam clamps for supporting branch lines:
  - 1. Piping 4" and smaller: Grinnell Figure No. 83, 86, 94, or 227.
  - 2. Piping 5" to 8": Grinnell Figure 225, 226, or 270.
  - 3. Use beam clamps where piping is supported from building structure.
- E. Do not punch or drill structure, except for support of piping. Provide supplementary steel for intermediate hangers as required.
- F. Indicate on working drawings the type and location of hangers proposed for use for the support of branch lines and mains under the different types of roof and ceiling construction.

- G. Provide wall and ceiling plates with set screws whenever pipes pass through walls or ceilings.
- H. Sleeves shall be as specified in Section 150060, PIPING.

## **2.12 FIRE PUMP**

- A. Provide a 2000 GPM electric motor driven horizontal split-case pump. The pump shall be Controlled by a *reduced voltage* starter with an integral Automatic Transfer Switch. The pump shall have a 50 PSI boost and be rated at 100 HP.
- B. Accessories shall include test header, jockey pump with controller, flow meter and all devices Required by NFPA, the LOCAL AHJ and the INSURANCE UNDERWRITERS.
- C. All components of the fire pump design shall have a U.L. listing and Factory Mutual approval.

## **PART 3 – EXECUTION**

### **3.01 REQUIREMENTS**

- A. Install in accordance with NFPA 13, NFPA 20, NFPA 24 and NFPA 25.
- B. Install gate valve inside building at main entrance ahead of alarm valve.
- C. Pitch all pipe for drainage and provide drain valves at low points.
- D. Thoroughly flush new water connection before connection to the sprinkler system riser. Provide necessary pipe, hose, etc. to discharge the water so that it will not damage buildings or surrounding property.
- E. Interface sprinkler system with building fire and smoke alarm system.
- F. Located fire department connection with sufficient clearance from walls, obstructions, or adjacent Siamese connectors to allow full swing of fire department wrench handle.
- G. All control valves shall be equipped with an electric supervisory switch with 120 volt contacts.
- H. All alarm devices shall be wired to the main FIRE ALARM CONTROL PANEL.

### **3.02 TESTS**

- A. Perform tests as required by standards listed and prepare report of tests as required by standards. The Fire Protection Contractor shall arrange for a FACTORY start up and testing of the fire pump, jockey pump and controllers.

### **3.03 WATER MOTOR GONGS**



- A. Provide a water operated gong with protective hood at each alarm valve. Connections to the alarm valves, drain connections, and all accessories shall be as required. Gongs shall be tested and left in fully operative condition. Drains from the alarm gongs shall be connected into the alarm valve drain with a check valve.

### **3.05 ALARM VALVES**

- A. Provide a variable pressure alarm valve in each of the sprinkler system supply risers, each equipped with retarding chamber, flow switch for electric alarm connections, gauges, test and drain connections, and required standard accessories.
- B. Mount the alarm valves as close to the wall as possible and accessories shall be mounted along the wall and not extended out into the room. Drains from alarm valves shall pass through building wall approximately on (1) foot above the floor or outside grade or shall extend to floor drain.

**END OF SECTION**

**SECTION 22 400u**

**PLUMBING**

**PART 1 – GENERAL**

**1.01 DESCRIPTION**

- A. Include all necessary apparatus, excavating, controls, valves, and fittings required for a complete sanitary plumbing system.
- B. Refer to Specification 23 0100 for additional general requirements.

**1.02 UTILITIES AND SERVICES**

- A. Sanitary: Provide sanitary drainage, connect to sewer.
- B. Water: Provide domestic water, connect to water mains.

**1.03 TESTS**

- A. Test the plumbing system as required by the applicable plumbing code.
- B. Test water piping for a continuous period of not less than four hours at a hydrostatic pressure of not less than one hundred twenty-five (125) pounds and make free from leaks. Completely remake leaky joints with piping dry. Retest system after leaks are corrected.
- C. Plug all necessary openings in the drainage and vent piping systems and fill the entire system with water to the level of the highest vent stack above the roof. The system shall hold this water for 30 minutes without showing a drop in water level greater than 4 inches. Subject to approval of the Architect, the drainage system may be tested in sections.

**1.04 STERILIZATION**

- A. Disinfect the potable water system in accordance with the Plumbing Code. After disinfection, send water samples to the Local Health Department for testing. Obtain approval of the Local Health Department before the system is placed into service.
- B. Unless the Local Health Department requires otherwise, disinfect potable water piping upon completion of the installation by a mixture containing not less than 0.6 pound of high test calcium hypochlorite, or 2 pounds of chlorinated lime to each 1,000 gallons of water to provide not less than 50 ppm of available chlorine. Inject the mixture into the system and retain for not less than 24 hours, at which time the chlorine level shall be at 10ppm or greater. Then drain the system and flush with potable water until only a normal chlorine residual remains (0.2 ppm).

**PART 2 – MATERIALS**

**2.01 PLUMBING MATERIALS**

- A. Potable Piping:

1. Plumbing for potable systems shall be lead-free per Public Law 99-339, Safe Drinking Water Act.
  2. Lead-free is defined as no more than 0.2 percent lead in solder and solder flux, and no more than 8 percent lead in pipe and fittings.
- B. Domestic Hot and Cold Water, Non-Potable Water, and Pressure Drain Piping:
1. Above Grade: Piping shall be Type L hard drawn copper tubing, ASTM B88, with wrought copper solder type fittings conforming to ANSI B16.22, or cast copper alloy solder joint fittings conforming to ANSI B16.18, or cast copper alloy flanged fittings Class 150 conforming to ANSI B16.24. Screwed joints in piping are restricted to pipe sizes 2" and smaller.
    - a. Exception: Modifications to existing steel systems may use schedule 40, galvanized steel pipe, ASTM A53, Grade A or B, with 150 pound galvanized malleable iron screwed fittings conforming to ANSI B16.3.
  2. CPVC PIPING:
    - a. CPVC potable water pipe and fittings shall be extruded/molded from FlowGuard Gold® CPVC compounds manufactured by Lubrizol Advanced Materials.
    - b. The pipe compound shall meet cell class 24448 and the fitting compound shall meet cell class 23447 as defined by ASTM D1784.
    - c. Both the pipe and the fitting compounds shall be certified by NSF International for use with potable water and shall be from the same compound manufacturer.
  3. Below Grade: Type K copper tubing shall be used. When piping is installed within a building and within or under a concrete slab, it shall be installed without joints. Where joints are unavoidable, they shall be brazed.
    - a. Protective pipe covering shall be factory or field applied according to manufacturer's written instructions.
      - i. 2-1/2" or Larger: Products shall be Polyken No. 1027 primer and Polyken No. 930-35 tape coating, 35 mil, 21 kV dielectric strength, as manufacturer by Tyco Adhesives, Corrosion Protection Group. Minimum 1" overlap required.
      - ii. 2" and Smaller: Products shall be 27 mil plastic sleeve protectors. LSP Products Group, Plasti-Sleeve or equivalent.
- C. Soil, Waste, Drain, and Vent Piping: Cast iron soil pipe, fittings and connection shall comply with CISPI guidelines.
1. Below Grade: Piping shall be service weight hub and spigot (with gasket) coated cast iron and shall conform to ASTM A74 or schedule 40 PVC.
  2. Above Grade: Piping shall be hubless cast iron pipe and fittings conforming to CISPI 301.
- D. Natural Gas Piping:

1. Above Grade: Piping shall be schedule 40 black steel with threaded fittings. Piping and fittings shall conform to ASME B36.10M and ASTM A53/A53M.
  2. Below Grade: Piping and fittings shall be high density polyethylene conforming to ASTM D2513. Tubing shall have a pressure rating of 100 PSI.
- E. Roof Drain Leaders:
1. Below Grade: Leaders shall be service weight hub and spigot coated cast iron and shall conform to ASTM A74.
  2. Above Grade: Hubless cast iron pipe and fittings conforming to CISPI 301.
- F. Equipment Drains and Indirect Waste: DWV copper pipe with DWV wrought copper fittings in compliance with ANSI B16.29.
- G. Laboratory/Process/Acid Waste and Vent Piping: For acid and caustic resistant drains.
1. From lab waste to neutralizing tank and vent piping: Pipe and fittings shall be flame retardant Schedule 40 Polypropylene (GF "Fuseal II" PPR Group 1 63153 or Enfield "Enfusion" Type II-37206) or polyvinylidene fluoride (PVDF) (Fuseal 24/40 PVDF) or Spears Labwaste (CPVC). Polypropylene pipe shall conform to ASTM F1412 and ASTM D4101. The PVDF pipe shall conform to ASTM F1673, ASTM E84, and ASTM E D3222. Joints and fittings shall be DWV electric fusion and made of the same material as the piping.
  2. From neutralizing tank to sewer main: Pipe and fittings shall be per Soil, Waste, Drain, and Vent Piping above.
  3. Connection to equipment and fixtures in accessible locations shall be made with mechanical joints.
  4. Connection to existing systems of different materials shall be made with appropriate adapter provided by the Contractor.

## **2.02 PLUMBING FIXTURES**

- A. Provide plumbing fixtures complete with trim. All fixtures, trimmings, and stops shall be Grade "A" and shall be of one manufacturer. Plumbing fixtures and trim shall be as scheduled on the plans.
- B. Plumbing fixtures for use by handicapped persons shall be in accordance with ANSI 117.1. Plumbing fixtures shall be low water consumption type: 1.28 gal/flush for water closets and 0.5 gal/flush for urinals.
- C. Approved Manufacturers:
1. Fixtures: American Standard, Toto, or Kohler
  2. Fittings: American Standard, Chicago Faucet, Kohler, T&S Brass, Speakman, Symmons, or Stern Williams
  3. Flush Valves: Sloan or Delaney

4. Seats: Bemis, Beneke, Church, or Olsenite
5. Drinking Fountains: Elkay, Halsey Taylor, or Oasis
6. Stainless Steel Fixtures: Elkay, Just, or Advance Tabco
7. Molded Stone, Fiberglass & Plastic Enclosures: Aquaglass, Stern Williams, or Advance Tabco

### **2.03 WATER HEATERS**

- A. Water heaters shall be fully automatic, electric, UL Listed, complete with: insulation in accordance with ASHRAE 90A-80 (1982 requirements), glass-lined tank, coated steel jacket, adjustable thermostat, magnesium anode, and overheat control.
- B. Water heaters shall be guaranteed by the manufacturer for a period not less than 3 years after start-up. Contractor shall furnish the manufacturer's guarantee to the Owner.
- C. Water heater shall have a combination temperature and pressure relief valve having the capacity to relieve the full capacity of the heating element on both temperature and pressure relief. Valve shall be Watts and shall be ASME rated.
- D. Water heaters shall be Lochinvar, Rudd, A.O. Smith, or State.

### **2.04 FLOOR DRAINS**

- A. Drains shall be Jay R. Smith or the approved equal as manufactured by Zurn, Wade, or Josam. All drains shall be of the same manufacturer. Floor drains shall be provided with a trap primer valve and line, JR Smith 2699, connected to the nearest cold water line serving a plumbing fixture.
- B. Floor drains in toilets and finished areas shall be JR Smith 2000 Series with 6" Type B square, adjustable strainer finished in satin nickel bronze; or equal products by Josam or Zurn. Provide vandal-proof secured tops. All floor drains shall be provided with a trap primer.
- C. Floor drains in mechanical rooms and unfinished concrete floors shall be JR Smith 2131 Series with round 11-3/4" cast iron grate, sediment bucket, and deep-seal P-trap; or equal products by Josam or Zurn. Provide vandal-proof secured tops. All floor drains shall be provided with a trap primer.

### **2.05 CLEANOUTS**

- A. Cleanouts in cast iron soil pipe lines shall consist of cast iron ferrule and heavy brass cleanout plug with square head. Where piping is concealed in floors or walls, install cleanouts with countersunk plugs and covers in and near surface of floors or walls.
- B. Cleanouts for floors shall be Josam Series 58360 with inside caulk outlet coated cast iron internal cleanout, brass rim, and Nikaloy scoriated cover plate for light traffic secured to plug by countersunk screw for installation flush with finished floor complete with carpet marker in carpeted areas. Cleanouts in walls shall be Josam Series 58610 with stainless steel covers.
- C. Equal manufactured by Zurn or Wade.

- A. Water hammer arrestors shall be selected and sized in strict accordance with Standard P.D.I. – WH201.
- B. Arrestors shall be Josam 75000 or equal by Zure, JR Smith, or Wade.

### **2.07 WATER PRESSURE REDUCING VALVE**

- A. Where pressure of water service exceeds 70 PSI, a water pressure reducing valve shall be provided. Water pressure reducing valve for building shall be high capacity regulator Watts Series 223 rated 250 PSI inlet, set to 65 PSI outlet.

### **2.08 BACKFLOW PREVENTER**

- A. Watts LF909 water pressure backflow preventer of same size as pipe installed in. Complete with check valve, gate valves, and test cocks. Equal by Cla-Val or Cash Acme.

### **2.09 VALVES**

#### **A. Gate:**

- 1. 2" and Smaller: Class 125, solder or threaded ends, bronze body, rising stem, screwed bonnet, and solid wedge. Nibco S-111 or Nibco T-111 or equivalent.
- 2. 2-1/2" and Larger: Class 125, flanged ends, OS&Y, iron body, bronze trim, rising stem, and solid wedge. Nibco F-617-0 or equivalent.

#### **B. Ball:**

- 1. 2" and Smaller: Bronze body, blowout-proof captive stem, double Teflon seats, full ported, stainless steel or chrome plated brass ball, two-piece, threaded or soldered ends. Nibco T-585-70 or S-585-70. Or a three-piece bronze body, full port, stainless steel trim, with a blowout-proof stem. Nibco T or S-595-Y or equivalent.
- 2. 2-1/2" to 3": Two or three-piece bronze body, blowout-proof captive stainless steel stem, double Teflon seals and seats, full ported, stainless steel or chrome plated brass ball and threaded ends. Nibco T-585-70-66 or Nibco T-585-Y.
- 3. 4" and Larger: Class 150, flanged ends, carbon steel body with 316 stainless steel trim, uni-body design, full ported, blowout-proof captive stainless steel stem and ball, and Teflon seat. Nibco F-510-CS-R-66-FS.

#### **C. Globe:**

- 1. 2" and Smaller: Class 125, screwed ends, bronze body, inside screw, screw-in bonnet, renewable seat and disc. Nibco T-211 or equivalent.
- 2. 2-1/2" and Larger: Class 125, iron body conforming to ASTM A126 Class B, bronze trim, flanged ends, bolted bonnet, bronze disc, replaceable seats. Nibco F-718-B or equivalent.

D. Butterfly:

1. 2-1/2" through 6": 200 PSI working pressure, ductile iron body, aluminum/bronze disc, stainless steel shaft, resilient seat, O-ring seals, lug type for dead-end service, level operator. Nibco LD-2000 series.
2. 8" and Larger: 150 or 200 PSI working pressure, ductile iron body, aluminum/bronze disc, stainless steel shaft, resilient seat, O-ring seals, lug type for dead-end service, gear operator. Nibco LD-1000 or LD-2000 series dependent on the application.

E. Check Valve:

1. 2" and Smaller: Class 125, threaded ends, bronze body, Y-pattern, renewable seat and disc, and screw cap. Nibco T-413 or equivalent.
2. 2-1/2" and Larger: Class 125, iron body, silent check, flanged ends, globe style, spring actuated, renewable seats and disc, bronze or 316 stainless steel trim. Nibco F-910 or equivalent.

F. Vertical Check:

1. 2" and Smaller: Class 125, threaded ends, bronze body, spring actuated, inline ventrical lift type, TFE seat ring. Nibco T-480-Y or equivalent.

G. Needle:

1. 1" and Smaller: Rated at 600 PSI and 300°F, positive shut-off for gauges, brass. Weiss Instruments 25NVBR or equivalent.

## **2.10 STRAINERS, FLANGES, AND UNIONS**

A. Strainers:

1. 2" and Smaller: Threaded ends, cast bronze body with screwed cap, and 20-mesh 304 stainless steel screen for water service. Watts Series LF777S.
2. 2-1/2" and Larger: Flanged ends, cast iron body and bolted cap, 20-mesh stainless steel screen for water service. Watts Series 77F-DI-125.

B. Flanges:

1. 1-1/2" and Smaller: Class 150, forged steel, screwed, ANSI B16.5.
2. 2" and Larger: Class 150, forged steel welding neck, ANSI B16.5.
3. Copper Systems: Class 150, cast copper or bronze, ANSI B16.23 or ANSI 16.24.

C. Unions:

1. Piping unions shall be of the ground joint type constructed from materials equivalent in alloy composition and strength to other fittings prescribed with which they are used. Union pressure classes and end connections shall be the same as the fittings used in the lines with the unions.

2. Steel unions shall have hardened stainless steel seating surfaces on both faces.
3. Copper unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

## **2.11 FIBERGLASS PIPE INSULATION**

### **A. Systems:**

1. All domestic hot & cold water piping.
2. Horizontal storm piping and roof drain bodies

### **B. Insulation:**

1. One-piece fibrous glass sectional pipe insulation with factory applied glass reinforced aluminum foil and white kraft paper flame retardant vapor barrier jacket, with self-sealing longitudinal jacket laps and butt strips; average thermal conductivity not to exceed  $0.23 \frac{\text{BTU}\cdot\text{in}}{\text{hr}\cdot\text{ft}^2\cdot^\circ\text{F}}$  at a mean temperature of 75°F. Insulation thickness shall be in accordance with IECC Table C403.2.10. Insulation shall have flame spread index not greater than 25 and a smoke developed index not greater than 50.

### **C. Insulation shall be:**

1. Johns-Manville Micro-Lok HP, or,
2. Owens Corning SSL II

### **D. Insulating cement shall be:**

1. Johns-Manville No. 301, or
2. 48 Insulations Quik-Set, or
3. Rockwood Mfg. Co. Delta-Maid One Shot

### **E. Vapor barrier coating shall be:**

1. Foster Tite Fit 30-35, or
2. Vimasco 740, or
3. Insul-Coustic F.R.V.B. IC-501, or
4. Childers Cil-Perm CP-30

### **F. Breather coating shall be:**

1. Foster Sealfas 30-36, or
2. Insul-Coustic Permsure IC-102, or
3. Vimasco 713, or



## **2.12 PREMOLDED LAVATORY INSULATION**

- A. Exposed waste and water piping under lavatories for use by handicapped persons shall be insulated with molded flexible vinyl insulation, finished in light gray. Insulation shall be fastened with nylon fasteners. Lavatory insulation systems shall be Truebro Handi Lavi-Guard or equal by ProWrap by McGuire Mfr.

## **PART 3 – EXECUTION**

### **3.01 GENERAL**

- A. Make connections to all fixtures, traps, and similar items. Place into operation all equipment.
- B. Refer to architectural drawings for the exact location of fixtures and drains. Determine roughing dimensions from the manufacturer of the equipment furnished on the job.

### **3.02 PLUMBING FIXTURES**

- A. Grout between plumbing fixtures and walls and/or floors.
- B. For connection of floor-outlet water closets, brass floor flanges shall be used. The joints between closet trap and flange shall be made tight with gaskets.
- C. Connection of fixture traps from lavatories, drinking fountains, service sinks, etc. to cast iron shall be made with DWV type copper.
- D. Seal, using sealant meeting requirements of Federal Specification TT-S-230, joint between urinals and wall and at water closet and floor.

### **3.03 DRAINS**

- A. Set floor drains with top flush with finished floor.

### **3.04 WATER HEATERS**

- A. Provide drain pan under water heater. Pipe relief valve discharge to drain pan. Pipe drain pan drain to floor drain, or to the nearest utility or janitor's sink. Do not make direct connection to drain.

### **3.05 CLEANOUTS**

- A. Provide cleanouts where required by the applicable plumbing code.
- B. Cleanouts shall be the same size as pipe line in line sizes 4" and smaller. Pipe lines larger than 4" shall have 4" cleanouts.
- C. Cleanouts installed outside buildings shall be same as in floors and shall be flush with grade and have a minimum 6" thick, 12"x12" concrete pad poured around cover. Cover shall be flush with top of concrete.

- A. Provide for a pressure test of the water service. Where pressure exceeds 70 PSI, provide a pressure reducing station. Pressure reducing station shall include a pressure reducing valve, bypass with globe valve, pressure gauges, and isolation valves at entering and leaving sides.

### **3.07 BACKFLOW PREVENTER**

- A. Provide backflow preventer in incoming domestic water service where required by local codes or utility requirements.
- B. Provide a full size copper drain line from unit to floor drain.

### **3.08 SOIL, WASTE, AND VENT PIPING INSTALLATION**

- A. Install Soil, Waste, and Vent piping in accordance with the International Plumbing Code (IPC).
- B. All excavation and backfill shall be in accordance with 31 0000, "Earthwork."

### **3.09 POLYPROPYLENE AND PVDF PIPING INSTALLATION**

- A. General: Fusion and mechanical joints shall be installed by manufacturer certified experienced pipe fitters and as per the manufacturer's instructions. The Contractor shall provide all tools and equipment necessary for proper installation. The Contractor shall provide for supports and thermal expansion to meet the manufacturer's recommendations.
- B. Horizontal Piping: Support horizontal piping at end of branches and at change of direction or elevation. Clamp piping to control thermal expansion per manufacturer's installation instructions.
- C. Vertical Piping: Support risers with standard riser clamp or wall brackets.
- D. Air Plenums: Piping installed in air plenums shall be installed with piping materials that have a flame/smoke rating of 25/50 or less per ASTM E84 or piping shall be wrapped with 3M Fire Barrier Plenum Wrap to meet a flame/smoke rating of 25/50 or less per ASTM E84.

### **3.10 APPLICATION OF PREFORMED FIBERGLASS PIPE INSULATION**

- A. Apply insulation to straight pipes and tubes as follows: Use preformed pipe insulation when able. Use pipe and tank insulation for larger diameter piping where preformed insulation is not available. To meet required thickness, apply multiple layers of insulation with longitudinal and end seams staggered.
  - 1. Keep SSL adhesive and contact surfaces clean and free of dirt and moisture. Seal immediately once adhesive is exposed. Seal circumferential joints with a minimum 3" wide tape. Rub the longitudinal joints firmly with a squeegee and secure with two outward clinching staples evenly spaced in each 3 foot section of insulation.
  - 2. Where vapor retarders are indicated: Seal staples and any penetrations in the insulation with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15-20 feet to form a vapor retarder between pipe insulation segments.

3. Taper the ends of insulation at terminations. Seal all raw edges of insulation with mastic.
- B. Apply insulation to flanges as follows:
1. Apply preformed pipe insulation to outer diameter of pipe flange.
  2. Make width of insulation segments the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
  3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with a collar fabricated for preformed pipe insulation.
  4. Fill all voids and seal all raw edges of insulation with vapor retarder mastic.
- C. Apply insulation to fittings and elbows and mechanical grooved couplings as follows:
1. Apply mitered sections of pipe insulation, or fiberglass blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
  2. Cover fittings with standard PVC fitting covers. Secure the fitting covers by wrapping the ends with minimum 1-1/2" wide PVC tape. Overlap a minimum of 2" and do not stretch the last 2" of tape. Secure the throat with a stainless steel tack.
  3. On systems requiring a vapor barrier, seal the throat with vapor barrier mastic (the PVC fitting cover is to act as the vapor barrier).
- D. Apply insulation to valves and specialties as follows:
1. Apply premolded pipe insulation sections of the same material as straight segments of pipe insulation, sized and cut to fit around the valve body, over the flanges, and around the bonnet. Fill all voids and seal all raw edges in insulation with vapor retarder mastic. Caulk around valve stem cutout.
  2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
  3. Apply insulation to flanges as specified for flange insulation application.

**END OF SECTION**

**SECTION 23 0100**

**MECHANICAL GENERAL REQUIREMENTS**

**PART 1 – GENERAL**

**1.01 INTERPRETATION OF SPECIFICATIONS**

- A. General provisions and requirements apply throughout. Cross references or general provisions may be repeated for convenience or emphasis only.
- B. Interpret the following as indicated:
  - 1. “or equal”:
    - a. “in accordance with the General Conditions” or
    - b. “an equivalent with respect to style and function”
  - 2. “approved”:
    - a. “approved or accepted by Governing Officials or the authorities having jurisdiction”
  - 3. “provide”:
    - a. “furnish and install, connect, and test, and contract for the performance of same”
  - 4. “wiring”:
    - a. “required conductors or cable and raceway system, including fittings, boxes, connections, supports, hardware, labeling, and miscellaneous related accessories”
  - 5. “work”:
    - a. “materials completely provided. Which shall include all activities and services necessary to meet contract requirements, including inspection and replacement as specified of any defective element.”
  - 6. “materials”:
    - a. “equipment and/or materials.”
  - 7. “.”:
    - a. “shall be/have” Specifications following a colon are criteria which apply to the term proceeding the colon.

**1.02 INSTRUCTIONS TO BIDDERS**

- A. Bidders are advised to visit the site and examine the existing conditions before submitting bids, as no allowance will be made for lack of knowledge of existing conditions where such conditions might reasonably be determined by observation.

### **1.03 SUBSTITUTIONS**

- A. Utilize only those materials specifically listed by the Contract Documents. Substitutions of alternative types of major materials will not be acceptable unless a written "prior" acceptance is obtained at least seven (7) working days before the Date for Submittal of Bids. Requests for prior acceptance of alternative materials must conform to the procedures for submitting shop drawings and product data.
- B. The design and layout shown on the plans are based on the manufacturer indicated on the equipment schedule. If equipment other than that used as the basis of design is submitted for use on this project, it shall be the responsibility of the contractor, including costs for redesign of these systems. Submittals shall clearly indicate any required changes to the building systems affected by substitution of equipment.

### **1.04 GENERAL SCOPE OF WORK**

- A. The Contract Documents establish the basic systems designs and the detail design of the work, or establishment systems or materials performance criteria and minimum design requirements. In either case, certain aspects of the work or of the detail design are not established completely. Establish said work and details in accordance with industry norms and practice to suit the needs of the job. The work shall provide for complete systems and services unless otherwise specified herein.
- B. The work covered by this specification shall include furnishing supervision, labor, supplies, materials, equipment, tools, services, taxes, and dollar costs required to construct and install the complete mechanical systems as specified herein and as shown by the plans and other relevant documents. Without limiting the generality thereof, the major items of the work are:
  - 1. Utility connections and metering, including temporary connections.
  - 2. Heating, Ventilation, and Air Conditioning systems.
  - 3. Specialty systems as specified or shown by plans.
  - 4. Special tools for maintenance or inspection of materials.
  - 5. Necessary services and support work, including scaffolding, and hoisting.
  - 6. Permits, inspection fees, approvals, licenses, registration, certifications, taxes, and specified or miscellaneous dollar costs.
  - 7. Shop Drawings and Product Data Submittals as specified.
  - 8. Inspections, tests, and systems and equipment demonstrations.
  - 9. Specified or necessary documentation and notifications.
  - 10. Materials transportation, delivery, handling, storage, protection, guarding, and inspecting.

11. Instruction of Owner's Operating and Maintenance Personnel.
12. Temporary utility and site distribution system(s).
13. Demonstration of completion of the work.
14. Replacement of Defective Work.

#### **1.05 CODES AND STANDARDS**

- A. The mechanical installation, equipment, materials, and workmanship shall as a minimum be in accordance with the requirements and recommendations of the applicable local codes and the following:
  1. Heating, Ventilation, and Air Conditioning: NFPA 90A and NFPA 96, current edition.
  2. Applicable federal, state, and local laws, codes, ordinances, and rulings of Governing Officials having jurisdiction.
  3. Utility and service company regulations and requirements.
- B. Codes and standards cited establish only the minimum requirements for the work. Where requirements of the contract Documents exceed requirements of the Codes and Standards, provide the work in accordance with the express requirements of the Contract Documents. Do not reduce the quality of the design or eliminate future capacity or options without acceptance by the Engineer, even if proposed changes meet minimum Code requirements.
- C. The latest editions of the specifications, standards, and listings of the following organizations are made a part of this specification. Mechanical work, unless otherwise indicated, shall comply with their requirements and recommendations wherever applicable:
  1. Underwriter's Laboratories, Inc. (UL)
  2. National Fire Protection Association (NFPA)
  3. American National Standards Institute (ANSI)
  4. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
  5. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- D. Material shall be installed as required for the Seismic Rating of the area of the project. Submit installation details.

#### **1.06 COMPLIANCE OF WORK WITH CODES AND ORDINANCES**

- A. Work shall comply with the requirements of local ordinances and Codes as modified and amended by Governing Officials having jurisdiction.
- B. Notify the Architect in writing of any instance where any requirement of the Contract Documents is in conflict with any Code or ordinance, so that any required changes may be made in a timely manner and without the need for remedial work. Do not perform work contrary to Codes, ordinances, regulation, or rulings of Governing Officials.

**1.07 RELATED WORK IN OTHER DIVISIONS**

A. The following work is generally specified by other divisions of specifications, except for specific applications as called for by Division 23 specifications or plans:

1. Installation of building access panels and plaster frames.
2. Painting.

**1.08 PERMITS AND COSTS**

A. Obtain and pay for permits, assessments, taxes, fees, licenses, etc. necessary for the installation of the work. Deliver to the Owner all such certificates of inspection or occupancy issued by Governing Officials.

**1.09 SHOP DRAWINGS AND PRODUCT DATA**

A. Submit shop drawings and product data for review for major systems and materials, including, but not limited to:

1. Cleanouts
2. Domestic Water Heaters
3. Floor and Roof Drains
4. Plumbing Fixtures and Accessories
5. Plumbing Specialties
6. Fire Protection System Layout (at same scale as the mechanical floor plans)
7. Sprinkler Heads
8. Fire Protection System Appurtenances (compressors, valves, etc.)
9. Air Distribution Products and Accessories
10. Air Conditioning and Heating Units with coil, fan, filter, and compressor data
11. Dampers
12. Duct Lining
13. Ductwork and Accessories
14. Equipment Layout Drawings
15. Fans (with curves for fans with motors 1/2 HP and larger)
16. Flexible Ductwork
17. Insulation (duct and pipe)

18. Motor controls
  19. Sheet Metal Work
  20. Temperature Control System including control diagrams, control panel layouts, descriptions of operation and cuts of instruments
  21. Valves and Piping Specialties
- B. Prepare shop drawings giving locations for major equipment, ductwork, and piping, based on equipment to be installed (as ordered), and submit these for review. Shop drawings shall show the location and weight of each item of roof mounted equipment, roof openings, pads, sleeves, anchor bolts, etc. and shall be of a scale not less than that of the contract plans. The shop drawings shall give all clearances recommended by the manufacturer for the service or removal of equipment/materials.
  - C. Sheet metal shop drawings shall be submitted, based on field measurements of actual conditions and the equipment submitted and approved for this project. Sheet metal shop drawings shall clearly indicate all changes required to accommodate actual field conditions such as interference with structural or other building elements and systems.
  - D. Submittals shall include catalog cuts, bulletins, plates, drawings, diagrams, schedules, and any other information as necessary to indicate the relative characteristics, ratings, and capacities of the respective items of equipment.
  - E. Submittals shall be checked for accuracy and coordinated between the involved trades before submission for review and acceptance by the Engineer. Notify the Architect in writing where shop drawings indicate elevations of piping or ducts which would place pipe or duct below lighting fixtures or ceilings, or that would require the lowering of lighting fixtures or ceilings. The Architect shall likewise be notified of any other similar type conflict between materials as installed, or shown by plans or Shop Drawings.
  - F. Each shop drawing, product data sheet, catalog cutsheet, etc. submitted shall bear on its face an acceptance date and signature of the Contractor, indicating that the submission has been checked and accepted for installation by the Contractor.
  - G. Submit complete drawings and product data for any modified materials or proposed substitution of equivalent materials. When such materials are required or proposed, provide technical information on operating conditions, ratings, and capacity of the materials, including any and all related changes necessary or desirable to the basic design of any involved system in the facility. Where standard material (equipment) is modified to suit the conditions required, provide certification from the manufacturer of the required operating conditions, ratings, and capacities of the materials. Any submittal of alternate materials shall be in accordance with the General Conditions.
  - H. Submittals for review shall be fully in accordance with and consistent with the General Conditions, and with the requirements of the technical specifications and plans. Any technical exceptions shall be clearly and fully stated in one place.



- I. The Engineer's review of shop drawings and product data shall not change the requirements or the contract documents, nor shall this review relieve the Contractor of full responsibility for any and all errors or omissions in said documentation.
- J. Six (6) copies of each submittal shall be provided to the Architect for appropriate distribution and action. Four (4) copies of each submittal shall be returned to the Contractor. Three (3) copies of each final submittal shall be included in the project manuals.
- K. Coordinate the structural, architectural and systems changes required for the mechanical equipment actually used on the project.
- L. Submit a complete plan supports and restraints for the Seismic requirements of this zone.

#### **1.10 DOCUMENTATION, MANUALS, AND RECORD PLANS**

- A. Prepare manuals containing certificates or letters of warranty or guarantee, operating and maintenance instructions and recommendations, test results, and other data specified herein, and deliver the manuals to the Owner's Representative upon completion of the work. These manuals shall include information on major materials (such as major equipment) and on special systems or materials. Any special tools required for service or repair shall be listed.
- B. Manuals shall be ring binders with the name of the manual, project, Architect, Engineer and Contractor placed on the cover of each manual. Each manual shall contain a table of contents listing the items contained therein by number and name. Each item shall be properly indexed with a standard metal reinforced cover page tab, with item number and name printed on tab per se.
- C. Installation, Operation, and Maintenance (IOM) Manuals for major materials (equipment) shall be provided in separate manuals, or sets of manuals, for each major system or item of material. These IOM Manuals shall contain detailed instructions for operation and maintenance of the major equipment, devices and materials requiring periodic inspection or service. IOM Manuals shall contain the following items of information:
  - 1. Manufacturer's maintenance and operation recommendations.
  - 2. Final (corrected) shop drawings and product data information.
- D. Make written certification to the Architect that tests, checks, verifications, and settings have been satisfactorily completed. Where any item cannot be certified as correct, make a written report of the relevant facts and test data.
- E. Have bonds, guarantees, receipts, affidavits, etc., called for in the various specification articles prepared and signed in advance of final demonstration of completion and acceptance of the work. Deliver to the Architect at or before the time of inspection with a letter of transmittal, listing each item included.
- F. On a set of contract documents, maintain an accurate record of all deviations made during the progress of the work from the contract documents (plans and specifications). Also, maintain an accurate as-built record of the dimensional locations of outside underground materials such as meters, valves, and incoming utility lines, piping, or conduits. The marked-up (record) documents shall be available on the site for inspection during normal working hours.

**1.11 SCHEDULING AND CONDUCT OF THE WORK**

- A. Work shall be performed on schedule and in a manner as described by the Special Conditions of the Specifications and by Division 15 specifications. Plan, coordinate, and execute the work to meet building schedules and so as not to produce interference between the work of the various trades, or with any special job site construction.
- B. Specified tests may be witnessed by the Architect or Engineer, at their option. Provide at least five (5) days' notice to the Architect of each test schedule, so that the Architect and Engineer may plan to attend the test if desired.
- C. The Architect or Engineer may inspect the site at any time, at their option. In order that they may plan to inspect the job after the installation of major materials and before the materials are enclosed from ready view, notify Architect at least five (5) days in advance of the following construction milestones:
  - 1. Underground piping installed, but prior to slab being placed or trenches backfilled.
  - 2. Ductwork or piping installed, but before installation of walls or dropped ceilings, and before application of any insulation.
- D. Work shall be performed within the access, security, proprietary, and housekeeping conditions specified.

**1.12 TRANSPORTATION AND DELIVERY**

- A. Provide and pay for the transportation, storage and handling of materials. Materials shall be delivered to the job site in ample quantities to provide for the uninterrupted progress of work as scheduled. Where necessary, provide expedited or special shipping or handling of materials to prevent interruption of the overall job progress.

**1.13 SPECIALIZED SERVICES**

- A. Provide any necessary specialized services, such as accredited direct factory representative, as may be required for survey, inspection, supervision, installation, calibration, test, placing of equipment into operation, or for trouble shooting during the period of replacement of defective work.
- B. Provide for the installation of control systems and related low voltage (generally 50 volts or less) wiring for the building systems covered by Division 23 specifications. Control systems and wiring shall meet the requirements of Division 26 specifications.

**1.14 GUARANTEES / WARRANTIES**

- A. Leave the entire mechanical system installed under this contract in proper working order. Replace any work or material which develops defects, except from ordinary wear and tear, within one (1) year from the date of beneficial acceptance by the Owner.
- B. The materials of the mechanical systems shall have the manufacturer's and/or supplier's guarantee or warranty put into effect by execution and filing of any and all related papers. For one

(1) year from the date of acceptance, obtain service or repair under the terms of any said guarantee or warranty in the Owner's behalf.

- C. For a period of one (1) year from the date of acceptance, upon receipt of notification from the Architect of the failure of any material or workmanship, replace the failed material or workmanship, including removal and replacement, or repair.

## **PART 2 – PRODUCTS**

### **2.01 MATERIALS**

- A. Equipment and materials shall be new, of the best quality and grade of the relative quality established, of manufacturer's standard, established product line. Where applicable standards are established, shall conform to National Board of Fire Underwriter's requirements and bear the seal of approval of a recognized and approved testing agency, as accepted by the Engineer.
- B. Once a product line has been established, it shall be consistently maintained throughout the entire installation.
- C. Equipment and components that interact to form equipment assemblies and/or systems shall be of the same manufacturer to the greatest extent possible.

### **2.02 BUILDING ACCESS PANELS**

- A. Building access panels shall be of metal construction with hinged door and an inconspicuous frame. The size shall be as required to provide proper access for maintenance and service, with a minimum size of 18"x18".
- B. Access panels shall be Milcor "DW", or equal, for drywall locations and Milcor "K", or equal, elsewhere.
- C. Access panels shall be "B" label where installed in rated walls.

### **2.03 PAINT**

- A. Paint used for touching up factory painted apparatus shall be top quality and selected to match the factory finish.
- B. Cold galvanizing compound shall be Sherwin-Williams "Zinc-Clad Primer" or equal.
- C. Rest Preventative paint shall be "Rust-Oleum" or equal.

### **2.04 ELECTRICAL MATERIALS**

- A. Electrical materials shall meet the requirements of Division 26 specifications.

## **PART 3 – EXECUTION**

### **3.01 GENERAL DESIGN AND WORK**

- A. Read and study relevant documents, including Codes. Become familiar with the site, the scope of work and services, type of general construction, and the civil, structural, architectural, interior design, mechanical, electrical and special system plans and specifications.
- B. Establish design and work details as necessary to provide for the complete installation of materials and the successful operation of systems. Notify the Engineer in writing and in a timely manner if responsibilities or directions are not clear, or if assistance is desired in determining the needs or requirements for any particular item.

### **3.02 INTERFERENCES AND COORDINATION**

- A. The plans showing mechanical work are generally diagrammatic in nature. The plans shall not be scaled for any dimension.
- B. Coordinate the work with that of different trades so that interferences between the mechanical work and other work will be avoided. Refer to building plans for guidance as to dimensions, finished grades, ceiling heights, door swings, room finishes, location of ducts, pipes, equipment, outlets and similar details that are required, and coordinate final installation with work as actually installed. Outlets and connections for equipment or devices to be installed by different trades shall be coordinated to assure that the outlets and connections are properly sized and located with respect to the equipment served and the surrounding areas.
- C. Offsets and fittings in lines, and adjustments to equipment and fixture locations, as accepted by the Owner's representative, shall be provided to accomplish the work in a satisfactory manner.
- D. If interference develops, the Owner's representative shall decide which item of equipment, ductwork, piping, conduit, etc. must be relocated, regardless of the sequence of installation of the affected items.

### **3.03 SPACE REQUIREMENTS**

- A. Materials shall fit into the space provided in the building or property and shall be installed at such time and in such manner as to avoid damage to the building structure or property, as required by the job progress.
- B. Materials requiring normal servicing or maintenance shall be made easily accessible, including associated connection devices, wiring and/or piping.
- C. Ductwork, piping, raceways, and supports must be kept as close as possible to walls, floor slabs, columns, etc., so as to take up a minimum amount of space. Offsets and fittings required to accomplish this shall be furnished and installed.
- D. Ductwork, piping or other such non-electrical materials shall not be located within 42-inches of switchboards, panelboards or motor control centers, including the space horizontally from the electrical equipment, and the space from floor to structural ceiling over electrical equipment.

### **3.04 WORKMANSHIP**

- A. Workmanship shall be of the highest quality and no substandard work will be accepted. Work shall be done by workmen skilled in the trade involved.

### **3.05 PROTECTION OF MATERIALS AND EQUIPMENT**

- A. Protect materials from the elements and other causes of damage during shipment, storage, and erection, until final acceptance by the Owner.
- B. During construction, cover the fronts of equipment to prevent marring or defacing.
- C. Open ends of ductwork, pipe, or conduit shall be closed with temporary closures or plugged when work is stopped, to prevent debris from entering.
- D. Air handling systems shall have filters installed before any operation of the system. Exhaust fans may be protected using temporary filters cut from roll media and fastened over air inlets.

### **3.06 INSTALLATION OF MATERIALS**

- A. Materials shall be installed in accordance with the manufacturer's published recommendations for installation, in accordance with any listing restrictions of a certifying laboratory or agency, and in accordance with the requirements of involved Government Agencies or local Governing Officials.
- B. Materials shall be set level, square and plumb, properly oriented, aligned and secured in the location indicated.
- C. Lock washers shall be installed under nuts which bear on metal.
- D. Surfaces to be painted shall be clean and free of dirt, dust, oil and rust.
- E. Where galvanizing is broken during fabrication or installation (including tack welding), recoat exposed areas with cold galvanizing compound.
- F. Exposed iron or steel materials such as ductwork, piping, conduits and supports (but not equipment, devices, and components), including those exterior to the building, where exposed to view without removing ceilings or access panels shall be painted with one coat of rust inhibiting paint. The type and color of paint shall be acceptable to the Architect.
- G. Materials and supports above ceilings, but visible through grilles or diffusers, etc., shall be painted flat black unless inappropriate due to listing restrictions or function.

### **3.07 BUILDING ACCESS PANELS**

- A. Building access panels shall be installed where required to provide access for service and maintenance for equipment, fans, heaters, ductwork, damper operators, valves, traps, instruments, etc., including associated connection devices, wiring and/or piping. In general, only one (1) access panel shall be provided for an item of equipment and associated connecting devices, wiring and/or piping. Where feasible one access panel may serve several items of equipment.
- B. Access panel location and size shall be coordinated with materials/ equipment served to allow for installation, operation, inspection and maintenance as necessary, including testing and recalibrating. Access panels for fire dampers and/or duct smoke detectors shall allow resetting of the dampers and/or detectors. Coordinate the requirements between all involved trades.
- C. Access panels are not required for materials above lay-in (push-up) ceiling systems.

### **3.08 SUPPORTING DEVICES AND MATERIALS**

- A. Necessary supports for properly mounting materials shall be provided. Supports shall provide adequate and rigid mounting for materials, unless otherwise indicated by plans or functionally required. Supports shall be fabricated and installed in a neat and workmanlike manner, and care shall be taken that at no time shall any portion of the building structure be overloaded or weakened in any manner.
- B. Unless otherwise indicated, select and size foundations, supports, and fasteners.

### **3.09 CUTTING AND PATCHING**

- A. Coordinate with the various trades sufficiently ahead of the construction of any floor, wall, ceiling, roof, or other element, and identify openings, foundations, pads, curbs, and inserts that will be required for the work. Do not cut any structural member without having received written permission from the Architect.

### **3.10 CLEANING**

- A. Clean equipment, fixtures, devices and other materials furnished or set in place. Plaster, paint, stickers, rust, stains, and other foreign matter or discoloration shall be removed. Surfaces shall be polished and free of paint, oil, grease, and other dirt and debris. Touch up or refinish materials which have been damaged or marred during the construction process.

### **3.11 LUBRICATION**

- A. After installation of equipment, motors and equipment components which were furnished or installed by the Contractor and require lubrication using oil, grease, or special type lubricant, shall be lubricated as recommended by the manufacturer.

### **3.12 MARKING AND LABELING**

- A. Provide marking and labeling for major items of equipment, controls, and materials.

### **3.13 CHECKS AND TESTS**

- A. Make tests as reasonably required by the Engineer to prove the integrity of the work, and leave the complete installation in first class condition and ready for operation.
- B. Individual systems shall be thoroughly tested and demonstrated to meet full functional requirements.
- C. See sections 23 05 93 and 23 09 00 for additional testing requirements.

### **3.14 DEMONSTRATION OF COMPLETION**

- A. The project shall be demonstrated to be completely installed and calibrated and suitable for acceptance by the Owner. Suitable acceptance inspections shall be performed to determine whether the Contractor has completed the work in a proper and workmanlike manner, that he has installed the work in accordance with the intent of the plans and specifications, that the

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installation is apparently safe for use by building occupants, including operating personnel, and that in the Architect and Engineer's opinion the work is satisfactory for the Owner to accept.

### **3.15 INSTRUCTIONS TO OPERATING PERSONNEL**

- A. Instruct Facility Operating Personnel in the safe and correct procedures for cleaning, checking, logging, lubricating, testing, trouble shooting and operating of equipment and systems. The instructions shall be conducted at the job site by qualified personnel of the Contractor, Supplier, or Manufacturer, and shall include reviewing the operation instructions and maintenance recommendations with qualified Facility Operating Personnel.

**END OF SECTION**

**SECTION 23 0593**

**TEST, ADJUST, AND BALANCE**

**PART 1 – GENERAL**

**1.01 DESCRIPTION**

- A. Perform testing, adjustment, and start-up of mechanical systems as described herein.
- B. Testing and balancing shall be performed by an independent test and balance agency that specializes in and whose business is limited to testing and balancing of air conditioning systems. The Engineer, acting for the Owner, shall approve this agency, which shall be one fully certified by AABC or NEBB.
- C. Testing and balancing agency, as part of its contract, shall act as authorized inspection agency, responsible to the Engineer and Owner, and shall, during the test and balance, list all items that are not installed correctly, require correction, or have not been installed in accordance with contract documents.
- D. Testing and balancing shall be performed in complete accordance with AABC National Standards, 1982, 4th Edition.

**PART 2 – PRODUCTS**

**2.01 GENERAL**

- A. Provide all instruments, equipment, materials, and recording devices necessary for tests and adjustments.

**PART 3 – EXECUTION**

**3.01 GENERAL**

- A. Perform initial test and balance immediately after equipment has been started up and before building is occupied.
- B. After initial test and balance has been completed, the test and balance agency shall re-balance the systems based on space temperatures, under actual occupied conditions, to provide CONSTANT even temperatures in each area. The control settings shall also be adjusted to achieve comfort in the spaces, and prevent one unit from "fighting" the other units.
- C. Installation shall not be considered complete until final reports by agency have been submitted and approved by the Consulting Engineer.

**3.02 AIR BALANCE:**

- A. Test system with fan speed set to maximum conditions. Make pitot tube traverse of main supply, exhaust and return ducts; determine CFM at fans and adjust fans to design CFM.



- B. Test and record system static pressure at fan suction and discharge.
- C. Test and record cooling apparatus entering and leaving air temperatures, dry bulb, and wet bulb.
- D. Test, balance, adjust, and tabulate the air quantities of all supply, return, exhaust, and outside air ducts and air terminal devices within 10% of indicated values.
- E. Adjust flow patterns from air terminal units to minimize drafts as equipment permits.

### **3.03 CONTROL PERFORMANCE CHECK**

- A. The results produced by the operation of automatic controls shall be checked by the testing agency; controls requiring adjustment shall be listed and reported to the Contractor. This does not reduce the responsibility of the Contractor for the checking and adjustment specified under the Temperature Control Section.

### **3.04 REPORTS**

- A. Reports shall be certified by the testing engineer that the methods used and the results obtained are as specified herein.
- B. The test and balance contractor shall, as part of its responsibility, submit written reports of all mechanical system deficiencies to the Project Manager for action.
- C. The final records of readings, calculations and adjustments shall be submitted to the Architect. The final report shall include a single line system schematic diagram indicating the location of testing points referenced in the report. Provide five (5) copies prior to final inspection.

### **END OF SECTION**

**SECTION 23 0700**

**HVAC INSULATION**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Provide insulation for ductwork furnished under this division.
- B. Provide insulation for piping furnished under this division.

**1.02 QUALITY ASSURANCE**

- A. Products of the manufacturers listed under PRODUCTS will be acceptable for use for the specific functions noted. Adhesives, sealers, vapor barriers and coatings shall be compatible with the materials to which they are applied, and shall not corrode, soften or otherwise attack such material in either the wet or dry state.
- B. Material shall be applied subject to their temperature limits. Application of insulating materials or finishes shall be in accordance with manufacturer's published recommendations unless otherwise specified herein.
- C. Insulation shall be applied by experienced workers regularly employed for this type of work.

**1.03 RATING**

- A. Insulation and accessories such as adhesives, mastics, cements, tape and jackets, unless specifically excepted, shall have a flame spread rating of not more than 25 and a smoke developed rating of not more than 50. Materials which are field applied may be tested individually.
- B. Flame Spread and Smoke Developed Ratings shall be determined by Method of Test of Surface Burning Characteristics of Building Materials, NFPA 255, ASTM E84, UL 723.
- C. Products or their shipping cartons shall bear a label indicating the flame and smoke rating do not exceed above requirements.
- D. Treatment of jackets or facings to impart flame and smoke safety shall be permanent. Water soluble, fugitive, or corrosive treatments shall not be used to meet RATING criteria.
- E. Certify in writing prior to installation, that products to be used will meet RATING criteria.
- F. The perm rating for vapor barriers shall be not more than 0.05 perms and the rating for adhesives, coatings and mastics shall be not more than 0.25 perms.

**PART 2 – PRODUCTS**

**2.01 FIBERGLASS BLANKET INSULATION FOR DUCTWORK**

- A. Systems:

1. Unconditioned outside air ductwork.
  2. Makeup air ductwork.
  3. Concealed supply air ductwork.
- B. Blanket type insulation:
1. K-value not to exceed  $0.27 \frac{\text{BTU}\cdot\text{in}}{\text{hr}\cdot\text{ft}^2\cdot^{\circ}\text{F}}$
  2. at a mean temperature of 75°F.
  3. Minimum density of  $0.75 \frac{\text{lb}}{\text{ft}^3}$
  4. 2" thick.
- C. Insulation shall be:
1. Johns-Manville Microlite FSK Faced Wrap, or
  2. Owens Corning Fiberglass Faced Duct Wrap FRK 25, Series ED-100, or
  3. Certainteed Ultralite Duct Wrap Type IV
- D. Fire retardant adhesive for securing insulation to ductwork and for sealing 2" facing flange at circumferential joints shall be:
1. Benjamin Foster 85-20, or
  2. Insul-Coustic IC-225, or
  3. Vimasco 733, or
  4. Childers CP-82, or
  5. Eplux Cadalar 400
- E. 3-inch wide foil reinforced kraft tape shall be:
1. Arno C-430, or
  2. Fason 0822, or
  3. Nashua FSK

## **2.02 FIBERGLASS LINER FOR DUCTWORK**

- A. Systems:
1. Supply ductwork exposed in the space.
  2. Supply ductwork for the first 10' from the air handling unit, or through the second elbow, counting the one which turns the duct horizontally from the air handling unit.

3. Return & transfer air ductwork

B. Duct liner:

1. Fibrous glass type with one side coated with a black fire-retardant compound
2. K-value not to exceed  $0.27 \frac{\text{BTU}\cdot\text{in}}{\text{hr}\cdot\text{ft}^2\cdot^{\circ}\text{F}}$  at a mean temperature of 75°F
3. Minimum density of  $0.75 \frac{\text{lb}}{\text{ft}^3}$
4. 2" thick.

C. Duct liner shall be:

1. Johns-Manville Microlite, or
2. Owens Corning Aeroflex Type 150, or
3. Certainteed Ultralite #150

D. Fire retardant adhesive for securing insulation to ductwork and for sealing 2" facing flange at circumferential joints shall be:

1. Benjamin Foster 85-20, or
2. Insul-Coustic IC-225, or
3. Vimasco 733, or
4. Childers CP-82, or
5. Eplux Cadalar 400

## **2.04 PIPING INSULATION**

A. Systems:

1. Condensate piping.
2. Refrigerant piping.

B. Piping insulation installed inside the building, except for refrigerant suction service:

1. Fiberglass preformed pipe insulation with a white all-service jacket/vapor barrier.
2. K-value not to exceed  $0.23 \frac{\text{BTU}\cdot\text{in}}{\text{hr}\cdot\text{ft}^2\cdot^{\circ}\text{F}}$  at a mean temperature of 70°F
3. For pipes smaller than 2", insulation shall be 1" thick
4. For pipes 2" to 4", insulation shall be 1-1/2" thick
5. For pipes larger than 4", insulation shall be 2" thick

- C. Piping insulation installed outside the building, except for refrigerant suction service:
1. Prefabricated  $2 \frac{\text{lb}}{\text{ft}^3}$  polyisocyanurate insulation, Trymer 9501 or approved equal, with waterproof mastic and glass fiber jacket finished with an aluminum jacket with waterproof silicone joints
  2. K-value not to exceed  $0.14 \frac{\text{BTU}\cdot\text{in}}{\text{hr}\cdot\text{ft}^2\cdot\text{°F}}$  at a mean temperature of 70°F
  3. For pipes smaller than 4", insulation shall be 1" thick
  4. For pipes 4" and larger, insulation shall be 1-1/2" thick
- D. Piping for refrigerant suction service and other services as specified or noted:
1. Closed-cell insulation
  2. 1/2" thick
  3. Basis of design:
    - a. AP Armaflex 25/50, or
    - b. K-FLEX INSUL-TUBE
- E. Insulation shall be continuous over all valve bodies, fittings, and wall & floor penetrations. Do not insulate unions on hot water piping, nor instruments, gauges, valve handwheels, etc. on any piping.
- F. All piping insulation covering water-carrying piping which is exposed to the weather and subject to bursting from freezing temperatures shall be oversized to accommodate heating cables.

### **PART 3 – EXECUTION**

#### **3.01 APPLICATION OF FIBERGLASS BLANKET DUCT INSULATION**

- A. Wrap insulation around ducts with circumferential joints butted and longitudinal joints overlapped a minimum of 2". Adhere insulation to ducts with 4" strips at 8" on center of fire-retardant adhesive; additionally, for ducts over 24" wide, impale insulation on the bottom of the ducts on metal pins, on maximum 18" centers, welded to the duct and secure with speed washers. On circumferential joints, seal the 2" flange on the insulation facing with fire retardant adhesive and tape with 3" foil reinforced kraft tape; tape terminations of insulation at fire dampers, flexible connections and ends of ducts to the duct with 3" wide foil reinforced kraft tape. Seal penetrations and punctures in insulation facing with foil reinforced kraft tape and fire-retardant vapor barrier coating.
- B. Mark insulation in such a manner to allow easy inspection after installation.
- C. Apply insulation to standing seams and other projections in ductwork or casings so that at least 1/4" of insulation covers such projections.
- D. Where ductwork is lined, no external ductwork insulation is required.

- E. Where unlined duct and lined duct connect, the external insulation shall overlap lined section a minimum distance of 4”.

### **3.02 APPLICATION OF FIBERGLASS DUCT LINER**

- A. Cut duct liner to provide overlapped and compressed longitudinal corner joints. Install liner with black coated surface facing the air stream. Adhere duct liner to the ductwork interior with a 100% coverage of the sheet metal surfaces using a fire-retardant adhesive; adhesive shall be applied by spraying. Coat all exposed leading edges and all transverse joints with fire retardant adhesive. In addition, secure liner using metal pins welded to the duct and speed washers. Spacing of metal pin shall be in accordance with the current edition of SMACNA HVAC Duct Construction Standards – Metal and Flexible.
- B. Protect exposed edges of the lining by 24 gauge galvanized "Z" shapes installed at the edge of the lining, extending over flat side of lining 1/2 from edge.

### **3.03 APPLICATION OF PREFORMED PIPE INSULATION**

- A. Indoor piping:
  - 1. Preformed pipe insulation with all-service jackets shall have all longitudinal joints lapped by a minimum of 2” and sealed with fire-retardant adhesive. Butt joints shall be sealed with 3” wide tape similar to the insulation vapor-barrier jacket and secured with adhesive. All elbows shall be insulated with preformed fitted insulation equal to the thickness specified for the adjacent piping insulation. As an alternative, provide fitting covers meeting NFPA/UL 25/50 ratings; stuff all covers with fiberglass insulation having characteristics equal to adjacent pipe insulation.
- B. Outdoor piping:
  - 1. Pre-fabricated pipe insulation for exterior water-carrying pipe shall have insulation secured on with copper wire with ends twisted and turned into the insulation. Over the insulation, apply mastic to a minimum 1/4” thickness and draw in, while mastic is wet, glass fiber cloth. Finish with aluminum jacket with waterproof silicone caulk joints. All water-carrying piping subject to freezing weather shall have self-regulating electric heat tracing.

### **3.04 APPLICATION OF CLOSED-CELL PIPE INSULATION**

- A. The insulation shall be installed by the slip-on method; slitting of the insulation is prohibited and shall be cause for rejection. All elbows shall be mitered and all such joints and butt joints shall be tightly made and glued.
- B. All insulation installed outdoors shall be coated with a glossy white, ultraviolet protective coating applied in two coats.

### **END OF SECTION**

**SECTION 23 300u**

**DUCTWORK AND AIR DISTRIBUTION**

**PART 1 – GENERAL**

**1.01 DUCTWORK**

- A. SMACNA Standards referred to hereinafter shall mean standards published by the Sheet Metal and Air Conditioning Contractor's National Association, Inc.
- B. Except where indicated otherwise, duct construction and installation shall conform to the recommendations of the SMACNA manual for Low Pressure Duct Construction Standards. Ductwork shall be constructed and sealed as required for a 2" static pressure rating, Seal Class "C", in the previously referenced standard.
- C. Ductwork as indicated is diagrammatic only and does not show all necessary offsets, hangers, and accessories. All such items required for a completed system shall be furnished by the Contractor.
- D. Sizes shown for lined ductwork are clear inside dimensions and sheet metal dimensions shall be increased to allow for thickness of lining.

**1.02 AIR DISTRIBUTION**

- A. Select products to provide full coverage of areas served without objectionable noise or draft. Products shall be selected for noise levels not in excess of NC-30. Air distribution products shall be tested and rated in an Air Diffusion Council Certified Laboratory. Unless indicated otherwise, all air distribution products shall be furnished by one manufacturer, who shall catalog a full line of both steel and aluminum air distribution devices.

**PART 2 – PRODUCTS**

**2.01 DUCTWORK**

- A. Supply, outside air, return, transfer and restroom exhaust ductwork shall be constructed of galvanized steel sheets of lock form quality per ASTM A653 with a G90 zinc coating (0.90 oz/ft<sup>2</sup> both sides), unless otherwise shown on the contract documents. Sheets shall be free of pits, blisters, slivers, and ungalvanized spots.
- B. Grease exhaust ductwork shall be constructed of 16 gauge black steel. Ducts shall have longitudinally welded seams and welded or flanged joints and connections to equipment or accessories. Grease exhaust ducts shall slope a minimum of 1/4" per foot toward the kitchen hood. 12"x12" clean outs shall be provided at a minimum of 10' intervals in addition to all changes in direction. All grease exhaust duct shall be inspected by means of a "light test" in addition to other tests required by the local authority. The "light test" shall consist of passing a 100 watt light within the ductwork while inspecting the exterior of the ductwork, welds and flanged joints for any light escaping.

- C. Lab and dish exhaust ductwork shall be constructed of type 316L stainless steel sheet per ASTM A480 and ASTM A240 with a finished surfaced No. 4 for exposed locations, and No. 2B for concealed locations. Ducts shall have longitudinally welded seams and welded or flanged joints and connections to equipment or accessories.
- D. Angles, rivets, nuts and bolts used in the construction, bracing, or hanging of ducts shall be of the same material as the duct in which installed.
- E. Low pressure ductwork, ductwork that is installed downstream of a low pressure air moving device or terminal unit, shall be fabricated to meet minimum 2" w.g. internal pressure.
- F. Medium pressure ductwork, ductwork that is installed between an air moving device and terminal units, shall be fabricated to meet minimum 4" w.g. internal pressure.
- G. Return air ductwork shall be fabricated to meet minimum 1" w.g. internal pressure.
- H. Lab exhaust ductwork shall be fabricated to meet minimum negative 4" w.g. or the maximum negative pressure the associated exhaust fan is capable of, whichever is lower.
- I. Restroom exhaust and dish exhaust ductwork shall be fabricated to meet minimum negative 2" w.g. or the maximum negative pressure the associated exhaust fan is capable of, whichever is lower.
- J. Exposed sheet metal shall be constructed of "paint grip" type galvanized steel.
- K. Longitudinal seams at corners of rectangular ducts shall be Pittsburgh type or button punch snap lock with locks preferably on the tops and bottoms of ducts, not on the sides.
- L. All duct panels for rectangular ducts over eighteen (18) inches in either height or width shall be cross broken, except as noted and/or specified. Duct panels in which grilles, diffusers or access doors are to be installed shall not be cross broken unless the distance from the edge of the grille, diffuser or access door to the edge of the panel exceeds eighteen (18) inches, in which case this portion of the panel shall be cross broken. The area to which the grille, diffuser or access door is attached shall be left flat. Ducts which are specified to be finished with rigid insulation shall not be cross broken.
- M. Low pressure elbows shall be full radius type or square type with turning vanes. Where elbows have a different size inlet and outlet, turning vanes shall be single thickness type with extensions on the leaving side. Turning vanes shall be installed with vanes parallel to the elbow.
- N. Medium pressure elbows shall be full radius type, no exceptions. Turning vanes are strictly prohibited in medium pressure ductwork.
- O. Tee connections on branch ducts shall be the radius tap in type. Branch take offs from trunk ducts shall be similar to SMACNA Plate 2 5, except that adjustable splitter damper shall be provided at these points or SMACNA Plate 26, Fig. B with adjustable vanes.
- P. Sheetmetal air plenums and partitions shall be constructed of 18 ga. galvanized steel and 1-1/2" x 1-1/2" x 1/4" galvanized steel angles.

## **2.02 HANGER & SUPPORTS**



- A. Hangers and supports for ductwork shall be in accordance with SMACNA standards.
- B. Hangers and supports for hood exhaust system shall consist of either angles under the duct or clips welded to the duct supported by rods secured to the structure.

### **2.03 FLEXIBLE CONNECTIONS**

- A. Flexible connections in rectangular ducts shall be weatherproof minimum 20 oz. Ventglas as manufactured by Vent Fabrics, Inc., Eigin Mfg., or Duro Dyne Corp. Flexible connections shall be not less than six (6) inches long and shall have suitable metal collar frame at each end with allowance of at least two (2) inch slack in fabric to eliminate vibration transmission. Flexible connections exposed to the weather shall be constructed of at least two layers of fabric, and shall be watertight. Provide flexible connections to ductwork at the air handling unit.

### **2.04 DUCT CLOSURE COLLARS**

- A. Provide duct collars where ducts pass through masonry walls and partitions which extend full height to the underside of the structure and shall be fabricated from 22 gauge galvanized steel sheet. Provide duct collar on both sides of walls and partitions, except where registers and grilles are installed. Install flanges tight against the wall. Pack the space between the duct and the wall with fiberglass blanket insulation.

### **2.05 FLEXIBLE DUCT**

- A. Flexible duct shall be insulated, with a flame spread rating not over 25 and a developed smoke rating not over 50. Inner sleeves shall be fiberglass or Tedlar covered spring steel. Insulation shall be no less than 1" thick fiberglass with a vapor barrier jacket.
- B. Flexible duct shall be rated for 6.0 in-w.c.
- C. Flexible duct shall be connected with circumferential compression clamps consisting of either screw driven, slotted stainless steel bands or ratcheted nylon straps.
- D. Flexible duct shall be:
  - 1. Clevaflex, or
  - 2. Genflex, or
  - 3. Flexmaster, or
  - 4. Thermaflex or
  - 5. Wiremold

### **2.06 SPIN-IN FITTINGS**

- A. Spin-in fittings shall consist of a round galvanized sheet metal collar with a groove designed to allow the fitting to screw into a mating hold. Spin-in fittings shall have an extractor and manual balancing damper with a locking quadrant operator. Spin-in fittings on the inlet side of variable volume boxes shall be bell mouth type, without dampers or extractors.

- B. Spin-in fittings shall be mounted with the extractor facing into the airstream. After insulation, a galvanized sheet metal strap shall be screwed to the duct and the fitting to ensure permanent, proper positioning of the fitting.

## **2.07 AIR DISTRIBUTION DEVICES**

- A. Air distribution devices shall be as scheduled on the drawings.
- B. Diffusers shall be complete with pattern adjustment device, straightening vanes and volume control dampers. Diffuser backplate shall transition smoothly from neck size to full face size. Straightening vanes and dampers are not required where diffusers are attached to round flexible ductwork. Internal parts of diffusers shall be secured so that they can be removed and assembled without special tools.
- C. Grilles and registers with borders shall have felt or rubber gaskets cemented to the back face and holding screws not over 18 inches on centers around the perimeter. Grilles passing air through partitions shall be as described for wall return grilles, 1 for each side partition.
- D. Frame types of diffusers and ceiling return grilles shall match ceiling type(s) as indicated on architectural drawings. Diffusers and ceiling return grilles in lay in ceilings shall be sized to lay in a nominal 24"x24" grid opening.
- E. Registers shall be same as grilles with opposed blade damper.
- F. Finish shall be off white baked enamel unless otherwise indicated. Aluminum construction, linear diffusers and bar grilles: exposed surfaces to be clear anodized aluminum, interiors to be flat black.
- G. Air distribution devices shall be:
  - 1. Anemostat, or
  - 2. Carnes, or
  - 3. Krueger, or
  - 4. Metalaire, or
  - 5. Price, or
  - 6. Titus, or
  - 7. Tuttle & Bailey

## **2.08 DUCT AND PLENUM ACCESS DOORS**

- A. Doors:
  - 1. Double wall construction of not less than 24 gauge galvanized steel sheet, with 1" thick neoprene coated fiberglass insulation between the walls.
  - 2. A continuous hinge on one side and cam latch with striker plate on the other side

3. Height over 12 inches: not less than 2 cam latches with striker plates.
- B. Door Frames:
1. Not less than 22 gauge galvanized steel
  2. Knock over edges for securing to duct.
- C. Door Assembly:
1. Double gasketed to provide seals from the door to the frame and from the frame to duct.
- D. Size:
1. To allow proper access to intended device
  2. Minimum 12" x 16", except as indicated on the drawings.

## **2.09 MANUAL DAMPERS AND DAMPER HARDWARE**

- A. Splitter Dampers:
1. Constructed of not less than 20 gauge galvanized steel sheet.
  2. The length of the damper blade shall be the same as the width of the widest duct section at the split, but in no case shall blade length be less than 12 inches.
- B. Manual Volume Control Dampers:
1. Single blade butterfly dampers:
    - a. Use in ducts up to and including 18"x12" size
    - b. Constructed of not less than 16 gauge galvanized steel blade mounted in a galvanized steel frame.
    - c. For rectangular dampers, the top and bottom edges of the blade shall be crimped to stiffen the blade.
    - d. Provide an extended rod to permit installation of a damper regulator.
  2. Multi louver dampers:
    - a. Use in ducts larger than 18"x12", in either or both dimensions.
    - b. Opposed blade type, constructed of not less than 16 gauge galvanized steel blades mounted in a galvanized steel channel frame. Blade spacing shall not exceed 6", and the top and bottom edges of the blades shall be crimped to stiffen the blades. Damper blades shall be interconnected by rods and linkages to provide simultaneous operation of all blades. Damper shall be provided with an extended rod to permit installation of a damper regulator.
  3. Dampers for outside air intake or relief:

- a. Edge and jamb seals
- b. Rated at less than 1% leakage when tested at 2" water.

## **2.10 FIRE DAMPERS**

### **A. Fire Dampers:**

1. Factory fabricated curtain type
2. Constructed and tested in accordance with UL 555
3. Rated for 1-1/2 hour unless noted otherwise
4. Manufacturer: provide instructions for installation conforming to manner in which dampers were approved by UL

### **B. Frames:**

1. Connected to ductwork: "B" frame
2. In transfer openings in wall shall be "A" frame

### **C. Fusible link rating:**

1. In supply ducts: 160°F
2. In return ducts: 135°F
3. In other locations: approximately 50°F above maximum temperature normally encountered with system in operation or shutdown

### **D. Basis of Design:**

1. Ruskin, or
2. Greenheck, or
3. Nailor, or
4. Hart

## **PART 3 – EXECUTION**

### **3.01 SHEET METAL WORK – GENERAL**

- A. Access panels shall be installed on entering side of all turning vanes, fire dampers, control dampers and other locations where cleaning, oiling, inspection or maintenance are required. Access doors shall be located in bottom or side of ducts for ease of access.
- B. Provide supplemental stiffening on ducts and apparatus casings to prevent drumming and to provide a structurally sound assembly.

- C. Interior of ducts shall be smooth with joints caulked or sealed with duct sealer. The entire air system shall be rigid, free from rattles and air noises.
- D. Ductwork connections to unit shall be arranged to avoid restricting access to panels which must be removed for servicing or cleaning of unit.
- E. Paint exposed sheet metal with two coats of paint in a color and type selected by the architect.
- F. Provide auxiliary frames set flush with the plaster line for outlets in plaster.
- G. Install exposed ductwork in finished areas tight to structure.
- H. Ductwork exposed in the space shall be painted with two coats of paint, in a color to be selected by the Interior Designer.
- I. Branch takeoffs to flexible ducts shall be made using spin in fittings. Branch take-offs shall not be located in the following locations: within 5 ft. downstream of an elbow, within 3 ft. of another take-off.

### **3.02 HANGERS AND SUPPORTS**

- A. Duct hangers and support shall be in accordance with Section V (pages 5-1 through and including page 5-13) HANGERS AND SUPPORTS of the referenced SMACNA Standard, except:
  - 1. Hangers shall be spaced no greater than 8'-0" on center
  - 2. For rectangular ducts: with longest dimensions up through 60" hangers shall be the galvanized steel strap type; with longest dimension 61" and larger, hangers shall be trapeze type constructed of galvanized steel angles with round hanger rods. Sizes for strap hangers and trapeze angles and rods shall be based on duct size as scheduled in the SMACNA Standard, Table 5-1 (page 5-8) for strap hangers and Table 5-3 (pages 5-10) for trapeze hangers.
- B. Hangers for ducts suspended directly from the structure shall be screwed or "pop" riveted to the bottom and sides of the duct and secured to the structure by inserts, expansion shield bolts, beam clamps, welding, or bolting. Drive anchors shall not be installed in any location which will weaken the existing building. Install supplementary steel as required to bridge between joists and all supports shall be at joist panel points.

### **3.03 FLEXIBLE DUCTWORK**

- A. Install flexible ductwork in a fully extended condition, free of sags and kinks using the minimum length required to make connection. Maximum length of flexible duct shall be eight feet.
- B. Support on a maximum of 4' centers with bands of 1" minimum width or wire through grommets furnished in seam of jacket.

### **3.04 GRILLES, REGISTERS, AND DIFFUSERS**

- A. Secure sidewall grilles and registers to duct with galvanized sheet metal screws.

**DALTON PICKLEBALL COMPLEX**

**DALTON, GA**

**PROJECT NO. 2024-0283**

Prime Engineering, Inc.

February 28, 2025

- B. Wall return and relief grilles installed above eye level shall have blades positioned so that inside of duct or the adjacent space will not be visible through the grille.

**3.05 FIRE DAMPERS**

- A. Provide fire dampers in all duct and air transfer openings of fire rated walls, ceilings, and floors. Install damper in sleeve and install unit in wall using retaining angles. The installation shall be in accordance with the manufacturer's recommendation for complying with UL label.
- B. Duct shall be connected to sleeve using slip type joints on top and bottom and a drive slip on each side so that duct can breakaway leaving damper and sleeve in wall or floor.
- C. After installation prove damper operation by removing link and operating damper.

**END OF SECTION**

## SECTION 237730

### Split Systems

#### PART 1 - GENERAL

##### 1.01 DESCRIPTION:

- A. Split system fan coil, heating section and condensing units.
- B. Control system (interlocked to all split system components)
- C. Split system units shall be self-contained, automatic, packaged units. These units shall be completely factory assembled as unitary packages complete with operating controls, internal wiring and piping and fully charged with R-410a refrigerant. Only one electrical power connection shall be required for each unit.
- D. Units shall be UL listed and cooling capacities shall be certified in accordance with ARI 210.
- E. Refrigerant piping.

##### 1.02 QUALITY ASSURANCE:

- A. Products of the manufacturers listed under PRODUCTS will be acceptable for use for the specific functions noted.
- C. Installation shall be by experienced workers regularly employed for this type of work.

#### PART 2 - PRODUCTS

##### 2.01 UNIT CASINGS:

- A. Unit casings shall be formed, galvanized steel construction with welded assembly. Galvanized steel surfaces shall be bonderized and painted with baked acrylic enamel for complete weather protection. Accessories and components shall match and interlock with all other split system components. Fan coil unit casings shall be fully internally insulated with liner which meets NFPA 25/50 flame spread/smoke developed ratings.

##### 2.02 CONDENSING UNITS:

- A. Condensing unit refrigeration systems shall be factory charged and ready for operation. All units with capacities greater than five (5) tons shall be provided with minimum 2-stage (50% and 100%) cooling. Compressor(s) shall be direct drive, 3600 RPM, hermetic reciprocating type with centrifugal oil pump, crankcase heater and internal pressure relief valve. Compressor(s) shall have internal spring isolation and sound muffling and exhibit minimum vibration transmission and noise. Anti-recycle timers shall be provided to prevent excessive cycling of compressors thru utilization of a minimum five (5) minute time shutdown of unit on interruption of power or controlled shutdown.

## **2.01 COILS**

- A. Evaporator and condenser coils shall be copper tubing mechanically bonded to heavy duty aluminum fins. Aluminum tubes shall not be acceptable.

## **2.02 ELECTRIC HEATING SECTIONS**

- A. Electric heating sections shall be UL listed with nickel-chromium open coil resistance heating elements. Each heater shall be protected by an automatic reset high-limit thermostat and manual reset high-limit thermostat for the primary and secondary overcurrent/thermal protection. A proof of airflow/fan interlock shall also be provided. Controls shall provide for multiple stage start-up and operation.

## **2.05 CONTROLS AND ACCESSORIES**

- A. All operating and safety controls which are internal to each unit shall be factory installed and shall include, as a minimum, solid state compressor overload protection, magnetic contactors, thermostatic expansion valve(s), refrigerant line drier(s), outdoor fan and compressor cycling thermostats, high and low limit protection against excessive temperatures or pressures.
- B. A 24 volt transformer shall be provided to accommodate an accessory 24 volt indoor thermostat complete with an electronic programmable night setback, separate automatic heat/cool settings, auto/manual fan control and seasonal selector. Thermostat shall provide staging of the cooling and heating to match the stages of each component.
- C. Provide a locking cover for each indoor thermostat.
- D. Controls on electric heat section shall meet NEMA specifications and requirements.
- E. Controls on gas heating sections shall be AGA certified.
- F. Automatic shutdown controls shall be provided to meet local codes (or NFPA 90A as a minimum) and shall consist of firestats and duct-mounted smoke detectors interlocked to the fan coil unit for shutdown on the detection of fire or smoke.

## **2.06 FILTERS**

- A. Units shall have minimum 1 inch thick, low velocity, glass fiber throwaway filters in commercially available sizes.

## **2.07 REFRIGERANT PIPING**

- A. Refrigerant piping shall be type ACR cleaned copper for refrigerant service with wrought copper fittings and sil-phos brazed joints.

## **2.08 CONDENSATE PIPING**

- A. Condensate piping shall be type L copper with wrought copper fittings and soldered joints.



**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. The split systems and associated controls shall be installed in strict accordance with the manufacturer's recommendations.
- B. The control system shall be completely wired under this Division 15. Wiring shall be in accordance with the N.E.C. and shall meet all requirements for this installation.
- C. Refrigerant piping joints shall be brazed with sil-phos and purged with nitrogen during brazing.

**3.02 STARTUP**

- A. Provide the services of a factory trained and qualified service technician employed by the unit manufacturer who shall inspect the installation including external interlock and power connections; supervise leak testing, initial operation, calibration of operating and safety controls and supervise electrical testing including insulation resistance of motors and voltage balance between phases during starting and running.
- B. This service technician shall forward a report in four (4) copies to the Owner when the unit is in safe and proper operating condition. This report shall include all pressure and control settings, meg readings, voltage readings per phase during start and run, and shall list minor discrepancies to be corrected that affect safe and reliable operation. One additional copy of the report shall be left in the unit control panel. One copy of bound installation, operation, maintenance service and parts brochures, including applicable serial numbers, full unit description and parts ordering sources, shall be placed in the unit control panel at the time of startup; four (4) additional copies shall be forwarded to the Owner.

**END OF SECTION**

**SECTION 260100**

**ELECTRICAL GENERAL REQUIREMENTS**

**PART 1 - GENERAL**

**1.01 INTERPRETATION OF SPECIFICATIONS:**

- A. General provisions and requirements apply throughout. Cross references or general provisions may be repeated for convenience or emphasis only.
- B. Interpret the following as indicated:
  - 1. "or equal": "in accordance with the General Conditions", or "an equivalent with respect to style and function".
  - 2. "approved": "approved or accepted by Governing Officials or the authorities having jurisdiction".
  - 3. "provide": "furnish and install, connect, and test, and contract for the performance of same."
  - 4. "wiring": "required conductors or cable and raceway system, including fittings, boxes, connectors, supports, hardware, labeling, and miscellaneous related accessories
  - 5. "work": "materials completely provided," which shall include all activities and services necessary to meet contract requirements, including inspection and replacement as specified of any defective element".
  - 6. "materials": "equipment and/or materials".
  - 7. "(": "shall be/have" Specifications following a colon are criteria which apply to the term preceding the colon.

**1.02 SCOPE OF WORK:**

- A. Install electrical work covered by the below specifications and approved drawings. Provide material, labor transportation, tools, supervision, etc., necessary to complete the total electrical job. Items not specifically mentioned herein which are obviously necessary to make a complete working installation shall be provided, including any necessary field engineering and/or detail drawings required. Submit drawings for approval as provided for "Shop Drawings".
- B. The work shall consist of, but shall not be limited to, the following systems:
  - 1. Interior and exterior electrical system for lighting, power and secondary service entrance.
  - 2. Empty conduits for telephone and misc. systems.
  - 3. Power connections to equipment specified in specifications and approved drawings.
  - 4. Temporary power as required for the project.
  - 5. New fire alarm system.

**1.03 CODES AND FEES:**

- A. Work shall be done in accordance with the requirements of the locally adopted edition of the National Electrical Code, NFPA #70 and local and state codes and regulations of utility company providing service.
- B. Obtain and pay for all permits and inspections required by the building and safety codes, and ordinances, and the rules and regulations of any legal body having jurisdiction.
- C. Electrical items covered by this specification shall be UL labeled and listed for the purpose.

**1.04 DRAWINGS:**

- A. The drawings indicate the general arrangement of electrical equipment. Review architectural drawings for door swings, cabinets, counters and other built-in equipment; conditions indicated on architectural plans shall govern for this work. Coordinate installation of electrical equipment with the structural and mechanical equipment and access thereto. Coordinate installation of recessed electrical equipment with concealed ductwork and piping, and wall thickness.
- B. Do not scale drawings. Dimensions for layout of equipment shall be obtained from architectural and/or mechanical unless specifically indicated on electrical drawings.
- C. Discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions shall be promptly brought to the attention of the Architect.

**1.05 SHOP DRAWINGS:**

- A. Submit for review by the architect a complete schedule and data of materials and equipment to be incorporated in the work. Submittals shall be supported by descriptive materials, such as catalog sheets, product data sheets, diagrams, performance curves, and charts published by the manufacturer, to show conformance to specification and drawing requirements, model numbers alone will not be acceptable. Data submitted for review shall contain all information required to indicate compliance with equipment specified. Complete electrical characteristics shall be provided for all equipment. Submittals for lighting fixtures shall include photometric data. The architect reserves the right to require sample of any equipment to be submitted for approval.
- B. Each individual submittal item for materials and equipment shall be marked to show specification section and paragraph number which pertains to the item.
- C. Prior to submitting shop drawings, review the submittal for compliance with the contract documents and place a stamp or other confirmation thereon which states that the submittal complies with contract requirements. Submittals without such verification will be returned without review.
- D. All submittals shall be made at one time. Submittals will not be reviewed until all of the submittals listed below have been received. Submittals shall be made for each of the following items:

Lighting Fixtures	Fire Alarm System Components
Disconnect Switches	Panelboards
Circuit Breakers	Wiring Devices

**1.06 RECORD DRAWINGS:**

- A. At the time of final inspection, provide three (3) sets of complete data on electrical equipment used in the project and as-built drawings reflecting all field changes. This data shall be in bound form and shall include the following items:
  - 1. Test results required by these specifications.
  - 2. Panelboard shop drawings and circuit directories reflecting all field changes.
  - 3. Data sheets indicating electrical characteristics of all devices and equipment.

**1.07 EQUIPMENT CONNECTIONS:**

- A. Connect equipment requiring electrical connections under this section of these specifications. Where electrical connections to equipment require specific locations, obtain such locations from

shop drawings. Do not scale drawings for location of conduit stub-ups or boxes mounted in wall or floor to serve specific equipment, unless dimensioned on approved electrical drawings.

- B. Electrical circuits to equipment furnished under other sections of these specifications are based on design loads. If actual equipment furnished has loads other than design loads, electrical circuits and protective devices shall be revised to be compatible with equipment furnished at no additional cost to the owner.
- C. Equipment furnished under other divisions of these specifications to be connected under this section of the specifications shall consist of, but not be limited to, the following:
  - a. Electrical equipment for heating, ventilating and air conditioning systems.
- D. Examine other sections of these specifications, where equipment requiring electrical service is specified. Become fully aware of the scope of the work under this section of these specifications requiring electrical service and connections to equipment specified elsewhere.

#### **1.08 MECHANICAL SYSTEMS:**

- A. Review plumbing and HVAC drawings and Division 23 of these specifications for mechanical equipment requiring electrical service. Provide service to and make connections to all such mechanical equipment requiring electrical service.
- B. Examine the nameplate data for equipment actually furnished on the project. If equipment has loads other than those indicated, control equipment and feeders shall be adjusted in size accordingly. Such adjustment shall be subject to the approval of the architect.
- C. Regardless of the drawing information, provide a NEMA 5-20R duplex receptacle at each indoor air handling unit above ceiling for use of condensate pump connection. Provide and extend #12 circuit wires from the receptacle to the nearest receptacle below floor.
- D. Regardless of the drawing information, provide minimum of (1) NEMA 5-20R weatherproof covered GFCI duplex receptacle at each outdoor mechanical equipment yard on grade or above roof. Receptacle must be located within 25' from any HVAC equipment. Provide and extend #12 circuit wires from the receptacle to the nearest receptacle.

#### **1.09 COORDINATION:**

- A. Coordinate electrical activities with other trades so as to avoid delays, interferences, and any unnecessary work.

#### **1.10 GUARANTEE:**

- A. Contractor for Work under this Division shall be fully responsible for determining in advance of purchase that equipment and materials proposed for installation shall fit into the confines of the space indicated, and shall allow sufficient Code clearance for maintenance and service of all electrical equipment including that of other Trades.
- B. No equipment including piping and ductwork shall be installed over or in this Code required clearance space.
- C. The electrical drawings are schematic, and are not intended to show the exact location of conduit, outlets, etc., nor are they intended to show all conduit and conductors which are required and which shall be provided. Exact locations of electrical equipment, outlets, conduit, etc., shall be coordinated with all other Trades so that there will be no interference between mechanical

equipment, piping, ducts, etc.

- D. In general, complete circuit work including all conduit and wire is not indicated; however, circuit numbers are indicated for all outlets and equipment. Where circuitry is shown, the installation shall be as indicated. Where complete circuitry is not shown, outlets and equipment shall be connected together with the shortest run allowed by the building structure. Conduit fill and conductors installed in the same raceway shall be derated and be conformed to the NEC requirement. Three (3) phase and single (1) phase circuit homeruns shall not be combined.
- E. All single phase electrical circuit homerun shall have individual phase and neutral conductors regardless whether to combine multiple circuit homerun. Only shared ground conductor is allowed.
- F. The Contractor shall refer to the architectural, structural, and mechanical plans and details for dimensions, and shall fit his work to conform to the details of building construction. The right is reserved to relocate switches, receptacles, ceiling outlets, or other systems outlets a maximum of 10'-0" from its location as shown before it is permanently installed, without incurring additional expense to the Owner. Attention is called to receptacle outlets for coordination with Architectural and Mechanical equipment. Do not install these devices behind such equipment.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS:**

- A. Materials or equipment specified by manufacturer's name shall be used, unless approval of other manufacturers is listed in addendum to these specifications. Request for approval of substitute materials shall be submitted in writing to the architect at least ten working days prior to bid openings.
- B. Where substitution of materials alters space requirement indicated on the drawings, submit shop drawings indicating proposed layout of space, all equipment to be installed therein, and clearances between equipment.
- C. Material shall be new and shall conform to the applicable standard or standards where such have been established for the particular material in question. Publications and standards of the organization listed below are applicable to materials specified herein.
  - 1. American Society for Testing and Materials (ASTM)
  - 2. Underwriters' Lab (UL)
  - 3. National Electrical Manufacturer Association (NEMA)
  - 4. Insulated Cable Engineers Association (ICEA)
  - 5. Institute of Electrical and Electronic Engineers (IEEE)
  - 6. Edison Electric Institute (EEI)
  - 7. National Fire Protection Association (NFPA)
  - 8. American Wood Preservers Association (AWPA)
  - 9. American National Standards Institute (ANSI)
- D. Material of the same type shall be the product of one manufacturer.
- E. All cost incurred by the acceptance of substitutions shall be borne by the contractor. Proof for substitution shall be by the contractor.

## **PART 3 - EXECUTION**

**3.01 WORKMANSHIP:**

- A. Work shall be neatly, orderly, and securely installed with conduits, panels, boxes, switches, etc., perpendicular and/or parallel with the principle structural members. Exposed raceways shall be offset where they enter surface mounted equipment. Wiring installed in panels and other enclosures shall be looped and laced and not wadded or bundled.

**3.02 TESTS:**

- A. At final inspection, a test will be made and the entire system shall be shown to be in proper working order as per these specifications and the approved drawings.
- B. Provide instruments, labor and materials for any essential intermediate and final testing.
- C. Equipment covers (i.e., panelboard trims, motor controls, device plates, and junction box covers) shall be removed, as directed, for inspection of internal wiring. All circuits throughout project shall be energized and shall be tested for operation and equipment connections in compliance with contract requirements. Accessible ceiling shall be removed, as directed, for inspection of equipment installed above ceilings.

**3.03 IDENTIFICATION:**

- A. Identify each device such as circuit breakers, panelboards, controllers, etc. with enamel or lacquer letters using machine cut stencils with 1/2" minimum letters, unless otherwise noted.
- B. Identify circuits contained within junction boxes on the cover of all junction boxes.
- C. Provide a white finish, black core Bakelite nameplate for 480/277 volt electrical equipment.
- D. Provide a black finish, white core Bakelite nameplate for 208/120 volt electrical equipment.
- E. Provide a red finish, white core Bakelite nameplate for all emergency electrical equipment.
- F. Bakelite nameplates shall have 5/16" high engraved letters.
- G. Provide engraved laminated job identification nameplate with 3/8" high letters, 4"x8" minimum, centered on main service equipment.
- H. Nameplate shall be same finish at all equipment.
- I. Each distribution type panelboard shall have engraved nameplates for each branch circuit feeder identifying load served.
- J. Each branch circuit panelboard shall be provided with a directory frame on inside of cabinet door. A neat, carefully typewritten, directory card, identifying each branch circuit served by each such panel shall be placed in the frame, under clear plastic cover. Spares shall be noted in pencil.
- K. Nameplates for surface or recessed mounted equipment shall be installed on the exterior of the equipment with screws.
- L. Provide Electrical Safety Arc Flash Warning label conforming to NEC 70E on all electrical panelboards, Transformers, and distribution equipment.

- M. Available fault current and method of electrical equipment protection labels must be clearly identified on the service panel "MDP" as required per NEC 110.24(A) and NEC 110.22.

**3.04 CLEANING AND PAINTING:**

- A. Oil, dirt, grease, and other foreign materials shall be removed from all raceways, fittings, boxes, panelboard trims, and cabinets to provide a clean surface for painting. Scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, switchboard, or other equipment enclosures shall be touched up with paint furnished by the equipment manufacturers specifically for that purpose. Painting in general is specified under other sections of the specifications.
- B. Trim covers for flush-mounted panelboards, telephone cabinets, pull boxes, junction boxes and control cabinets shall not be painted unless specifically required by the architect. Where such painting is required, trim covers shall be removed for painting. Under no conditions shall locks, latches or exposed trim clamps be painted.
- C. Unless specifically indicated to the contrary, all painting shall be done under the "Painting" section of these specifications.

**END OF SECTION**

**SECTION 261000  
BASIC MATERIALS AND METHODS**

**PART 1 - GENERAL**

**1.01 GENERAL**

- A. Provide complete conduit system including boxes, fittings and supports. Leave empty conduits with fiber polyline pull cord. Conceal conduits except in unfinished spaces such as areas without ceilings. Type MC cable shall be used for wiring concealed in walls serving receptacles and switches. The MC wiring shall be extended from junction boxes mounted above the ceilings.

**1.02 RACEWAYS:**

- A. Install conduits per the below requirements:
1. Intermediate Metal Conduit (IMC): ferrous galvanized conduit. Comply with Article #342 of the National Electrical Code.
  2. Rigid steel conduit: ferrous galvanized conduit. Comply with Article #344 of the National Electrical Code.
  3. Electrical Metallic Tubing (EMT): ferrous galvanized conduit. Comply with Article #358 of the National Electrical Code.
  4. Liquid tight flexible metal conduit. Comply with Article #350 of the National Electrical Code.
  5. Flexible metal conduit. Comply with Article #348 of the National Electrical Code.
  6. Rigid nonmetallic conduit: Polyvinyl Chloride Schedule 40 (PVC) conduit. Comply with Article #352 of the National Electrical Code.
- B. Coordinate raceways with the mechanical ductwork and plumbing work installed in the job,

**1.03 OUTLETS:**

- A. Location of Outlets: located diagrammatically on the drawings. Refer to the architectural and mechanical plans for the exact location of outlets. Locate outlets so that they will be symmetrical with architectural details. Locate power outlets to serve the equipment. The location of any outlet may be moved ten feet before it has been installed without additional expense to the owner.

**1.04 SIGNS:**

- A. Provide identification to the following electrical equipment with permanently attached phenolic plates with 1/4" white engraved lettering on the face of each, attached with two sheet metal screws. Plates must use color code identification. Identification plates also, shall identify the panel name and branch of the electrical system.

Main switchboard and individual devices installed therein:  
Panelboards  
Safety Switches and Disconnects  
Shunt Trip Pushbutton  
Main Service Disconnects



## **PART 2 - PRODUCTS**

### **2.01 CONDUCTORS:**

- A. Conductors: Copper, 600 volt type THHN/THWN insulation except where noted on drawings. Conductors installed where fixtures are used as raceway shall be 90oC Type THHN or XHHN.
- B. Branch circuits: minimum #12 AWG solid copper except for motor leads, which shall be a minimum #12 AWG stranded copper, unless otherwise noted on drawings.
- C. Color code three phase system branch circuit and feeder conductors: No. 8 AWG and smaller as follows:

1. 208Y/120 volt

- a. Phase A: Black
- A. Phase B: Red
- B. Phase C: Blue
- C. Neutral: White
- D. Ground: Green

2. 480Y/277 Volt

- a. Phase A: Brown
- B. Phase B: Orange
- C. Phase C: Yellow
- D. Neutral: Gray

- D. MC Cable: Copper conductors with THHN insulation, steel armor, green grounding conductor, 600 volt.

### **2.02 PULLBOXES:**

- A. Pull boxes: code gauge galvanized sheet steel, per Article 314 of the National Electrical Code, for the number, size and position of conduits entering the box, size of box and maximum number of conductors in a box.

### **2.03 OUTLET BOXES:**

- A. Provide outlet boxes for each lighting fixture and for each device. Boxes shall not be smaller than specifically indicated herein and shall be larger if required by Article 314 of the National Electrical Code for the number and size of conductors installed. Where lighting fixtures are installed in continuous rows, only one outlet box shall be required unless otherwise noted on drawings.

### **2.04 RECEPTACLES AND WALL SWITCHES:**

- A. Receptacles and wall switches: the type and size indicated on the drawings. Equal by Bryant, Eagle or P & S.
  - 1. Switches shall be 20 Amp 120/277 volt specification grade. Number of poles: as indicated on drawings.
  - 2. Duplex outlets shall be 20 Amp 125 volt AC 3 wire specification grade straight blade.
  - 3. Single outlets shall be 20 Amp 125 volt AC 3 wire specifications grade straight

blade.

- B. Device plates: one piece single or multi-gang type selected to match the specific device or combination of devices. Devices flush mounted in exposed masonry construction shall be jumbo type. Device plates for surface mounted devices shall be used with the type of outlet or outlet box in which the device is mounted. Provide devices installed in areas exposed to the weather with a weatherproof device plate. Cover plates shall be metal unless indicated differently on contract documents.
- C. Finishes: Finish of Switch handles and receptacles shall be color per the architect/interior designer.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Type MC cable shall be used for all branch circuit wiring in inaccessible areas and above accessible ceilings. EMT steel conduit shall be used for all branch circuit homeruns and feeders.
- B. MC cable shall be run from homerun junction boxes to devices, switches, and light fixtures in inaccessible areas.
- C. Rigid steel conduit shall be used for raceways run exposed on exterior of building, in slabs on grade, or in poured concrete walls or columns.
- D. Non-Metallic Conduit shall be used for raceways run underground and where non-metallic conduit or plastic conduit (PVC) is specified herein or shown on the drawings.
- E. All conduit and MC cable shall be run concealed unless otherwise directed or indicated on the drawings. Concealed conduit shall be run in walls and above ceilings.
- F. Conduit shall be run below grade or in the slab where indicated.
- G. MC cable shall not be installed exposed.

#### **3.02 RACEWAYS**

- A. Install exposed conduits parallel or at right angles to existing walls, ceilings, and structural members. Support exposed conduits at not more than ten foot intervals and within three feet of outlets, junction boxes, cabinets and fittings. Support individual runs of conduits by one hole conduit straps. Support groups of conduits on 1/2" x 1/2" fourteen gauge channel. Kindorf, Unistrut, or Powers, suspended from structure with 3/8" threaded steel rods with spring steel conduit supporters. Attach rods to structure with swivel type clamps. Support individual runs of exposed conduits attached to structural steel by beam clamps. Where conduits must pass through structural members obtain approval of architect with respect to location and size of hole prior to drilling.
- B. Support concealed branch circuit conduits at intervals not exceeding ten feet and within three feet of each outlet, junction box, cabinet or fitting. Attach individual branch circuit conduits to structural steel members with spring steel type conduit clips and to non-metallic structural members with one hole conduit straps. Where branch circuit conduits must be suspended below structure, support conduits by trapeze type support of exposed conduits. Attach concealed feeder conduits larger than one inch trade diameter above ceiling to structure on

intervals not exceeding twelve feet with conduit beam clamps, one hole conduit straps or trapeze type support in accordance with conditions encountered. Do not attach conduits to channels of ceiling suspension system or suspension wires.

- C. Attach conduit support device to structure with wood screws on wood, toggle bolts on hollow masonry, lead shield on solid masonry and machine bolts, clamps, or spring steel clips on steel. Nails are not acceptable.
- D. Attach rigid conduit to sheet metal enclosures with two bonding type lock nuts and insulated bushing. EMT connectors and couplings shall be steel set screw type. Connectors shall be of the insulated throat type. Terminate rigid conduit stub ups not attached to enclosure with steel insulated throat, grounding type bushing. Connectors and couplings shall be approved for the purpose.
- E. Provide expansion fittings in feeder conduits where conduits pass through building expansion joints. Conduits penetrating rated fire walls or rated fire floors shall be installed with devices to maintain the fire rating of the wall or floor penetrated. Contractor shall caulk holes on both sides of smoke walls where conduits penetrate.
- F. Support conduit on the roof by clamping to premanufactured polyethylene blocks with integral standard strut channel.
- G. Protect conduits against dirt, plaster, and foreign debris with conduit plugs. Plugs shall remain in place until masonry work is complete.
- H. Seal conduits entering buildings from below grade with fiber and insulating electrical putty to prevent entrance of moisture.
- I. Use conduit seals where noted on drawings and per Article #300-5 and #300-7 of the National Electrical Code. Crouse-Hinds Type "EYS", Appleton Type "EYF" or O.Z. Gedney Type "EY" or "EYA".
- J. Flexible conduit shall comply with the above and below specifications.
  - 1. Use flexible conduit connection to vibrating equipment, electric duct heaters, unit heaters and rotating machinery, and for connection from junction box to corresponding recessed lighting fixture.
  - 2. Flexible liquidtight conduit connecting motors, duct heaters, unit heaters and other electrical equipment subject to vibration shall not exceed eighteen inches in length.
  - 3. Flexible metal conduit from outlet box to recessed lighting fixture shall not exceed six feet in length.
  - 4. Flexible conduit used for other than connections to lighting fixtures shall not be less than one-half inch trade size and in no case shall flexible conduit size be less than permitted by the National Electrical Code for the number and size of conductors to be installed therein. Three-eighths inch flexible conduit may be used for connection to lighting fixtures providing conduit fill requirements of National Electrical Code are not exceeded.
  - 5. Maintain ground continuity through flexible conduit with green equipment grounding conductor; do not use flexible conduit for ground continuity.
  - 6. When exposed to weather, when specifically indicated, or when installed in areas subject to moisture, flexible conduit shall be liquidtight type.
  - 7. Connectors for flexible conduit shall be the insulated throat type. When used with liquid type flexible conduit, connectors shall be of the screw-in ground cone type.
- K. All raceways installed in the service shop shall be concealed behind walls.

- L. If a conduit is required to be installed exposed due to owner change's after construction of wall and cavity is not accessible, explosion proof fittings shall be installed on both ends of exposed raceway stub-ups from underground in the service shop area conforming to National Electrical Code, Article 511. Continuous exposed GRC raceway unbroken exiting shop floor to 30" AFF before any coupling or connector to box may be exempted conforming to 511.3.
- M. Explosion proof fittings shall be used for underground electrical raceway system in the service shop areas conforming to National Electrical Code, Article 511.
- N. If a conduit is required to be installed exposed due to owner change's after construction of wall and cavity is not accessible , surface electrical raceway system in the service shop areas installed below 10'-0" above finished floor shall be rigid galvanized raceway system.
- O. All feeders in rigid conduit 3/4" and larger or having conductors #6 and larger terminating in switchboards, panelboards, pull boxes, tap boxes and similar boxes shall have nylon insulated grounding bushings.
- P. Conduits below service shop areas shall be IMC or threaded rigid metal conduit per 511.8.
- Q. Conduits and junction boxes in service shops, service drives and compressor rooms shall not be installed within 18" of the ceiling.

**3.03 PULL OR JUNCTION BOXES:**

- A. Provide pull boxes where specifically indicated and where required to facilitate the installation of conductors. Install pull boxes exposed only in unfinished spaces, unless otherwise specifically indicated, and install to be fully accessible.
- B. Where pull boxes are installed in finished spaces, boxes shall be flush mounted, with trim, hinged door and flush latch and lock to match panel trim for flush mounted electrical panel. Surface mounted boxes shall be Type "FD" with blank covers.
- C. Pull boxes required for horizontal feeders containing more than one feeder shall be provided with reinforced flange and removable 12 gauge 1/2" x 1/2" galvanized channel for support of conductors. Wood supports within pull boxes are not acceptable.
- D. Splices shall not be permitted in pull boxes except when specifically approved in writing by the architect or where specifically shown on the drawings. Where splices are permitted, splices shall be made with splicing sleeves attached to conductors with hydraulic crimping tool. Split bolt connectors are not acceptable for splices within pull boxes.
- E. Feeders within pull boxes shall be individually laced with nylon tie straps of the type with enlarged tab to permit identification of each feeder within pull box.
- F. Minimum pull or junction box size shall be 4 11/16" square by 2 1/8" deep.
- G. Mark on the coverplate of the junction box the circuit numbers of the circuits in that box. Marking may be made with permanent markers, in legible writing.

**3.04 OUTLET BOXES:**

- A. Outlet boxes for surface mounted and pendant mounted lighting fixtures shall be 4" octagon

boxes, 1-1/2" deep.

- B. Outlet boxes for flush mounted lighting fixtures shall be 4" square boxes 2 1/8" deep, with blank cover installed adjacent to fixture. Box shall be accessible when fixture is removed. Connection to fixture shall be with flexible conduit and fixture wire.
- C. Outlet boxes for switches, receptacles and wall mounted junction boxes shall be 4" square boxes 2-1/2" deep with square edge cover. Where only one conduit enters box, 3 1/2" deep single gang switch box may be used. Outlet boxes shall be set to within 1/8" of finished wall.
- D. Outlet boxes for switches and receptacles in exposed wiring system shall be "FD" boxes with matching device plate.
- E. Outlet boxes for individual switches, and receptacles flush mounted in exposed concrete block shall be single gang masonry boxes 3 1/2" deep, set to within 1/8" of finished block.
- F. Where special purpose device specified requires larger outlet box than specified herein, provide outlet box suitable for specific device. These outlet boxes shall be of the same type as specified herein for the specific installation required.
- G. Where low voltage device is to be installed in common outlet box with line voltage device, provide metal barrier within outlet box to establish two separate compartments.
- H. Outlet boxes used for support of surface mounted incandescent lighting fixtures shall be provided with fixture stud. Boxes shall be supported by light weight channel spanning between and attached to main ceiling support member. Attach channel to ceiling support members with galvanized tie wire or nylon tie straps.
- I. Outlet boxes shall not be used for support of fluorescent fixtures, boxes shall be used only as junction boxes.
- J. Outlet boxes for use with communication, alarm and signal systems are specified with specific systems.
- K. Review architectural and interior drawings for areas where outlets occur within specific architectural or structural features and install outlets as shown on architectural drawings, or, if not shown, accurately center and align boxes within the architectural feature or detail.
- L. Unless otherwise indicated or specified, switches and receptacles shall be mounted with middle of device, the distances indicated herein, above the finished floor except where finished walls are exposed concrete block, in which case height shall be adjusted to allow outlet box for device to be mounted at block joint. Review architectural drawings for any device requiring specific location. Mounting heights for devices shall be as follows (unless noted otherwise):
  - A. Wall Switches: 46" (42" if above counter or other obstruction)
  - B. Wall Receptacles: 18"
  - C. Receptacles above counter tops: 4" above back splash with major axis horizontal
  - D. Telephone and Computer Outlets: 18"
- M. Devices shall be mounted within outlet boxes to allow device plates to be in contact with wall on sides. Devices shall be accurately aligned with major axis of device parallel to adjacent predominate building feature.
- N. Wall switches shall be installed on the strike side of doors.

- O. Unless otherwise noted on Drawings, wall outlet boxes in the service shop area shall be installed at 44" AFF. Service shop is classified as any place or location that vehicle will be serviced without ventilation provided, including but not limited to Service Bays, Details, Carwash Tunnel, Fluid/Compressor Rooms, etc. that must conform to NEC 511.

**3.05 CONDUCTORS:**

- A. Feeder and branch circuit conductors No. 6 AWG and larger shall be phase identified in each accessible enclosure by 1" wide plastic tape attached to conductors in a readily visible location. Tape colors shall match color requirements specified herein.
- B. Branch circuit conductors shall be connected as indicated on the drawings. Common neutrals and ground wires may be pulled in conduits where only opposite phase conductors are run. Conduits shall have a ground wire pulled and shall comply with Article 250 of the National Electrical Code.
- C. Conductors within enclosures, i.e., panels, terminal cabinets, control cabinets shall be grouped and laced with nylon tie straps. Conductors within pull boxes shall be grouped and identified with nylon tie straps with circuit identification tag.
- D. Splices in conductors shall be made only within junction boxes, wiring troughs and other enclosures as permitted by the National Electrical Code. Do not splice conductors in panelboards, safety switches, or motor control enclosures. Splices in conductors No. 10 AWG or smaller shall be made with Skotchlok insulated spring connectors, Ideal wing nuts, or Ideal steel crimp connectors with wrap-cap insulating caps. Splices in conductors No. 8 AWG and larger shall be made with split bolt connectors taped with No. 88 plastic electrical tape or Ideal Type GP or GT tap connectors and insulating cover unless splices are specifically indicated to be made with crimping sleeve applied to conductors with hydraulic operated crimping tool.
- E. Conductors used only for 120 volt control wiring systems shall be minimum No. 14 AWG stranded type MTW 600 volt insulation. Control conductors to be J.I.C. color coded. Where control conductors terminate on terminal strip, make termination with lug applied to conductor with crimping tool.
- F. Maintain phase rotation established at service equipment throughout entire project.
- G. Pull Wires: 500# minimum test continuous fiber polyline.
- H. All conductors shall be copper. Aluminum conductors are not permitted.

**END OF SECTION**

**SECTION 264000**

**ELECTRICAL DISTRIBUTION EQUIPMENT**

**PART 1 - GENERAL**

**1.01 GENERAL:**

- A. Provide electrical distribution equipment as specified, scheduled or indicated on the approved drawing and these specifications.

**PART 2 - PRODUCTS**

**2.01 PANELBOARDS:**

- A. Panelboards: bolt-in circuit breaker type with a rated main breaker or rated main lugs only as noted on drawings. Interrupting capacity as shown on plans. Multiple breaker shall be common trip type only. Provide GFCI (Ground Fault Circuit Interrupter) breakers where indicated. Panels shall be fully rated, no series ratings are acceptable.
- B. End and side gutter shall have minimum clearance as required by the NEC. Depth shall be 5 3/4" minimum.
- C. Approved manufacturers are: Square D, Cutler Hammer, and ABB-General Electric.
- D. Main lugs of panels or main circuit breaker shall be UL listed for copper or aluminum conductors. Lugs shall be of the proper range for feeder conductors indicated on the drawings.
- E. Panels throughout project shall be keyed alike.
- F. Provide circuit breakers with trip rating class and poles as indicated on the drawings. Class indicated is designation according to Federal Specification W-C-375b and indicates the frame size and interrupting rating required. Operation of multiple breakers shall be by single handle; tie handles are not acceptable.
- G. Circuit breakers used for the control of discharge lighting shall be designated for the purpose and bear the marking "SWD".

**2.02 DISCONNECT SWITCHES:**

- A. Provide Heavy Duty, Load Break type Fusible or Non-Fusible disconnect switches for all motors located out of sight of motor controller and where specifically indicated on the drawings. Disconnect switches shall disconnect all underground conductors. When exposed to weather, enclosure shall be NEMA 3R (Raintight); otherwise, enclosure shall be NEMA-1. Switches shall be installed to be fully accessible in accordance with Article 110-26 of the National Electrical Code.
- B. Disconnect switches for single phase motors shall be horsepower rated, motor switches without

overload protection, voltage rating as per motor nameplate voltage or greater.

- C. Fusible disconnect switch shall disconnect all ungrounded conductors and shall be supplied with the proper sized fuse clips and fuses. Fuse size over frame size will be noted on drawings. Fuses shall be current limiting low peak dual element Type RK-1 fuses.
- D. Disconnect switches shall be Square D, Siemens - ITE or Cutler Hammer. All disconnect switches shall be identified in accordance with the "Identification" section of these specifications and Article 110-22 of the National Electrical Code.

**2.03 SURGE PROTECTIVE DEVICE (SPD):**

- A. SPD shall be mounted within the panelboard enclosure by the panelboard manufacturer. SPD mounted in separate enclosures will not be accepted.
- B. The SPD provided shall meet or exceed the following single pulse surge current capacity requirements:
  - 1. Line to Ground 100kA
  - 2. Line to Neutral 100kA
  - 3. Neutral to Ground 100kA

**2.04 BACKBOARDS:**

- A. Provide backboards for all panels and power distribution equipment and as required by the local inspectors.
- B. Backboards: be made of 3/4" FRP grade plywood, supported by an angle iron frame painted light gray.

**PART 3 - EXECUTION**

**3.01 MANUFACTURERS' RECOMMENDATIONS:**

- A. Install electrical distribution equipment in accordance with the manufacturer's recommendations and these specifications.
- B. Where ground-fault protection of equipment is provided, performance testing by means of primary current injection shall be conducted and documented by qualified persons in accordance with NEC 230.95 (C). Electrical contractor shall be prepared to provide "proof of test" document from qualified person having performed the test, should the AHJ request.

**3.02 PANELBOARDS:**

- A. Identify each circuit protective device with numeral designation, cross referenced with typewritten circuit directory on interior of panel door. Include a copy of each panel directory, reflecting all field changes, in the bound data provided at the time of final inspection.
- B. Circuit breakers shall be numbered and connected to panel bus in the following sequence:



Circuit 1, Phase A; Circuit 3, Phase B; Circuit 5, Phase C. Where bus diagrams are indicated on the drawings, breakers shall be positioned in panel to conform to diagrams; otherwise, single pole breakers shall occupy top positions in panel with blank spaces in lower positions and two and three pole breakers in between.

- C. Conductors within panels shall be grouped and laced with nylon tie straps. Splicing of conductors within panels is not acceptable. Only one conductor shall be installed under terminal of individual circuit breaker.

### **3.03 FLOOR MOUNTED EQUIPMENT**

- A. Provide a 4" high concrete housekeeping pad beneath all floor mounted electrical equipment. This pad shall extend 6" beyond the electrical equipment in all directions. All exterior edges on the concrete pad shall be beveled.
- B. Enclosure shall be secured to floor by a minimum of four (4) anchoring devices for equipment up to 24" deep and 36" wide and by a minimum of six (6) anchoring devices for larger equipment. Refer to manufacturer recommendation for anchoring.

**END OF SECTION**

**SECTION 264500**

**GROUNDING**

**PART 1 - GENERAL**

**1.01 GROUNDING:**

- A. Grounding shall comply with Article 250 of the National Electrical Code, state and local codes, and the requirements of the utility company serving the site.
- B. The building electrical system shall be a grounded wye supplemented with equipment grounding systems. Non-current carrying parts of the electrical system i.e., raceways, equipment enclosures and frames, junction and outlet boxes, machine frames and other conductive items in close proximity with electrical circuits, shall be grounded to provide a low impedance path for potential ground faults.

**PART 2 - PRODUCTS:**

**2.01 MATERIALS:**

- A. Ground rods shall be 3/4" copperweld sectional rods 8'-0" in length. Top of the ground rod shall be twelve (12) inches below finished grade. Connection to the ground rod shall be made by chemical weld process. Resistance to ground shall not exceed twenty-five (25) ohms.
- B. Grounding conductor: copper sized in accordance with Articles 250-66 of the National Electrical Code.

**PART 3 - GROUNDING:**

**3.01 GROUNDING:**

- A. Ground the neutral conductor of the building electrical system to the metal cold water system and to the ground rod system. Make connections with ground clamp. Install conductor in PVC conduit to point of ground connection. Make connection to the metal cold water pipe of the main metal water line entering the building or the first metal portion of the water line within the building. Install jumper around water meter by approved methods.
- B. Provide each panelboard with a copper equipment grounding bar brazed or riveted to the associated enclosures or cabinet and an insulated neutral bar. Braze the related feeder and branch circuit grounding conductors to the grounding bar or connected with pressure connector. The initial panelboard of each separate system served from a system source or dry type transformer shall have an insulated neutral bar interconnected with the grounding bar to establish the system common ground point.
- C. Ground motors by drilling and tapping the bottom of the motor junction box and attaching the conductor to the box with a round head bolt used for no other purpose. Conductor attachment shall be through the use of a lug attached to conductor with crimping tool.
- D. Install a grounding conductor in power and lighting conduit installations. All circuit grounding

conductors shall be sized per Article 250 of the National Electrical Code.

- E. Upon completion of the ground rod installation, test the system by the “fall of potential” measuring method using a ground resistance test meter and two auxiliary electrodes driven into the earth, interconnected through the meter with the ground rod installation being tested. Placement of the auxiliary electrodes shall be in accordance with operating instructions of the test meter, but in no case shall be placed within the effective resistance area of the system being tested. The effective resistance area shall be considered twice the ground rod length of the ground rod(s) driven. The test shall not be taken within forty-eight (48) hours of rainfall and shall include the data tested and the lowest reading recorded. Test results shall be forwarded, in writing, immediately to the engineer.

**END OF SECTION**

**SECTION 265000**

**LIGHTING FIXTURES**

**PART 1 - GENERAL**

**1.01 GENERAL**

- A. Select lighting fixtures from those fixtures included in the fixture schedule. Request for fixtures other than those listed in the fixtures schedule must be submitted in writing at least ten working days prior to opening of bids to the architect with copy to engineer.
- B. Request for fixture substitution must be accompanied by construction specifications, photometric test data including foot lambert reading, and complete dimensions. Data for exterior lighting luminaires must also contain isocandle curves and average lumen distribution data.
- C. Select fixtures from the fixture schedule not only by catalog number, but with consideration to mounting, number and types of lamps, and reference notes as contained in the fixture schedule and/or drawings.
- D. Lamps shall be provided for fixtures in accordance with fixture schedule and/or manufacturer's recommendations.
- E. Plaster frames shall be provided for recessed fixtures as required when installed into gyp ceilings.
- F. Verify fixture numbers, before placing order, to assure that fixtures will be furnished with proper frames, fitting, and devices for installation in the ceiling system which is to be installed.

**PART 2 - PRODUCTS**

**2.01 BALLASTS:**

- A. Ballasts provided with fixtures shall be ETL-CBM approved, high power factor, with UL label. Ballasts for rapid start lamps shall be Premium Class P. Ballasts for T-8 lamps shall be electronic. Ballasts shall be for the voltage of the circuit to which connected. Ballasts shall be provided for fluorescent and high intensity discharge lamps. Ballasts shall not be less than or equal to 10% THD.
- B. Fluorescent fixtures exposed to outside temperatures shall be provided with 0 degree ballasts.

**2.02 LAMPS**

- A. Provide all lamps for lights on this project. All lamps to be 3500K unless otherwise noted.
- B. Lamps shall be Philips, Sylvania or ABB/General Electric.

**2.03 LED SOURCES**

- A. LED light sources shall be rated for operation between -40 degrees Celsius and 50 degree Celsius.

- B. Provide CCT (Correlated Color Temperature) as specified in fixture schedule included within contract documents.
- C. Fixture CRI (Color Rendering Index) shall meet or exceed that specified in fixture schedule included within contract documents. Where no CRI is scheduled, CRI shall be 80 or greater.

**2.04 LED DRIVERS**

- A. All drivers shall have an operating efficiency meeting or exceeding that of 85%.
- B. All drivers shall have a minimum starting temperature of at least -40 degrees Celsius.
- C. All drivers shall have a voltage input and phase of that specified in fixture schedule included within contract documents.
- D. All drivers shall be rated for operation at 60Hz.
- E. All drivers shall have a power factor greater than that of 0.9.
- F. All drivers shall have a THD (Total Harmonic Distortion) not exceeding that of 20%.

**2.05 LED FIXTURES**

- A. LED fixtures shall come equipped with integral heat dissipation systems.
- B. LED fixtures shall have a minimum service life of 55,000 hours at ambient 25 degrees Celsius operating temperature.
- C. LED fixtures shall have LED sources and drivers that are accessible from the exposed side of the fixture and do not require removal of fixture for LED source and/or driver repair/replacement.

**PART 3 - EXECUTION**

**3.01 GENERAL:**

- A. Install lighting fixtures in accordance with the manufacturer's recommendations, as herein specified, or as indicated on the drawings.
- B. Hang fluorescent fixtures suspended from ceiling joist by means of fixture chain and approved light support supplied by light manufacturer. Two supports are required for each four (4) foot fixture.
- C. Surface and wall mounted emergency lights are to be hung as per approved manufacturers methods for each light.
- D. Ceiling grids shall not be used for the sole support of recessed, lay-in type fixtures. Each lay-in type, recessed fixture shall be independently supported from the structure by two #10 hanger wires installed on diagonal corners of the fixture.
- E. Provide integral test switch as part of the fixture for lighting fixtures with emergency battery units. Do not use remote test switches.
- F. Provide U.L. "FR" Label for recessed lighting fixtures mounted in fire rated ceilings. Construct a

fire rated enclosure around the fixture housings using fire rated acoustical ceiling tile.

**END OF SECTION**

**SECTION 267500**

**MISC. SYSTEMS**

**PART 1 - GENERAL**

**1.01 SCOPE**

- A. Provide empty conduit systems as indicated on the drawings and as required by the Data Systems provider.

**PART 2 - PRODUCTS**

**2.01 CONDUIT**

- A. Conduit shall be as specified under Section 261000 – BASIC MATERIALS AND METHODS.

**2.02 OUTLET BOXES**

- A. Outlet boxes shall be as specified under Section 261000 – BASIC MATERIALS AND METHODS

**2.03 BACKBOARD**

- A. Backboards shall be U.S. Plywood or approved equal of minimum 3/4 inch thickness, grade A/D minimum, and installed with good side exposed.

**PART 3 - EXECUTION**

**3.01 INSTALLATION:**

- A. Conduits shall contain a nylon pull wire.
- B. Provide pullboxes with blank cover plate minimum every 100 feet as directed by Telephone Company.
- C. The telephone service shall be installed as indicated on the drawings. Coordinate with the Telephone Company so that the entire system is installed in accordance with the Telephone Company standards and policies.
- D. Permanently and securely install backboards and paint with two coats of gray paint on both sides prior to the installation of any equipment.
- E. Provide (1) #6 awg ground wire to each telephone backboard location. The wire shall be connected to the electrical building grounding system.

**END OF SECTION**

## SECTION 311000 - SITE CLEARING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:

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

- B. Related Sections:

1. Section 024100 "Demolition"

#### 1.3 DEFINITIONS

- A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.
- D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.
- E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.



- F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and indicated on Drawings, defined by a circle concentric with each tree with a radius 1.5 times the diameter at chest height unless otherwise indicated.
- G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

#### 1.4 MATERIAL OWNERSHIP

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

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
  - 1. Use sufficiently detailed photographs or videotape.
  - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.
- B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

#### 1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at location agreed upon by Developer.

#### 1.7 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.
  - 1. Do not proceed with work on adjoining property until directed by Architect.
- C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises unless directed otherwise.

- D. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- E. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- F. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- G. Do not direct vehicle or equipment exhaust towards protection zones.
- H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.
- I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
  - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation within 30 feet of the limits of disturbance to remain. Flag each tree trunk at 54 inches above the ground.
- C. Protect existing site improvements to remain from damage during construction.
  - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXISTING UTILITIES

- A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.
  - 1. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- C. Locate, identify, and disconnect utilities indicated to be abandoned in place.
- D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
  - 1. Notify Engineer/Architect not less 3 working days in advance of proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Engineer/Architect's written permission.
- E. Excavate for and remove underground utilities indicated to be removed.
- F. Removal of underground utilities is included in earthwork sections and with applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security and utilities sections.

### 3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  - 2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
  - 3. Use only hand methods for grubbing within protection zones.
  - 4. Chip removed tree branches and stockpile in approved areas or dispose of offsite.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
  - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

### 3.5 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 4-6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
  - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
  - 1. Limit height of topsoil stockpiles to 72 inches.
  - 2. Do not stockpile topsoil within protection zones.
  - 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
  - 4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

### 3.6 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
  - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.

2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

### 3.7 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

## SECTION 31 2000 - EARTH MOVING

### PART 1 – GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for **slabs-on-grade pavements turf and grasses and plants**.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete **pavements**.
6. Subbase course **and base course** for asphalt paving.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

#### 1.2 DEFINITIONS

##### A. Backfill: Soil material used to fill an excavation.

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

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

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

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

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

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

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

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

- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at **Project site**.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Material test reports.

### 1.5 FIELD CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- B. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.

## PART 2 – PRODUCTS

### 2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification **Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487**, or a combination of these groups; free of rock or gravel larger than **3 inches** in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
  - 1. Liquid Limit: Per Geotech Engineer.
  - 2. Plasticity Index: Per Geotech Engineer
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

## 2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.

## PART 3 – EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.



- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

### 3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

### 3.3 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
  - 2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
  - 3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.
- B. Excavations at Edges of Tree- and Plant-Protection Zones:
  - 1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Cut and protect roots according to requirements per Landscaping plan

### 3.4 EXCAVATION FOR WALKS AND PAVEMENTS

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

### 3.5 EXCAVATION FOR UTILITY TRENCHES

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

- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  - 1. Clearance: **12 inches** each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trenches in Tree- and Plant-Protection Zones:
  - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
  - 3. Cut and protect roots according to requirements in Landscaping plan.

### 3.6 SUBGRADE INSPECTION

- A. Proof-roll subgrade **below the building slabs and pavements** with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

### 3.7 UNAUTHORIZED EXCAVATION

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

### 3.8 STORAGE OF SOIL MATERIALS

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

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

### 3.9 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within **18 inches** of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in **Section 033000 "Cast-in-Place Concrete."**
- D. Trenches under Roadways: Provide **4-inch-thick**, concrete-base slab support for piping or conduit less than **30 inches** below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of **4 inches** of concrete before backfilling or placing roadway subbase course. Concrete is specified in **Section 033000 "Cast-in-Place Concrete."**
- E. Initial Backfill: Place and compact initial backfill of **subbase material**, free of particles larger than **1 inch** in any dimension, to a height of 12 inches over the pipe or conduit.
  1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- F. Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

### 3.10 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
  1. Under grass and planted areas, use satisfactory soil material.
  2. Under walks and pavements, use satisfactory soil material.
  3. Under steps and ramps, use engineered fill.
  4. Under building slabs, use engineered fill.
  5. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than **8 inches** in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to **ASTM D 698**:
  - 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at **98** percent.
  - 2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at **98** percent.
  - 3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at **85** percent.
  - 4. For utility trenches, compact each layer of initial and final backfill soil material at 90 percent.

3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
  - 1. Turf or Unpaved Areas: Plus or minus **1 inch**.
  - 2. Walks: Plus or minus **1 inch**.
  - 3. Pavements: Plus or minus **1/2 inch**.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of **1/2 inch** when tested with a 10-foot straightedge.

3.14 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course **and base course** on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course **and base course** under pavements and walks as follows:
  - 1. Shape subbase course **and base course** to required crown elevations and cross-slope grades.
  - 2. Place subbase course **and base course** that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 3. Compact subbase course **and base course** at optimum moisture content to required grades, lines, cross sections, and thickness to not less than **98** percent of maximum dry unit weight according to **ASTM D 698**.

3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
  - 1. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
  - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than **98** percent of maximum dry unit weight according to ASTM D 698.

3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform inspections:
- B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.17 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

## **SECTION 31 2319 – DEWATERING**

### **PART I – GENERAL**

#### **1.1 SECTION INCLUDES**

- A. This section specifies the control, handling, and disposal of groundwater and surface water during construction. This work includes the installation, operation, and removal of all facilities required to maintain open excavations and trenches in a dewatered condition to permit unrestricted construction operations.
- B. The Contractor shall be responsible for the stability of all temporary and permanent slopes, grades, trenches, foundations, materials, and structures during the course of the Work. The Contractor shall repair and replace all slopes, grades, foundations, materials, and structures damaged by water, both surface and subsurface, to the lines, grades, and conditions existing prior to the damage, at no additional cost to the Owner.
- C. The Contractor shall construct all permanent work in areas free from water. The Contractor shall design, construct, and maintain all pumping systems, dikes, levees, cofferdams, and diversion and drainage channels as necessary to maintain construction areas free from water and to protect the areas occupied by permanent work from water damage. The Contractor shall remove temporary work after it has served its purpose.
- D. Excavation/Trench Dewatering Requirements.
- E. Stream and Surface Water Diversion Provisions.
- F. Disposal of Water Removed from Excavations and Trenches.

#### **1.2 RELATED SECTIONS**

- A. Section 312000 – Earth Moving

#### **1.3 REFERENCES**

- A. Occupational Safety and Health Administration (OSHA) Regulations.

#### **1.4 QUALITY ASSURANCE**

- A. The Contractor shall perform dewatering operations with supervisory personnel having at least 5 years' experience in field of dewatering.
- B. The Contractor shall maintain adequate supervision and control to ensure that stability of excavated and constructed slopes are not adversely affected by water, that erosion is controlled and that flooding of excavation or damage to structures does not occur.

1.5 DEFINITIONS

- A. **Dewatering:** includes lowering the water table and intercepting seepage which would otherwise emerge from slopes or bottoms of excavations and disposing of removed water. The intent of dewatering is to increase stability of excavated slopes; prevent dislocation of material from slopes or bottoms of excavations; reduce lateral loads on sheeting and bracing; improve excavating and hauling characteristics of excavated material; prevent failure or heaving of the bottom of excavations; and provide suitable conditions for placement of backfill materials and construction of structures and other installations.
  
- B. **Surface drainage:** includes use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines as required to protect the Work from any source of surface water.

1.6 JOB CONDITIONS

A. Permits:

- 1. Prior to land disturbing activities or discharging water into a storm sewer or waterway, the Contractor shall obtain all necessary permits from the jurisdictional agencies and submit a Notice of Intent to the Georgia Department of Environmental Protection by certified return receipt mail at least fourteen (14) days prior to conducting any land disturbance activities.
- 2. Notice of termination and applicable requirements to be submitted to the Georgia Department of Environmental Protection and be approved prior to close out of project.

B. Responsibilities:

- 1. The Contractor shall select and install a system to control water as specified in this section, and to comply with the requirements of the jurisdictional agencies.
- 2. The Contractor shall take measures to prevent damage to properties, buildings or structures, sewers and other utility installations, pavements, sidewalks, and the Work.
- 3. The Contractor shall not overload or obstruct existing facilities.
- 4. The Contractor shall modify the dewatering system at no additional cost to the Owner if after installation and while in operation it causes or threatens to cause damage to existing buildings, structures, utilities, facilities, or other adjoining property.
- 5. The Contractor shall monitor the quality of the discharge from the dewatering system to determine if soil particles are being removed by the system and install and maintain settling basins or other measures as required to control particle removal.
- 6. The Contractor shall measure and evaluate if movements are being caused to adjacent buildings, structures, utilities, facilities, or other adjoining properties by dewatering operations.
- 7. The Contractor shall repair damage, disruption, or interference resulting directly or indirectly from dewatering operations at no additional cost to the Owner and to the Owner Engineer's approval.
- 8. The Contractor shall submit plans and details for the protection of the Work where applicable. These plans shall include details of bulkheads, pumping facilities, dikes, and drainage.



## 1.7 PERFORMANCE REQUIREMENTS

- A. The Contractor shall provide a dewatering system to produce the following results:
1. Effectively reduce the hydrostatic pressure affecting excavations.
  2. Develop a substantially dry and stable subgrade for subsequent construction operations.
  3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work.
  4. Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation strata.
  5. Maintain stability of sides and bottom of excavations.
- B. The Contractor shall provide drainage of seepage water, surface water, and water from any other source entering the excavation. Dewatering of excavations and trenches may include placement of drainage materials, such as crushed stone and filter fabric, together with sump pumping.
- C. The Contractor shall provide ditches, berms, pumps, and other methods necessary to divert and drain surface water from excavations and other Work areas.
- D. The Contractor shall locate groundwater and surface water control and dewatering systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.
- E. The Contractor shall assume sole responsibility for the dewatering system and for any loss or damage resulting from partial or complete failure of protective measures and any settlement, or resultant damage caused by the dewatering operations. The Contractor shall modify dewatering system if it causes or threatens to cause damage to new construction, existing improvements within the site of the Work, adjacent properties, or adjacent water wells. The Contractor shall repair damage caused by the dewatering system or damage resulting from failure of the dewatering system to protect properties as required.

## 1.8 SUBMITTALS

- A. The Contractor shall submit a dewatering plan to the Owner prior to commencing Work. The dewatering plan shall be submitted for each site where required and include the following:

A description of the proposed dewatering system indicating arrangement, location, depth, and capacities of system components, installation details, and operation and maintenance procedures.

1. Design calculations (if any).
2. Standby equipment and power supply.
3. Location and size of berms, dikes, settling basins, sumps, and discharge items.
4. Pollution control facilities.
5. Discharge locations.
6. Surface water control and drainage installations.
7. Proposed methods and locations for disposing of removed water.
8. Copies of all permits and applications when submitted to permitting agency required to discharge water removed from construction areas.

- B. Working drawings and supporting documents shall be revised and resubmitted to the Owner if the dewatering system is modified during installation or during operation.

## PART 2 – PRODUCTS

(Not Used)

## PART 3 - EXECUTION

### 3.1 PROTECTION OF RESOURCES

- A. Construction operations shall be planned and conducted in such a manner so as to prevent adverse impact on streams, lakes, and reservoirs with sediment or other harmful material used in the construction of the project. The Contractor shall comply with all regulations of the Environmental Protection Agency (EPA), Georgia Department of Environmental Protection (GDEP), the Georgia Department of Transportation, and local issuing authority.

### 3.2 EXCAVATIONS/TRENCH DEWATERING

- A. Dewatering shall include removal of all liquid, regardless of source, from excavations and trenches. The Contractor shall provide an adequate dewatering system for all excavations and trenches. The dewatering system shall be capable of removing any water that accumulates in excavations and trenches and maintain the excavation and trench in a dry condition while construction is in progress. The area excavated at any time shall be limited to that which can be properly dewatered by the equipment or system in use.
- B. The Contractor shall make the effort necessary to secure a dry trench bottom before bedding or haunching, laying pipe, placing concrete, or backfilling. If, in the opinion of the Owner, the Contractor has failed to obtain an absolutely dry trench bottom by insufficient use of all known methods of trench dewatering, the Owner may order the Contractor to excavate below grade and place not less than six (6) inches of graded crushed stone fill material over the trench bottom to form french drains to suitably locate sumps and to remove the water by bailing or pumping. The graded crushed stone fill material shall be placed at the Contractor's expense, and shall be of such depth that there shall be no water in bell holes at the time of coupling the pipe.
- C. The Contractor shall provide and maintain ditches of adequate size to collect surface water and seepage which may enter the excavations and divert the water into a sump so that it can be drained or pumped into drainage channels and settling basins prior to discharge to storm sewers if approved by the Owner and the jurisdictional agency concerned.
- D. The Contractor shall install all drainage ditches, sumps, and pumps to control excessive seepage on excavated slopes, to drain isolated zones with perched water tables and to drain impervious surfaces at final excavation elevation.
- E. The Contractor shall perform dewatering operations by means which will insure dry excavations, preserve final lines and grades, and not disturb or displace adjacent soil.

- F. Excavations shall be continuously dewatered to maintain a ground water level no higher than two (2) feet below the lowest point in the excavation. Dewatering shall be accomplished well enough in advance of excavation to ensure that groundwater is already lowered prior to completing the final excavation to finish subgrade.
- G. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two (2) feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump at least two (2) feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operating.
- H. The Contractor shall dewater trenches by use of a well point system when pumping from sumps does not lower the water level at least two (2) feet below the trench bottom. Where soil conditions dictate, the Contractor shall construct well points cased in sand wicks. A casing, six (6) to ten (10) inches in diameter, shall be jetted into the ground, followed by the installation of the well point, filling casing with sand, and withdrawing the casing.
- I. All destabilized subgrade conditions caused by inadequate or untimely dewatering operations shall be undercut and backfilled with suitable backfill material at no additional cost to the Owner.
- J. The Contractor shall install settling basins or other approved apparatus as required to control the amount of fine particles and other pollutants which may be carried by water diverted into storm sewers or flowing off the site of the Work.
- K. Should a storm sewer become blocked or have its capacity restricted due to the dewatering operations, the Contractor shall make arrangements with the jurisdictional agency for the cleaning of the sewer and appurtenances at no additional cost to the Owner.
- L. The Contractor shall backfill drainage ditches, sumps, and settling basins when no longer required, with granular material, concrete, or other material as approved by the Owner.

### 3.3 STREAM AND SURFACE WATER DIVERSION

- A. The Contractor shall use all practical means such as ditches, berms, dikes, sand bags, hay bales, or other methods, approved by the Owner's Engineer, to prevent surface water from entering excavations. The diversion of surface water shall be performed in a manner that will prevent the accumulation of water around structures or any other locations within the site of the Work where it may be detrimental.
  - 1. The Contractor shall intercept and divert surface drainage away from the excavations, by the use of dikes, curb walls, ditches, pipes, sumps, or other means.
  - 2. The Contractor shall design surface drainage systems so that they do not cause erosion on or off the site or cause unwanted flow of water.
  - 3. The Contractor shall remove the surface drainage system when no longer required.
  - 4. The Contractor shall remove debris and restore the site or sites to original condition.
  - 5. Where pipes cross natural drainage channels, the Work shall be conducted in such a manner that unnecessary damage or delays in the prosecution of the Work shall be prevented.

- B. If stream diversion or relocation around the site of the Work is required, the Contractor shall return the stream to its original location and contours. Slopes in stream relocations shall be seeded above the waterline.

### 3.4 DISPOSAL OF WATER REMOVED FROM EXCAVATIONS AND TRENCHES

- A. The Contractor shall dispose of water from the Work in accordance with the regulations established by the Environmental Protection Agency (EPA), Georgia Department of Environmental Protection (GDEP), and in a manner approved by the Owner.
- B. The Contractor shall dispose of the water resulting from dewatering operations in a manner that will not damage or interfere with the normal drainage of the site of the Work. In addition, the Contractor shall protect from damage any portion of the Work completed or in progress, surfaces of streets, and public or private property.
- C. All gutters, drains, culverts, storm sewers, and inlets around the site of the Work shall be kept clean and open for normal surface drainage.
- D. The Contractor shall not direct water across or over pavement except by methods approved by the Owner. Water shall not be drained into Work under construction.
- E. Water removed from excavations and discharged into streams shall be filtered through granular material prior to pumping or through hay bales and siltation fabric after pumping, or both, if required by the Owner. Discharges into streams shall be conducted in accordance with regulations established by the Environmental Protection Agency (EPA) Georgia Department of Environmental Protection (GDEP).

### 3.5 OBSERVATION WELLS

- A. The Contractor shall provide, take measurements and maintain at least a minimum number of observation wells (piezometers) as indicated and additional observation wells as may be required by governing authorities.
- B. The Contractor shall observe and record daily elevation of groundwater and piezometric water levels in observation wells.
- C. The Contractor shall repair or replace within 24 hours, observation wells that become inactive, damaged, or destroyed. If required, suspend construction activities in areas where observation wells are not functioning properly until reliable observations can be made. The Contractor shall add or remove water from observation well risers to demonstrate that observation wells are functioning properly.
- D. The Contractor shall remove observation wells when dewatering completed.

END OF SECTION 312319

SECTION 31 2500 – EROSION AND SEDIMENTATION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work specified in this Section consists of providing, maintaining and removing temporary erosion and sedimentation controls as necessary.
- B. Temporary erosion controls include, but are not limited to, grassing, mulching, netting, and watering, and reseeding on-site surfaces and spoil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the Owner, City and State.
- C. Temporary sedimentation controls include, but are not limited to, silt fencing, silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained.
- D. Provide effective temporary erosion and sediment control measures during construction or until final controls become effective.
- E. Erosion, Sedimentation and Pollution Control shall be performed in accordance with Georgia's NPDES Permit No. GAR100000 and as detailed in the drawings.

1.2 WORK SPECIFIED IN OTHER SECTIONS

- A. Earth Moving: Section 312000.
- B. Turf and Grasses: Section 329200.
- C. Rip Rap: Section 313710.
- D. Silt Fence: Section 312510.

1.3 REFERENCE DOCUMENTS

- A. Georgia Building Code.
- B. Any Soil Erosion and Sediment Control Ordinances in force by the local Government.
- C. State of Georgia, Department of Transportation, Standard Specifications.

## PART 2 - PRODUCTS

### 2.1 EROSION CONTROL

- A. Seeding
- B. Sodding
- C. Netting - fabricated of material acceptable to the Owner.

### 2.2 SEDIMENTATION CONTROL

- A. Bales - clean, seedfree cereal hay type.
- B. Netting - fabricated of material acceptable to the Owner.
- C. Filter stone - No. 57 - crushed stone.

## PART 3 - EXECUTION

### 3.1 EROSION CONTROL

- A. Minimum procedures for grassing are:
  - 1. Scarify slopes to a depth of not less than 6" and remove large clods, rock, stumps, roots larger than 1/2" in diameter and debris.
  - 2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
  - 3. Apply mulch loosely and to a thickness of between 3/4" and 1-1/2".
  - 4. Apply netting over mulched areas of sloped surfaces.
  - 5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit un-satisfactory growth. Backfill and seed eroded areas.

### 3.2 SEDIMENTATION CONTROL

- A. Install and maintain silt fencing, silt dams, traps, barriers and appurtenances as shown on the approved descriptions and working drawings. Hay bales which deteriorate and filter stone which is dislodged shall be replaced.

### 3.3 PERFORMANCE

- A. Should any of the temporary erosion and sediment control measures employed fail to produce results which comply with the requirements of the State, immediately take whatever steps are necessary to correct the deficiency.

**DALTON PICKLEBALL COMPLEX**

**DALTON, GA**

PROJECT NO. 2024-0283

Prime Engineering, Inc.

February 28, 2025

3.4 MONITORING, REPORTING AND RETENTION OF RECORDS

A. Contractor shall monitor, report and retain records as required by the GA NPDES Permit No. GAR100000. Attached to the end of this section are the minimal reports which should be performed and maintained. The following are the attached reports:

1. Erosion and Sedimentation Inspection and Maintenance Reports
2. Daily Rainfall Monitoring Report
3. Stormwater Monitoring Data

End of Section

Erosion & Sedimentation Inspection  
To be completed every 7 days AND within 24-hours of a q

Prime Engineering, Inc.  
February 28, 2025

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

Time/date of last rainfall: \_\_\_\_\_ Amount of last rainfall: \_\_\_\_\_ inches

Inspector: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

Describe the most recent land disturbance/phase of the project: \_\_\_\_\_

Date of the most recent disturbance: \_\_\_\_\_

Weather:  Cold  Mild  Hot  Clear  Cloudy  Rain  Windy

Erosion Control:

- 1. Construction Exit:  Good  N/A  Deficient  Redress  Other
- 2. Silt Fence:  Good  N/A  Deficient  Remove Silt  Other
- 3. Sediment Traps:  Good  N/A  Deficient  Remove Silt  Other
- 4. Sediment Ponds:  Good  N/A  Deficient  Remove Silt  Other
- 5. Outlet Protection:  Good  N/A  Deficient  Remove Silt  Other
- 6. Temporary Ground Cover:  Good  N/A  Deficient  Remove Silt  Other
- 7. Permanent Vegetation:  Good  N/A  Deficient  Remove Silt  Other

Other Erosion Control Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Has Silt Left the Site:  Yes  Not Apparent  N/A

Drainage:

- Detention Pond Grade:  Good  N/A  Deficient
- Detention Pond Outlets:  Good  N/A  Deficient
- Detention Pond Vegetation:  Good  N/A  Deficient

Other Drainage Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Other Additional Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



**Deficiencies:**

Prime Engineering, Inc.  
February 28, 2025

**Is this site in compliance? Y or N If not, complete the following**

1. Deficiency(ies):	Location: _____
Code: <b>I M GC</b>	
Corrective actions:	

2. Deficiency(ies):	Location: _____
Code: <b>I M GC</b>	
Corrective actions:	

3. Deficiency(ies):	Location: _____
Code: <b>I M GC</b>	
Corrective actions:	

4. Deficiency(ies):	Location: _____
Code: <b>I M GC</b>	
Corrective actions:	

Required under the EPD NPDES Construction Permit for sites between 5 and 250 acres.

Photo document deficiencies and retain in permanent file. **Codes: I Immediate – Must be corrected in 24 hours.**  
Include site map identifying location of all deficiencies. **M Minor – Must be corrected within 72 hours.**  
Return original reports to construction site file and copy in **GC General Condition – Must be maintained monthly.**  
Permanent office file.





SECTION 312510 – SILT FENCE/SEDIMENT BARRIER

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. The work covered by this Section consists of furnishing all materials, equipment, and labor and performing all operations in connection with the construction of the Silt Fence System in accordance with the Contract Documents.

1.2 RELATED SECTIONS

- A. Section 013300: Submittal Procedures
- B. Section 016000: Product Requirements
- C. Section 312500: Erosion and Sedimentation Control
- D. Division 31: Earthwork

1.3 QUALIFICATIONS

- A. Contractor and Applicator shall have all state erosion control certifications and be active at the time of installation.
- B. Installation shall be by an experienced applicator approved by the manufacturer of the material supplied.
- C. Applicator shall have a minimum of one year experience.
- D. Submit written proof of qualifications to the Owner.
- E. The woven fiber filter and appurtenances specified under this Section shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the fabric furnished. The woven fiber filter and all related appurtenances shall be designed, constructed and installed with the best practices and methods.

1.4 SUBMITTALS

- A. Furnish sample 36 by 36 inches for each fabric, as specified in Section 01300.
- B. Furnish composite filter media sock sample 36 inches in length.
- C. Final acceptance of fabric and socks shall be contingent upon approval of samples.
- D. Furnish an affidavit that all materials comply with these Specification requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store all materials in a clean, dry storage area.
- B. Do not store fabric in an upright position.
- C. Storage area temperature shall be maintained above 40 degrees F. with normal humidity.
- D. Comply with the requirements of Section 016000 – Product Requirements.

PART 2 - PRODUCTS

2.1 POST SIZE

Table 6-27.2 Post Size			
Type	Min Length	Type of Post	Size of Post
NS	4'	Soft wood Oak Steel	3" dia or 2x4 1.5" x1.5" 1.3lb./ft. min
S	4"	Steel Oak	1.3lb./ft. min 2"x2"

2.2 FABRIC – Sd1

- A. The filter fabric shall be designed to control water seepage of the fine particle and or soil without clogging under varying water flow conditions, thereby serving as a soil stabilizer.
- B. The filter fabric shall be chemically resistant to prolonged exposure to fresh water, and either alkaline or acidic soil conditions.

C. Physical Properties:

	<u>TEST METHOD</u>
1. Color	Black ----
2. Weight, oz./sq. ft.	0.8 ASTM D-1910
3. Equivalent opening size	70-100 CE-1310
4. % open area	4-10 CE-1310
5. Tensile Strength, #	400 x 280 ASTM D-1682
6. Elongation, %	34 x 32 ASTM D-1682
7. Trapezoidal tear strength, #	92x 40 ASTM D-2263
8. Mullen burst, psi	510 ASTM D-751
9. Puncture Strength, #	150 ASTM D-751-MS

- |     |   |   |
|-----|---|---|
| 10. | Abrasion resistance<br>Abraded strength, #  | ASTM D-01175-71<br>80 ASTM D-1682   |
| 11. | Weather-Ometer strength<br>retention, %   | 90 ASTM E-42-69   |
| 12. | Water permeability, water flow rates*, milliliters/min.<br>6" head<br>8" head<br>36" head | 460-520 Canvas Products<br>620-760 Assn.Intern'l<br>2510-2790 Test Method<br>(for canvas) |

\*Water flow perpendicular to fabric

- D. The upper level of the fabric form work edges shall be structured so as to accommodate the type of anchorage to be utilized at that point.
- E. Individual mill-width panels shall be cut to suitable lengths, and the two layers of fabric separately jointed, edge-to-edge, by means of heavy, double-stitched nylon thread. The tensile strength of stitched joints shall not be less than 100 lbs/inch.

2.3 FASTENERS

Table 6-27.3 Fasteners for Wood Posts				
	Gauge	Crown	Legs	Staples / Post
Wire Staples	17 min.	3/4" wide	1/2" long	5 min.
	Gauge	Length	Button Heads	Nail/ Post
Nails	14 min.	1"	3/4"	4 min.
Note: Filter Fabric may also be attached to the post by wire, anchors, and pockets or any other method provided minimum P-factor, as required by GSWCC, is met.				

2.4 WIRE BACKING FOR SILT FENCE

- A. Wire backed silt fence should be used in high load or sensitive areas.
- B. Woven wire shall be a minimum of 32" in width and with a minimum of 6 line wires with 12" stay spacing.
- C. Top and bottom strands of woven wire shall be a minimum of 10 gauge, and middle and vertical wires shall be a minimum of 12½ gauge.

- D. The minimum wire size should be 14.5 gauge with a maximum opening of 6"x6".
- E. Stake spacing should not exceed 6 feet on center.
- F. The wire should be in contact with the ground but it is not necessary to bury the wire.

**2.5 COMPOST FILTER MEDIA SOCK**

A. Compost used for compost filter sock filler material (filter media) shall be weed free and derived from a well-decomposed source of organic matter. The compost shall be produced using an aerobic composting process meeting CFR 503 regulations including time and temperature data. The compost shall be free of any refuse, contaminants or other materials toxic to plant growth. Non-composted products will not be accepted. Test methods for the items below should follow US Composting Council Test Methods for the Examinations of Composting and Compost guidelines for laboratory procedures:

1. PH – 5.0-8.0 in accordance with TMECC 04.11-A, “Electrometric pH Determinations of Compost”
2. Particle size – 99% passing in a 2 in (50mm) sieve and a maximum of 40% passing a 3/8 in (9.5mm) sieve, in accordance with TMECC 02.02-B, “ample Sieving for Aggregate Size Classification.” *(Note- In the field, product commonly is between 1/2 in [12.5mm] and 2 in [50mm] particle size.)*
3. Moisture content of less than 60% in accordance with standardized test methods for moisture determination.
4. Material shall be relatively free (<1% by dry weight) of inert or foreign man made materials.
5. A sample shall be submitted to the Engineer for approval prior to being used and must comply with all local, state and federal regulations.

**Table 2.**

Material Type	Multi-Filament Polypropylene	Multi-Filament Polypropylene
Material Characteristic	Photodegradable	Photodegradable
Mesh Opening	3/8 in (10mm)	1/8 in (3mm)
Tensile Strength (ASTM 5035-95)	44 psi (3.09 kg/cm <sup>2</sup> )	202 psi (14.2 kg/cm <sup>2</sup> )
% Original Strength from Ultraviolet Exposure (ASTM G-155)	100% at 1000 hr	100% at 1000 hr

**Table 3.**

	<b>12 in (300mm) Diameter</b>
Effective Circumference	38 in (960 mm)
Density (when filled)	32 lbs/ft (50kg/m)
Air Space	20%

Hydraulic Flow Through Rate	11.3 gpm/ft (141 L/min/m)
P Factor (RUSLE)	0.1-0.32

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Installation instructions shall be supplied by the manufacturer. The fabric shall be applied in accordance with the manufacturer's recommendations.
- B. The surfaces to be protected shall be prepared and graded to the extent they are normally stable in the absence of erosion forces. All stones, roots, and other waste material exposed on the slopes which could disturb the finished mat profile shall be removed. The fabric shall be positioned over these surfaces.
- C. Construction Specifications
  1. The compost filter sock shall be installed according to this specification, as shown on the plans or as directed by the engineer. For installation of the compost filter sock see the construction documents.
    - a. Compost filter socks should be installed parallel to the base of the slope or other disturbed area. In extreme conditions (i.e., 2:1 slopes), a second compost filter sock shall be constructed at the top of the slope.
    - b. Stakes shall be installed through the middle of the compost filter sock on 10 ft (3m) centers, using 2 in (50mm) by 2 in (50mm) by 3 ft (1m) wooden stakes. In the event staking is not possible, i.e., when compost filter socks are used on pavement, heavy concrete blocks shall be used behind the compost filter socks to help stabilize during rainfall/runoff events.
    - c. Staking depth for sand and silt loam soils shall be 12 in (300mm), and 8 in (200mm) for clay soils.
    - d. Loose compost may be backfilled along the upslope side of the compost filter sock, filling the seam between the soil surface and the device, improving filtration and sediment retention.
    - e. If the compost filter sock is to be left as a permanent filter or part of the natural landscape, it may be seeded at time of installation for establishment of permanent vegetation. The engineer will specify seed requirements.
    - f. Compost filter socks are not to be used in perennial, ephemeral, or intermittent streams.
  2. **Maintenance:** Sediment shall be removed once it has accumulated to one-half the original height of the barrier. Compost filter socks shall be replaced whenever it has deteriorated to such an extent the effectiveness of the compost filter sock is reduced. Compost filter socks shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulation at the compost filter sock shall be removed and properly disposed of before the compost filter sock is removed.



D. Silt Fence

**1. Non-sensitive areas**

Sediment barriers being used as Type NS shall have a support spacing of no greater than 6 feet on center, with each driven into the ground a minimum of 18 inches. Type NS sediment barriers shall have a P-factor no greater than 0.045.

**2. Sensitive areas**

Sediment barriers being used as Type S shall have a support spacing of no greater than 4 feet on center, with each driven into the ground 18 inches. Type S sediment barriers shall have a P-factor no greater than 0.030.

**3. Installation**

- a. Sediment barriers should be installed along the contour.
- b. Temporary sediment barriers shall be installed according to the following specifications as shown on the plans or as directed by the design professional.
- c. Post installation shall start at the center of a low point (if applicable) with the remaining posts spaced no greater than 6 feet apart for Type NS sediment barriers and no greater than 4 feet apart for Type S sediment barriers. For post size requirements, see Table 6-27.2. Fasteners for wood posts are listed in Table 6-27.3.

**4. Static Slicing Method**

The static slicing machine pulls a narrow blade through the ground to create a slit 12" deep, and simultaneously inserts the silt fence fabric into this slit behind the blade. The blade is designed to slightly disrupt soil upward next to the slit and to minimize horizontal compaction, thereby creating an optimum condition for compacting the soil vertically on both sides of the fabric. Compaction is achieved by rolling a tractor wheel along both sides of the slit in the ground 2 to 4 times to achieve nearly the same or greater compaction as the original undisturbed soil. This vertical compaction reduces the air spaces between soil particles, which minimizes infiltration. Without this compaction infiltration can saturate the soil, and water may find a pathway under the fence. When a silt fence is holding back several tons of accumulated water and sediment, it needs to be supported by posts that are driven 18 inches into the soil. Driving in the posts and attaching the fabric to them completes the installation.

**5. Trenching Method**

- a. Trenching machines have been used for over twenty-five years to dig a trench for burying part of the filter fabric underground. Usually the trench is about 2'-6" wide with a 6" excavation. Post setting and fabric installation often precede compaction, which make effective compaction more difficult to achieve. EPA supported an independent technology evaluation (ASCE 2001), comparing three progressively better variations of the trenching method with static slicing method. The static slicing method performed better than two lower performance levels of the trenching method, and was as good as or better than the trenching method's highest performance level. The best trenching method typically required nearly triple the time and effort to achieve results comparable to the static slicing method.

- b. Along all state waters and other sensitive areas, two rows of Type S sediment barriers shall be used. The two rows Type S should be placed a minimum of 36 inches apart.

### 3.2 MAINTENANCE

- A. Sediment shall be removed once it has accumulated to one-half the original height of the barrier. This is extremely important when selecting BMPs with a lower profile.
- B. Sediment barriers shall be replaced whenever they have deteriorated to such an extent that the effectiveness of the product is reduced (approximately six months) or the height of the product is not maintaining 80% of its properly installed height.
- C. Temporary sediment barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and properly disposed of before the barrier is removed.

END OF SECTION 312510

**SECTION 31 3116 – TERMITE CONTROL**

**PART 1 - GENERAL**

**1.1 WORK INCLUDES**

- A. Soil treatment solution.

**1.2 RELATED WORK**

- A. Section 013300 – Submittal Procedures
- B. Section 313000 – Earthwork

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 013300 – Submittal Procedures
- B. Product Data:
  - 1. Submit manufacturer’s data on all products.

**1.4 WARRANTY**

- A. Provide guarantee for period of 5 years from date of treatment, signed by Applicator and Contractor.
- B. Furnish two (2) copies of written warranty certifying that applied soil poisoning treatment will prevent infestation of subterranean termites and, that when subterranean termite activity is discovered during warranty period, Contractor will retreat soil and repair or replace damage caused by termite infestation.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Chapman Chemical Company
- B. Kerr-Mcgee Chemical Corp.
- C. Shell Chemical Company
- D. Southern Agricultural Chemicals

- E. Stephenson Chemical Company
- F. Stevens Ind.
- G. Terminex, Div. of Cook Ind.
- H. Tobacco States Chemical Company
- I. Triangle Chemical Company
- J. Agrotec
- K. B & G Equipment Co.
- L. Cornell Chemical & Equipment Co.
- M. Dill Chemicals
- N. Mercury Chemical Co.
- O. Redwood Chemical Co.
- P. Southern Mill Creek Products
- Q. Thompson-Hayward Chemical Co.
- R. York Chemical Co.
- S. AG Supply Company
- T. Apperton Chemical Company
- U. Bell Chemical Company
- V. Farmingdale Garden Labs
- W. Forshaw Chemicals

## 2.2 MATERIALS

- A. Toxicant Chemical: EPA Local authority approved; synthetically color dyed to permit visual identification of treated soil.
- B. Diluent: Recommended by toxicant manufacturer.

## 2.3 MIX

- A. Mix toxicant to manufacturer's instructions.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise indicated in construction operations.
- B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather.
- C. Surface Preparation:
  - 1. Remove foreign matter which could decrease effectiveness of treatment on areas to be treated.
  - 2. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations.
  - 3. Toxicants may be applied before placement of compacted fill under slabs, when recommended by toxicant manufacturer and when required by sequencing of project.

3.2 APPLICATION RATES

- A. Apply in accordance with manufacturer's recommend rates or the following, whichever is greater.
- B. Under Slab-On-Grade:
  - 1. Inside of foundation walls, along both sides interior partitions, around plumbing: 4 gal./10 lin. ft.
  - 2. Overall under-slab treatment: 1 gal./10 sq. ft., except 1-1/2 gal./10 sq. ft. where fill is washed gravel or similar coarse absorbent material.
  - 3. Footing trench outside building perimeter: 4 gal./10 lin. ft. for each foot depth grade to footing.
    - a. Dig trench 8 inches x 12 inches deep along outside of foundation.
    - b. Punch holes to footing maximum 12 inches o.c. and apply chemical solution.
    - c. Mix chemical solution with soil replaced in trench.
- C. Under Crawl Space and Basement Structures:
  - 1. Inside of foundation walls, along both sides interior partitions, around piers, plumbing: 4 gal./10 lin. ft.
  - 2. Footing trench outside building perimeter: 4 gal./10 lin. ft. for each foot depth grade to footing.
  - 3. Along inside and outside foundation walls of porches: 4 gal./ lin. ft.
  - 4. Overall treatment only where attached concrete platform and porches are on fill or ground: 1 gal./10 sq. ft.
  - 5. Hollow masonry foundations or grade beams: 2 gal./10 lin. ft. directly into hollow spaces.

6. Expansion and control joints and other areas where slabs will be penetrated: 4 gal./10 lin. ft. penetration.

### 3.3 APPLICATION

- A. Allow minimum 12 hours for drying after application, before beginning concrete placement or other construction activities.
- B. Warning signs:
  1. Post in areas of application, warning workers that soil poisoning has been applied.
  2. Remove signs when areas are covered by other construction.

### 3.4 ADJUSTING AND CLEANING

- A. Reapply soil treatment solution to areas disturbed by subsequent excavation or other construction activities following application.

END OF SECTION 313116

SECTION 313710 – RIP RAP

PART 1 - GENERAL

1.1 WORK INCLUDED

The work covered by this Section includes furnishing all labor, equipment and materials required to furnish and install rip rap as specified herein and as shown on the Drawings.

1.2 RELATED WORK

- A. Division 1: General Requirements
- B. Division 2: Existing Conditions

PART 2 - PRODUCTS

2.1 ROCK RIP RAP

- A. Rock rip rap shall be constructed using sound, dense, durable stones, or rock fragments, free from cracks, pyrite intrusions and other structural defects. Stones which will be used with mortar shall be free from dirt, oil, or other material that might prevent good adhesion with the mortar. Stones with a laminated structure shall be avoided. Field stones shall not be used as a source of rock for rip rap. Only rock that has been approved by the Engineer shall be used for rip rap.
- B. When the crushed aggregate is subjected to five alternations of the sodium sulfate soundness test, the weighted percentage of loss shall be not more than 12 percent.
- C. Shape of the stones shall be generally rectangular or cubic. Flat or elongated stones having a small dimension less than 1/3 of the large dimension shall not be used.
- D. At least 35 percent of the stones or rock fragments for plain rock rip rap shall weigh 125 pounds or more. The sizes of the stones shall be well graded from the smaller to the larger, with the largest stones being a maximum of two cubic feet in size.
- E. At least 90 percent of the stones or rock fragments for hand placed rock rip rap shall weigh 100 pounds or more and shall be not less than 12 inches long, 12 inches deep, and 8 inches wide.

PART 3 - EXECUTION

3.1 CREEK CROSSINGS

- A. Rip rap shall be installed at all creek and storm drain crossings where shown or required by the Engineer in accordance with the Drawing details and specifications. The dimensional width of rip rap material at creek or storm drain crossings shall be equal to the trench width cut to install the pipe line plus 6 feet. The method of installation shall be in accordance with 3.2 Construction Methods.
- B. Installation of rip rap shall be kept up as closely as possible with the progress of pipe laying so as to perform the work in a uniform workmanlike manner.

### 3.2 CONSTRUCTION METHODS

- A. Unless otherwise shown or specified, plain rock rip rap shall be placed using a crane and clamshell or other suitable equipment approved by the Engineer. The rock shall be placed as nearly as practicable in final position using powered equipment. If necessary, larger rocks shall be worked up to the surface when the material on the surface does not meet the weight specification or when the voids next to the foundation material are too large.
- B. The quantity of small stones shall be kept as low as possible, sufficient only to fill the voids between the larger stones. Care shall be taken that this small material is well distributed throughout the mass and not allowed to segregate or form pockets of small stone. All bridging shall be broken down. Large interstices, or open channels, or voids shall be filled by chinking or otherwise manipulating the stones.
- C. When rip rap is to be built on existing rip rap, special care shall be taken to provide positive anchorage of the new rip rap to the existing rip rap.
- D. The finished rip rap surface shall in general conform to the slope lines shown on the Drawings. No objectionable, hazardous, or unsightly projections above the general plane surface will be permitted.
- E. The main stones shall be thoroughly chinked and filled with the smaller stones by throwing them over the surface in any manner that is practicable for the smaller stones to fill the voids. This work shall continue with the progress of the construction. Tamping of the stones will not be required if the stones have been placed in a reasonable and satisfactory manner.
- F. Knapping of the stones will not be required except stone protruding more than 4 inches above what is considered the normal surface of the stones, in which case these stones shall be broken down to come within 4 inches of the normal surface.

END OF SECTION 313710



## **SECTION 31 5000 - EXCAVATION SUPPORT AND PROTECTION**

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes temporary excavation support and protection systems.
- B. Related Requirements:
  - 1. Section "Photographic Documentation" for recording preexisting conditions and excavation support and protection system progress.
  - 2. Section 312000 "Earth Moving" for excavating and backfilling and for controlling surface-water runoff and ponding.
  - 3. Section 312319 "Dewatering" for dewatering excavations.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review geotechnical report.
  - 2. Review existing utilities and subsurface conditions.
  - 3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
  - 4. Review proposed excavations.
  - 5. Review proposed equipment.
  - 6. Review monitoring of excavation support and protection system.
  - 7. Review coordination with waterproofing.
  - 8. Review abandonment or removal of excavation support and protection system.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.
- B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.

1. Include plans, elevations, sections, and details.
2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
3. Indicate type and location of waterproofing.
4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor and professional engineer.
- B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Existing Conditions: Using photograph or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.
- D. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

#### 1.6 FIELD CONDITIONS

- A. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
  1. Notify Construction Manager no fewer two days in advance of proposed interruption of utility.
  2. Do not proceed with interruption of utility without Owner's written permission.
- B. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
  1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection according to the performance requirements.
  2. The geotechnical report is referenced elsewhere in Project Manual.
- C. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting earth and hydrostatic pressures and superimposed and construction loads.
  - 1. Contractor Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer.
  - 2. Prevent surface water from entering excavations by grading, dikes, or other means.
  - 3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.
  - 4. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

### 2.2 MATERIALS

- A. General: Provide materials that are either new or in serviceable condition.
- B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.
- C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.
  - 1. Corners: Roll-formed corner shape with continuous interlock.
- D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application 4 inches.
- E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.
- F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- G. Tiebacks: Steel bars, ASTM A 722/A 722M.
- H. Tiebacks: Steel strand, ASTM A 416/A 416M.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

1. Shore, support, and protect utilities encountered.
- B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- C. Locate excavation support and protection systems clear of permanent construction so that construction and finishing of other work is not impeded.

### 3.2 SOLDIER PILES AND LAGGING

- A. Install steel soldier piles before starting excavation. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- B. Install wood lagging within flanges of soldier piles as excavation proceeds. Trim excavation as required to install lagging. Fill voids behind lagging with soil, and compact.
- C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

### 3.3 SHEET PILING

- A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock vertical edges to form a continuous barrier.
- B. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches. Accurately align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.
- C. Cut tops of sheet piling to uniform elevation at top of excavation.

### 3.4 TIEBACKS

- A. Drill, install, grout, and tension tiebacks.
- B. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.
  1. Have test loading observed by a qualified professional engineer responsible for design of excavation support and protection system.

- C. Maintain tiebacks in place until permanent construction is able to withstand lateral earth and hydrostatic pressures.

### 3.5 BRACING

- A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
  - 1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
  - 2. Install internal bracing if required to prevent spreading or distortion of braced frames.
  - 3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

### 3.6 FIELD QUALITY CONTROL

- A. Survey-Work Benchmarks: Resurvey benchmarks **regularly** during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.
- B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.
- C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

### 3.7 REMOVAL AND REPAIRS

- A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
  - 1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction and abandon remainder.
  - 2. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
  - 3. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.
- B. Leave excavation support and protection systems permanently in place.

END OF SECTION 315000

SECTION 32 0117 – PAVEMENT REPAIRS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Guidelines and requirements for pavement replacement.
- B. Procedures and requirements for surface preparation.
- C. Equipment requirements for appropriate completion of the Work.
- D. Requirements for asphaltic concrete placement and compaction.
- E. Requirements for pavement milling.
- F. Requirements for the cleaning and protection of pavement operations.
- G. Requirements for the installation and replacement of Standard Granite Curb, Grade B.
- H. Specifications for temporary pavement repairs.
- I. Requirements for specialty brick paver replacement.
- J. Requirements for special brick sidewalk replacement.

1.2 RELATED SECTIONS

- A. Section 032000: Concrete Reinforcing
- B. Section 321600: Curbs, Gutters, Sidewalks, and Driveways

1.3 REFERENCES

- A. ASTM C94 - Standard Specification for Ready Mix Concrete.
- B. ASTM C33 - Standard Specification for Concrete Aggregates.
- C. ASTM C150 - Standard Specification for Portland Cement.
- D. ACI 301 - Specifications for Structural Concrete.
- E. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- F. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- G. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.

**DALTON PICKLEBALL COMPLEX**

**DALTON, GA**

PROJECT NO. 2024-0283

Prime Engineering, Inc.

February 28, 2025

- H. ASTM C494 - Chemical Admixtures for Concrete.
- I. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- J. ASTM D3371 - Standard Specification for Viscosity-Graded Asphalt Cement for use in Pavement Construction.
- K. ASTM D946 - Standard Specification for Penetration Graded Asphalt Cement for use in Pavement Construction.
- L. AI (Asphalt Institute) - MS-2- Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.
- M. AI (Asphalt Institute) - MS-3- Asphalt Plant Manual.
- N. AI (Asphalt Institute) - MS-8- Asphalt Paving Manual.
- O. AI (Asphalt Institute) - MS-19 - Basic Asphalt Emulsion Manual.
- P. AASHTO M147-65 - Materials for Aggregate and Soil Aggregates.
- Q. ASTM C-136 - Sieve Analysis of Fine and Coarse Aggregates.
- R. Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.4 SUBMITTALS

- A. The Contractor shall submit asphalt mix design to the Engineer for approval.
- B. Certificates:
  - 1. The Contractor shall submit certification of quality control and compliance with the requirements of this section. Certificates must be signed by asphalt and concrete producers and the Contractor.

1.5 PERFORMANCE REQUIREMENTS

- A. The Contractor shall comply with the performance standards and requirements established by the Georgia Department of Transportation.
- B. Pavement shall be designed for movement of trucks up to 60,000 lbs.
- C. In addition to other specified conditions, the Contractor shall comply with the following minimum requirements:
  - 1. Finished asphaltic concrete courses shall be compacted to the following densities:

- a. Asphaltic Concrete Hot Mix Surface Course; Not less than ninety-two (92) percent of theoretical density.
  - b. Asphaltic Concrete Hot Mix Binder Course: Not less than ninety (90) percent of theoretical density.
2. On the day following placement of asphaltic materials, samples for the determination of in-place density shall be taken from the finished pavement. The Contractor shall core the samples at locations and in the manner directed by the Engineer. The cuts made in taking such samples shall be repaired by the Contractor at no expense to the Owner other than for materials.
  3. The finished surface, when checked with a ten-foot straightedge placed parallel to the centerline, shall show no variation more than one-quarter ( $\frac{1}{4}$ ) inch for base and intermediate courses, and not more than one-eighth ( $\frac{1}{8}$ ) inch for surface courses. All testing will be made in a longitudinal direction at intervals as directed by the Engineer. Surface deviations for intermediate courses may be corrected by skin patching, feather-edging, or other methods which would provide the required smoothness and maintain quality material. However, surface deviations for surface courses shall be corrected in such a manner as to maintain a quality pavement having the same uniform texture and appearance as the adjoining surface. All corrective work shall be performed at the expense of the Contractor.
- D. The Contractor shall conform to applicable code for paving work on public and private properties.

## 1.6 JOB CONDITIONS

### A. Weather Limitations:

1. The Contractor shall apply bituminous prime and tack coats only when the ambient temperature in the shade is at least forty (40) degrees F.
2. The Contractor shall not conduct paving operations when the surface is wet, frozen, or contains excess moisture which would prevent uniform distribution and required penetration.
3. The Contractor shall construct asphaltic courses only when atmospheric temperature in the shade is above forty (40) degrees and rising, when the underlying base is dry and when weather is not rainy.
4. The Contractor shall place base course when air temperature is above forty (40) degrees F and rising. The Contractor shall not place base course on a frozen or muddy subgrade.

### B. Traffic Control:

1. The Contractor shall maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.
2. In addition, the Contractor shall provide flagmen, barricades, and warning signs for the safe and expeditious movement of traffic through construction zones within public rights-of-way.

- C. The Contractor shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.



1.7 QUALITY ASSURANCE

- A. The Contractor shall perform Work in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- B. The Contractor shall obtain materials from the same source throughout the duration of the paving Work.
- C. The Contractor shall use only materials which are furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete.

1.8 SOURCE QUALITY CONTROL

- A. The Contractor shall submit proposed mix design of each class of mix to the Engineer for review prior to commencement of the Work.
- B. The Owner's independent testing laboratory shall test samples in accordance with AI MS-2.
- C. Designs shall be submitted in timely fashion near the beginning of project to allow for review time.

1.9 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed.
- B. The Owner's independent testing laboratory shall take samples and perform tests in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.10 PROTECTION

- A. Immediately after placement, the Contractor shall protect pavement from mechanical injury for seven (7) days.

PART 2 - PRODUCTS

2.1 FLEXIBLE PAVEMENT

- A. **Aggregates** for asphaltic concrete shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- B. **Asphaltic Cement** for asphaltic concrete shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

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- C. **Bituminous Prime Coat** shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- D. **Bituminous Tack Coat** shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- E. **Hot Mix Asphaltic Concrete** construction shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

### 2.2 RIGID PAVEMENT

- A. Concrete and reinforcing bars (where required) for rigid pavement shall conform to the requirements of Section 032000 – Concrete Reinforcing and Section 033000 – Cast-In-Place Concrete. Concrete for pavement shall be as shown on plans.

### 2.3 CURB AND GUTTER

- A. Concrete for curb, curb and gutter, or valley gutter shall be Class A. Concrete shall conform to the requirements of Section 321600 –Curbs, Gutters, Sidewalks, and Driveways.

### 2.4 SIDEWALKS

- A. Concrete for sidewalks shall be Class A conforming to the requirements of Section 321600 – Curbs, Gutters, Sidewalks, and Driveways.

### 2.5 DRIVEWAYS

- A. Concrete for driveways shall be as shown on plans conforming to the requirements of Section 033000 – Cast-In-Place Concrete.

### 2.6 STANDARD GRANITE CURB, GRADE B

- A. Curbs shall be furnished in standard lengths of eight (8) feet in so far as possible employing shorter lengths where required such that the minimum length employed shall not be less than four (4) feet long. Curb sections shall have a split face and split top. Each joint shall have an unreinforced concrete footing as specified in the Detail Drawings. On wheel chair ramps and driveways, the granite curb shall continue through depressed sections of these elements as shown in the Detail Drawings. On curved sections of roadway, the granite curb shall be split or cut on the curve.

PART 3 - EXECUTION

3.1 PAVEMENT REPLACEMENT

- A. The Contractor shall obtain prior approval from the Owner for any paving subcontracts.
- B. The Contractor shall replace all pavements following the guidelines established by the Georgia Department of Transportation and other authorities having jurisdiction.
- C. Where paved streets, sidewalks, driveways, and gutters are removed or damaged by the Contractor beyond the specified construction limits they shall be replaced in accordance with these specifications at the Contractor's expense.
- D. Where chert, gravel, slag, or other unpaved street or driveway surfaces are removed or damaged, they shall be replaced with the same type of materials that were removed as an incidental part of the Work and no specific payment therefore shall be allowed. Unpaved drives shall be topped with gravel at no additional cost to the Owner.
- E. In replacing pavements and unpaved surfaces, the materials used and the construction methods shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- F. Where shown on the Plans, service lines and small diameter pipes, eight (8) inches in diameter or less located across paved surfaces shall be installed by boring or other approved methods that will not require cutting or removing the pavement where feasible.
- G. All concrete pavement replaced shall not be less than four (4) inches thick or equal to the original if greater than four (4) inches.
- H. Pavements replaced shall be of the same type of construction as was removed, except that no asphalt surface replaced shall be less than three (2) inches thick consisting of a binder and seal coat. Wearing surfaces shall be slag sealed in accordance with the requirements established by the Georgia Department of Transportation.

3.2 SURFACE PREPARATION

- A. Graded Aggregate Base Course:
  - 1. The Contractor shall check subgrade for conformity with elevations and cross-section immediately before placing aggregate base material.
  - 2. The Contractor shall place aggregate base material in compacted layers not more than six (6) inches thick, unless continuing tests indicate that the required results are being obtained with thicker layers.
  - 3. In no case shall more than eight (8) inches of compacted base be placed in one lift.
  - 4. The Contractor shall spread, shape, and compact all aggregate base material deposited on the subgrade during the same day.
  - 5. The compacted base shall have sufficient stability to support construction traffic without pumping.

6. If compacted base becomes unstable as a result of too much moisture, the base material and underlying subgrade, if necessary, shall be dried and reworked to a moisture content that can be re-compacted.

**B. Loose and Foreign Material:**

1. The Contractor shall remove loose and foreign material from the surface immediately before application of paving.
2. The Contractor shall use power brooms or blowers, and hand brooming as required.
3. The Contractor shall not displace surface material.

**C. Prime Coat:**

1. The Contractor shall uniformly apply at a rate of 0.20 to 0.50 gallon per square yard over compacted and cleaned sub base surface.
2. The Contractor shall apply enough material to penetrate and seal, but not flood the surface.
3. The Contractor shall allow material to cure and dry as long as required to attain penetration and evaporation of volatiles, and in no case less than twenty-four (24) hours unless otherwise acceptable to the Engineer.
4. The Contractor shall blot excess asphalt with just enough sand to prevent pick-up under traffic.
5. The Contractor shall remove loose sand before paving.

**D. Tack Coat:**

1. The Contractor shall dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or Portland cement concrete and similar surfaces.
2. The Contractor shall apply at a rate of 0.05 to 0.15 gallons per square yard of surface.
3. The Contractor shall apply tack coat by brush to contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting asphalt concrete pavement.
4. The Contractor shall allow surfaces to dry until material is at a condition of tackiness to receive pavement.

### 3.3 EQUIPMENT

- A. The Contractor shall provide size and quantity of equipment to complete the work specified in this section within the Project Schedule.
- B. Bituminous pavers shall be self-propelled that spread hot asphalt concrete mixtures without tearing, shoving, or gouging surfaces, and control pavement edges to true lines without use of stationary forms.
- C. Rolling equipment shall be self-propelled, steel-wheeled, or pneumatic-tired rollers that can reverse direction without backlash.

- D. The Contractor shall provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the work specified in this section.

### 3.4 ASPHALTIC CONCRETE PLACEMENT

- A. The Contractor shall place asphalt concrete mix on prepared surfaces, spread, and strike-off using paving machine.
- B. The Contractor shall spread the asphaltic concrete mixture at a minimum temperature of two-hundred and twenty-five (225) degrees F.
- C. Inaccessible and small areas may be placed by hand.
- D. The Contractor shall place each course at a thickness such that when compacted it will conform to the indicated grade, cross-section, finish thickness, and density indicated in the Plans.
- E. **Pavement Placing:**
  - 1. Unless otherwise directed by the Engineer, the Contractor shall begin placing asphaltic concrete along the centerline of areas to be paved on crowned section, and at high side of sections on one-way slope, and in direction of traffic flow.
  - 2. After first strip has been placed and rolled, the Contractor shall place succeeding strips and extend rolling to overlap previous strips.
  - 3. The Contractor shall complete base courses for a section before placing surface courses.
  - 4. The Contractor shall place the asphaltic concrete mixture in as continuous an operation as practical.
- F. **Hand Placing:**
  - 1. The Contractor shall spread, tamp, and finish the asphaltic concrete mixture using hand tools in areas where machine spreading is not possible, as acceptable to Engineer.
  - 2. The Contractor shall place the asphaltic concrete mixture at a rate that will ensure handling and compaction before mixture becomes cooler than acceptable working temperature.
- G. **Joints:**
  - 1. The Contractor shall carefully make joints between old and new pavements, or between successive days work, to ensure a continuous bond between adjoining work.
  - 2. The Contractor shall construct joints to have the same texture, density, and smoothness as adjacent sections of asphalt concrete course.
  - 3. The Contractor shall clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
  - 4. The Contractor shall offset transverse joints in succeeding courses not less than twenty-four (24) inches.
  - 5. The Contractor shall cut back edge of previously placed course to expose an even, vertical surface for full course thickness.
  - 6. The Contractor shall offset longitudinal joints in succeeding courses not less than six (6) inches.

7. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, the Contractor shall cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.

### 3.5 ASPHALTIC CONCRETE COMPACTION

- A. The Contractor shall provide sufficient rollers to obtain the required pavement density.
- B. The Contractor shall begin rolling operations as soon after placing as the mixture will bear weight of roller without excessive displacement.
- C. The Contractor shall not permit heavy equipment, including rollers, to stand on finished surface before it has thoroughly cooled or set.
- D. The Contractor shall compact the asphaltic concrete mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- E. The Contractor shall start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. The Contractor shall roll to slightly different lengths on alternate roller runs.
- F. The Contractor shall not roll centers of sections first under any circumstances.
- G. Breakdown Rolling:
  1. The Contractor shall accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and the outside edge.
  2. The Contractor shall operate rollers as close as possible to paver without causing pavement displacement.
  3. The Contractor shall check crown, grade, and smoothness after breakdown rolling.
  4. The Contractor shall repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.
- H. Second Rolling:
  1. The Contractor shall follow breakdown rolling as soon as possible, while the asphaltic concrete mixture is hot and in condition for compaction.
  2. The Contractor shall continue second rolling until the asphaltic concrete mixture has been thoroughly compacted.
- I. Finish Rolling:
  1. The Contractor shall perform finish rolling while the asphaltic concrete mixture is still warm enough for removal of roller marks.
  2. The Contractor shall continue rolling until roller marks are eliminated and the course has attained specified density.

J. Patching:

1. The Contractor shall remove and replace defective areas.
2. The Contractor shall cut-out and fill with fresh, hot asphalt concrete.
3. The Contractor shall compact by rolling to specified surface density and smoothness.
4. The Contractor shall remove deficient areas for full depth of course.
5. The Contractor shall cut sides perpendicular and parallel to direction of traffic with edges vertical.
6. The Contractor shall apply tack coat to exposed surfaces before placing new asphaltic concrete mixture.

3.6 PAVEMENT MILLING

- A. In street areas where pavement replacement occurs, pavement milling will be performed by the Contractor to eliminate excessive buildup of pavement. The depth of milling will range from zero (0) inches measured at six (6) feet from each edge of pavement to a minimum depth of one and one-half (1½) inches measured at each edge of pavement or as directed by the Engineer.

3.7 CLEANING AND PROTECTION

A. Cleaning:

1. After completion of paving operations, the Contractor shall clean surfaces of excess or spilled asphalt materials to the satisfaction of the Engineer.

B. Protection:

1. After final rolling, the Contractor shall not permit vehicular traffic on asphaltic concrete pavements until it has cooled and hardened and in no case no sooner than six (6) hours.
2. The Contractor shall provide barricades and warning devices as required to protect pavement and the general public.

C. Maintenance:

1. The Contractor shall maintain the surfaces of pavements until the acceptance of the Work. Maintenance shall include replacement, overlaying, milling, and reshaping as necessary to prevent raveling of the road material, the preservation of smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the Engineer.

3.8 STANDARD GRANITE CURB, GRADE B

- A. This work shall consist of furnishing and installing the standard granite curb where indicated in the Plans or directed by the Engineer. In general, granite curb required to be installed shall match existing granite curb that has been removed or damaged in the progress of the Work.
- B. Installation of standard granite curb, Grade B, shall include saw cutting existing asphalt concrete pavement a minimum of one (1) inch and removing remaining pavement to subgrade, excavation

of base and subgrade as necessary to install the granite curbing and backfilling and compacting of the installation.

**3.9 TEMPORARY ROADWAY PAVING REPAIRS**

- A. Temporary cold or permanent hot asphalt patching will be required for both transverse and longitudinal roadway cuts upon completing backfilling requirements at the end of each day's work if the road is to be opened for local traffic while work has stopped.
- B. It shall be the Contractor's responsibility to maintain the temporary paving in such condition as to prevent hindrance or hazard to traffic. When final paving is undertaken the temporary surfacing materials shall be removed to accommodate final paving of types and thicknesses as specified in this section, the edges of the existing paving shall be neatly and uniformly trimmed, and the permanent pavement shall be placed.
- C. Steel Plate Bridging
  - 1. At the Engineer's discretion, steel plate bridging may be used. The Contractor must adhere to the following chart with respect to minimum plate size and thickness.

Trench Width	Minimum Plate Thickness
10" (0.25 m)	½" (13 mm)
1'-11" (0.58 m)	¾" (19 mm)
2'-7" (0.80 m)	7/8" (22 mm)
3'-5" (1.04 m)	1" (25 mm)
5'-3" (1.60 m)	1 ¼" (32 mm)
*For trench widths greater than 5' 3", the Engineer will determine the plate thickness.	

- 2. Steel plates used for bridging must extend a minimum of twelve (12) inches beyond all edges of the trench.
- 3. For traffic speeds less than forty-five (45) mph, the surrounding pavement shall be cold planed to a depth equal to that of the steel plate selected.
- 4. For traffic speeds greater than forty-five (45) mph, approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of two (2) dowels pre-drilled into the corners of the plate and drilled two (2) inches into the pavement. Subsequent plates shall be butted to each other. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope eight and one-half (8½) percent with a minimum twelve (12) inches taper to cover all edges of the steel plates. When steel plates are removed, the dowel holes in the pavement shall be backfilled with either graded fines of asphalt concrete mix, concrete slurry, or equivalent slurry that is satisfactory to the Engineer.
- 5. Steel plates shall not be left on the road for more than the minimum required days for the performance of paving.

**D. Crusher Run Aggregate**



1. Temporary patch paving using crusher run aggregate (8910 stone) shall be placed only as approved and directed by the Engineer. All compacted material shall conform closely enough to the existing road surface so as to permit safe travel.
2. Crusher run aggregate shall consist of coarse crushed stone, crushed slag fragments, or Portland cement concrete fragments blended with crushed particles of the same material.

3.10 SPECIALTY BRICK PAVER REPLACEMENT

- A. This work shall consist of replacing existing brick pavement required to be removed for installation of sanitary sewers or connection of services.
- B. Existing brick pavers removed to accommodate sanitary sewers or services or damaged by the Work shall be removed in neat, rectangular sections the full width of the pavement as shown on the Plans. Existing concrete base slabs shall be cut with a concrete saw and removed prior to replacement. Replacement construction shall match existing pavement section including concrete base slab.

3.11 SPECIALTY BRICK SIDEWALK REPLACEMENT

- A. This work shall consist of replacing existing brick sidewalks required to be removed for connection of services or for installation of sanitary sewers.
- B. Existing brick sidewalk removed to accommodate the sanitary sewers or services or damaged by the Work shall be removed in neat, rectangular sections the full width of the sidewalk or driveway on a line perpendicular to the street. Existing concrete base slabs shall be cut with a concrete saw and removed prior to replacement. Brick pavers shall be laid on a four (4)-inch thick concrete base slab and meet the same requirements as Standard Concrete Sidewalk four (4) inches thick.

END OF SECTION 320117

SECTION 32 0119.61 – JOINT SEALING IN CONCRETE PAVING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. This section includes requirements and specifications for joint/crack sealing in concrete paving.

1.2 SUBMITTALS

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

1.3 QUALITY ASSURANCE

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers that have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

1.4 REFERENCE STANDARDS

- A. ASTM C 920 – Standard Specification for Elastomeric Joint Sealants; current edition.
- B. ASTM D 5249 – Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints; current edition.
- C. ASTM D 5893 – Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements; current edition.
- D. ASTM D 6690 – Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements; current edition.

PART 2 – PRODUCTS

2.1 MATERIALS – COLD-APPLIED APPLICATIONS

- A. Rubberized Joint Sealing Material: Modified ASTM D6690-Type I. Furnish a rubberized joint sealing material conforming to the following physical requirements:
  - 1. Cone penetration, non-immersed @ 25°C (77°F), 150 g, 5s: 50 to 90
  - 2. Flow @ 60°C (140°F) for 5 hours: 1.0 cm max.
  - 3. Resilience @ 25°C (77°F): 25% to 60%
  - 4. Ductility @ 25°C (77°F) (ASTM D 113): 40 cm max.

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5. Bond, non-immersed @ -18°C (0°F), 100% extension (Specimen thickness 12.7 mm (1/2 inch)): Pass 5 cycles
6. Asphalt compatibility @ 60°C (140°F): Pass
7. Sealant life at application temperature: 8 hours min.

### B. Urethane Elastomeric Joint Sealants:

#### 1. Acceptable Manufacturers:

- a. Pecora Corp., Harleysville, PA 19438 (800) 523-6688
- b. Sika Corp., Conyers, GA 30013 (770) 760-1300
- c. Tremco, Beachwood, OH 44122 (800) 321-7906

2. Type and Application: One-part nonsag urethane sealant, ASTM C 920. Use for joints in interior and exterior vertical and horizontal surfaces.

### C. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.

1. Dow Corning Corporation; 888
2. Pecora Corporation; 301 NS.
3. Type and Application: One-part nonacid-curing silicone sealant, ASTM C 920, modulus as required for application. Use for joints in exterior vertical surfaces.
4. Type and Application: One-part mildew-resistant silicone sealant, ASTM C 920. Use for sanitary applications, interior use.

### D. Jet Fuel-Resistant, Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.

1. Dow Corning Corporation; 890-SL.
2. Pecora Corporation; 300 SL.

## 2.2 MATERIALS – HOT-APPLIED APPLICATIONS

### A. Hot-Applied, Single-Component Joint Sealant for Concrete and Asphalt: ASTM D 6690, Types I, II, and III.

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

- a. W. R. Meadows, Inc.; Sealtight Hi-Spec Sealtight 3405.
- b. Right Pointe; D-3405 Hot-Applied Sealant.

## 2.3 PAVING JOINT FILLERS

- A. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D 5249, Type 1& Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

- B. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D 5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- C. Acceptable manufacturers:
  - 1. BASF Master Builders Solutions, Shakopee, MN 55379 (800) 243-6739
  - 2. W.R. Meadows, Cartersville, GA 30120 (770) 386-6440
- D. Type: Bituminous fiber
- E. Application: Filler for exterior paving joints.

#### 2.4 AUXILLARY MATERIALS

- A. Backer Rod: shall comply with joint sealant manufacturer's specification. Backer rod width should be 25% greater than the width of the joint being sealed.
- B. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

- A. The crack shall be blown out with compressed air and cleaned free of dirt, vegetation, debris, and loose sealant. No routing will be required unless specified by the manufacturer. The cracks shall be dried using compressed air with a heat lance when moisture is present. The use of flame cleaning to dry the cracks will not be permitted. Cracks shall be kept clean and dry until sealant is applied.
- B. The contractor may install a backer rod in joints that are excessively wide or deep prior to applying the joint sealant to control the amount of joint sealant applied. The backer rod must meet the requirements and specifications of the joint sealant manufacturer. The optimum joint sealant installation is a 1:1 ratio of width to depth.
- C. Crack sealing shall not occur when surface temperature is below 35°F and the air temperature is below 40°F.
- D. Melt the joint sealant in a conventional double-boiler, oil-jacketed melter-appliator equipped with an agitator and separate control thermometers for both the oil bath and melting vat. Ensure the temperature of the joint sealant does not exceed the manufacturer's maximum temperature (usually 390°F).

- E. The crack shall be filled with joint sealant in accordance with manufacturer's instructions allowing it to penetrate the crack depth.
- F. For joints 1/4 inch and larger, the sealant shall be placed slightly below the paving surface.
- G. For joints less than 1/4 inch, the sealant shall be placed slightly over full to allow striking off.
- H. The sealant on the surface shall be struck off with a squeegee to feather the sealant out to a width of approximately two to three inches.
- I. The sealant surface shall be dusted with sand as necessary to prevent tracking in areas that cannot be closed off to traffic until cured.
- J. Discard all joint sealant remaining in the melter-kettle at the end of the day unless manufacturer specifically allows the product to be reheated and used again.
- K. Contractor, with the Owner Engineer present, shall perform random tests on sealed joints for proper adhesion by inserting a knife or flat object to verify adhesion to the sides of the joint. Cut along both sides of the joint to release a 1/2 inch long section of sealant. Pull on the sealant to ensure that it is adhered to the existing paving. If joint sealant pulls out, contractor shall remove all unbonded sealant, clean and dry joint sides, and install new joint sealant to all failed joints at no extra cost. Repair all test sections.

END OF SECTION 320119.61

SECTION 32 1313 – CONCRETE PAVING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Section includes preparation of sub-grade to receive Portland cement concrete curbs, gutters, walks, and paving.
- B. Section includes Portland cement concrete paving curbs, gutters, walks, form-work, reinforcement, joints, finishing, curing, and concrete testing.

1.2 RELATED SECTIONS

- A. Section 01 3300 – Submittal Procedures
- B. Section 01 4000 – Quality Requirements
- C. Section 31 2000 – Earth Moving
- D. Section 32 0119 – Joint Sealing In Concrete Paving
- E. Section 03 3000 Cast-In-Place Concrete

1.3 SUBMITTALS

- A. Shop Drawings: Submit shop drawings of reinforcing steel in accordance with Section 01 3300 – Submittal Procedures and ACI 301.
- B. Test Reports: Submit, at least 15 days prior to start of concrete paving, certified laboratory test reports sufficient to verify compliance of proposed mix design (proportions) with the specifications for type and strength of concrete.
- C. Product Data: Provide data on joint filler, admixtures, and curing compound.
- D. Samples: Submit two sample panels, 12 x 12 inch in size, illustrating exposed aggregate finish.
- E. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

1.4 QUALITY ASSURANCE

- A. Perform concrete work in accordance with all applicable requirements of ACI 301 except as modified in this Section.
- B. Keep copy of ACI 301 in field office for duration of project.

1.5 REFERENCE STANDARDS

- A. AASHTO M 233 – Standard Specification for Boiled Linseed Oil Mixture for Treatment of Portland Cement Concrete; current edition.
- A. ACI 211.1 – Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; current edition
- B. ACI 301 – Specifications for Structural Concrete; current edition.
- C. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; current edition.
- D. ACI 305 – Guide to Hot Weather Concreting; current edition.
- E. ACI 306 – Guide to Cold Weather Concreting; current edition.
- F. ASTM A 615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; current edition.
- G. ASTM A 1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; current edition.
- H. ASTM C 31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field; current edition.
- I. ASTM C 33 – Standard Specification for Concrete Aggregates; current edition.
- J. ASTM C 39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; current edition.
- K. ASTM C 94 – Standard Specification for Ready-Mixed Concrete; current edition.
- L. ASTM C 143 – Standard Test Method for Slump of Hydraulic-Cement Concrete; current edition.
- M. ASTM C 150 – Standard Specification for Portland Cement; current edition.
- N. ASTM C 171 – Standard Specification for Sheet Materials for Curing Concrete; current edition.
- O. ASTM C 173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; current edition.
- P. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; current edition.
- Q. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; current edition.
- R. ASTM C 494 - Standard Specification for Chemical Admixtures for Concrete; current edition.

- S. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; current edition.
- T. ASTM C 685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; current edition.
- U. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); current edition.
- V. ASTM D 1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction; current edition.

1.6 SUSTAINABILITY REQUIREMENT

- A. Refer to Section 03 3000 Cast-in-Place Concrete for full sustainability requirements, mix designs and concrete materials.
- B. Provide an Environmental Product Declaration (EPD) identifying the global warming potential (GWP) for each mix design, or one EPD that includes all mix designs used in the project scope. The EPD(s) is/are to meet the requirements of Section 01 3329 - Sustainable Design Reporting, Part 4 - Scope 3 Carbon Emissions Tracking. Suppliers are encouraged to maximize reduction in GWP values, provided all performance requirements identified in Section 03 3000 - Cast-in-Place Concrete are met.
- C. The total Global Warming Potential (GWP) of the project’s concrete (Project GWP) must demonstrate an overall reduction of 40% below the Baseline GWP (Table 1). This total reduction is to be calculated on a volume-weighted basis, with each mix measured against the values in Table 1, averaging across all concrete poured.
- D. Project GWP is calculated as the summation of the product of each mix-specific GWP and the placed volume of that mix.
- E. The Baseline GWP is calculated as the summation of the product of each mix’s Baseline GWP and the placed volume of each mix.

TABLE 1. BASELINE GWP FOR CONCRETE MIX DESIGNS

Mix Design Application	Min. Design Strength <i>psi</i>	Baseline GWP kg CO2e per yd <sup>3</sup>
Pavement	4000	293
Walks and curbs	4500	326



PART 2 – PRODUCTS

2.1 CEMENT

- A. Use one brand and type of cement throughout project unless otherwise specified.
- B. Cement: ASTM C 150 Normal - Type I or III Portland type, gray color.
- C. Fine- and Coarse-Mix Aggregates: ASTM C 33.
- D. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES

- A. Fly Ash: ASTM C 618, Class C or F. Maximum 15% of cementitious material by weight.
- B. Calcined Pozzolan: ASTM C 618, Class N maximum 10% of cementitious material by weight.
- C. Silica Fume: ACI 211.1 Maximum 5% of cementitious material by weight.
- D. Add air-entraining agent to obtain total air content in accordance with ACI 301.
- E. Use ASTM C494 type A or D water reducer when required.
- F. Use no [other] admixtures unless written approval is obtained from Project Engineer.
- G. Chemical Admixtures: ASTM C 494, Type A - Water Reducing, Type C - Accelerating, and Type G - Water Reducing, High Range and Retarding.
- H. Do not use chemicals that will result in soluble chloride ions in excess of 0.1% by weight of cement.

I. Admixtures containing calcium chloride will not be permitted.

2.3 CONCRETE

- A. Weight: Normal weight.
- B. Strength for Concrete Paving: 4000 psi, 28-day compressive strength; minimum cement requirements in accordance with ACI 301, except not less than 520 pounds of cement per cubic yard.
- C. Strength for Concrete Curbs, Gutters, and Walks: 3000 psi, 28-day compressive strength; minimum 480 pounds of cement per cubic yard.
- D. Water-Cement Ratio: Maximum 40% by weight.

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- E. Slump: In accordance with ACI 301, except three inch max. design slump for concrete paving; tolerance as specified in ACI 301.
- F. Total Air Content: 4%, determined in accordance with ASTM C 173.

### 2.4 REINFORCING STEEL

- A. Reinforcing Bars: 60 ksi yield grade, ASTM A 615; deformed carbon steel [bars.]
- B. Steel-Welded Wire Reinforcement: Plain type, ASTM A 1064 in flat sheets; unfinished.
- C. Dowels: ASTM A 615 Grade 40 (280); deformed carbon steel bars; unfinished finish.

### 2.2 JOINT MATERIALS

- D. Expansion Joint Filler: ASTM D1751.
- E. Expansion Caps: Metal; specifically designed to allow longitudinal dowel movement of not less than 1-1/4 inches in expansion joints.
- F. See Section 320119 – Joint Sealing in Concrete Paving.

### 2.3 ACCESSORIES

- G. Anti-Spalling Treatment: 50% (by volume) boiled linseed oil and 50% (by volume) mineral spirits, complying with AASHTO M233.

## PART 3 – EXECUTION

### 3.2 PREPARATION OF SUBGRADE

- A. Ensure compaction and grading of subgrade are in accordance with Section 313000 – Earthwork before placing concrete paving.
- B. Remove loose material from compacted subgrade surface prior to placing concrete.
- C. Moisten base to minimize absorption of water from fresh concrete.
- D. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.
- E. Notify Project Engineer a minimum of 24 hours prior to commencement of concreting operations.

### 3.3 PLACING, FINISHING AND CURING

- A. Perform concrete work in cold and hot weather as specified in ACI 301 and in accordance with the recommendations of ACI 306 and ACI 305.
- B. Finishing: Float finish in accordance with ACI 301. Then finish by drawing a stiff bristled broom or burlap across concrete surface. Finish to surfaces of uniform texture free from depressions (“birdbaths”).
- C. Curing: Begin curing concrete paving immediately after finishing. Use one of the following procedures:
  - 1. Ponding or continuous sprinkling.
  - 2. Application of absorptive mats or fabric kept continuously wet.
  - 3. Continuous application of steam (not exceeding 150°F) or mist spray.
  - 4. Application of waterproof sheet materials conforming to ASTM C171 and application of a curing compound conforming to ASTM C309. Apply a white tinted solution at the rate specified by the manufacturer.

### 3.4 PLACING JOINTS

- A. Place joints true to line with face perpendicular to surface of concrete.
- B. Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2 hour, except where such placements terminate at expansion joints.
- C. Construct weakened plane, contraction joints utilizing either or both of the following methods:
  - 1. Saw cut contraction joints to a depth equal to one-quarter of concrete paving thickness with powered saws using 3/16 inch blade as soon as surface will not be torn, abraded, or otherwise damaged by cutting action. Cut completely through concrete at edge of form.
  - 2. For Concrete Paving up to 10 Inches Thick: Saw cut contraction joints with G-2000 system, Model 270. The first saw-cut contraction joints are to be to a depth equal to one-quarter (1/4) of concrete paving thickness using a 3/16 inch blade. The second saw-cut at joint location is to be one inch minimum depth using a 1/4 inch blade within 2 hours after final finish.
- D. Construct expansion joints with one end of dowel set in expansion cap to allow longitudinal movement, as indicated.
- E. Place expansion joint filler between abutting concrete curbs, gutters, walks, manholes, catch basins, and inlets, unless otherwise indicated.

### 3.5 ANTI-SPALLING TREATMENT

- A. Apply treatment to concrete paving no sooner than 28 days after placement.

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- B. Thoroughly clean paving of oil, dirt, debris, and other foreign material. Ensure paving is dry prior to application.
- C. Apply treatment to paving evenly at a rate of 40 square yards per gallon. Allow paving to dry completely and apply a second coat at a rate of 60 square yards per gallon.

### 3.6 TOLERANCES

- A. Elevation: Plus 1/2 inch of required elevations, except that no difference in elevation will be permitted at joints with other surfaces intended to be at same elevation as Portland cement concrete paving.
- B. Thicknesses indicated are minimum in-place thickness.
- C. Finished Surfaces: True planes within 1/4 inch in 10-footas determined by a 10-foot straightedge placed anywhere on the paving in any direction.

### 3.7 FIELD QUALITY CONTROL

- A. Perform concrete testing in accordance with Section– Quality Requirements.
- B. Contractor to engage independent testing laboratory to perform tests for strength, slump, and air content as follows:
  - 1. Test specimens for compressive strength in accordance with ASTM C31 and C39.
  - 2. Make at least one strength test for each 100 cubic yards, or fraction thereof, of each mix design of concrete placed in any one day.
  - 3. Test three specimens for each strength test consisting of one specimen tested at seven days and two specimens tested at 28 days. Make a fourth specimen for each strength test. Retain in reserve for later testing if required.
  - 4. Determine slump of the concrete for each strength test in accordance with ASTM C143.
  - 5. Determine air content of the concrete for each strength test in accordance with ASTM C173, for concrete requiring air-entraining agent.

### 3.8 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305 when concreting during hot weather.
- B. Follow recommendations of ACI 306 when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40° F, or surface is wet or frozen.

END OF SECTION 32 1313

SECTION 32 1373 – CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section includes requirements and specifications for joint sealants in concrete paving.

1.2 RELATED SECTIONS

- A. Section – Miscellaneous Work and Clean Up

1.3 APPLICABLE PUBLICATIONS

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

- B. Federal Specifications (Fed. Spec.):

SS-S-200	Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold-Applied, For Portland Cement Concrete Pavement
SS-S-1401B	Sealing Compound, Hot-Applied, for Concrete and Asphalt Pavements
SS-S-1614	Sealing Compound, Jet Fuel Resistant, & Am-1 Hot-Applied, One Component, For Portland Cement and Tar Concrete Pavements

1.4 SAMPLING AND TESTING JOINT SEALERS

- A. Submit a 5 gallon sample of joint sealer plus primer to the Waterways Experiment Station in Vicksburg, Mississippi for testing. The Contracting Officer will provide details of the submittal requirements. The Contractor is advised that this testing will require approximately 45 days to complete. Joint sealers will be tested by the Government, and no material shall be used prior to receipt by the Contractor of written notice that the material is acceptable. The cost of the first test of samples from each lot of joint sealer will be borne by the Government. If the sample fails to meet specification requirements, the material represented by the sample shall be replaced. Retests of rejected material shall be at the expense of the Contractor.

1.5 SUBMITTALS

- A. Certified Test Reports: Submit copies of reports for the following materials:
  - 1. Bond Breakers

2. Primers
3. Joint Seals

- B. Equipment: Submit a list and description of the equipment to be used and a statement from the supplier of the joint sealant that the proposed equipment is acceptable for installing the specified sealant.
- C. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with recommendations of the manufacturer of sealing compounds, submit catalog data and copies of recommendations, and a Material Safety Data Sheet (Department of Labor Form OSHA-20 or comparable form) to identify toxic components such as asphalt and coal tar products.
- D. Samples: Submit samples of sealant materials and bond breakers.

#### 1.6 DELIVERY AND STORAGE

- A. Inspect materials delivered to the site for visible damage, and unload and store with a minimum of handling. Joint materials shall be delivered in original sealed containers and shall be protected from freezing or overheating. Provide jobsite storage facilities capable of maintaining temperature ranges within manufacturers recommendations.

#### 1.7 WEATHER LIMITATIONS

- A. Do not proceed when weather conditions detrimentally affect the quality of forming joints and applying joint sealants. Apply sealants only if the atmospheric temperature is at least 40 degrees F in the shade and is rising. Surfaces shall be dry and component materials shall be protected from free moisture.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Joint Sealant
  1. Fed Spec. SS-S-200, Type H&M.
  2. Fed Spec. SS-S-1614.
  3. Fed Spec. SS-S-1401.
- B. Primer: Select concrete primer recommended by the manufacturer of the proposed liquid joint sealant.

C. Bond Breakers:

1. Blocking Media (Roving): Compressible, nonshrink able, nonreactive with joint sealant, such as, upholstery cord, cotton, and jute, or polyethylene foam rod, all free of oils or bitumens. Minimum width shall be 1/8 inch greater than joint width.
2. Separating Tape: Polyethylene or polyester tape, 3 mil minimum thickness, or masking tape, rubber tape, or other barrier sheet, nonreactive, non-absorptive, adhesive-back tape, 1/8-inch wider than the nominal width of the joint. Select type of tape that will not bond to joint sealer.

2.2 EQUIPMENT

A. General Requirements: Furnish all equipment, tools, and accessories necessary to clean existing joints and install liquid joint sealants. Maintain machines, tools, and other equipment in proper working conditions at all times.

B. Joint Cleaning Equipment:

1. Routing Tool: To remove old sealant from joints, select routing tool that is adjustable to varying widths and depths required, but not wider than the existing joint, and of such dimension that will not strike and damage the sides of joints. V-shaped tools, or rotary impact routing devices shall not be permitted. The equipment shall be capable of maintaining accurate cutting depth and width control.
2. Concrete Saw: Self-propelled power saw with diamond saw blades designed for sawing hardened concrete, to reface, widen, or deepen existing joints as specified without damaging the sides, bottom, or top edge of joints. Blades may be single or gang type with one or more blades mounted in tandem for fast cutting. Select saw adequately powered and sized to cut specified opening with not more than two passes of the saw through the joint.
3. Sandblasting Equipment: Commercial type capable of removing residual sealer, oil, or other foreign material which may prevent bond of new sealer. Equipment shall include an air compressor, hose and nozzles of proper size, shape, and opening. Attach an adjustable guide to the nozzle or nozzles that will hold the nozzles aligned with the joint to effectively and efficiently clean without damage to concrete edges, except for slight edge chipping of deteriorated concrete edges, inherent in this type of cleaning existing weathered concrete. Adjust the height, angle of inclination, or size of nozzles to sandblast the joint faces and not the bottom of the joint.
4. Air Compressor: Potable air compressor capable of operating the sandblasting equipment and capable of blowing out sand, water, dust adhering to sidewalls of concrete, and other objectionable materials from the joints. The compressor shall furnish oil free air at a pressure not less than 90 psi and a minimum rate of 150 cubic feet of air per minute at the nozzles, and free of oil.
5. Jet Waterblasting: High-pressure water jet machine shall include compressor, pressure pumps, hose, water jets, and controls capable of discharging water up to 10,000 psi pressure at 22 gallons per minute. Use adjustable nozzles to control nozzle pressure between 7,000 and 10,000 psi. Select high-pressure hoses with burst pressures from 20,000 psi to 30,000 psi.
6. Vacuum Sweeper: Self-propelled, vacuum pickup sweeper capable of completely removing all loose sand, water, joint material, and debris from pavement surface.

7. Hand Tools: When approved, hand tools such as brooms and chisels may be used in small areas for removing old sealant from joints and repairing or cleaning the joint faces.

C. Joint Sealing Equipment:

1. Hot-Poured Liquid Sealant: Install hot-poured sealant materials with unit applicators which will heat and extrude the sealant. Equip the mobile units with double-wall agitator type kettles with an oil medium in the outer space for heat transfer, a direct-connected pressure-type extruding device with nozzle or nozzles shaped for insertion in the joints to be filled, and positive devices for controlling the temperature of oil and sealer. Design the applicator so that the sealant will circulate through the delivery hose and return to the kettle when not sealing a joint. Insulate the applicator wand from the kettle to the nozzle. Select dimensions of nozzles such that the tip will easily feed sealant into the void space of the joint. Equip the nozzle tip with a metal cross-bar to assure that the top of the sealant fed into the joint is level and within the indicated tolerance below the pavement surface.
2. Cold-Applied Liquid Sealant: Select equipment designed to mix and install cold-applied joint sealant materials.
  - a. Applicators: The equipment shall deliver two semifluid components to a portable mixer through a hose at a controllable present ratio by positive displacement with an accuracy within 5 percent, plus or minus, for the quantity of each component. Equip the reservoirs for each component with mechanical agitation devices that will maintain the components in uniform condition without entrapping air.
  - b. Incorporate provisions to permit thermostatically controlled indirect heating of the components when required; however, immediately prior to proportioning and mixing, do not permit the temperature of either component to exceed the temperature recommended by the manufacturer.
  - c. Screens: Provide screens with openings not exceeding 1/2-inch square at the top of each reservoir to eliminate any foreign particles or partially polymerized material that would clog fluid lines or otherwise cause misproportioning or improper mixing of the two components. The equipment shall be capable of intimately mixing the two components through a range of application rates of 10 to 60 gallons per hour and through a range of pressures from 50 to 1,500 psi, as required by material, climatic, or operating conditions. Equipment shall deliver a homogeneous product from the mixer to the nozzle without undue elapsed time which tends to tear down the molecular structure of the chemically reacting components while passing through the mixer.
  - d. Equipment Selection: Select supply lines and nozzles for easy removal and cleaning and for readily accommodating nozzles of different types and sizes and as many as may be required for the various operations. Select dimensions of the nozzle such that the tip of the nozzle will easily feed sealant into the void space of the joint. Equip the nozzle tip with a metal cross-bar to assure that the top of the sealant fed into the joint is level and within the indicated tolerance below the pavement surface.



PART 3 - EXECUTION

3.1 JOINT PREPARATION

- A. General Joint Preparation: Unless otherwise indicated, saw, clean and reseal all joints. Do not proceed with final cleaning operations by more than one working day in advance of sealant. Thoroughly clean the joints by removing existing joint sealing compound, sealants, dirt, and other foreign material with the equipment specified herein, but not limited thereto. Cleaning procedures which damage joints or previously repaired patches by chipping or spalling will not be permitted. Remove existing sealant to the required depth. Precise shape and size of existing joints vary, and the conditions of the joint walls and edges vary and include but are not limited to rounding, square edges, sloping, chips, voids, depressions, and projections.
  
- B. Removal of Existing Material: Remove from the joint faces major portion of the existing sealants by using the specified routing tool. After cutting free the existing sealant from both joint faces, remove the sealant to the depth required to accommodate the bond breaking material and to maintain the specified depth for the new sealant to be installed. For expansion joints, remove existing sealant to a depth of not less than the indicated depth. one inch. If existing preformed expansion-joint material is more than one inch below the surface of the pavement, remove the existing sealant to the top of the preformed joint filler. For joints other than expansion joints, remove in-place sealant to the depth of grooves, which are 1 inch, plus or minus 1/4 inch. At the completion of routing operations clean the pavement surface with vacuum sweeper and clean the joint opening by blowing with compressed air, or water blast. Protect previously cleaned joints from being contaminated by subsequent cleaning operation.
  
- C. Refacing of Joints: When other cleaning methods are unsatisfactory to widen the joint space to the width and depth as shown reface concrete joint walls. Refacing shall be by use of a power-driven concrete saw specified herein to remove all residual sealant and a minimum of concrete. Removal shall provide exposure of newly clean concrete. Remove all burrs and irregularities from sides of joint faces. Immediately after sawing each joint, thoroughly clean the saw cut and adjacent concrete surface. Flush with water under pressure, simultaneously blowing the water out with compressed air until all debris is removed from the joint. Protect adjacent previously cleaned joint spaces from receiving water and debris during the cleaning operation.
  - 1. Joint Widening (Except Expansion Joints): Saw joints having grooves less than 3/8-inch wide and less than one inch deep to a minimum width of 1/2 inch and to the minimum depth, as shown.
  
- D. Final Cleaning of Joints:
  - 1. Expansion Joints: Following removal of existing sealant, and immediately before resealing, thoroughly clean the joints by sandblasting until all concrete surfaces in the joint space are free of sealing compound, sealants, dust, dirt, water and any other foreign materials which would prevent bonding of new sealants to the concrete. Use sand particles of the proper size and quality for the work. Perform sandblasting with the specified nozzles, air compressor, and other appurtenant equipment. Position nozzles to clean the joint faces and not the bottom of the joint. Make as many passes of the sandblast nozzle along the joint as required for proper cleaning. Immediately prior to sealing the joint, blow out the joint spaces with compressed air until completely free of sand, water, and dust. Joints shall be

dry before installation of joint sealant. Replace expansion joint filler material damaged in performing the work with new materials of the same type and dimensions as the existing material, or with appropriate blocking material.

2. Joints (Except Expansion Joints):
  - a. Waterblast Cleaning: By use of the specified high-pressure water jets, complete the final cleaning of the joints by removing all evidence of the old sealant from the joint faces and from the pavement surface for a distance of one inch from the edges of the joint. Remove the sealant for the depth of the groove or void space. In any event, remove the sealant to the depth required to accommodate any bond breaker to be used and to maintain the above depth for the newly installed sealant. Select the specified high-pressure water jet machines and accessories for water blasting the joints. If required, attach an adjustable guide to the nozzle or nozzles that will support and align the nozzle with the joint at the required height above the joint faces. The tip of the nozzle shall be capable of simultaneously fanning the water toward each joint face at approximately 15 degrees with the pavement surface. Operate the water blast equipment in accordance with the manufacturer's printed instruction, and if necessary, adjust the equipment to secure thorough cleaning. Make as many passes as necessary for proper cleaning. Control the flow of water and prevent any operation that will damage the concrete joints or float the concrete slabs. After water blasting, blow out the joints with compressed air using the specified air compressors to remove all debris and moisture and to ensure that the joints are dry and clean at the time of sealing.
- E. Bond Breaker: At the time the joints receive the final cleaning and are dry, install bond breaker material as indicated in the bottom of the joint with a steel wheel or other approved device.
  1. Blocking Media (Roving) (Except for Expansion Joints): When the existing sealant has been removed to a depth greater than required, plug or seal off the lower portion of the groove by installing the specified blocking media.
  2. Separating Tape: When the existing sealant has been removed to a depth less than one inch and the bottom of the joint opening has been formed by saw-cuts, or previously installed joint water stops, insert the specified tape to prevent contact of the newly installed sealant with the existing sealant, joint filler, or groove bottom.
- F. Rate of Progress: The final stages of joint preparation, which include placement of bond breakers, if required, shall be limited to only that lineal footage of joint that can be resealed during the same workday.
- G. Disposal of Debris: Sweep from pavement surface to remove excess joint material, dirt, water, sand, and other debris by vacuum sweepers or hand brooms. Remove the debris immediately in accordance with Section – Miscellaneous Work and Clean Up.

### 3.2 PREPARATION OF SEALANT

- A. Hot-Poured Type: Heat hot-poured sealing materials in accordance with safe heating temperature ranges recommended by the manufacturer. Sealant that has been overheated or subjected to heating for over 3 hours or that remain in the applicator at the end of the day's operation shall be withdrawn and wasted. Heat the sealant in the specified equipment.

- B. Cold-Applied: Arrange for the inspection of the sealant components and containers before the materials are installed. Reject materials which contain water, hard caking of any separated constituents, nonreversible jell, or other unsatisfactory conditions such as settlement of constituents into a soft mass that cannot be readily and uniformly remixed in the field with simple tools. In conformance with the manufacturer's recommendations, mix the individual components in the separate shipping containers before transferring the components to the appropriate reservoirs of the application equipment. Thoroughly mix the components to ensure homogeneity of the components and the incorporation of all constituents at the time of transfer. If necessary, for remixing prior to transfer, warm the components to a temperature not exceeding 90 degrees F by placing the components in heated storage or by other approved methods. In no case shall the components be heated by direct flame or in single-walled, non-oil-bath heating kettles. [hand mixing of cold-applied two component sealant may be done at the option of the Contractor for sealants conforming to Fed. Spec. SS-S-200, Type H.

### 3.3 INSTALLATION OF SEALANT

- A. Time of Application: Seal the joints immediately following the final cleaning and placing of the bond breakers, if these are required. Commence sealing the joints when the walls of the concrete joint are dust-free and dry, and when both the atmospheric temperature and pavement temperature within the joint opening are above 40 degrees F and rising. If the above conditions cannot be met, or if rains interrupt sealing operations, reclean the open joints prior to installing the sealant.
- B. Sealing the Joints: Do not install joint sealant until the joints to be sealed have been inspected and approved. Install bond breaker just prior to pouring sealant. Fill the joints with sealant from the bottom up until the joints are uniformly filled solid from bottom to top using the specified equipment for the type of sealant required. Fill the joints to as shown in the plans below the top of the pavement within the tolerances as shown, and without formation of voids or entrapped air. Except as otherwise permitted, tool the sealant immediately after application to provide firm contact with the joint walls and to form the indicated sealant profile below the pavement surface. Remove excess sealant that has been inadvertently spilled on the pavement surface. When cold-applied sealants are placed, each day check hourly the proportioning capability of the equipment to determine that the present volume output for each component is being maintained. The material used for these checks may be returned to the proper component reservoir. In no case shall cold-applied sealants be installed using gravity methods and pouring spouts, except for approved hand mixing methods. When a primer is supplied or recommended by the manufacturer of a cold-applied sealant, apply the primer evenly to the joints faces in accordance with the manufacturer's recommendations. Check the sealed joints frequently to assure that the newly installed sealant is cured to a tack-free condition within 3 hours. The new sealant shall be protected from rain during the curing period.
- C. Trial Joint Installation: For each type of joint, as a preliminary to the resealing of joints for the entire project, the Contractor shall select a length of not less than 600 feet of joint in an approved location and clean and seal the joint with the specified sealant in the manner proposed for resealing joints for the entire project. Following the sealing of the 600-foot trial length, and before any other joint sealed, the trial joint installation shall be inspected to determine That the sealant and installation meet the requirements specified herein. If it is determined that the cleaning method, material, or installation do not meet the requirements, remove the material and again clean and prepare the joint for resealing. After approval of a 600-foot trial joint, clean and seal all other joint grooves in the same manner and subject to approval.

- D. Safety Provisions: In accordance with the provisions of the contract respecting "Accident Prevention," the Contractor shall take appropriate measures to control worker exposure to toxic substances during the work. Provide personnel protective equipment as required. Material Safety Data Sheets (Department of Labor Form OSHA-20 or comparable form) shall be available on the site. Sandblasting operations shall conform with Environmental Protection regulations.

#### 3.4 TRAFFIC CONTROL

- A. During the protection, curing, and maintenance periods recommended by the manufacturer, do not permit vehicular or heavy equipment in the area of the joints. At the end of the curving period, light local traffic may be permitted on the pavement if approved.

#### 3.5 ACCEPTANCE

- A. Joint sealer that fails to bond firmly to the joint walls, or is gummy, or fails in cohesion, or shows excessive air voids, blisters, surface defects, swelling, or deficiencies, or is not properly recessed within the indicated tolerances, shall be rejected. Such unacceptable sealer shall be removed and the joint recleaned and resealed in accordance with the specification. This removal and reseat work shall be done promptly by and at the expense of the Contractor.

END OF SECTION 321373

SECTION 32 1600 – CONCRETE CURBS, GUTTERS AND SIDEWALKS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements for preparation of subgrade.
- B. Specifications for setting forms.
- C. Curb construction requirements.
- D. Specifications for sidewalk construction.

1.2 RELATED SECTIONS

- A. Section 033000: Cast-In-Place Concrete
- B. Section 320117: Pavement Repairs
- C. Section 312000: Earth Moving

1.3 REFERENCES

- A. Georgia Department of Transportation Standard Specifications, latest edition.
- B. ACI 614 “Recommended Practice for Measuring, Mixing and Placing Concrete”
- C. ASTM C309 “Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete”
- D. ASTM D994 “Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)”

PART 2 -PRODUCTS

2.1 FORMS

- A. Materials for curb forms shall be standard metal, wood, or fiberglass forms free from defects which would impair the appearance or structural quality of the completed curb. Form material for the face of the curb shall not have any horizontal joints closer than seven (7) inches from the top of the curb. The Contractor shall provide stakes and bracing materials as required to hold forms securely in place at no cost to the Owner.

2.2 CRUSHED ROCK BASE

- A. Crushed rock base shall consist of clean three-quarters (3) inch or smaller crushed rock or crushed gravel, free from foreign material and meeting the Georgia Department of Transportation Standard Specifications, latest edition.

2.3 EXPANSION JOINT FILLER

- A. Expansion joint filler shall be one-half (1/2) inch thick, preformed asphalt- impregnated, expansion joint material conforming to the requirements of ASTM D994.

2.4 CONCRETE

- A. Concrete shall be Class A or B conforming to the requirements of Section 03300 - Cast-In-Place Concrete.

2.5 CURING COMPOUND

- A. Liquid membrane-forming curing compound shall be clear or translucent, suitable for spray application and shall conform to the requirements of ASTM C309, Type 1 or otherwise specified by the Owner's Engineer.

PART 3 – EXECUTION

3.1 PREPARATION

- A. The Contractor shall perform all excavation and backfill work in accordance with the requirements of Section 312000 – Earth Moving.
- B. The Contractor shall bring the areas, on which curbs and sidewalks are to be constructed, to required grade on undisturbed ground and compact by rolling or mechanical tamping. As depressions occur, the Contractor shall refill with suitable material and recompact. Contractor is to install no more than 6" lifts of suitable material prior to compaction unless instructed otherwise by the Owner's Engineer. Compaction required on the subgrade shall be 98% unless otherwise specified by the Owner's Engineer.
- C. The Contractor shall construct forms to the shape, lines, grades, and dimensions shown on the Plans. The Contractor shall stake wood or steel forms securely in place, true to line and grade. Forms on the face of the curb shall not have any horizontal joints within seven (7) inches of the top of the curb. The Contractor shall brace forms to prevent change of shape or movement in any direction resulting from the weight of the concrete during placement. The Contractor shall construct short-radius curved forms to exact radius. Tops of forms shall not depart from grade line more than one-eighth (1/8) inch when checked with a ten (10) foot straightedge. Alignment of straight sections shall not vary more than one-eighth (1/8) inch in ten (10) feet.

### 3.2 INSTALLATION

#### A. Curb Construction

1. The Contractor shall construct curbs to line and grade shown on the Plans. Curbs shall conform to the details shown on the Plans.
2. The Contractor shall place preformed asphalt-impregnated expansion joints at intervals not exceeding fifty (50) feet and at the beginning and end of curved portions of the curb.
3. The Contractor shall place contraction joints in the curb at intervals not exceeding fifteen (15) feet. Contraction joints shall be of the open joint type and shall be provided by inserting a thin, oiled steel sheet vertically in the fresh concrete to force coarse aggregate away from the joint. The steel sheet shall be inserted in the full depth of the curb. The Contractor shall place, process, finish, and cure concrete in conformance with the applicable requirements of ACI 614, and the requirements of this section. Whenever the requirements differ, the more stringent shall govern. After initial set has occurred in the concrete and prior to removing the front curb form, steel sheet shall be removed with a sawing motion. The Contractor shall finish top of curb with a steel trowel and finish edges with a steel edging tool.
4. As soon as the concrete has set sufficiently to support its own weight, the Contractor shall form and finish all exposed surfaces. The Contractor shall finish formed face by rubbing with a burlap sack or similar device that will produce a uniformly textured surface, free of form marks, honeycomb, and other defects. All defective concrete shall be removed and replaced at the Contractor's sole expense. Upon completion of the finishing, the Contractor shall apply an approved curing compound to exposed surfaces of the curb. Curing shall continue for a minimum of seven (7) days.
5. Upon completion of the curing period, but not before seven (7) days have elapsed since pouring the concrete, the Contractor shall backfill the curb with earth, free from rocks two (2) inches or larger and other foreign material. The Contractor shall tamp or compact backfill firmly in place.
6. Finished curb shall present a uniform appearance for both grade and alignment. The Contractor shall remove any section of the curb showing abrupt changes in alignment or grade, or which is more than one-quarter (1/4) inch away from its location as staked, and construct new curb in its place at the Contractor's sole expense.

#### B. Sidewalk Construction

1. Sidewalks shall be four (4) inches thick in walk areas and six (6) inches thick in driveway areas.
2. At locations where the new sidewalks are to abut existing concrete, the Contractor shall saw concrete for a depth of one-half (1/2) inch and chip the old concrete back to sound material on a straight line, clean the surface, and apply a neat cement paste just prior to pouring the new sidewalk.
3. The Contractor shall place preformed asphalt expansion joints as in the adjacent curb, where the sidewalk ends at a curb, and around posts, poles, or other objects protruding through the sidewalk.
4. The Contractor shall provide contraction joints transversely to the walks at locations opposite the contraction joints in the curb. These joints shall be three- sixteenths (3/16) inch weakened plane joints. They shall be straight and at right angles to the surface of the walk.

5. The Contractor shall place, process, finish, and cure concrete in conformance with the applicable requirements of ACI 614 and the requirements of this section. Where the requirements differ, the more stringent shall govern.
6. The Contractor shall broom the surface with a fine-hair broom at right angles to the length of the walk and tool all edges, joints, and markings. The Contractor shall mark the walks transversely at five (5) foot intervals with a joining tool. Upon completion of the finishing, the Contractor shall apply an approved curing compound to exposed surfaces. The Contractor shall protect the sidewalk from damage for a period of seven (7) days from the date of pouring.

### 3.3 TESTING

- A. Concrete shall be tested in accordance with the requirements of Section 033000 – Cast-In-Place Concrete.

END OF SECTION 321600



## SECTION 321713 - PARKING BUMPERS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes wheel stops.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. LEED Submittals:
  - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Samples for Initial Selection: For each type of exposed finish requiring color selection.
- D. Samples for Verification: For wheel stops, 6 inches (150 mm) long, showing color and cross section; with fasteners.

### PART 2 - PRODUCTS

#### 2.1 PARKING BUMPERS

- A. Concrete Wheel Stops: Precast, steel-reinforced, air-entrained concrete, 4000-psi (27.6-MPa) minimum compressive strength, 4-1/2 inches (115 mm) high by 9 inches (225 mm) wide by 72 inches (1800 mm) long. Provide chamfered corners, transverse drainage slots on underside, and a minimum of two to three factory-formed or -drilled vertical holes through wheel stop for anchoring to substrate.
  - 1. Surface Appearance: Free of pockets, sand streaks, honeycombs, and other obvious defects. Corners shall be uniform, straight, and sharp.
  - 2. Mounting Hardware: Galvanized-steel spike or dowel, 1/2-inch (13-mm) diameter, 10-inch (254-mm) minimum length lag screw, shield, and washers; 1/2-inch (13-mm) diameter, 8-inch (203-mm) minimum length hardware as standard with wheel-stop manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install wheel stops according to manufacturer's written instructions unless otherwise indicated.
- B. Install wheel stops in bed of adhesive before anchoring.
- C. Securely anchor wheel stops to pavement with hardware in each preformed vertical hole in wheel stop as recommended in writing by manufacturer. Recess head of hardware beneath top of wheel stop.

END OF SECTION 321713

## SECTION 32 1723 - PAVEMENT MARKINGS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes painted markings applied to asphalt and concrete pavement.
- B. Related Requirements:
  - 1. Section 099900 "Painting and Coating"

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to marking pavement including, but not limited to, the following:
    - a. Pavement aging period before application of pavement markings.
    - b. Review requirements for protecting pavement markings, including restriction of traffic during installation period.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include technical data and tested physical and performance properties.
- B. LEED Submittals:
  - 1. Product Data for Credit IEQ 4.2: For interior, field-applied, pavement-marking paints, documentation including printed statement of VOC content.
- C. Shop Drawings: For pavement markings.
  - 1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
  - 2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

- D. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

#### 1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of GDOT for pavement-marking work.
  - 1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

#### 1.6 FIELD CONDITIONS

- A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for alkyd materials and 55 deg F for water-based materials, and not exceeding 95 deg F.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

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

#### 2.2 PAVEMENT-MARKING PAINT

- A. Pavement-Marking Paint: Alkyd-resin type, lead and chromate free, ready mixed, complying with AASHTO M 248; colors complying with FS TT-P-1952.
  - 1. Color: White.
- B. Pavement-Marking Paint: MPI #32, alkyd traffic-marking paint.
  - 1. Color: White.
- C. Pavement-Marking Paint: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, Type II, with drying time of less than 45 minutes.
  - 1. Color: White.
- D. Pavement-Marking Paint: MPI #97, latex traffic-marking paint.
  - 1. Color: White.
- E. Glass Beads: AASHTO M 247, Type 1 made of 100 percent recycled glass.

1. Roundness: Minimum **75** percent true spheres by weight.
- F. VOC Content: Pavement markings used on building interior shall have a VOC content of 150 g/L or less.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.
- B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

#### 3.2 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for a minimum of **30** days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of **15 mils**.
  1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.
  2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal..

#### 3.3 PROTECTING AND CLEANING

- A. Protect pavement markings from damage and wear during remainder of construction period.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

## **SECTION 32 3113 – CHAIN LINK FENCES AND GATES**

### **PART 1 – GENERAL**

#### **1.1 SECTION INCLUDES**

- A. This section includes requirements and specifications for chain link fencing and gates for site perimeter and areas requiring separation.

#### **1.2 RELATED SECTIONS**

- A. Section 033000 – Cast-In-Place Concrete

#### **1.3 SUBMITTALS**

- A. Product Data: Submit manufacturer's product data and installation instructions for each material and product used.

#### **1.4 QUALITY ASSURANCE**

- A. Comply with governing codes and regulations. Provide products of acceptable manufacturers that have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.

#### **1.5 REFERENCE STANDARDS**

- A. AASHTO M181/ASTM A 392 – Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric; current edition.
- B. ASTM A 491 – Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric; current edition.
- C. ASTM A 653 – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; current edition.
- D. ASTM A 1011 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; current edition.
- E. ASTM F 567 – Standard Practice for Installation of Chain-Link Fence; current edition.
- F. ASTM F 668 – Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric; current edition.

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- G. ASTM F 934 – Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials; current edition.
- H. ASTM F 1083 – Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures; current edition.
- I. CID A-A-1928 – Padlocks; current edition.
- J. Fed.Spec. RR-F-191/2 – Fencing, Wire and Post, Metal (Chain-Link Fence Gates); current edition.

### PART 2 – PRODUCTS

#### 2.1 MATERIALS

##### A. Steel Chain-Link Fence Fabric:

- 1. Mesh and Wire Size: Two inch mesh, 0.148 inch diameter (9 gage).
- 2. Zinc-Coated Steel Fabric: ASTM A392 hot dipped galvanized before or after weaving, Class 2 - 2.0 oz/ft<sup>2</sup>, 9 gauge
- 3. Aluminum-Coated Steel Fabric (Aluminized): ASTM A 491.
- 4. Polymer Coated Steel Fabric: ASTM F 668, wire gauge specified is that of the metallic coated steel core wire, Class 1 extruded, Color: [dark green] [olive green] [brown] [black] in compliance with ASTM F 934.

##### B. Framework:

- 1. Acceptable Types:
  - a. ASTM F 1083, galvanized round steel pipe, standard weight (schedule 40), hot dip galvanized with not less than 1.8 oz./sq. ft.
  - b. Round steel pipe from ASTM A 1011 or ASTM A 653 steel; 50,000 psi minimum yield strength; in compliance with AASHTO M181 requirements for interior and exterior coatings.
- 2. Line Posts: 2.375 inches O.D.
- 3. End, Corner, and Pull posts: 2.875 inches O.D.
- 4. Gate Posts (for nominal width of gate leaf):
  - a. Up to 6 feet – 2.875 inches O.D.
  - b. 6 to 13 feet – 4.000 inches O.D.
  - c. 13 to 18 feet – 6.625 inches O.D.
  - d. Over 18 feet – 8.625 inches O.D.
- 5. Top Rail: 1.66 inches O.D.; not less than 18 foot lengths; with expansion type couplings not less than six inches long; provided with means for securely attaching top rail to each end, corner, pull, and gate post.

6. Brace Rail: 1.66 O.D.; trussed to line posts with 3/8 inch diameter rod and adjustable tightener.
- C. Post Tops: Combination with single, 45-degree barbed wire supporting arm; furnished with opening to permit passage of top rail; hot dip galvanized steel; fitted with clips or other means for attaching three rows of barbed wire; of sufficient strength to withstand a weight of 250 pounds applied at outermost end.
- D. Couplings, Bands, Clips, Wire Ties, Tension Bars, Fasteners, and Fittings: Hot dip galvanized steel.
- E. Bottom Tension Wire: 7 gage, coil-spring wire, galvanized or aluminized steel.
- F. Barbed Wire: 12-1/2 gage wire, two (2) strands, with 14 gage, 4-point barbs at not more than five inches o.c.; galvanized or aluminized steel.
- G. Concrete: As specified in Section 033000 – Cast-In-Place Concrete.

### PART 3 – EXECUTION

#### 3.1 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions and approved submittals. Comply with ASTM F 567. Install materials in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections. Install posts to depth to avoid frost heave.
- B. Cut pipe with pipe-cutters only. Cutting with backsaws is not acceptable. Tack weld gates for strength. Use spring-loaded latches, not yokes.
- C. Restore or replace damaged components. Clean and protect work from damage.

END OF SECTION 323113



SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes planting soils and layered soil assemblies specified by composition of the mixes.
- B. Related Requirements:
  - 1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
  - 2. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
  - 3. Section 329300 "Plants" for placing planting soil for plantings.

1.3 ALLOWANCES

- A. Preconstruction and field quality-control testing is part of testing and inspecting allowance.

1.4 DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- F. Imported Soil: Soil that is transported to Project site for use.
- G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

- H. **Manufactured Soil:** Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.
- I. **NAPT:** North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
- J. **Organic Matter:** The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
- K. **Planting Soil:** Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- L. **RCRA Metals:** Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
- M. **SSSA:** Soil Science Society of America.
- N. **Subgrade:** Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- O. **Subsoil:** Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
- P. **Surface Soil:** Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
- Q. **USCC:** U.S. Composting Council.

#### 1.5 ACTION SUBMITTALS

- A. **Product Data:** For each type of product.
  - 1. Include recommendations for application and use.
  - 2. Include test data substantiating that products comply with requirements.
  - 3. Include sieve analyses for aggregate materials.
  - 4. **Material Certificates:** For each type of imported soil, soil amendment and fertilizer before delivery to the site, according to the following:
    - a. Manufacturer's qualified testing agency's certified analysis of standard products.
    - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
    - c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- B. **LEED Submittals:**

1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
- C. Samples: For each bulk-supplied material, 1-quart volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For each testing agency.
- B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
- C. Field quality-control reports.

#### 1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.
  1. Laboratories: Subject to compliance with requirements, provide testing by the following:
    - a. University of Georgia Soil, Plant & Water Laboratory  
2400 College Station Road  
Athens, GA 30602-9105  
soiltest@uga.edu
    - b. Local UGA Extension Office : 1-800-ASK-UGA1
  2. Multiple Laboratories: At Contractor's option, work may be divided among qualified testing laboratories specializing in physical testing, chemical testing, and fertility testing.

#### 1.8 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil and imported soil.
  1. Notify Owner seven days in advance of the dates and times when laboratory samples will be taken.
- B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by

a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

#### 1.9 SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article.
- B. Sample Collection and Labeling: Have samples taken and labeled by Contractor under the direction of the testing agency.
  1. Number and Location of Samples: Minimum of ONE soil sample representative per acre from varied site locations for each soil to be used or amended for landscaping purposes.
  2. Procedures and Depth of Samples: Per testing laboratory directions.
  3. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

#### 1.10 TESTING REQUIREMENTS

- A. General: Perform tests on soil samples according to requirements in this article.
- B. Physical Testing:
  1. Soil Texture: Soil-particle, size-distribution analysis according to standard laboratory protocol by **one of** the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
    - a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
    - b. Hydrometer Method: Report percentages of sand, silt, and clay.
  2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
  3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
  4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).
- C. Chemical Testing:
  1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

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2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
  3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
  4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.
- D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT NCR-13, including the following:
1. Percentage of organic matter.
  2. CEC, calcium percent of CEC, and magnesium percent of CEC.
  3. Soil reaction (acidity/alkalinity pH value).
  4. Buffered acidity or alkalinity.
  5. Nitrogen ppm.
  6. Phosphorous ppm.
  7. Potassium ppm.
  8. Manganese ppm.
  9. Manganese-availability ppm.
  10. Zinc ppm.
  11. Zinc availability ppm.
  12. Copper ppm.
  13. Sodium ppm and sodium absorption ratio.
  14. Soluble-salts ppm.
  15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
  16. Other deleterious materials, including their characteristics and content of each.
- E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
- F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. for 6-inch depth of soil.
  2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. for 6-inch depth of soil.

#### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  - 3. Do not move or handle materials when they are wet or frozen.
  - 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.
  - 5. Topsoil and/or planting soil stockpile(s) shall be formed under normal industry standards. Stockpile height shall not exceed highest point of lifting mechanism of equipment (maximum height: 72 inches; maximum width: 12") creating the stockpile. Stockpile will be considered defective if equipment drives or otherwise compacts stockpile. Do not stockpile within protection zones.

### PART 2 - PRODUCTS

#### 2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

- A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.
- B. Planting-Soil: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable planting soil. Blend existing, on-site surface soil with the following soil amendments and fertilizers in quantities recommended by the testing agency to produce planting soil.
- C. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of loam soil according to USDA textures; and modified to produce viable planting soil.
  - 1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and brome grass.
  - 2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 6 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
  - 3. Unacceptable Properties: Clean soil of the following:

- a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
  - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
  - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.
4. Amended Soil Composition: Blend imported, unamended soil with soil amendments and fertilizers in the quantities recommended by the testing agency to produce the planting soil.

## 2.2 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
1. Class: T, with a minimum of 99 percent passing through a No. 8 sieve and a minimum of 75 percent passing through a No. 60 sieve.
  2. Class: O, with a minimum of 95 percent passing through a No. 8 sieve and a minimum of 55 percent passing through a No. 60 sieve.
  3. Form: Provide lime in form of ground dolomitic limestone or mollusk shells.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 sieve and a maximum of 10 percent passing through a No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 sieve.
- F. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M.

## 2.3 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
1. Feedstock: Limited to leaves and other green waste (grass clippings, twigs, green food waste).
  2. Reaction: pH of 5.5 to 8.

3. Soluble-Salt Concentration: Less than 4 dS/m.
  4. Moisture Content: 35 to 55 percent by weight.
  5. Organic-Matter Content: 50 to 60 percent of dry weight.
  6. Particle Size: Minimum of 98 percent passing through a 2-inch sieve.
- B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.
- C. Muck Peat: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture with 100 percent passing through a 1/2-inch sieve, a pH of 6 to 7.5, a soluble-salt content measured by electrical conductivity of maximum 5 dS/m, having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.
- D. Wood Derivatives: Shredded and composted, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
- E. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

## 2.4 FERTILIZERS

- A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.
- C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.
- D. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Place planting soil and fertilizers according to requirements in other Specification Sections.



- B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- C. Proceed with placement only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

- A. Excavation: Excavate soil from designated area(s) to a depth of 6 inches and stockpile until amended.
- B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
- C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.
- D. Screening: Pass unamended soil through a 2-inch sieve to remove large materials.

### 3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 6 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
- C. Mixing: Spread unamended soil to total depth of 8 inches, but not less than required to meet finish grades after mixing with amendments and natural settlement. 110Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
  - 1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.
    - a. Mix lime and/or sulfur with dry soil before mixing fertilizer.
    - b. Mix fertilizer with planting soil no more than seven days before planting.
  - 2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 12 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.

- D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

#### 3.4 PLACING MANUFACTURED PLANTING SOIL OVER EXPOSED SUBGRADE

- A. General: Apply manufactured soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Subgrade Preparation: Till subgrade to a minimum depth of 4 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
  - 1. Apply approximately half the thickness of planting soil over prepared, loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
- C. Application: Spread planting soil to total depth of 8 inches but not less than required to meet finish grades after natural settlement. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.
  - 1. Lifts: Apply planting soil in lifts not exceeding 12 inches in loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- D. Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place.
- E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

#### 3.5 BLENDING PLANTING SOIL IN PLACE

- A. General: Mix amendments with in-place, unamended soil to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Preparation: Till unamended, existing soil in planting areas to a minimum depth of 6 inches. Remove stones larger than 2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- C. Mixing: Apply soil amendments and fertilizer (excluding compost), if required, evenly on surface, and thoroughly blend them into full depth of unamended, in-place soil to produce planting soil.
  - 1. Mix lime and/or sulfur with dry soil before mixing fertilizer.
  - 2. Mix fertilizer with planting soil no more than seven days before planting.

- D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D 698 and tested in-place.

### 3.6 APPLYING COMPOST TO SURFACE OF PLANTING SOIL

- A. Application: Apply compost component of planting-soil mix 6 inches to surface of in-place planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

### 3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor to engage a qualified testing agency to perform tests and inspections.
- B. Perform the following test:
  - 1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 1000 sq. ft. of in-place soil or part thereof.
- C. Soil will be considered defective if it does not pass compaction tests.
- D. Prepare test reports.
- E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

### 3.8 PROTECTION

- A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."
- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Parking vehicles or equipment.
  - 3. Vehicle traffic.
  - 4. Foot traffic.
  - 5. Erection of sheds or structures.
  - 6. Impoundment of water.
  - 7. Excavation or other digging unless otherwise indicated.

- C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

### 3.9 CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
  - 1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329113

SECTION 32 9200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Sodding.
4. Plugging.
5. Sprigging.
6. Meadow grasses and wildflowers.
7. Turf renovation.
8. Erosion-control material(s).
9. Grass paving.

B. Related Requirements:

1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.
2. Section 334600 "Subdrainage" for below-grade drainage of landscaped areas.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.

- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

#### 1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
  - 1. Certification of each seed mixture for turfgrass sod Include identification of source and name and telephone number of supplier.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

#### 1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

#### 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.
  - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
  - 2. Experience: Five years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
  - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  - 4. Personnel Certifications: Installer's personnel assigned to the Work shall have certification in one of the following categories from the Professional Landcare Network:
    - a. Landscape Industry Certified Technician - Exterior.
    - b. Landscape Industry Certified Lawncare Manager.
    - c. Landscape Industry Certified Lawncare Technician.

5. Pesticide Applicator: State licensed, commercial.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- C. Bulk Materials:
  1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  3. Accompany each delivery of bulk materials with appropriate certificates.

#### 1.9 FIELD CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
  1. Spring Planting: As specified in the GSWCC Field Guide for Erosion and Sediment Control.
  2. Fall Planting: As specified in the GSWCC Field Guide for Erosion and Sediment Control.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

### PART 2 - PRODUCTS

#### 2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:

1. Quality: State-certified seed of grass species as listed below for solar exposure.
  2. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more 0.5 percent weed seed:
  3. Full Sun: Bermudagrass (*Cynodon dactylon*).
  4. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
  5. Sun and Partial Shade: Proportioned by weight as follows:
    - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
    - b. 30 percent chewings red fescue (*Festuca rubra* variety).
    - c. 10 percent perennial ryegrass (*Lolium perenne*).
    - d. 10 percent redtop (*Agrostis alba*).
  6. Shade: Proportioned by weight as follows:
    - a. 50 percent chewings red fescue (*Festuca rubra* variety).
    - b. 35 percent rough bluegrass (*Poa trivialis*).
    - c. 15 percent redtop (*Agrostis alba*).
- C. Grass-Seed Mix: Proprietary seed mix as follows:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

## 2.2 TURFGRASS SOD

- A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Bermudagrass (*Cynodon dactylon*).
- C. Turfgrass Species: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
  1. Full Sun: Kentucky bluegrass (*Poa pratensis*), a minimum of three cultivars.
  2. Sun and Partial Shade: Proportioned by weight as follows:
    - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
    - b. 30 percent chewings red fescue (*Festuca rubra* variety).
    - c. 10 percent perennial ryegrass (*Lolium perenne*).
    - d. 10 percent redtop (*Agrostis alba*).
  3. Shade: Proportioned by weight as follows:
    - a. 50 percent chewings red fescue (*Festuca rubra* variety).
    - b. 35 percent rough bluegrass (*Poa trivialis*).
    - c. 15 percent redtop (*Agrostis alba*).



## 2.3 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
  2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
  2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

## 2.4 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Sphagnum Peat Mulch: Partially decomposed sphagnum peat moss, finely divided or of granular texture, and with a pH range of 3.4 to 4.8.
- C. Muck Peat Mulch: Partially decomposed moss peat, native peat, or reed-sedge peat, finely divided or of granular texture, with a pH range of 6 to 7.5, and having a water-absorbing capacity of 1100 to 2000 percent, and containing no sand.
- D. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
1. Organic Matter Content: 50 to 60] percent of dry weight.
  2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- E. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- F. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- G. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

## 2.5 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

## 2.6 EROSION-CONTROL MATERIALS

- A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd., with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.
- C. Erosion-Control Mats: Cellular, nonbiodegradable slope-stabilization mats designed to isolate and contain small areas of soil over steeply sloped surface, of 6-inch nominal mat thickness. Include manufacturer's recommended anchorage system for slope conditions.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Invisible Structures, Inc; Slopetame 2.
    - b. Presto Products Company; Geoweb.
    - c. Tenax Corporation - USA; Tenweb.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
  - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.

3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

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

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

### 3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.

2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

### 3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."

B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.

1. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

### 3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

- E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

### 3.5 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
  - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
  - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 5 to 8 lb/1000 sq. ft..
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding [1:4 with erosion-control blankets] [and] [1:6 with erosion-control fiber mesh] installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas with erosion-control mats where indicated on Drawings; install and anchor according to manufacturer's written instructions.
- F. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
  - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
  - 2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1000 sq. ft.. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- G. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

### 3.6 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, slow-release fertilizer and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
  - 1. Mix slurry with fiber-mulch manufacturer's recommended tackifier.
  - 2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3. Spray-apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre.

### 3.7 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
  1. Lay sod across slopes exceeding 1:3.
  2. Anchor sod on slopes exceeding 1:6 with wood pegs[ or steel staples] spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

### 3.8 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
  1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding [90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
  2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
  3. Satisfactory Plugged Turf: At end of maintenance period, the required number of plugs has been established as well-rooted, viable patches of grass, and areas between plugs are free of weeds and other undesirable vegetation.
  4. Satisfactory Sprigged Turf: At end of maintenance period, the required number of sprigs has been established as well-rooted, viable plants, and areas between sprigs are free of weeds and other undesirable vegetation.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.9 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.10 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

3.11 MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:
  - 1. Seeded Turf: 60 days from date of Substantial Completion.
    - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
  - 2. Sodded Turf: 30 days from date of Substantial Completion.
  - 3. Plugged Turf: 30 days from date of Substantial Completion.
  - 4. Sprigged Turf: 30 days from date of Substantial Completion.
- B. Meadow Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Meadow Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than maintenance period below.
  - 1. Maintenance Period: 40 days from date of Substantial Completion.

END OF SECTION 329200

## **SECTION 32 9300 - PLANTS**

### **PART 1 - GENERAL**

#### **RELATED DOCUMENTS**

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

### **1.2 SUMMARY**

#### **A. Section Includes:**

- 1. Plants.
- 2. Tree stabilization.
- 3. Tree-watering devices.
- 4. Landscape edgings.

#### **B. Related Requirements:**

- 1. Section 32 9200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.
- 2.

### **1.3 ALLOWANCES**

#### **A. Allowances**

- 1. Perform planting work under quantity allowances and only as authorized. Authorized work includes work required by Drawings and the Specifications work authorized in writing by Architect.
- 2. Notify Architect weekly of extent of work performed that is attributable to quantity allowances.
- 3. Perform work that exceeds quantity allowances only as authorized by Change Orders.

#### **B. Furnish trees as part of tree allowance.**

### **1.4 UNIT PRICES**

- A. Unit prices apply to authorized work covered by quantity allowances.
- B. Unit prices apply to additions to and deletions from the Work as authorized by Change Orders.

1.5 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- G. Finish Grade: Elevation of finished surface of planting soil.
- H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
- I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- J. Planting Area: Areas to be planted.
- K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" for drawing designations for planting soils.
- L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.



- N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

## 1.6 COORDINATION

- A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
  - 1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

## 1.7 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
  - 2. Plant Photographs: Include color photographs in digital **3- by 5-inch** format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of [three] photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
- B. Samples for Verification: For each of the following:
  - 1. Trees and Shrubs: Three Samples of each variety and size delivered to site for review. Maintain approved Samples on-site as a standard for comparison.
  - 2. Compost Mulch: **1-quart** volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
  - 3. Mineral Mulch: **2 lb** of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on-site; provide an accurate indication of color, texture, and makeup of the material.
  - 4. Weed Control Barrier: **12 by 12 inches**.
  - 5. Proprietary Root-Ball-Stabilization Device: One unit.
  - 6. Slow-Release, Tree-Watering Device: One unit of each size required.
  - 7. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.
  - 8. Root Barrier: Width of panel by **12 inches**.

1.8 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
  - 1. Manufacturer's certified analysis of standard products.
  - 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- D. Sample Warranty: For special warranty.

1.9 CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.
  - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
  - 2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
  - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
  - 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
    - a. Landscape Industry Certified Technician - Exterior.
    - b. Landscape Industry Certified Interior.
    - c. Landscape Industry Certified Horticultural Technician.
  - 5. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
  - 1. Selection of plants purchased under allowances is made by Architect, who tags plants at their place of growth before they are prepared for transplanting.

- C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
  - 1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements **6 inches** above the root flare for trees up to **4-inch** caliper size, and **12 inches** above the root flare for larger sizes.
  - 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
  - 1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

#### 1.11 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
  - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  - 3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Handle planting stock by root ball.
- F. Store bulbs, corms, and tubers in a dry place at **60 to 65 deg F** until planting.

- G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.
  - 1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.
- H. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- I. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
  - 1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
  - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
  - 3. Do not remove container-grown stock from containers before time of planting.
  - 4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

#### 1.12 FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
  - 1. Spring Planting: March to May
  - 2. Fall Planting: September to October
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

#### 1.13 WARRANTY

- A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
  - 1. Failures include, but are not limited to, the following:

- a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
  - b. Structural failures including plantings falling or blowing over.
  - c. Faulty performance of tree stabilization.
  - d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
2. Warranty Periods: From date of planting completion.
- a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
  - b. Ground Covers, Biennials, Perennials, and Other Plants: 12 months.
  - c. Annuals: Three months.
3. Include the following remedial actions as a minimum:
- a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
  - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
  - c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
  - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

## PART 2 - PRODUCTS

### 2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than **3/4 inch** in diameter; or with stem girdling roots are unacceptable.
  2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

- D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.
- E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- F. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

## 2.2 FERTILIZERS

- A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
  - 1. Size: 5-gram tablets.
  - 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

## 2.3 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
  - 1. Type: Pine straw.
  - 2. Size Range: 3 inches maximum, 1/2 inch minimum.
  - 3. Color: Natural.
- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
  - 1. Organic Matter Content: 50 to 60 percent of dry weight.
  - 2. Feedstock: Agricultural residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

## 2.4 WEED-CONTROL BARRIERS

- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

- B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, **4.8 oz./sq. yd.**

## 2.5 PESTICIDES

- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

## 2.6 TREE-STABILIZATION MATERIALS

### A. Trunk-Stabilization Materials:

- 1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, **2-by-2-inch nominal** by length indicated, pointed at one end.
- 2. Wood Deadmen: Timbers measuring **8 inches** in diameter and **48 inches** long, treated with specified wood pressure-preservative treatment.
- 3. Flexible Ties: Fabric straps of length required to reach stakes or turnbuckles.
- 4. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
- 5. Flags: Standard surveyor's plastic flagging tape, white, **6 inches** long.
  - a. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) **Arborbrace**; ArborBrace Tree Guying System.
    - 2) **Bio-Plex**, Tree Guying kits and Ties.
    - 3) **Better Bilt Products, Inc**; Tree Anchor Kit.
    - 4) **DeepRoot Green Infrastructure, LLC**; ArborTie AT LD100 Professional Anchoring Kit
    - 5) **J. R. Partners**; Tree Grate Stakes

### B. Root-Ball Stabilization Materials:

- 1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, **2-by-2-inch nominal** by length indicated; stakes pointed at one end.
- 2. Wood Screws: ASME B18.6.1.

3. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball and that do not encircle the trunk; sized according to manufacturer's written recommendations unless otherwise indicated.
  - a. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - 1) **Border Concepts, Inc;** Tomahawk Tree Stabilizers.
    - 2) **Foresight Products, LLC;** Duckbill Rootball Fixing System.
    - 3) **Platipus Anchors, Inc.** Earth Anchoring Systems
    - 4) **Tree Staple, Inc;** Tree Staples.

## 2.7 LANDSCAPE EDGINGS

- A. Wood Edging: Of sizes indicated on Drawings, and wood stakes as follows:
  1. Species: Southern pine with specified wood pressure-preservative treatment.
  2. Stakes: Same species as edging, **1-by-2-inch nominal** by **18 inches** long, with galvanized nails for anchoring edging.
- B. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. **Border Concepts, Inc.**
    - b. **Colmet, Inc.** (formerly Collier Metal Specialties)
    - c. **Russell, JD. Company (The).**
    - d. **Sure-loc Edging Corporation.**
  3. Edging Size: **3/16 inch** thick by **4 inches** deep.
  4. Stakes: Tapered steel, a minimum of **12 inches** long.
  5. Accessories: Standard tapered ends, corners, and splicers.
  6. Finish: Manufacturer's standard paint.
    - a. Paint Color: Black
- C. Aluminum Edging: Standard-profile extruded-aluminum edging, **ASTM B 221**, Alloy 6063-T6, fabricated in standard lengths with interlocking sections with loops stamped from face of sections to receive stakes.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:



2. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. [Curv-Rite, Inc.](#)
  - b. [Permaloc Aluminum Edging](#)
  - c. [Russell, JD Company \(The\).](#)
  - d. [Sure-loc Edging Corporation.](#)
3. Edging Size: **3/16 inch** thick by **5-1/2 inches** deep.
4. Stakes: Aluminum, **ASTM B 221**, Alloy 6061-T6, approximately **1-1/2 inches** wide by **12 inches** long.
5. Finish: Manufacturer's standard paint.
  - a. Paint Color: Black.

D. Plastic Edging: Standard black polyethylene or vinyl edging, horizontally grooved, extruded in standard lengths, with **9-inch** plastic stakes.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. [Oly-Ola Edgings, Inc.](#)
  - b. [Permaloc Corporation.](#)
  - c. [Sure-loc Edging Corporation.](#)
  - d. [Valley View Industries.](#)
  - e. [Villa Root Barrier.](#)
3. Edging Size: **0.1 inch** thick by **5 inches**.
4. Top Profile: Straight, with top **2 inches** being **1/4 inch** thick.
5. Top Profile: Round top, **1/2 inch** in diameter.
6. Accessories: Manufacturer's standard alignment clips or plugs.

## 2.8 TREE-WATERING DEVICES

- A. Watering Pipe: PVC pipe **4 inches** in diameter, site-cut to length as required, and with snug-fitting removable cap.
- B. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.
  1. **Products:** Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [BIO-PLEX.](#)
    - b. [Engineered Watering Solutions; PQ Partners, LLC.](#)

c. [Spectrum Products, Inc.](#)

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

## 2.9 MISCELLANEOUS PRODUCTS

- A. Wood Pressure-Preservative Treatment: AWWPA U1, Use Category UC4a; acceptable to authorities having jurisdiction, and containing no arsenic or chromium.
- B. Root Barrier: Black, molded, modular panels 24 inches high (deep), 85 mils, and with vertical root deflecting ribs protruding 3/4 inch out from panel surface; manufactured with minimum 50 percent recycled polyethylene plastic with UV inhibitors.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. [Basis-of-Design Product](#): Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. [DeepRoot Green Infrastructure, LLC.](#)
    - b. [NDS Inc.](#)
    - c. [Villa Root Barrier.](#)
- C. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.
- D. Burlap: Non-synthetic, biodegradable.
- E. Planter Drainage Gravel: Washed, sound crushed stone or gravel complying with ASTM D 448 for Size No. 8.
- F. Planter Filter Fabric: Woven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.
- G. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

## DALTON PICKLEBALL COMPLEX

DALTON, GA

PROJECT NO. 2024-0283

Prime Engineering, Inc.

February 28, 2025

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
  3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  4. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.
- D. Lay out plants at locations directed by provided landscape plans or Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

### 3.3 PLANTING AREA ESTABLISHMENT

- A. General: Prepare planting area for soil placement and mix planting soil according to Section 32 9113 "Soil Preparation."
- B. Placing Planting Soil: Blend planting soil in place.
- C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- D. Application of Mycorrhizal Fungi: At time directed by Architect, broadcast dry product uniformly over prepared soil at application rate according to vendors recommendation.

### 3.4 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
  2. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
  3. Excavate at least **12 inches** wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
  4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
  5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
  6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
  7. Maintain supervision of excavations during working hours.
  8. Keep excavations covered or otherwise protected overnight.
  9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Backfill Soil: Subsoil and topsoil removed from excavations may not be used as backfill soil unless otherwise indicated.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
1. Hardpan Layer: Drill **6-inch-** diameter holes, **24 inches** apart, into free-draining strata or to a depth of **10 feet**, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions show unexpected water seepage or retention in tree or shrub planting pits.
- E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

### 3.5 TREE, SHRUB, AND VINE PLANTING

- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare **2 inches** above adjacent finish grades.
1. Backfill: Planting soil for trees, use excavated soil for backfill.

2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about **1 inch** from root tips; do not place tablets in bottom of the hole.
    - a. Quantity: Three for each caliper inch of plant.
  5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare **2 inches** adjacent finish grades.
1. Backfill: Planting soil for trees, use excavated soil for backfill.
  2. Carefully remove root ball from container without damaging root ball or plant.
  3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about **1 inch** from root tips; do not place tablets in bottom of the hole.
    - a. Quantity: Three for each caliper inch of plant.
  5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. Fabric Bag-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare **2 inches above** adjacent finish grades.
1. Backfill: Planting soil for trees, use excavated soil for backfill.
  2. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
  3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about **1 inch** from root tips; do not place tablets in bottom of the hole.
    - a. Quantity: Three for each caliper inch of plant.
  5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- F. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare **2 inches (50 mm)** above adjacent finish grade.

1. Backfill: Planting soil for trees, use excavated soil for backfill.
  2. Spread roots without tangling or turning toward surface. Plumb before backfilling, and maintain plumb while working.
  3. Carefully work backfill in layers around roots by hand. Bring roots into close contact with the soil.
  4. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
  5. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside soil-covered roots about **1 inch** from root tips; do not place tablets in bottom of the hole or touching the roots.
    - a. Quantity: Three for each caliper inch of plant.
  6. Continue backfilling process. Water again after placing and tamping final layer of soil.
- G. Watering Pipe: During backfilling, install watering pipe **4 feet** deep into the planting pit outside the root ball with top of pipe **1 inch** above the mulched surface.
- H. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

### 3.6 MECHANIZED TREE-SPADE PLANTING

- A. Trees may be planted with an approved mechanized tree spade at the designated locations. Do not use tree spade to move trees larger than the maximum size allowed for a similar field-grown, balled-and-burlapped root-ball diameter according to ANSI Z60.1, or larger than manufacturer's maximum size recommendation for the tree spade being used, whichever is smaller.
- B. Use the same tree spade to excavate the planting hole as will be used to extract and transport the tree.
- C. When extracting the tree, center the trunk within the tree spade and move tree with a solid ball of earth.
- D. Cut exposed roots cleanly during transplanting operations.
- E. Plant trees following procedures in "Tree, Shrub, and Vine Planting" Article.
- F. Where possible, orient the tree in the same direction as in its original location.

### 3.7 TREE, SHRUB, AND VINE PRUNING

- A. Remove only dead, dying, or broken branches. Do not prune for shape.
- B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.

- C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- D. Do not apply pruning paint to wounds.

### 3.8 TREE STABILIZATION

- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
  - 1. Upright Staking and Tying: Stake trees of **2- through 5-inch** caliper. Stake trees of less than **2-inch** caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least **18 inches** below bottom of backfilled excavation and to extend at least one-third of trunk height above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
  - 2. Upright Staking and Tying: Stake trees with two stakes for trees up to **12 feet** high and **2-1/2 inches** or less in caliper; three stakes for trees less than **14 feet** high and up to **4 inches** in caliper. Space stakes equally around trees.
  - 3. Support trees with bands of flexible fabric web ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than **16 feet** in height and more than **6 inches** in caliper unless otherwise indicated.
  - 1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.
    - a. Securely attach guys to stakes **30 inches** long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses. Provide turnbuckle for each guy wire and tighten securely.
    - b. For trees more than **6 inches** in caliper, anchor guys to wood deadmen buried at least **36 inches** below grade. Provide turnbuckle for each guy wire and tighten securely.
    - c. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
    - d. Support trees with guy cable or multiple strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
    - e. Attach flags to each guy wire, **30 inches** above finish grade.
    - f. Paint turnbuckles with luminescent white paint.
- C. Root-Ball Stabilization: Install at- or below-grade stabilization system to secure each new planting by the root ball unless otherwise indicated.

1. Wood Hold-Down Method: Place vertical stakes against side of root ball and drive them into subsoil; place horizontal wood hold-down stake across top of root ball and screw at each end to one of the vertical stakes.
    - a. Install stakes of length required to penetrate at least **18 inches** below bottom of backfilled excavation. Saw stakes off at horizontal stake.
    - b. Install screws through horizontal hold-down and penetrating at least **1 inch** into stakes. Pre-drill holes if necessary to prevent splitting wood.
    - c. Install second set of stakes on other side of root trunk for larger trees.
  2. Proprietary Root-Ball Stabilization Device: Install root-ball stabilization system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.
- D. Install root barrier where trees are planted within **60 inches** of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.
- E. Align root barrier with bottom edge angled at 20 degrees away from the paving or other hardscape element and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
- F. Install root barrier continuously for a distance of **60 inches** in each direction from the tree trunk, for a total distance of **10 feet** per tree. If trees are spaced closer, use a single continuous piece of root barrier.
  1. Position top of root barrier flush with finish grade.
  2. Overlap root barrier a minimum of **12 inches** at joints.
  3. Do not distort or bend root barrier during construction activities.
  4. Do not install root barrier surrounding the root ball of tree.
- G. Place a layer of drainage gravel at least **4 inches** thick in bottom of planter. Cover bottom with filter fabric and wrap filter fabric **6 inches** up on all sides. Duct tape along the entire top edge of the filter fabric, to secure the filter fabric against the sides during the soil-filling process.
- H. Fill planter with planting soil. Place soil in lightly compacted layers to an elevation of **1-1/2 inches** below top of planter, allowing natural settlement.
- 3.9 GROUND COVER AND PLANT PLANTING
- A. Install as indicated on Drawings in even rows with triangular spacing.
  - B. Use planting soil for backfill.
  - C. Dig holes large enough to allow spreading of roots.
  - D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.



- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

### 3.10 PLANTING AREA MULCHING

- A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches and secure seams with galvanized pins.
- B. Mulch backfilled surfaces of planting areas and other areas indicated.
  - 1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of **3-inch** average thickness, with 36-inch radius around trunks or stems. Do not place mulch within 6 inches of trunks or stems.
  - 2. Existing Trees and Treelike Shrubs in Turf or Planting Areas: Apply **4-inch** average thickness of organic mulch for 6 feet around base of tree. Do not place mulch within 6 inches of trunks or stems.
  - 3. Organic Mulch in Planting Areas: Apply **3-inch** average thickness of organic mulch extending **12 inches** beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within **6 inches** of trunks or stems.
  - 4. Mineral Mulch in Planting Areas: Apply **2-inch** average thickness of mineral mulch extending **12 inches** beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within **6 inches** of trunks or stems.

### 3.11 EDGING INSTALLATION

- A. Wood Edging: Install edging where indicated. Mitre cut joints and connections at a 45-degree angle. Fasten each cut joint or connection with two galvanized nails. Anchor with wood stakes spaced up to **36 inches** apart, driven at least **1 inch** below top elevation of edging. Use two galvanized nails per stake to fasten edging, of length as needed to penetrate both edging and stake and provide **1/2-inch** clinch at point. Pre-drill stakes if needed to avoid splitting. Replace stakes that crack or split during installation process.
- B. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately **30 inches** apart, driven below top elevation of edging.
- C. Aluminum Edging: Install aluminum edging where indicated according to manufacturer's written instructions. Anchor with aluminum stakes spaced approximately **36 inches** apart, driven below top elevation of edging.

- D. Plastic Edging: Install plastic edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately **36 inches** apart, driven through upper base grooves or V-lip of edging.
- E. Shovel-Cut Edging: Separate mulched areas from turf areas, curbs, and paving with a 45-degree, **4- to 6-inch-** deep, shovel-cut edge.
- F. Mow-Strip Installation:
  - 1. Excavate for mow strip.
  - 2. Compact subgrade uniformly beneath mow strip.
  - 3. Apply nonselective, pre-emergent herbicide that inhibits growth of grass and weeds.
  - 4. Install steel edging, delineating the edge of mow strip.
  - 5. Install weed-control barrier before mulching, covering area of mow strip, and overlapping and pinning edges of barrier at least **6 inches** and according to manufacturer's written instructions.
  - 6. Place indicated thickness of organic mulch, fully covering weed barrier.
  - 7. Rake mulch to a uniform surface level with adjacent finish grades.

### 3.12 TREE GRATE INSTALLATION

- A. Tree Grates: Install according to manufacturer's written instructions. Set grate segments flush with adjoining surfaces. Shim from supporting substrate with soil-resistant plastic. Maintain a **3-inch-** minimum growth radius around base of tree; break away portions of casting, if necessary, according to manufacturer's written instructions.

### 3.13 INSTALLING SLOW-RELEASE WATERING DEVICE

- A. Provide one device for each tree.
- B. Place device on top of the mulch at base of tree stem and fill with water according to manufacturer's written instructions.

### 3.14 PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices to minimize use of pesticides

and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

### 3.15 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

### 3.16 REPAIR AND REPLACEMENT

- A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.
  - 1. Submit details of proposed pruning and repairs.
  - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
  - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect or municipality inspector.
- B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
  - 1. Provide new trees of same size as those being replaced for each tree of **4 inches** or smaller in caliper size.
  - 2. Provide one new tree(s) of **4-inch** caliper size for each tree being replaced that measures more than **6 inches** in caliper size.
  - 3. Species of Replacement Trees: Species selected by Architect.

### 3.17 CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

**DALTON PICKLEBALL COMPLEX**

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Prime Engineering, Inc.

February 28, 2025

- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.
- E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.18 MAINTENANCE SERVICE

- A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" section. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
  - 1. Maintenance Period: Twenty four months from date of Substantial Completion or issuance of Certificate of Occupancy.
- B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:
  - 1. Maintenance Period: Twenty four months from date of Substantial Completion or issuance of Certificate of Occupancy.

END OF SECTION 32 9300

SECTION 33 0130.13 – SEWER AND MANHOLE TESTING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. This section of the specifications provides for testing for acceptance of non-pressurized sanitary sewer installations. Upon completion of all or a part of a gravity sanitary sewer line installation, the Contractor shall test and/or inspect the sewer for acceptability. Testing and inspection shall be performed in accordance with the requirements of this section.
- B. One or more of the following tests and/or inspections may be required:
  - 1. Exfiltration of water.
  - 2. Infiltration of water.
  - 3. Exfiltration of air under pressure.
  - 4. Joint testing.
  - 5. Direct visual inspection.
  - 6. Deflection testing.
  - 7. Closed Circuit Television Inspection (CCTV).
  - 8. Smoke Testing
  - 9. Vacuum Testing
- C. Prior to any testing, lines shall be backfilled, cleaned of debris and flushed clean. Debris shall be caught and removed from the line and shall not be flushed into existing live sanitary sewers. (The debris is to be disposed of properly in accordance with all laws. The Municipality can furnish a letter to the landfill stating that the contractor is authorized to dispose of the materials. Debris and liquids quantities are to be tracked in the daily contractor reports.)

1.2 RELATED SECTIONS

- A. Section 312000: Earth Moving
- B. Section 333113.13: Gravity Flow Sanitary Sewers
- C. Section 333913.13: Precast Concrete Manholes
- D. Section 330500: Common Work Results For Utilities
- E. Section 3301513: Manhole Frames and Covers
- F. Section 333113.15: Ductile Iron Sanitary Sewer Pipe and Fittings
- G. Section 333133.16: PVD Gravity Sewer Pipe
- H. Section 339313.16: Manhole Frame and Cover Installation
- I. Section 3915: Manhole Height adjustment

### 1.3 REFERENCES

- A. ASTM C924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
- B. ASTM C969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
- C. ASTM F1417 - Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air
- D. ASTM C1244 – Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test Prior to Backfill
- E. Codes, Specification, and Standards
  - 1. NASSCO – National Association of Sewer Service Companies

### 1.4 SUBMITTALS

- A. Field Leakage Testing Plan: Submit at least 15 days in advance the testing and include at least the following:
  - 1. Testing dates
  - 2. Piping systems and sections to be tested
  - 3. Test type
  - 4. Method of isolation
  - 5. Method of conveying water from the source to system being tested
  - 6. Calculation of maximum allowable leakage for piping section(s) to be tested.
  - 7. Method of disposal of test water, if applicable
- B. Leakage test results
- C. Pipe deflection test results
- D. CCTV inspection data in accordance with Section 330130.17: Sanitary Sewer Main and Lateral Television Sonar Inspection (CCTV)
- E. Pipeline lamping test results

### 1.5 TEST SECTIONS

- A. Unless otherwise specified or directed by the Owner, each section of sanitary sewer between manholes shall be tested by the air testing method.
- B. Testing shall be conducted in accordance with ASTM C924, ASTM C969, ASTM F1417, ASTM C1244, and ASTM C1244. The Owner's Engineer may allow alternate testing methods at his discretion or require additional testing methods if, in his opinion, they are warranted.

- C. The Contractor may at his option divide a section of sewer into subsections of more convenient length for testing. If the section or subsection tested does not pass the tests, it shall be repaired and the test repeated until a satisfactory test is obtained.

1.6 SAFETY

- A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, entry permit, and appropriate safety and Personal Protection Equipment (PPE).
- C. Refer to Section 312000: Earth Moving for trench safety and protective systems.

1.7 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. It shall be the responsibility of the Contractor to schedule and perform the work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.
- B. In the event that the Contractor's activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the local Municipality dispatch center and the Owner's Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.
- C. The Contractor shall indemnify and hold harmless the Owner for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the Owner, Owner's employees, and local Municipality elected officials in defending such fines and claims.
- D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to Owner's utilities that is caused by the Contractor's equipment or operation shall be repaired in a manner approved by the Owner's Engineer at the Contractor's expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor's expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor's equipment is the Contractor's responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The Owner reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 SANITARY SEWERS INSPECTION AND TESTING METHODS

- A. Contractor to notify Owner in writing 5 days in advance of testing. Perform testing in presence of the Owner.
- B. Individual joints may be tested on pipe 24 inches in diameter and larger at Contractor's option.
- C. Pipe shall successfully pass leakage test prior to acceptance
- D. Contractor to furnish testing equipment and perform tests as approved by the Owner. Testing equipment shall provide observable and accurate measurement of leakage under specified conditions.
- E. All Testing Methods: All wyes, tees, and stubs shall be plugged with flexible jointed caps, or acceptable alternate, and securely fastened to withstand the internal test pressure. Such plugs or caps shall be readily removable.
- F. The Contractor shall backfill, clean and test lines before requesting final acceptance. Where any obstruction is met, the Contractor shall clean the sewers by means of rods, swabs, or other instruments. When requested by the Owner, the Contractor shall flush out lines and manholes before final inspection in accordance with Section 331013.41 – Cleaning of Sewers.
- G. **Alignment:** Pipe lines shall be straight and show a uniform grade between manholes, except for curves specifically shown on the Plans or approved by the Owner. The Contractor shall correct any discrepancies discovered during inspection at no additional cost to the Owner.
- H. **Watertightness:** All sewers constructed shall be tested for water tightness to the maximum extent feasible. Infiltration and exfiltration tests shall be performed on all new or replacement sewers constructed as specified in this section, except for those new sewers constructed which have active services tied into them as the pipe is being installed. In such cases the water tightness of the sewers less than or equal to twenty-four (24) inches shall be based on tests as specified in sections 3.1E and 3.1F. For sewers thirty (30) inches and larger testing shall be based on the individual joint test as specified in this section. All visible leaks, including those found via television inspection, shall be repaired at no additional cost to the Owner.
- I. Infiltration Tests:
  - 1. The Contractor shall install suitable weirs in manholes selected by the Owner to determine the leakage of ground water into the sewer. The maximum length of line for each infiltration test shall be five-thousand (5,000) feet. The Contractor shall install weirs for a minimum of four (4) hours before measuring flow. If leakage in any section of the sewer line exceeds one-hundred (100) gallons per 24 hours per inch-mile of pipe, the Contractor shall locate and repair leaks. Repair methods must be approved by the Owner. After



repairs are completed, the Contractor shall re-test for leakage. Infiltration testing shall be performed before sanitary sewer lateral reconnections are made.

2. The Contractor shall furnish, install, and remove the necessary weirs, plugs, and bulkheads required to perform the leakage tests.
3. Weirs shall be V-notch type by Pollard, or equivalent approved by Owner.

J. Exfiltration Tests:

1. Exfiltration Water Test:

- a. If groundwater is present and is 2 feet and above the top of the pipe for the segment being tested then an infiltration test is required.
- b. For VCP and concrete pipe fill pipe test section 24 hours prior to time of testing, if desired, to permit normal absorption into pipe walls
- c. **Procedure:**

- 1) Maximum filling velocity shall not exceed 0.25 fps, calculated based on full area of pipe
- 2) Expel air from piping system during filling.
- 3) Apply and maintain specified test pressure with hydraulic force pump. Valve off piping system when test pressure is reached.
- 4) Maintain hydrostatic test pressure continuously for 2 hours minimum, adding additional make up water only as necessary to restore test pressure.
- 5) Determine actual leakage by measuring quantity of water necessary to maintain specified test pressure for duration of test.

d. **Measurement Accuracy:** Plus or minus 1/8 gallon of water leakage under specified conditions.

e. **PVC and ductile iron pipe and joints** shall sustain maximum water loss limit of 0.8 gallon per inch diameter per 1,000 feet of pipe, including service connections within test section per 2 hours. Allowable leakage shall be modified as stated below if hydrostatic head is other than 6 feet.

f. **Clay and concrete pipe and joints** shall sustain maximum water loss limit of 1.5 gallons per inch diameter per 1,000 feet of pipe, including service connections within test section per 2 hours. Allowable leakage shall be modified as stated below if hydrostatic head is other than 6 feet.

g. **Hydrostatic Head:**

- 1) At least 2 feet above maximum estimated groundwater level in section being tested, but no less than 6 feet above inside top of highest section of pipe in test section, including service connections.
- 2) In every case, determine height of water table at time of test by exploratory holes or such other methods approved by Engineer. Engineer will make final decision regarding test height for water in pipe section being tested.

- 3) If hydrostatic head is other than 6 feet, allowable leakage as computed by criteria above shall be adjusted by the square root of actual head divided by square root of 6.
  - h. **Length of Pipe Tested:** Limit length such that pressure on invert of lower end of section does not exceed 16 feet of water column. In no case shall length be greater than 700 feet or distance between manholes when greater than 700 feet.
  - i. **Dispose of test water** in a manner that will not damage or interfere with adjacent property and in a manner acceptable with Owner and regulatory agencies.
    - 1) **Low-Pressure Air Test:** Sewer diameters less than or equal to twenty-four (24) inches:
  - j. Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor's option, sewers may be tested in lengths between manholes or in short sections (twenty-five [25] feet or less) using inflatable balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately four (4) psig. After this pressure is reached and the pressure allowed to stabilize (approximately two (2) to five (5) minutes), the pressure may be reduced to three and one-half (3.5) psi before starting the test. If a one (1) psi drop does not occur during the test time, then the line will be considered as having passed the test. If the pressure drops more than one (1) psi during the test time, the line will be presumed to have failed the test, and the Contractor shall be required to locate the failure, make necessary repairs, and retest the line at no additional cost to the Owner. Refer to ASTM C924-02 and ASTM F1417-11a for detailed testing requirements and minimum test times for various pipe sizes and types.
  - k. Required test equipment, including, but not limited to: inflatable balls, braces, cut-off valves, air hose, rotameter (standard CFM reading with an accuracy of  $\pm$  two (2) percent), mechanical or pneumatic plugs, time measuring equipment with an accuracy of 0.1s, oil free air source with a singular control panel containing a main shut-off valve, pressure regulating valve, pressure-relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range of 0 psi to at least 10 psi with minimum divisions of 0.10 psi and an accuracy of  $\pm$  two (2) percent shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing Systems.
  - l. The Contractor shall keep records of all tests made. Copies of such records shall be given to the Owner. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the Owner.
  - m. The Contractor is cautioned to observe proper safety precautions in the performance of the air testing. It is imperative that plugs be properly installed, restrained and braced to prevent the sudden expulsion of a poorly installed or partially inflated plug. Care shall be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.
2. **Individual Joint Test:** Pipe joints for sewers greater than (24) inches in diameter shall be air tested individually as specified in paragraph 3.2 Joint Testing Procedures.

- K. **Smoke Testing:** Smoke testing may be used only to locate leaks and in no case shall be considered conclusive or a substitute for air tests, exfiltration tests, or infiltration tests. In all cases a smoke test shall be accompanied by an air test, exfiltration test, or infiltration test. The Owner may order a smoke test if another leakage test fails and the source of the leak cannot be determined by other means. Smoke testing may only be performed where ground water is low. Smoke shall be blown into a sealed section of sewer under pressure and the Contractor and Owner shall observe for any smoke appearing on top of the ground indicating the presence of leaks. The Owner may require that the Contractor excavate the sewer to determine the source of any smoke appearing during the smoke test. All leaks or breaks discovered by the smoke tests shall be repaired and/or corrected by the Contractor at his own expense in a manner acceptable to the Owner. Equipment and supplies required for smoke tests shall be furnished by the Contractor. The Contractor may perform smoke tests at any time during construction at his option; however, any such tests shall not supplant the final test of the completed work.
- L. **Deflection Test:** All PVC gravity sewers:
1. The Contractor shall test PVC gravity sewers for excessive deflection by passing a mandrel through the pipe. Deflection of the pipe shall not exceed five (5) percent. The mandrel size shall be based upon the maximum possible inside diameter for the type of pipe being tested, taking into account the allowable manufacturing tolerances of the pipe. The mandrel shall be configured as shown on the Plans or directed by the Owner and shall have an odd number of legs, or vanes, with a quantity equal to or greater than nine (9). The legs of the mandrel shall be permanently attached to the mandrel. A mandrel with variable sizes shall not be allowed. The mandrel shall be constructed of steel, aluminum, or other material approved by the Owner, and shall have sufficient rigidity so that the legs of the mandrel will not deform when pulling through a pipe. The Contractor shall provide a proving ring for each size mandrel, with a tolerance of no more than 0.02 inch clearance, and the mandrel dimensions shall be checked by the Owner using this proving ring, before use by the Contractor.
  2. The Contractor shall excavate and install properly any section of pipe not passing this test and re-test until results are satisfactory at no additional cost to the Owner.
  3. This test shall be performed twice:
    - a. Once within the first thirty (30) days of installation, and
    - b. Once during final inspection, but no sooner than thirty (30) days after pavement backfill is done.
- M. **Closed Circuit Television Inspection:** The Owner's Engineer may require that the interior of a new gravity sewer be subjected to television inspection. CCTV Inspections shall be in accordance with National Association of Sanitary Sewer Companies Specification Guidelines. Prior to final acceptance the Owner shall be provided with one copy of the TV inspection report and CD-ROMs showing the entire length of the gravity sewer tested. The report shall contain the condition of pipe, type of pipe, depth, location of services, length, type of joints, roundness, and distance between manholes. Any pipe found to be cracked, leaking, misaligned, bellied, or otherwise defective shall be removed and replaced at no additional cost to the Owner.
- N. **Direct/Manual Visual Inspection:** The inspection of new pipe 36 inches in diameter and larger may be manually inspected. The contractor shall provide any specialized equipment for inspection for the Owner. Voice communication between in-pipe and aboveground personnel

will be maintained at all times during the inspection. Record inspection in format required by the owner and provide inspection logs. Provide digital, color, still photographs of defects or other features as requested by the Owner. Log sheets to include but not limited to: time and date of inspection, location, upstream and downstream structure numbers, pipeline length, pipe size, pipe segment length, pipe material, lateral connection located by pipe segment number, and location and detail of defects encountered.

### 3.2 JOINT TESTING PROCEDURES

- A. **Joint Testing Procedures:** Each sanitary sewer joint shall be individually air tested using a packer or other approved testing device at the following test pressure:
1. Joint test pressure shall be 3-psi higher than the groundwater pressure, if any, outside the pipe. Groundwater pressure may be determined by positioning the testing device on a visibly infiltrating joint and measuring the resulting VOID pressure with the VOID pressure monitoring equipment.
  2. In the absence of groundwater pressure data, the test pressure shall be equal to 1/2 psi per vertical foot of pipe depth or 3 psi, whichever is greater.
  3. The testing device shall be positioned within the line in such a manner as to straddle the pipe joint to be tested. The testing device end elements (sleeves) shall be expanded so as to isolate the joint from the remainder of the line and create a VOID area between the testing device and the pipe joint. The ends of the testing device shall be expanded against the pipe with sufficient inflation pressure to contain the air within the VOID without leakage past the expanded ends. Air shall then be introduced into the VOID area until a pressure equal to or greater than the required test pressure is observed with the VOID pressure monitoring equipment. If the required test pressure cannot be developed (due to joint leakage), the joint will have failed the test. After the VOID pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the VOID pressure decays by more than 2 psi within 15 seconds (due to joint leakage), the joint will have failed the test.
  4. All test monitoring shall be above ground and in a location to allow for simultaneous and continuous observation by the Owner's Engineer. The void pressure data shall be transmitted electronically from the void to the monitoring equipment.
  5. Prior to starting the sanitary sewer joint testing, a two (2) part control test shall be performed as follows:
    - a. To insure the accuracy, integrity, and performance capabilities of the testing equipment, a demonstration test will be performed in a test cylinder constructed in such a manner that a minimum of three (3) known leak sizes can be simulated (0.062, 0.094, 0.125 inch diameter). This technique will establish the test equipment performance capability in relationship to the test criteria and insure that there is no leakage of the test medium from the system or other equipment defects that could affect the joint testing results. If this test cannot be performed successfully, the Contractor shall be instructed to repair or otherwise modify his equipment and re-perform the test until the results are satisfactory to the Owner. This test may be required at any other time during the joint testing work if the Owner suspects the testing equipment is not functioning properly. The demonstration test may be

- required, by the Owner, at any other time during the joint testing work at no additional cost to the Owner.
- b. After entering each manhole section with the test equipment, but prior to the commencement of joint testing, the test equipment shall be positioned on a section of sound sewer pipe between pipe joints, and a test performed as specified. This procedure will demonstrate the reality of the test requirement, as no joint will test in excess of the pipe capability. Should it be found that the barrel of the sewer pipe will not meet the joint test requirements, the requirements will be modified as necessary.
6. During the sanitary sewer joint testing work, the Contractor shall keep the following records:
    - a. Identification of the manhole to manhole section tested.
    - b. Test pressure used.
    - c. Location (footage) of each joint tested.
    - d. Test results for each joint tested.
  - B. Lamping Procedures: Lamping will be performed on all sewer pipelines by the Owner. When lamping is to be performed by the Owner, the Contractor shall provide access to the sewer and facilitate the Owner in execution, as needed.

### 3.3 MANHOLE TESTING METHODS

- A. All manhole inserts, new manholes, and replacement manholes shall be tested by the Contractor using the vacuum test method, following the manufacturer's recommendations for proper and safe procedures. Vacuum testing of manholes and structures shall be performed after installation of inserts. Any leakage in the manhole or structure, before, during, or after the test shall be repaired at no additional cost to the Owner.
- B. Manholes:
  1. Prior to testing manholes for water tightness, all lift holes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced.
  2. Vacuum Tests shall be performed in accordance with ASTM C1244: If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be equal to that as manufactured by P.A. Glazier, Inc., or approved equal.
- C. The Owner reserves the right to have third party consultants perform construction materials testing and assessments to any new manhole.
- D. The use of soapy water on the manhole walls to help determine the areas of leakage is permitted.

END OF SECTION 330130.13

SECTION 33 0500 - COMMON WORK RESULTS FOR UTILITIES

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 includes the following:
  - 1. Piping joining materials.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Sleeves.
  - 5. Identification devices.
  - 6. Grout.
  - 7. Flowable fill.
  - 8. Piped utility demolition.
  - 9. Piping system common requirements.
  - 10. Equipment installation common requirements.
  - 11. Painting.
  - 12. Concrete bases.
  - 13. Metal supports and anchorages.

1.3 DEFINITIONS

- A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.
- B. Concealed 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.
- C. ABS: Acrylonitrile-butadiene-styrene plastic.
- D. CPVC: Chlorinated polyvinyl chloride plastic.
- E. PE: Polyethylene plastic.
- F. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
  - 1. Dielectric fittings.
  - 2. Identification devices.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.7 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 to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.8 COORDINATION

- A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.
- C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Section 033000 "Cast-in-Place Concrete."

## PART 2 - PRODUCTS

### 2.1 PIPING JOINING MATERIALS

- A. 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 otherwise 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.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAgl, silver alloy for refrigerant piping, unless otherwise indicated.
- F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Solvent Cements for Joining Plastic Piping:
  - 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.
- H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

### 2.2 TRANSITION FITTINGS

- A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.
- B. Transition Couplings NPS 1-1/2 and Smaller:
  - 1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
  - 2. Aboveground Piping: Specified piping system fitting.



C. AWWA Transition Couplings NPS 2 and Larger:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cascade Waterworks Mfg. Co.
  - b. Dresser, Inc.; DMD Div.
  - c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
  - d. JCM Industries.
  - e. Smith-Blair, Inc.
  - f. Viking Johnson.
3. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

D. Plastic-to-Metal Transition Fittings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Spears Manufacturing Co.
3. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.

E. Plastic-to-Metal Transition Unions:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Colonial Engineering, Inc.
  - b. NIBCO INC.
  - c. Spears Manufacturing Co.
3. Description: MSS SP-107, PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

- F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cascade Waterworks Mfg. Co.
    - b. Fernco, Inc.
    - c. Mission Rubber Company.
    - d. Plastic Oddities.
  3. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

### 2.3 DIELECTRIC FITTINGS

- A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.
- B. Dielectric Unions:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. EpcO Sales, Inc.
    - d. Hart Industries, International, Inc.
    - e. Watts Water Technologies, Inc.
    - f. Zurn Plumbing Products Group; Wilkins Div.
  3. Description: Factory fabricated, union, NPS 2 and smaller.
    - a. Pressure Rating: **150 psig** at 180 deg F.
    - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.
- C. Dielectric Flanges:
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Capitol Manufacturing Co.
    - b. Central Plastics Company.
    - c. EpcO Sales, Inc.
    - d. Watts Water Technologies, Inc.

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3. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger.
  - a. Pressure Rating: **150 psig**.
  - b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Advance Products & Systems, Inc.
  - b. Calpico, Inc.
  - c. Central Plastics Company.
  - d. Pipeline Seal and Insulator, Inc.
3. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 and larger.
  - a. Pressure Rating: **150 psig**.
  - b. Gasket: Neoprene or phenolic.
  - c. Bolt Sleeves: Phenolic or polyethylene.
  - d. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Calpico, Inc.
  - b. Lochinvar Corporation.
3. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller.

- a. Pressure Rating: 300 psig at 225 deg F.
- b. End Connections: Threaded.

F. Dielectric Nipples:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Perfection Corporation.
  - b. Precision Plumbing Products, Inc.
  - c. Victaulic Company.
3. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.
  - a. Pressure Rating: **300 psig at 225 deg F.**
  - b. End Connections: Threaded or grooved.

2.4 SLEEVES

- A. Mechanical sleeve seals for pipe penetrations are specified in Section 22400: Plumbing
- B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.
- C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.
- D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.
- F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.
- G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.5 IDENTIFICATION DEVICES

- A. General: Products specified are for applications referenced in other utilities Sections. If more than single type is specified for listed applications, selection is Owner's option.
- B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.
  1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.

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2. Location: Accessible and visible.
- C. Stencils: Standard stencils prepared with letter sizes complying with recommendations in ASME A13.1. Minimum letter height is 1-1/4 inches for ducts, and 3/4 inch for access door signs and similar operational instructions.
1. Material: **Brass**.
  2. Stencil Paint: Exterior, oil-based, alkyd-gloss black enamel, unless otherwise indicated. Paint may be in pressurized spray-can form.
  3. Identification Paint: Exterior, oil-based, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.
- D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.
- E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.
- F. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.
- G. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.
- H. Lettering: Manufacturer's standard preprinted captions as selected by Architect.
- I. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.
- J. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.
1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
  2. Color: Comply with ASME A13.1, unless otherwise indicated.
- K. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch (13-mm) sequenced numbers. Include 5/32-inch hole for fastener.
1. Material: 0.032-inch- thick, **polished brass**
  2. Material: 0.0375-inch- thick stainless steel.
  3. Material: 3/32-inch- thick plastic laminate with 2 black surfaces and a white inner layer.
  4. Material: Valve manufacturer's standard solid plastic.
  5. Size: 1-1/2 inches in diameter, unless otherwise indicated.
  6. Shape: As indicated for each piping system.
- L. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

- M. 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. Fabricate in sizes required for message. Provide holes for mechanical fastening.
1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
  2. Thickness: **1/16 inch, 1/8 inch**, unless otherwise indicated.
  3. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
  4. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.
- N. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:
1. Green: Cooling equipment and components.
  2. Yellow: Heating equipment and components.
  3. Brown: Energy reclamation equipment and components.
  4. Blue: Equipment and components that do not meet criteria above.
  5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
  6. Terminology: Match schedules as closely as possible. Include the following:
    - a. Name and plan number.
    - b. Equipment service.
    - c. Design capacity.
    - d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
  7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.
- O. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.
1. Size: 3-1/4 by 5-5/8 inches.
  2. Fasteners: Brass grommets and wire.
  3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.
- P. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.
1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

## 2.6 GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
1. Characteristics: Post hardening, volume adjusting, 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.

## 2.7 FLOWABLE FILL

- A. Description: Low-strength-concrete, flowable-slurry mix.
1. Cement: ASTM C 150, Type I, portland.
  2. Density: **115- to 145-lb/cu. ft.**
  3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
  4. Aggregates: ASTM C 33, natural sand, fine.
  5. Admixture: ASTM C 618, fly-ash mineral.
  6. Water: Comply with ASTM C 94/C 94M.
  7. Strength: **100 to 200 psi** at 28 days.

## PART 3 - EXECUTION

### 3.1 PIPED UTILITY DEMOLITION

- A. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.
1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
  3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
  4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
  5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.2 DIELECTRIC FITTING APPLICATIONS

- A. Dry Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 and Smaller: Dielectric unions.
2. NPS 2-1/2 to NPS 12: Dielectric flanges **or dielectric flange kits**.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 and Smaller: Dielectric **couplings or dielectric nipples**
2. NPS 2-1/2 to NPS 4: Dielectric nipples.
3. NPS 2-1/2 to NPS 8: Dielectric nipples or dielectric flange kits.
4. NPS 10 and NPS 12: Dielectric flange kits.

### 3.3 PIPING INSTALLATION

- A. Install piping according to the following requirements and utilities Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping to permit valve servicing.
- E. Install piping at indicated slopes.
- F. Install piping free of sags and bends.
- G. Install fittings for changes in direction and branch connections.
- H. Select system components with pressure rating equal to or greater than system operating pressure.
- I. Sleeves are not required for core-drilled holes.
- J. Permanent sleeves are not required for holes formed by removable PE sleeves.
- K. Install sleeves for pipes passing through concrete and masonry walls 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 equipment areas or other wet areas **2 inches** above finished floor level.
  2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
    - a. **Steel Pipe Sleeves:** For pipes smaller than NPS 6.



- b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.
- L. Verify final equipment locations for roughing-in.
- M. Refer to equipment specifications in other Sections for roughing-in requirements.

### 3.4 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and utilities Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. 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:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. 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.
- E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.
- I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.
- K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
  3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
  5. PVC Nonpressure Piping: Join according to ASTM D 2855.
  6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
- L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.
- N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End PE Pipe and Fittings: Use butt fusion.
  2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.
- O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

### 3.5 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  3. Install dielectric fittings at connections of dissimilar metal pipes.

### 3.6 EQUIPMENT INSTALLATION

- A. Install equipment level and plumb, unless otherwise indicated.
- B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.
- C. Install equipment to allow right of way to piping systems installed at required slope.

3.7 PAINTING

- A. Painting of piped utility systems, equipment, and components is specified in Section 099113: "Painting and Coating"
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 IDENTIFICATION

- A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
  - 1. Stenciled Markers: According to ASME A13.1.
  - 2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
  - 3. Locate pipe markers on exposed piping according to the following:
    - a. Near each valve and control device.
    - b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
    - c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
    - d. At manholes and similar access points that permit view of concealed piping.
    - e. Near major equipment items and other points of origination and termination.
- B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
  - 1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high 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 among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.
- C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.9 CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

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2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Section 033000 "Cast-in-Place Concrete."

3.10 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Section 055000 "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.11 GROUTING

- A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

END OF SECTION 330500

SECTION 33 0513 – MANHOLE FRAMES AND COVERS

PART 1 - GENERAL

1.1 SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and install all miscellaneous metal as shown on the drawings and specified herein.

1.2 COORDINATION

- A. The work of this Section shall be completely coordinated with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this section before fabrication and installation of items herein specified.
- B. Furnish to the pertinent trades all items included under this section that are to be built into the work of other sections.

1.3 SHOP DRAWINGS

Detail drawings, as provided showing sizes of members, method of assembly, anchorage, and connection to other members shall be submitted for approval before fabrication.

1.4 FIELD MEASUREMENTS

Field measurements shall be taken at the site to verify or supplement indicated dimensions and to insure proper fitting of all items.

PART 2 - PRODUCTS

2.1 FABRICATED ITEMS

- A. Manhole Frames and Covers:
  - 1. Manhole frames and cover castings shall be good quality, strong, tough, even-grained, cast iron, smooth, free from scale, lumps, blisters, sand holes and defects of any kind which render them unfit for the service for which they are intended. Castings shall be thoroughly cleaned and subject to hammer inspection. Manhole covers and frame seats shall be machined true to a plane surface. Before shipment from the factory, casting shall be given one coat of coal tar pitch varnish which shall present a coating which is smooth and tough, but not brittle.

- Sizes shall be as shown on the drawings. Cast iron shall be grey iron casting conforming to the AASHTO Designation M-105 and shall be Class No. 30.
2. Frames and covers shall have a minimum total weight of 460 pounds. Covers shall have a weight not less than 150 pounds.
  3. Frames and covers shall be of the "Type W" unless noted otherwise on the drawings. All covers shall have the words "STORM SEWER" in raised 2 inch letters cast into the top. Type "W" shall be the waterproof frame and cover with bolted lid, 1/8 inch neoprene gasket and sufficient counter sunk hexagonal-head cap screws cover to frame to produce a waterproof seal.
  4. All manhole frames and covers shall have a minimum of 22 inches clear opening between the innermost ring. The lower flange of the frame shall be at least 6 to 8 inches. The lower flange of the frame shall be at least 6 inches in width. All covers shall be supplied with two concealed watertight pick holes.

B. Manhole Steps:

1. Manhole steps shall be Clow Corporation F-3650 or approved equal.

PART 3 - EXECUTION

3.1 FABRICATION

All miscellaneous metal work shall be formed true to detail, with clean, straight, sharply defined profiles and smooth surfaces of uniform color and texture and free from defects impairing strength or durability.

3.2 INSTALLATION

- A. Install all items furnished except items to be imbedded in concrete or other masonry which shall be installed under Division 3 and Division 4 respectively. Items to be attached to concrete or masonry after such work is completed shall be installed in accordance with the details shown. Fastening to wood plugs in masonry will not be permitted. All dimensions shall be verified at the site before fabrication is started.
- B. All steel surfaces to come in contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bituminous troweling mastic applied in accordance with the manufacturer's instructions prior to installation.

END OF SECTION 330513

SECTION 33 1000 - WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related work specified elsewhere includes:
  - 1. Section 31 2000 - "Earth Moving"
  - 2. Division 22 - "Plumbing"

1.2 SUMMARY:

- A. This Section includes water service piping system, meter, vaults, valves, and appurtenances from the existing on-site utility source of potable water to a point 5 feet outside the building, and as indicated on the Drawings, and in this Section of the Project Manual.
- B. Note that the Contractor shall furnish and install connection, water meter, etc., acceptable to the utility company and call on the utility company to approve the meter and inspect the installation prior to covering.
- C. All fees and charges for water service, meters, taps, permits, impact fees, etc., if any, shall be paid by the Contractor from their contract amount.
- D. The extent of water service piping system, fire hydrants, etc., is indicated on the Drawings, in this Section, other referenced Sections of the Project Manual, and as otherwise required by authorities having jurisdiction.
  - 1. All water pipe which run under roads, streets, driveways, and other vehicular paving shall be sleeved in AWWA C151 ductile iron sleeves.
- E. Utility Compliance: Comply with Mobile County Water Authority regulations and standards pertaining to sanitary sewerage systems.
  - 1. Where conflicts or discrepancies occur with the plans or these specifications, Mobile County Authority regulations and standards shall govern.

1.3 SUBMITTALS:

- A. General: Submit the following in accordance with conditions of Contract and Division 1 Specification Sections
  - 1. Product data for water service piping and fire protection pipe and specialties.
  - 2. Shop drawings for vaults, junction boxes, valve boxes, manholes, meters, backflow preventers, and other similar water service equipment.

**PART 2 - PRODUCTS**

**2.1 PIPE AND PIPE FITTINGS - GENERAL:**

- A. General: Pipe, valves, fittings and installation in R.O.W. and on site shall comply with requirements of this Section, other referenced Sections of the Project Manual, the Drawings, and the Mobile County Water Authority.
1. Pipe, fittings, hydrants and valves shall be as specified herein, subject to acceptance by the Mobile County Water Authority, unless other specific materials acceptable to the Mobile County Water Authority are indicated on the Drawings.
  2. PVC piping and fittings smaller than 4" shall be C900 PVC, Class 200 plastic pipe, Schedule 40, or Type K Copper; and pipe 4" and larger, below paving and fire lines shall be ductile iron, of type(s) acceptable to the Mobile County Water Authority, unless other specific materials acceptable to the Mobile County Water Authority are indicated on the Drawings.
  3. PVC water piping and fittings 4" and larger shall be C900, Class 250 plastic pipe of type acceptable to local utility company, unless other specific materials acceptable to utility company are indicated on the Drawings.
  4. Ductile iron pipe for fire lines, pipe below paving and where indicated shall meet ANSI A21.51, Grade 60-42-10, and special thickness pressure class 50, (For 6" Pipe this is the same 0.25" wall thickness as Class 350) ductile iron, of type(s) acceptable to local utility company, unless other specific materials acceptable to utility company are indicated on the Drawings.
  5. Note that all water pipe which run under roads, streets, driveways, and other vehicular paving shall be either ductile iron or shall be sleeved in ductile iron sleeves.
  6. Copper pipe where indicated, provide Soft Copper Tube, ASTM B 88-62, Type K hard drawn, water tube, annealed temper.
    - a. Copper, Solder-Joint Fittings: AWWA C800-6 and 66. Corp stops shall be 3/4" Ford F-1000 CC x COMP or equal, curb stops shall be 3/4" Ford B-41-233W COMP x FIP or equal, and service saddles shall be dresser style 194 or equal. Furnish only wrought-copper fittings if indicated.
- B. PVC Plastic, Schedule 40/80 PVC with pressure-rated fittings: Conform to ASTM D 1785 standard specifications for PVC plastic pipe.
- C. PVC Plastic, Water Pipe: AWWA C900, Class 200. Include elastomeric seal according to ASTM F477.
- D. Ductile Iron Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type, and specifically designed for joining PVC pipe; Include elastomeric seals according to ASTM F 477 or as otherwise required for joining plastic pipe specified



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- E. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended in writing by piping system manufacturer, unless otherwise indicated.
- F. Where copper pipe is indicated, provide Soft Copper Tube, ASTM B 88, Type K, water tube, annealed temper.
  - 1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.
- E. Ductile-Iron, Push-on-Joint Pipe: AWWA C151 and ANSI C150, C151, A21.50, and A21.15 respectively, Class 350 as approved by the Mobile County Water Authority, tar coated outside, with cement lining and seal coat according to AWWA C104. Include rubber compression gasket according to AWWA C111.
  - 1. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111 (ANSI 21.11) and according to ASTM D-3139.
  - 2. Joining Materials: AWWA C111 rubber gaskets and lubricant according to ASTM F477 requirements.
- F. Ductile-Iron, Mechanical-Joint Pipe: AWWA C151, with cement-mortar lining and seal coat according to AWWA C104. Include gland, rubber gasket, and bolts and nuts according to AWWA C111.
  - 1. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
  - 2. Joining Materials: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
- G. PE Encasement for Ductile-Iron Piping: ASTM A 674 or AWWA C105, PE film, 0.008-inch (0.20-mm) minimum thickness, tube or sheet.
- H. Pipe Sleeves: Provide pipe sleeves at least one size larger than water service piping required below existing concrete and paving, and as follows.
  - 1. Below Concrete, Entry Pads, and Paving Subject to Only Pedestrian Traffic, and for Future Irrigation: Schedule 40/80 PVC.
  - 2. Below Concrete, Equipment Pads, Dumpster Pads, Valley Gutters, Curbs and Gutters, Paving Subject to Vehicular Traffic, and Where Indicated: Ductile Iron, as specified above herein this Section.
- I. Identification for Underground Plastic Pipe:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Allen Systems, Inc.; Reef Industries, Inc.
    - b. Brady (W.H.) Co.; Signmark Div.
    - c. Calpico, Inc.
    - d. Carlton Industries, Inc.
    - e. EMED Co., Inc.
    - f. Seton Name Plate Co.
  2. Plastic Underground Warning Tapes: Polyethylene plastic tape with metallic core, 6 inches wide by 4 mils thick, solid blue in color with continuously printed caption in blue letters "CAUTION - WATER LINE BURIED BELOW."
- K. Domestic Water Meter – Provide in accordance with Mobile County Water Authority specifications.
1. Meter box and cover shall be traffic-bearing in all paved areas.
- L. Tapping Sleeve and Valve:
1. Tapping sleeves and valves shall be Mueller, mechanical joint, 250 psi or equal.
  2. Tapping sleeves shall have 24"x24"x8" concrete pad in undisturbed soil with solid blocking to support tapping valves.
- M. Valves:
1. Unless otherwise specified, all gate valves up to 12" shall be resilient seat, and all gate valves larger than 12" shall be butterfly type. All valves larger than 12" shall receive approval from the City before installation.
  2. Acceptable manufacturers of gate valves are American-Darling, Dresser M&H, or equal.
- N. Valve Accessories:
1. All buried valves shall be furnished with cast iron, screw type; extendable valve boxes marked "WATER". Acceptable manufacturers are Mueller, M&H Valve, or equal.
  2. Valve boxes shall be mounted plumb in an 18" round concrete valve pad and centered over the operating nut.
  3. One concrete valve marker shall be furnished and set at each line valve. The marker shall be made of 3,000 psi concrete with four #4 reinforcing bars. The size shall be four feet long by 4" on each side.
- O. Hydrants
1. Fire Hydrants shall meet AWWA C-502-80 as well as the local authorities having jurisdiction.
  2. Hydrants shall be manufactured by Mueller or an approved equal.

3. Hydrants shall be equipped with tamper proof caps that will work with City operating wrenches to prevent unauthorized use of water.
4. Hydrants shall be warranted by the manufacturer against defects in materials or workmanship for at least 10 years from the date of manufacture.

**PART 3 - EXECUTION:**

**3.1 INSTALLATION:**

- A. Comply with requirements of Division 22, the International Plumbing Code, Drawings, the Mobile County Water Authority and requirements of other authorities having jurisdiction.
- B. Comply with requirements of the State Health Department, the local Health Department, and authorities having jurisdiction.

**3.2 DEPTH OF COVER:**

- A. Provide minimum cover of 36-inches for all water bearing piping.

**3.3 INSTALLATION OF IDENTIFICATION:**

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

**3.4 CLEANING:**

- A. Clean and disinfect water distribution piping as follows, or as required by utility company, Code, and authorities having jurisdiction:
  1. Purge all new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired, prior to use.
  2. Use the purging and disinfecting procedure prescribed by the authority having jurisdiction or, in case a method is not prescribed by that authority, use the procedure described in AWWA C651, or as described below:
    - a. Fill the system or part thereof with a water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) the system or part thereof and allow to stand for 24 hours.
    - b. Drain the system or part thereof of the previous solution and refill with a water/chlorine solution containing at least 200 parts per million of chlorine and isolate and allow to stand for 3 hours.

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- c. Following the allowed standing time, flush the system with clean, potable water until chlorine does not remain in the water coming from the system.
  - d. Submit water samples in sterile bottles to the authority having jurisdiction. Repeat the procedure if the biological examination made by the authority shows evidence of contamination.
- B. Prepare reports for all purging and disinfecting activities and submit for review and along with each set of "Record Documents".

END OF SECTION 33 1000

SECTION 33 1113 – EXTERIOR DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The Contractor shall supply all labor, equipment, materials and incidentals necessary to install and disinfect all piping and appurtenances located outside the buildings and structures and test as specified herein.
- B. Yard piping shall begin five (5) feet outside face of structures and buildings.
- C. Yard piping shall not include piping below structures.
- D. Furnish all concrete thrust blocks. Also all excavation, backfilling, sheeting, slope protection, drainage, concrete work, rip rap, grading and all other work necessary to complete the construction, installation and testing of the piping.
- E. The water distribution system shall comply with NFPA 24 and shall have the approval of Factory Mutual and local authorities.

1.2 RELATED WORK

- A. Section 312000: Earth Moving
- B. Section 315000: Excavation Support and Protection
- C. Section 331115: Valves and Appurtenances for Site Utilities.
- D. Division 15: Plumbing.

1.3 SUBMITTALS

- A. Submit shop drawings showing a complete laying plan of all pipe, including all fittings, adapters, valves and specials along with the manufacturer's drawings and specifications indicating complete details of all items. The above shall be submitted for approval before fabrication and shipment of these items. The locations of all pipes shall conform to the locations indicated in the drawings. In most cases, a certain amount of flexibility in positioning of pipes will be allowed, especially where new pipes will connect to existing structures or piping.
- B. Test certificates in accordance with Section 51-13 of AWWA C151 shall be furnished prior to shipment of valves to the job site.

1.4 INSPECTION

- A. All pipe and fittings to be installed under this Contract may be inspected at the site of manufacture for compliance with these Specifications by an independent laboratory selected by the Owner.

1.5 APPROVAL OF MATERIALS

- A. Submit to the Engineer for approval, within thirty (30) days after the Notice to Proceed, a listing, including materials to be furnished, the name of the suppliers, the date of delivery of materials to the job site, and a time schedule for the completion of the project.

1.6 QUALITY ASSURANCE

- A. It is the Contractor's responsibility that all pipe units and all component parts of the line are manufactured and installed such that the maximum infiltration/exfiltration limit will not be exceeded, as determined by AWWA C600-87.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Ductile iron pipe for yard piping shall meet the following requirements:
  - 1. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51-91. A minimum of Class 52 pipe shall be supplied for all sizes of pipe unless specifically called out in the drawings. Thickness of pipe to be supplied shall be one (1) class greater than that required under Table 51.1 AWWA C151 (ANSI 21.51). Type 1 Bedding Conditions shall be used for all diameters.
  - 2. The pipe shall be supplied in length not in excess of 20 feet. Pipe shall be either the rubber-ring type push-on joints, standard mechanical joint pipe or restrained joint where required. Ball joint pipe and flange joint pipe shall be used where shown on the drawings. Pipe shall be as manufactured by the American Ductile Iron Pipe Company, U.S. Pipe and Foundry Company, Clow Corporation, or McWayne Pipe Foundry.
- B. All ductile iron pipe fittings for yard piping shall be cast iron or ductile iron with a minimum pressure rating of 150 psi. Fittings shall meet the requirements of ANSI, NEWWA, and AWWA specifications as applicable. Rubber gasket joints shall conform to ANSI A21.11 for mechanical and push-on type joints. Ball joints shall conform to ANSI A21.51, with a separately cast ductile iron bell conforming to ASTM A536, Grade 70-5-05, and a cast steel retainer ring conforming to ASTM A148, Grade 90-60. Flanged fittings shall be furnished faced and drilled to 125 pounds template and conform to ANSI B16.1. All pipe and fittings shall have a cement mortar lining and bituminous seal coat on the inside and a coal tar enamel coat on the outside in accordance with ANSI A21.51 except that cement mortar lining shall be not less than 1/8" in thickness for pipe 2" to 12"

in diameter, 3/16" for 14" to 24" diameter pipe and 1/4" for 30" to 54" pipe with a plus tolerance of 1/8".

### PART 3 - EXECUTION

#### 3.1 HANDLING PIPE AND FITTINGS

- A. Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or coatings. Pipe or fittings shall not be dropped. All pipe for fittings shall be examined before laying, and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired.
- B. All pipe and fittings shall be subjected to a careful inspection and hammer test just prior to being laid or installed.
- C. If any defective pipe is discovered after it has been laid it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to the Owner. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work, and when installed or laid, shall conform to the lines and grades required.

#### 3.2 DUCTILE IRON PIPE

- A. Ductile iron pipe and fittings shall be installed in accordance with requirements of AWWA Standard Specification C600 except as otherwise provided herein. A firm, even bearing throughout the length of the pipe shall be constructed by tamping selected material at the sides of the pipe up to the springline. **BLOCKING WILL NOT BE PERMITTED.**
- B. All pipe shall be sound and clean before laying. When laying is not in progress, including lunch time, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved in laying. The deflection at joints shall not exceed that recommended by manufacturer. Fittings, in addition to those shown on the plans, shall be provided, if required, in crossing utilities which may be encountered upon opening the trench.
- C. When cutting pipe is required, the cutting shall be done by machine, leaving a smooth cut at right angles to the axis of the pipe. Cut ends of pipe to be used with a Tyton bell shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged.
- D. Jointing Ductile-Iron Pipe:
  - 1. Push-on joints shall be made in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in

alignment with the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

2. Mechanical joints at valves, fittings and where designated on the drawings and/or as specified shall be in accordance with the "Notes On Method of Installation" under ANSI Specification A21.11 and the instructions of the manufacturer. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Bolts shall be tight to the specified torque. Under no condition shall extension wrenches or pipe over handle or ordinary ratchet wrench be used to secure greater leverage.
- E. Ball joints, where designated on the Drawings and/or as specified, shall be installed in strict accordance with the manufacturer's instructions. Where ball joint assemblies occur at the fact of structures or tanks, the socket end shall be at the structure or tank and the ball end assembled to the socket.
- F. All valves, hydrants, fittings and other appurtenances needed upon the pipe lines shall be set and jointed as indicated on the Drawings or as required by the manufacturer.

### 3.3 HYDRANTS

- A. Hydrants shall be set plumb on firm material, shall be well braced and anchored by depositing concrete between the hydrant and undisturbed material at the end of the trench as shown on the drawings, or it shall be tied to the pipe with suitable rods or clamps, galvanized, painted or otherwise rustproof treated.
- B. A drainage pit shall be excavated below each hydrant as shown on the drawings and filled with free draining granular fill under and around the bowl of the hydrant and to a level of 6" above drain openings.

### 3.4 VALVES AND VALVE BOXES

- A. Valves and valve boxes shall be installed as shown on the drawings. Mechanical joints shall be made in the standard manner. Valve stems shall be vertical in all cases. Place cast iron box over each stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Knobs on cover shall be parallel to pipe.

### 3.5 THRUST BLOCKS

- A. Longitudinal thrust along pipe lines of bends, tees, reducers, and caps or plugs shall be counteracted by thrust blocking, as shown on the drawings. Where the bends are in a vertical plane, the thrust shall be counteracted by enough weight of concrete to counterbalance the vertical thrust forces. Where undisturbed trench walls are not available for thrust blocking, the Contractor shall furnish and install suitable pipe harnesses or ties designed and manufactured specifically for this purpose.



- B. Joints shall be protected by felt roofing paper prior to placing concrete.
- C. Bearing area of thrust blocks shall be adequate to prevent any movement of the fitting and shall be of the size and dimensions as shown on the drawings.
- D. Concrete for thrust blocking shall be no leaner than 1 part cement, 1-1/2 parts sand and 5-1/2 parts stone. Concrete shall be placed against undisturbed material, and shall not cover joints, bolts or nuts, or interfere with the removal of any joint. Wooden side forms shall be provided for thrust blocks.
- E. In lieu of thrust blocking and with prior approval, pipe harnesses and/or ties or restrained push-on or restrained mechanical joints may be used.

### 3.6 TESTING

- A. Furnish all necessary equipment and labor for carrying out a pressure test and leakage test on the pipelines.
- B. Make any traps and furnish all necessary caps, plugs, etc., as required in conjunction with testing a portion of the pipe between valves. Also, furnish a test pump, gauges, and any other equipment required with carrying out the hydrostatic tests.
- C. Domestic water pipelines shall be subjected to a hydrostatic pressure of 50% above the normal working pressure of 150 psi and this pressure maintained for at least 30 minutes. The leakage test shall be conducted at the maximum operating pressure of 200 psi, and this pressure shall be maintained for at least 60 minutes during this test. The amount of leakage which will be permitted shall be in accordance with the Specifications for Installation of Water Mains, AWWA C600.

END OF SECTION 331113

SECTION 33 1115 – VALVES AND APPURTENANCES FOR SITE UTILITIES

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals and install complete and ready for operation all valves and appurtenances as shown on the drawings and as specified herein.
- B. The equipment shall include, but not be limited to, the following:
  - 1. Gate valves
  - 2. Post indicator

1.2 RELATED WORK

- A. Section 312000: Earth Moving
- B. Sections 315000: Excavation Support and Protection.

1.3 QUALIFICATION

- A. All of the types of valves and appurtenances shall be the products of firms fully experienced and qualified in the manufacture of the particular equipment to be furnished. The equipment shall be designed, constructed and installed in accordance with the best practices and methods and shall comply with these specifications as applicable.

1.4 SUBMITTALS

- A. Submit within thirty (30) days after execution of the contract a list of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.
- B. Complete shop drawings of all valves and appurtenances shall be submitted for review.

1.5 TOOLS

- A. Special tools, if required for normal operation and maintenance shall be supplied with the equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

#### A. General:

1. All valves and appurtenances shall be of the same size shown on the drawings and as far as possible all equipment of the same type shall be from one manufacturer.
2. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.

#### B. Gate Valves and Appurtenances:

1. Gate valves for water shall meet the requirements of AWWA C509. Valve shall be rated for 150 psi working pressure and a minimum 300 psi test pressure. Valves shall be iron body, bronze-mounted, double disc, parallel seat, non-rising stem type fitted with "O-Ring" seals. The operating nuts shall be 2" square. All valves shall open left, or counterclockwise. Stuffing boxed shall be the "O-Ring" type. Gate valves shall be mechanical joint, ANSI Standard 21.11 except where shown otherwise. Flange joint shall be ANSI B16.1 standard. Bell joint shall be AWWA Class 150.
2. All buried valves shall have cast iron three piece valve boxes. Valve boxes shall be provided with suitable heavy bonnets and to extend to such elevation at or slightly above the finished grade. The barrel shall be two-piece, sliding type, having 5-1/4" shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling.

- #### C. Where shown on the drawings Post Indicators for the gate valves shall be M & H Floor Stand Style, as manufactured by Clow Coperation, Eddy-Iowa Division or approved equal.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired before they are installed.
- B. After insulation, all valves and appurtenances shall be tested at least 1 hour at the working pressure corresponding the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired.
- C. Buried flanged or mechanical joints shall be made with cadmium plated bolts. All exposed bolts shall be made with cadmium plated bolts. All exposed bolts and nuts shall

be heavily coated with two (2) coats of bituminous paint comparable to Inertol No. 66 Special Heavy.

- D. Prior to assembly of split couplings, the grooves as well as other parts shall be thoroughly cleaned. The ends of the pipes and outside of the gaskets shall be moderately coated with petroleum jelly, cup grease, soft soap or graphite paste, and the gasket shall be slipped over one pipe end. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, metal-to-metal, without excessive bolt tension.
- E. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8". Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6" from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flares. After the bolts have been inserted and all nuts have been made up finger tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferable by use of a torque wrench of the appropriate size and torque for the bolts.
- F. Castings shall be of good quality, strong, tough, even grained, smooth, free from scale, lumps, blisters, sand holes, and defects of any kind which render them unfit for the service for which they are intended. Castings shall be thoroughly cleaned and will be subjected to a hammer inspection in the field. All finished surfaces shown on the drawings and/or specified shall be machined to a true plane surface and shall be true and seat at all points without rocking. Allowances shall be made in the patterns so that the thickness specified or shown shall not be reduced in obtaining finished surfaces. Castings will not be acceptable if the actual weight is less than 95% of the theoretical weight computed from the dimensions shown. Provide facilities for weighing castings showing true weights, certified by the supplier.
- G. All steel surfaces to come in contact with exposed concrete or masonry shall receive a protective coating of an approved heavy bituminous trowelling mastic applied in accordance with the manufacturer's instructions prior to installation.

### 3.2 SHOP PAINTING

- A. Paint used for coating valves shall comply with the following Fed. Spec. TT-V-51, TT-C-494a, AWWA C-550. The asphalt varnish shall be applied to the ferrous parts of the valves except for finished or seating surfaces. Surfaces shall be clean and dry before painting. Two coats shall be applied to both the inside and outside ferrous metals. A coating conforming to AWWA C-550 may be used on the interior and/or exterior ferrous surfaces.

3.3 INSPECTION AND TESTING

- A. Completed pipe shall be subjected to hydrostatic pressure test for 12 hours at full working pressure. All leaks shall be repaired and lines re-tested. Prior to testing, the gravity pipelines shall be supported in an approved manner to prevent movement during tests.

END OF SECTION 331115

SECTION 33 3113.13 – GRAVITY FLOW SANITARY SEWERS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. The work covered under this section includes furnishing all labor, equipment, and materials required to furnish, install, test, and inspect gravity flow sanitary sewers as shown on the Plans and specified in this section. Unless directed otherwise in writing by the Owner's Engineer, the Contractor shall use only the pipe size and material specifically designated on the Plans.

1.2 RELATED SECTIONS

- A. Section: Submittal Procedures
- B. Section: Product Requirements
- C. Section: 312000: Earth Moving
- D. Section: 312319: Dewatering
- E. Section: 333113.13: Gravity Flow Sanitary Sewers
- F. Section: 333113.15: Ductile Iron Sanitary Sewer Pipe and Fittings
- G. Section: 333113.16: PVC Gravity Sewer Pipe
- H. Section: 333913.13: Precast Concrete Manholes

1.3 REFERENCES

- A. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457-mm (180-in) Drop.
- B. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
- C. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
- D. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
- E. ASTM D1557 - Standard Test Method for Laboratory, Compaction Characteristics of Soils Using Modified Proctor Effort (56,000 ft-lb/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
- F. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

**DALTON PICKLEBALL COMPLEX**

**DALTON, GA**

PROJECT NO. 2024-0283

Prime Engineering, Inc.

February 28, 2025

- G. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
- H. American Water Works Association (AWWA), Latest Revisions.

1.4 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 013300 – Submittal Procedures.
- B. The Contractor shall submit:
  - 1. Proposed methods for sewer construction.
  - 2. Equipment for sewer construction.
  - 3. Materials for sewer construction.
  - 4. Sequence of operations for sewer construction.
- C. The Contractor shall plan operations to minimize disruption of utilities and to occupied facilities on adjacent property.
- D. The Contractor shall submit manufacturers' instructions indicating special procedures required to install products specified.
- E. The Contractor shall submit certifications that products meet or exceed the requirements specified in these Specifications.
- F. The Contractor shall submit a set of plans (modified to show as-built conditions.)
- G. The Contractor shall submit test reports.
- H. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:
  - 1. **Delays:** Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
  - 2. **Weather:** Conditions (e.g., rain, sunny, windy, etc.).
  - 3. **Equipment:** On site (e.g., specialty cleaning, by-pass equipment, etc.).
  - 4. **Submittals:** To the Owner's Engineer.
  - 5. **Personnel:** On site by name (e.g., all labor, specialty services, etc.).
  - 6. **Accident:** Report (e.g., all injuries, vehicles, etc.).
  - 7. **Incident:** Report (e.g., damage to property, property owner complaint, etc.).
  - 8. **Major defects encountered:** including collapsed pipe, if any, cave-ins, sink holes, etc.
  - 9. **Visitors:** On site.
  - 10. **Disposals:** Type and quantity of debris (including liquids).
- I. For projects entering a State controlled right-of-way:
  - 1. If any portion of a proposed project enters a state controlled right-of-way, then a state DOT permit application is required. Owner shall submit to the Local Municipality the required material in hard copy and in electronic form, on a CD. Hard copy forms, permits, and

drawings, etc. must be 8 ½" X 11" in size, drawings need not be to scale. All measurements necessary for the permit application must be submitted in English. Generally, portions of the project design can be reduced in size and matchlined, if necessary, as long as the text is still legible. Compaction notes indicating compaction requirements must be included on every construction drawing required for the application (See Section 312000 – Earth Moving for backfill requirements). Submittal shall include four (4) each of the following: plan, profile, traffic control plan, and section from the state DOT county map. Owner to comply with state required checklist.

2. The state may require the permit application to be submitted through a specific permitting agency. The Owner is to determine the appropriate agency and follow the guidelines indicated. In such cases where the Owner is not to submit the state DOT permit directly through the applicable permitting system, the Owner is to provide all necessary information, as stated above, and the Local Municipality shall review the information and provide comments (if necessary). Once the necessary information has been approved, the Local Municipality shall submit the state DOT permit application through the appropriate permitting system.

#### 1.5 QUALITY ASSURANCE

- A. The Contractor shall provide the Owner's Engineer with the product manufacturers' written certification that all products furnished comply with all applicable provisions of these Specifications. Except as may be modified herein, all materials used in the manufacture of pipe, linings, manholes, and castings shall be new and shall be tested in accordance with the referenced standards, as applicable. The Contractor shall be responsible for performing and paying for sampling and testing as necessary for the certifications. The Owner's Engineer shall have the right to witness testing of the materials.
- B. The sewer pipe shall be tested and inspected at the place of manufacture for all requirements of the latest applicable ASTM standards, and certified copies of the test report covering each shipment shall be submitted to the Owner's Engineer prior to laying. After delivery, pipe and fittings will be subject to inspection by and approval of the Owner's Engineer. No broken, cracked, misshaped, or otherwise damaged or unsatisfactory pipe, fittings, or damaged concrete lining shall be used.
- C. Each pipe shall be clearly marked as required by the applicable ASTM standard specifications to show pipe class, date of manufacture, date coated, type of coating, and manufacturer's trademark.
- D. All pipe, accessories, and specials shall be new material.
- E. If directed by the Owner's Engineer, each pipe manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of five (5) days during initial pipe installation.
- F. All pipes shall be subject to inspection by the Owner's Engineer at the place of manufacture. The Contractor shall notify the Owner's Engineer in writing of the manufacturing start date at least fourteen (14) days prior to the start of manufacturing. The Contractor shall be responsible for all inspection costs.



- G. All pipes shall be inspected upon arrival. If any portion of a shipment is found to be defective in diameter or thickness, the entire shipment shall be rejected and removed from the Site of the Work at no cost to the Owner. Each section of pipe shall again be thoroughly inspected immediately prior to lowering it into the trench to insure that the interior is clean and to check for joint scratches, chipped ends, and imperfect gasket seats. Any defective pipe or fitting discovered after the pipe is laid shall be removed and replaced with a satisfactory pipe or fitting without additional cost to the Owner.

**1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING**

- A. The Contractor shall inspect pipe materials and fittings upon arrival at the Site of the Work.
- B. The Contractor shall handle and store pipe materials and fittings to protect them from damage due to impact, shock, shear, or free fall. The Contractor shall not drag pipe and fittings along the ground. The Contractor shall not roll pipe unrestrained from delivery trucks.
- C. The Contractor shall use mechanical means to move or handle pipe. The Contractor shall employ acceptable clamps, rope, or slings around the outside barrel of pipe and fittings.
- D. Comply with the requirements of Section – Product Requirements.

**1.7 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY**

- A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.
- B. In the event that the Contractor’s activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the local municipality dispatch center and the Owner; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the local municipality’s Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP).
- C. The Contractor shall indemnify and hold harmless the Owner for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the Owner, Owner’s Engineer, and Owner’s employees in defending such fines and claims.
- D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to the Owner’s utilities that is caused by the Contractor’s equipment or operation shall be repaired in a manner approved by the Owner’s Engineer at the Contractor’s expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor’s expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor’s equipment is the Contractor’s responsibility.

If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The Owner reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

## 1.8 SAFETY

- A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

## PART 2 – PRODUCTS

### 2.1 PIPE MATERIALS

- A. All materials used in the construction of gravity flow sanitary sewers shall be new, unused, and shall be of the sizes indicated on the Plans.
- B. All materials shall be in strict compliance with the required standards and specifications including ASTM, ANSI, and AWWA.
- C. At points of the sewer where a change in pipe classification is shown on the Plans, the Contractor may begin at the next joint of pipe rather than cutting the pipe and constructing a collar unless there is a change in horizontal or vertical alignment. In the event the pipe is cut, there shall be no torch cutting, only saw cutting will be allowed.
- D. Ductile Iron Pipe and fittings shall conform to the requirements of Section 333113.15 – Ductile Iron Sanitary Sewer Pipe and Fittings.

### 2.2 TRANSITION COUPLINGS

- A. Transition joints between sewer pipes of different materials shall be accomplished by the use of the local municipality's standard for concrete collar walls. Use of any other material shall require approval by the Owner's Engineer.

### 2.3 APPURTENANCES

- A. Manholes shall conform to the requirements of Section 333913.13 – Precast Concrete Manholes.

### 2.4 BACKFILL

- A. Pipe backfill materials shall conform to the requirements of Section 312000 – Earth Moving.

- B. Topsoil shall conform to the requirements of Section 329000 – Planting.

### PART 3 – EXECUTION

#### 3.1 GENERAL

- A. The Contractor shall control traffic in accordance with the requirements of the Traffic Regulation section of the local municipal specifications and regulations.
- B. All activities shall be performed in accordance with the manufacturers' recommendations and regulations established by OSHA. Particular attention shall be drawn to those safety requirements involving working with scaffolding and entering confined spaces.
- C. The Contractor shall identify the locations of all existing underground utilities prior to commencing excavation activities. The Contractor shall consult with the local Call Before You Dig and any utility companies if necessary to verify the locations of existing underground utilities.
- D. The Contractor shall notify the agency or company owning any utility line which is damaged, broken, or disturbed. The Contractor shall obtain approval from the Owner's Engineer and the utility owner prior to performing any temporary or permanent repairs or relocation of utilities.
- E. The Contractor shall install and operate a dewatering system in accordance with the requirements of Section 312319 – Dewatering.
- F. Where wastewater flow diversion is required for the performance of the Work, the Contractor shall provide wastewater flow diversion in accordance with Local Regulations and City personnel present during installation.
- G. The contractor will repair any damaged cleanout. If there is no clean out, then the Owner, as part of a specific upgrade project, may instruct the contractor to install a clean out that is appropriate to the existing lateral size (4", 6", 8", or as directed) from the property line to the main. This includes the "Y" in connection back to the home owner's line as part of the installation.

#### 3.2 MANUFACTURER CERTIFICATION

- A. The manufacturer shall certify that the contractor is properly trained in the method or system being used.
- B. The manufacturer should be on site for 2 to 5 eight-hour days or more depending on project size to confirm that the contractor is doing the installation correctly.

#### 3.3 GRAVITY SANITARY SEWER WITHIN GDOT RIGHT-OF-WAY

- A. Traffic control shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

- B. Trench restoration within a state DOT right-of-way shall be in accordance with applicable state standard details.
- C. All bore and jack pits must be a minimum of ten (10) feet from outside edge of pavement. Plans shall show casing size and carrier pipe size within the approach slab for bridge crossings.
- D. All documents necessary for the state DOT application must be provided by the Owner's Engineer to the Local Municipality.

### 3.4 PIPE LAYING

- A. The Contractor is responsible for accurately placing pipe to the exact line and grade shown on the Plans. The control of vertical and horizontal alignments shall be accomplished by the use of a laser beam instrument. When a laser is used, the elevation and alignment of the pipe shall be checked by transit and level rod every fifty (50) feet for smaller pipe and every joint for pipe forty eight (48) inches and larger. Other approved methods of controlling vertical and horizontal alignments may be used if specifically authorized by the Owner's Engineer. The pipe section may be adjusted by the use of "come-along" of approved design and anchorage. The practice of bumping or snatching (with backhoe or crane, etc.) used to adjust pipe after placement in the trench, will not be permitted. The Contractor shall furnish all labor and materials necessary for controlling the line and grade.
- B. Each piece of pipe and special fitting shall be carefully inspected before it is placed, and no defective pipe shall be laid in the trench. Before a sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells uphill. Trench bottoms found to be unsuitable for foundations shall be undercut and brought to exact line and grade with pipe cushion, concrete cradles, foundation backfill, or as directed by the Owner's Engineer.
- C. For bell and spigot pipe, bell holes shall be of sufficient size to allow ample room for properly making the pipe joints. Bell holes shall be cut no more than five (5) joints ahead of pipe laying. The bottom of the trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets or inequalities in the flow line.
- D. Water shall not be allowed to run or stand in the trench while pipe laying is in progress or before the trench has been backfilled. The Contractor shall not open up at anytime more trench than his available pumping facilities are able to dewater. Movement of water that would tend to erode or affect the trench walls will not be allowed.
- E. As the work progresses, the interior of all pipe in place shall be thoroughly cleaned. After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.
- F. Backfilling of trenches shall be started immediately after the pipe is in place and the joints completed, inspected, and approved by the Owner's Engineer.

- G. At times when work is not in progress, open ends of pipe and fittings shall be securely closed, to the satisfaction of the Owner, so that trench water, earth or other substances will not enter the pipe or fittings.

### 3.5 JOINT CONSTRUCTION

- A. For bell and spigot pipe, the inside of all bells and the outside of all spigots shall be wiped to remove all dirt, water, or other foreign matter so that their surfaces are clean and dry when the pipes are joined.
- B. Rubber ring gasket joints for sewer pipe shall be installed in accordance with the pipe manufacturer's specifications and recommendations. Extreme care shall be used in joining large diameter pipe to avoid damaging the rubber ring or displacing it from the proper operating position.
- C. Joints on ductile iron pipe sewers shall be compression joints, except where mechanical or flanged joints are called for on the Plans, and shall be installed in accordance with the pipe manufacturers' specifications and recommendations.
- D. After the joints have been completed, they shall be inspected by the Owner's Engineer before they are covered. Any leaks or defects discovered at any time after completion of the Work shall be repaired immediately. Testing of gravity sewers shall be performed in accordance with the requirements of Section 330130.13 – Sewer and Manhole Testing. All pipes in place shall be carefully protected from damage until the backfilling operations have been completed. Any pipe which has been disturbed after jointing shall be removed, the joint cleaned and remade and the pipe re-laid at the Contractor's expense.

### 3.6 TEE CONNECTIONS

- A. Tee branches shall be installed in sanitary sewer lines at all points shown on the Plans or as directed by the Owner's Engineer. If such branches are not to be used immediately, they shall be closed with approved stoppers and shall be physically restrained.
- B. Tees shall be installed in sanitary sewers so as to properly connect each existing house and to serve each vacant lot facing or abutting on the street or alley in which the sewer is being laid and at such other locations as may be designated by the Owner's Engineer. The exact location of each connection shall be recorded by the Contractor, on the record drawings, utilizing conventional GPS survey, before backfilling and said records delivered to the Owner's Engineer.
- C. Tees shall be standard manufactured tees.

### 3.7 CONNECTING RISERS

- A. Where shown on the Plans, included in Special Conditions, or directed by the Owner's Engineer, and where the depth of cut is over eight (8) feet or where the grade of a sanitary sewer is lower than necessary to drain abutting property, and at such other locations as may be designated by the

Owner's Engineer, connecting risers shall be installed to connect each existing house and to serve each vacant lot facing or abutting on the street on which the sewer is being laid.

- B. Connecting risers shall be sized in accordance with the plumbing code in effect at the time of construction but shall not be smaller in size than shown on the Plans. Risers shall be installed from a tee connection to the elevation needed to connect house services, the elevations shown on the Plans, or as directed by the Owner's Engineer. The tee connection shall be installed at the location shown on the Plans, and in accordance with the Detail Drawings. Open ends of connecting risers shall be closed with approved stoppers and be physically restrained. Backfilling shall be carefully done around risers using materials specified in Section 312000 – Earth Moving, and compacted to the equivalent density of the surrounding undisturbed material.
- C. For more details of the infrastructure acceptance process, review the Infrastructure Acquisition Program document. This document can be found on Department of Watershed Management website under the Consent Decree Program.

### 3.8 HOUSE SEWERS AND MULTIPLE DWELLING SEWERS

- A. Stubouts for house service lines and multiple dwelling service lines shall be installed when stipulated in the Special Conditions or shown on the Plans. However, additional connections shall be installed by the Contractor when directed by the Owner's Engineer.
- B. House service lines for single dwelling units shall consist of six (6) inch diameter sewer pipes. Service lines for multiple dwelling units served by a single line shall consist of eight (8) inch diameter or larger sewer pipes, constructed as specified in this section. If the Construction Standards in effect at the time of construction specifies larger pipe or if the existing house service line is larger/smaller than the specified diameters, then the larger/smaller pipe shall be installed. House service line stubouts for vacant lots shall be installed at the locations shown on the Plans or designated by the Owner's Engineer to provide a service line from the tee in the sewer. House service line stubouts shall be installed in accordance with the Detail Drawings. The open end of such stubouts shall be closed with approved stoppers and properly restrained.
- C. Cleanouts shall be installed for each continuous run of one hundred (100) feet and at each change in horizontal or vertical direction. Cleanouts shall be constructed in accordance with the Detail Drawings. Cleanouts shall be plugged with approved stoppers. Stoppers shall be properly restrained.
- D. Backfilling for service lines shall commence immediately upon acceptance by the Owner's Engineer. Backfill materials shall be as specified in Section 312000 – Earth Moving, and shall be compacted to the equivalent density of the surrounding undisturbed material.
- E. For more details of the infrastructure acceptance process, review the Georgia Department of Environmental Protection (GDEP).

### 3.9 CONNECTING EXISTING SANITARY SEWERS TO NEW SANITARY SEWERS

- A. All new sanitary sewers shall be connected to existing sanitary sewers as shown on the Plans or as directed by the Owner's Engineer. Connections shall be made by the construction of a manhole or utilization of an existing manhole.
- B. Connection of lateral collector sewers to large diameter trunk sewers shall be made at existing manholes or new manholes.
- C. Connections to existing manholes shall be made by coring a hole in the wall of the existing manhole, installing a boot, inserting a minimum length of eighteen (18) feet of ductile iron pipe into the hole, filling around same with non-shrinking grout and troweling the inside and outside surfaces of the joint to a neat finish.

### 3.10 TOLERANCES

- A. Invert Elevations: The invert elevations shown on the Plans shall be for the invert at the centerline of the precast concrete manhole. Prior to setting the laser or other vertical alignment control system for the sewer upstream of the manhole, the Contractor shall verify the elevation of the sewer installed at the manhole. Should the elevation differ from that shown on the Plans, the Contractor shall take the following corrective action:
  - 1. If the sewer is laid at negative grade, the Contractor shall remove and reinstall the sewer at the correct grade at no additional cost to the Owner.
  - 2. If the sewer is laid at a grade less than that shown on the Plans, thus reducing the sewer's capacity, the Owner may require the sewer to be removed and re-laid at the correct grade at no additional cost to the Owner. As a minimum, the grade to the next upstream manhole shall be adjusted such that the next upstream manhole shall be set at the correct elevation.
  - 3. If the sewer is laid at a grade greater than that shown on the Plans, and if the Contractor can show that there are no conflicts with upstream existing utilities or obstructions, the Contractor shall adjust the grade of the next upstream manhole such that the next upstream manhole shall be set at the correct elevation. If such an adjustment, in the Owner's opinion, is substantial, the grade adjustment shall be spread over multiple sections of the sewer. If such an adjustment, in the Owner's opinion, significantly reduces the sewer's capacity, the Owner may require the Contractor to remove and relay that portion of the sewer laid at the improper grade.

### 3.11 PIPE PROTECTION

- A. Where foundation conditions are not satisfactory, as determined by the Owner's Engineer, the sewer pipe shall be protected with proper pipe protection as shown on the Plans or as directed by the Owner's Engineer.
- B. Plain concrete ditch checks may be required by the Owner's Engineer on steep slopes and other locations to prevent erosion of the backfilled trench.

### 3.12 TESTING

- A. All manholes and gravity flow sanitary sewer and joints shall be vacuum tested in accordance with the requirements Section 333113.13 –Gravity Flow Sanitary Sewers.
- B. Testing shall be performed in the presence of the Owner’s Engineer.

### 3.13 CLEANUP

- A. After completing each section of the sewer line, the Contractor shall remove all debris and construction materials and equipment from the Site of the Work; grade and smooth over the surface on both sides of the line; and leave the entire construction area in a clean, neat, and serviceable condition. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The local municipality can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor. The Contractor shall restore the Site of the Work to the original or better condition as shown.
- B. Prior to requesting a final inspection, the Contractor shall remove and dispose of all shipping timbers, shipping bands, boxes, and other like debris brought to the Site of the Work.
- C. Any lawns, fences, drainage culverts, or property damaged by the sewer construction shall be repaired or replaced to equal or better condition than existing prior to commencement of the Work.
- D. All shoulders, ditches, culverts, and other areas affected by the sewer construction shall be at the proper grades and smooth in appearance to provide positive drainage of the Site of the Work.
- E. All manhole covers shall be brought to grade, as shown on the Plans, or as directed by the Owner’s Engineer. Manholes in the unpaved area shall be above grade according to the local municipal Design Standards.

### 3.14 WARRANTY

- A. The Contractor shall guarantee his work for a warranty period of one (1) year from the date of final acceptance.
- B. Within the warranty period, the Owner may inspect the work, and if repairs are needed, the repairs shall be made on a case by case basis at no cost to the Owner. For the localized repairs, the warranty period shall be one additional year.
- C. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION 333113.13



SECTION 33 3113.15 – DUCTILE IRON SANITARY SEWER PIPE AND FITTINGS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Requirements for the product, installation and testing of ductile iron pipe.
- B. Specifications for ductile iron pipe fittings and applicable ASTM/AWWA code requirements.
- C. Testing and product specifications and requirements for ductile iron pipe.

1.2 RELATED SECTIONS

- A. Section 312000: Earth Moving
- B. Section 312319: Dewatering
- C. Section 315000: Excavation Support and Protection
- D. Section 330130.13: Sewer and Manhole Testing
- E. Section 330500: Common Work Results for Utilities
- F. Section 333113.13: Gravity Flow Sanitary Sewers

1.3 REFERENCES

- A. ANSI A21.4 (AWWA C104) - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, for Water and Other Liquids
- B. ANSI A21.10 (AWWA C110) - Ductile Iron and Gray Iron Fittings, 3-in. through 48-in., for Water and Other Liquids
- C. ANSI A21.11 (AWWA C111) - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
- D. ANSI A21.15 (AWWA C115) - Flanged Ductile Iron Pipe with Threaded Flanges
- E. ANSI A21.50 (AWWA C150) - Thickness Design of Ductile Iron Pipe
- F. ANSI A21.51 (AWWA C151) - Ductile Iron Pipe, Centrifugally Cast for Water and Other Liquids
- G. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings

- H. ASTM A370 – Standard Test Method and Definitions for Mechanical Testing of Steel Products
- I. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe
- J. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials
- K. ASTM E8 – Tension Testing of Metallic Materials
- L. ASTM E23 – Standard Test Methods for Notched Bar Impact Testing of Metallic Materials
- M. ASTM G62 - Test Methods for Holiday Detection in Pipeline Coatings
- N. AWWA C600 - Standard for Installation of Ductile Iron Water Mains and Their Appurtenances
- O. SSPC-SP6 - Steel Structures Painting Council, Commercial Blast Cleaning

#### 1.4 SUBMITTALS

- A. The Contractor shall submit, for the Owner’s approval, descriptive details and shop drawings indicating piping layout in plan and elevations as may be required and shall be completely dimensioned. The Drawings shall include a complete schedule of all pipe, fittings, specials, hangers, and supports. Special castings shall be clearly detailed showing all pertinent dimensions.
- B. The Contractor shall provide manufacturers' certifications that all ductile iron pipe and fittings meet the provisions of this section and meet the requirements of ANSI A21.51 (AWWA C151). Product certification shall include tensile and Charpy test results traceable to pipe numbers and testing periods. For pipe sizes thirty (30) inches and larger, hydrostatic test charts including pipe numbers for each test cycle shall be furnished as part of the certification test reports. Chemical analysis shall be furnished for each ladle of iron covering each pipe cast and must correlate with the mechanical test results. For pipe sizes thirty (30) inches and larger, complete traceability is required throughout the certification process and must be clearly legible on each pipe at the point of installation. Hydrostatic test results for any size pipe shall be furnished to the Owner’s Engineer.
- C. The Contractor shall provide certifications insuring all pipe joints have been tested and meet the requirements of ANSI A21.11 (AWWA C151).
- D. The Contractor shall furnish the Engineer with lists, in duplicate, of all pieces of pipe and fittings in each shipment received. These lists shall give the serial or mark number, weight, class, size, and description of each item received.
- E. At project closeout, the Contractor shall submit record drawings of installed sanitary sewer piping and products.

**PART 2 - PRODUCTS**

**2.1 DUCTILE IRON PIPE**

- A. The attention of the Contractor is directed to the provisions of the Conditions of the Contract requiring the inspection and testing of materials to be incorporated into the Work. All materials to be tested in accordance and meet or exceed the requirements of AWWA C151.
- B. Unless otherwise specified herein, all ductile iron pipe and fittings and cast iron fittings shall be cleaned and provided with a bituminous coating and cement lining applied at the factory.
- C. Ductile iron pipe shall be centrifugally cast, manufactured, and tested in accordance with the requirements of ASTM A746 and furnished in minimum eighteen (18) feet to twenty (20) feet lengths unless otherwise approved by the Owner's Engineer. Pipe class (wall thickness) will be as directed by the Owner's Engineer; however, minimum thickness shall be Class 350.
- D. Pipe shall be either push-on or mechanical joint type conforming to the latest requirements of the latest revision of ANSI Standard Specifications A21.50/A21.51, Pressure Class 350 Ductile Iron, unless otherwise specified herein.
- E. Ductile iron pipe shall be designed in accordance with ANSI A21.50, "thickness Design of Ductile Iron Pipe", using 60,000 psi tensile strength, 42,000 psi yield strength, and 10 percent elongation.
- F. Ductile iron pipe shall be manufactured in accordance with ANSI A21.51; "Ductile Iron Pipe Centrifugally Cast in Metal Molds or Sand-Line Molds for Water or Other Liquids" and shall be made of ductile iron having a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi yield strength, and 10 percent minimum elongation.
- G. The weight, class or nominal thickness, and casting period shall be shown on each pipe. The pipe manufacturer's identifying mark, the year in which the pipe is produced, and the letters "DI" or "DUCTILE" are to be cast or stamped on the pipe. When specified on the purchase order, initials not exceeding four (4) in number are to be stamped on the pipe. All pipe markings are to be on or near the bell.

**2.2 FITTINGS**

- A. The Contractor shall use fittings of the same size and pressure rating as the pipe.
- B. Provide fittings with a body thickness and radii of curvature conforming to the latest ANSI Standard Specification A21.10 and joints in accordance with the latest ANSI Standard Specification A21.11.
  - 1. Whenever connections are made between ductile iron pipe and pipe of other materials, use of an approved type of transition gasket or coupling is required.
  - 2. All pipe and fittings shall be bituminous coated at the point of manufacture in accordance with the latest revision of ANSI A21.51.

- C. Unless otherwise specified elsewhere in these Specifications or approved by the Owner's Engineer, mechanical joint fittings shall be used for both push-on type pipe. Ductile iron fittings for push-on pipe shall be designed for the same working pressure, laying conditions, and cover as the pipe which is used.
- D. Fittings manufactured for ductile iron pipe shall conform to the requirements of ANSI A21.10 (AWWA C110), unless not made in C110, and C153 will be approved.
- E. Resilient Connector (Rubber Boot): All pipes entering a manhole must be sealed by a resilient connection (rubber boot) meeting the latest revision of ASTM C923 such as A-Lok, Z-Lok or Kor-n-Seal. The material is to be EPDM Rubber.

### 2.3 JOINTS

- A. Joints for ductile iron pipe shall be push-on type such as Fastite, Tyton, or Super Bell-Tite or approved equal unless mechanical joints are specified elsewhere in these Specifications or approved by the Owner. Joints shall be manufactured in accordance with the requirements of ANSI A21.11 (AWWA C111).
- B. Unless otherwise shown on the Drawings, specified or directed, all ductile iron pipe laid underground shall be joined using mechanical joints or push-on type joints.
- C. For ball and socket joints, the bell, ball, and retainer shall be ductile iron, Grade 60-42-10, conforming to the requirements of ANSI A21.11 (AWWA C111).
- D. Joints for flanged pipe shall conform to the requirements of ANSI A21.11 (AWWA C111).
- E. Mechanical Joints:
  - 1. Mechanical joints shall consist of a bolt joint of the stuffing box type as detailed in ANSI A21.10 and described in ANSI A21.11.
  - 2. Mechanical joints shall be thoroughly bolted in accordance with the manufacturer's recommendations with Tee Head Bolts and bolts of high strength, heat treated cast iron containing 0.50 percent copper or high strength low-allow steel having a minimum yield point strength of 40,000 pounds per square inch and an ultimate tensile strength of 70,000 pounds per square inch.
  - 3. Gaskets and bolts and nuts shall conform to ANSI A21.11. Gaskets shall be of neoprene or rubber of such quality that they will not be damaged by the liquid or gases with which they will come into contact.
  - 4. Glands for ductile iron shall be of high strength ductile iron, and glands for cast iron shall be of high strength cast iron.

### 2.4 COATINGS

- A. All ductile iron pipe and fittings and cast iron fittings buried underground or submerged shall have a standard bituminous outside coating conforming to ANSI A21.6 or A21.51. All exposed ductile iron pipe and ductile iron and cast iron fittings shall have an outside coating of universal primer.

- B. All ductile iron pipe used for water or Wastewater shall have cement mortar lining of standard thickness in accordance with ANSI A21.4. Cement mortar lining for cast iron and ductile iron fittings shall be double the standard thickness under ANSI A21.4
- C. No lining shall be provided for ductile iron pipe and ductile iron and cast iron fittings used for air.
- D. Where a special lining is indicated on the Drawings for resistance to corrosive wastewaters, pipe and fittings shall be furnished with a minimum 20 mil thick lining of chemically inert, abrasion resistant polyethylene. The lining shall be a blend of high density and low density polyethylene powders complying with ASTM D 1248 compounded with carbon black to provide resistance to ultraviolet rays during storage above ground. The pipe shall be preheated in a furnace (to ensure uniformity of heat distribution) to an adequate temperature to provide uniform fusing of the polyethylene powders and proper bonding to the pipe. The lining shall be unaffected by hydrogen sulfide, detergents, grease, oil, inorganic acid, alkalis, and most organic materials found in municipal wastewaters and shall be suitable for service at operating temperatures of up to 180 degrees F. The lining shall have a Hazen-Williams "C" coefficient of approximately 150 and a Manning "n" coefficient of approximately 0.010. Polyethylene-lined ductile iron pipe shall be U.S. Pipe "Polylined," American Cast Iron Pipe "Polybond," or equal.

2.5 POLYETHYLENE ENCASEMENT

- A. Contractor will use polyethylene encasement for corrosion protection system for Ductile and gray-iron pipe when directed by the engineer. However, other options should be considered for uniquely severe environments as defined in ANSI/AWWA C105/A21.5.
- B. Polyethylene encasement is to be specifically manufactured to meet the formulation, physical tests, thickness, and dimensional requirements specified in standard ANSI/AWWA C105/A21.5.
- C. Low density film is to be 8 mil minimum, group 2, linear low density, flat tube, virgin polyethylene film provided meets or exceeds the requirements of AWWA C105-10, ANSI A21.5-10, ASTM D4976 and NT4112-10. The film is marked showing trademark, year of manufacture, type of resin, specification conformance, applicable pipe sizes and the words "warning corrosion protection-repair any damage."

Property	Minimum Strength	Standard
Tensile Strength	3600 psi	ASTM 0882
Elongation	800%	ASTM 0882
Dielectric Strength	800 V/ mil	ASTM D149
Impact Resistance	600 g	ASTM 01709-B
Propagation Tear Resistance	2550 gf	ASTM 01922

2.6 PIPE COUPLINGS

- A. Pipe couplings shall be installed where shown on the Drawings, required for installation, or directed by the ENGINEER.

- B. Pipe couplings shall conform to the requirements of the section entitled "Pipe Couplings and Expansion Joints" of these Specifications.

## 2.7 WALL PIPE AND WALL SLEEVES

- A. Contractor shall furnish and install ductile iron wall pipe or wall sleeves where ductile iron piping connects with or passes through concrete walls or floors and in locations where small piping and electric wiring and conduits connect with or pass through concrete walls or floors.
- B. Where wall pipes or sleeves are to be installed flush with the wall or slab, the flange or bell shall be tapped for studs. Where the flange or bell will project beyond the wall, the projection shall be sufficient to allow for installation of connecting bolts.

## 2.8 SPARE PARTS

- A. The Contractor shall furnish four (4) spare gaskets for each size and type of joint requiring the use of a gasket. The Contractor shall furnish eight (8) bolts and nuts of each size and type used for cast iron and ductile iron pipe joints.

## 2.9 MATERIAL TESTING

- A. The Owner or the Owner's designated inspection agency shall have access to all areas of the pipe manufacturer's plant during production, inspection, and shipping and shall have the opportunity to witness all tests associated with production and inspection of pipe and fittings for any given order. Reasonable facilities shall be provided for the Owner or the Owner's designated inspection agency to facilitate their work while at the manufacturing facility. All production and quality assurance records shall be made available for review by the Owner or the Owner's designated inspection agency upon request.
- B. All testing work specified in this section shall be performed by the supplier. The manufacturer shall perform all tests in house as part of their quality assurance/quality control. Test results shall be submitted to the Owner in accordance with the requirements of this section.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. At no time will any gravity sanitary sewer construction commence prior to approval of all plans, receipt of all required documents including necessary easement issuance of sanitary sewer construction permit to approved contractor by Owner and a preconstruction conference held with the Owner's Inspector (twenty-four hours advance notice required).
- B. All gravity sanitary sewer lines, manholes, and other appurtenances to be governed by the Owner shall be installed according to approved plans and profiles. If a field change must occur, the redesigned area(s) must be submitted for approval prior to installation, in accordance with

Georgia Department of Environmental Protection Rules and Regulations for Water Quality Control, Chapter 391 3 6 .02 (10). Contractor must have a set of the “approved” design containing an original Owner stamp, and a copy of these Design Standards, current edition, on site at all times.

- C. Contractor shall adhere to all Federal, State, County and local laws, ordinances and regulations which in any manner affect the conduct of the work, including but not limited to initiating, maintaining and supervision all safety precautions and programs in connection with the work.
- D. Sanitary sewer construction shall be done in open trenches and in a manner to protect lines, sanitary sewers or structures from unusual stresses.
- E. The Contractor shall provide for the flow of all sanitary sewers, drains or creeks interrupted during the progress of the Work and shall restore same to preconstruction condition.
- F. At the start of construction, the Contractor shall install an air plug in the first pipe laid out of the entrance manhole and in the downgrade side of the first newly installed manhole. Said plugs shall remain in place until final inspection and approval is given by the Owner. Contractor must exercise extreme caution to insure that plugs are not lost into the gravity sanitary sewer system.
- G. The Contractor must comply with all requirements of the local Municipality’s Soil Erosion and Sediment Control Ordinance, the provisions of the State Manual for Erosion and Sediment Control and any special conditions required by the ADEM associated with any variances issued by the same, and any special conditions required by the Owner’s Inspector.

### 3.2 DUCTILE IRON PIPE

- A. The Contractor shall conform to the installation requirements of Section 333113.13 - Gravity Flow Sanitary Sewers.
- B. The joining of push-on joint ductile iron pipe shall be performed in accordance with the AWWA Standard for Installation of Ductile Iron Water Mains, Section C600.4.3.4.1. Instructions for assembly of push-on joints may vary according to the particular manufacturer. The procedure for joining pipe equipped with push-on joints must therefore be in accordance with the instructions of the manufacturer of the particular joint furnished.
- C. For push-on ductile iron pipe, the inside of the bell and the outside of the spigot end shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. The circular rubber gasket shall be flexed inward and inserted in the gasket recess of the socket. A thin coating of gasket lubricant shall be applied to both the inside surface of the gasket or outside surface of the spigot. Gasket lubricant shall be as supplied by the particular manufacturer and approved by the Owner.
- D. For mechanical joint pipe and fittings, the ends of the two (2) pieces of pipe to be joined (outside 8" of spigot and inside 8" of bell) shall first be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter, and then shall be painted with a soap solution made by dissolving one-half (½) cup of granulated soap in one (1) gallon of water. The ductile iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the socket end. The rubber gasket shall be painted with the soap solution and placed on the spigot

end with the thick edge toward the gland. The entire section of the pipe shall be pushed forward to seat the spigot end in the bell. The gasket shall then be pressed in place within the bell, care being taken to locate the gasket evenly around the entire joint. The ductile iron gland shall be moved along the pipe and into position for bolting, all of the bolts shall be inserted, and the nuts shall be fastened finger-tight. All nuts shall then be tightened with a suitable (preferable torque-limiting) wrench. Nuts spaced one-hundred and eighty (180) degrees apart shall be tightened alternately in order to produce an equal pressure on all parts of the gland. The torque for various sizes of bolts shall be as follows:

<b>Bolt Size (inches)</b>	<b>Range or Torque (ft-lbs)</b>
$\frac{5}{8}$	40 - 60
$\frac{3}{4}$	60 - 90
1	70 - 100
1 $\frac{1}{4}$	90 - 120

### 3.3 FITTINGS

- A. The Contractor shall install fittings in accordance with applicable ANSI/AWWA standards and manufacturers' recommendations.

### 3.4 TESTING

- A. Each end of each pipe (each pipe socket and pipe spigot) shall be measured and shall conform to the standard dimensions of ANSI A21.51 (AWWA C151). In addition, each socket and spigot shall be inspected in a well-lighted area for injurious defects which could affect joint performance. Such defects may be removed by cutting off pipe ends. Pipe with injurious defects in the bell must be scrapped.
- B. Following the installation of ductile iron pipe, the Contractor shall test all sewer pipe & joints in accordance with the requirements of Section 330130.13 Sewer and Manhole Testing. Joints failing the air test are subject to rejection, repair, or replacement at the Contractor's expense.

END OF SECTION 333113.15



SECTION 33 3113.16 – PVC GRAVITY SEWER PIPE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. This section includes requirements to furnish, install, make the joints, and test PVC gravity sewer pipe and appurtenances as shown on the drawings and as required by these Specifications.

1.2 RELATED SECTIONS

- A. Section 312000: Earth Moving
- B. Section 315000: Excavation Support and Protection
- C. Section 330130.13: Sewer and Manhole Testing
- D. Section 333913.13: Precast Concrete Manholes
- E. Section 333913.16: Manhole Frames and Cover Installation

1.3 REFERENCES

- A. ASTM D 2241 – Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
- B. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- C. ASTM D 3034 – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe Fittings
- D. ASTM F679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

1.4 QUALIFICATIONS AND REQUIREMENTS

- A. Sanitary sewer piping shall be PVC pipe unless otherwise noted on the drawings.

1.5 SUBMITTALS

- A. Submit for review completely detailed working drawings and schedules of all PVC pipe and fittings required.
- B. Submit for review the proposed exfiltration and/or infiltration testing method.

PART 2 - PRODUCTS

2.1 PVC GRAVITY SEWER PIPE

- A. PVC pipe and fittings shall be solid wall PVC gravity sewer pipe conforming to ASTM D 3034, SDR 26 in sizes 4-inch through 15-inch and ASTM D 2241 for 18-inch. All pipe shall be thoroughly inspected by the Engineer upon delivery, and the pipe that does not conform to the above requirements will be rejected and shall be removed immediately from the site of the work by the Contractor. The Owner's representative will apply all standard tests of the pipe necessary to assure conformity with the specifications. All such tests shall be made in accordance with the methods prescribed by, and the acceptance or rejection of PVC pipe shall be based upon the ASTM Standard Specifications referred to above.
- B. Pipe which is out of round, or defective otherwise will be rejected even though it meets the strength requirements of the specifications. Rejected pipe shall be removed from the site at once.
- C. Attention is called to the proper method of stacking integral bell gasketed joint pipe. To avoid stress in the bell end of the pipe due to a pipe resting thereon, the pipes shall be stacked with bell ends projecting from the stack in opposite directions for alternate rows. The bottom row of pipe shall be supported free of the ground.

2.2 PVC FITTINGS

- A. PVC gravity sewer fittings shall meet the requirements of ASTM D 3034 Type PSM Poly (Vinyl-Chloride) (PVC) Sewer Pipe and Fittings for sizes 4-inch through 15-inch, and ASTM F679 Poly (Vinyl-Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings in sizes 18-inch and larger.
- B. All pipe and fittings shall have integral bell gasketed joints especially engineered for gravity sewer mains and laterals. Rubber gaskets shall be factory installed in a precision formed recessed groove.
- C. Laying instructions of the manufacturer of the pipe and joint shall be followed explicitly. Examine each bell and spigot end to determine whether the preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected.

PART 3 - EXECUTION

3.1 LAYING PVC PIPE

- A. Gravity sewer lines shall be laid according to the details shown on the drawing or specified herein, and according to the applicable portions of ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications. The type bedding to be used shall be as shown on the drawings, specified herein, or as directed in writing.
- B. The trench bottom shall be graded to the proposed elevation of the pipeline and the bottom shaped to fit the lower quadrant of the pipe. Holes shall be excavated at each bell so that pipe is supported along the barrel only. Pipe bedding shall be described in Section 312333 – Earth Moving
- C. The storage of pipe on the job site shall be done in accordance with pipe manufacturer's recommendations and with the approval of the Engineer. Pipe shall be protected during handling against impact shocks and free fall. Pipe laying shall not precede backfilling by more than 100 feet.
- D. The laying of the pipe in finished trenches shall be commenced at the lowest point, with the spigot ends pointing in the direction of flow. The interior of the pipe and the jointing seal shall be free from sand, dirt, and trash before installing in the line. Extreme care must be taken to keep the bells of the pipe free from dirt and rocks so joints may be properly assembled without overstressing the bells. The jointing of the pipe shall be done in strict accordance with the pipe manufacturer's instructions and shall be done entirely in the trench.
- E. Each time the work on the sewer is halted for more than one (1) hour, the ends of the pipe shall be sealed to prevent foreign material from entering the pipe.

3.2 Y-BRANCHES

- A. PVC Y-branches shall be manufactured with watertight preformed joints suitable for use with PVC gravity sewer pipe. Each Y-branch shall be provided with a PVC plug. The Y-branches shall be installed as detailed on the plans at locations to be indicated by the Engineer in the field.
- B. The manhole drops where indicated on the plans shall be constructed of ductile iron pipe and fittings as detailed on the plans and encased in concrete.
- C. Stubs for future pipe connections shall be installed from the main to the property line (right-of-way) at locations as shown on the drawings. Stubs shall be PVC gravity sewer pipe with a PVC plug.

3.3 TESTING AND CLEANING

- A. Leakage tests by exfiltration or infiltration, as described below, will be made on all PVC gravity sewer pipe. The Engineer shall have the option of determining which test shall be employed. Generally, if the groundwater table is above the top of the pipe, an infiltration test shall be used. If the groundwater table is below the top of the pipe an exfiltration test shall be used.

- B. Exfiltration tests will be made on the pipe before or after backfilling at the discretion of the Engineer. The length of the sewer to be tested shall be such that the head over the crown of the upstream is not less than 2 ft. and the head over the downstream crown is not more than 6 ft. unless directed otherwise by the Engineer. The sewer shall be plugged by pneumatic bags or mechanical plugs in such a manner that the air can be released from the sewer while it is being filled with water. The test shall be continued for one (1) hour and provisions shall be made for measuring the amount of water required to maintain the water at a constant level during this period. If test results are unsatisfactory, the Engineer may direct that additional tests are made on any or all of the pipe.
- C. If any joint shows an appreciable amount of leakage, the jointing material shall be removed and joint remade. If any pipe is defective, it shall be removed and replaced. If the quantity of water required to maintain a constant level in the sewer for one hour does not exceed 100 gals per inch of diameter per day per mile of sewer and all the leakage is not confined to a few joints, the workmanship shall be considered satisfactory. If the amount of leakage indicates defective joints of broken pipes, that shall be corrected by the Contractor.
- D. Pipe shall be tested for infiltration after the backfill has been placed. Infiltration tests shall be made under the supervision of the Engineer, and the length of line to be tested shall be as directed by the Engineer. The allowable infiltration shall be 100 gals per inch of diameter per day per mile of sewer.
- E. Rates of infiltration shall be determined by means of V-notch weirs, pipe spigot or by plugs in the end of the pipe, to be provided and installed by the Contractor in an approved manner, and at such times and locations as may be directed by the Engineer.
- F. If an inspection of the completed sewer or any part thereof show any manholes, pipes, or joints which allow the infiltration of water in a noticeable stream or jet, the defective work or material shall be replaced or repaired as directed.

### 3.4 AIR TESTING

- A. The Contractor may use an air test in lieu of the exfiltration test as described above. If he elects to do this, he shall submit his proposed method to the Engineer for approval.
- B. If the results of the air test are unsatisfactory, as determined by the Engineer, the Contractor shall be required to perform the exfiltration test as outlined above.

### 3.5 CLEANING

- A. At the conclusion of the work the Contractor shall thoroughly clean all of the pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the lowest outlet. If, after this outlet cleaning, obstructions remain, they shall be removed. After the pipe is cleaned and if the groundwater level is above the pipe, or following a heavy rain, the Engineer will examine the pipe for leaks. If defective pipes or joints are discovered at this time, they shall be repaired by the Contractor.

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END OF SECTION 333113.16

SECTION 33 3913.13 – PRECAST CONCRETE MANHOLES

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. The work covered by this section includes furnishing all labor, equipment, and materials required to install precast concrete manholes complete with frames and covers as described herein and as shown on the Plans.

1.2 RELATED SECTIONS

- A. Section 03300: Cast-In-Place Concrete
- B. Section 31200: Earth Moving
- C. Section 312319: Dewatering
- D. Section 315000: Excavation Support and Protection
- E. Section 330130.13: Sewer and Manhole Testing
- F. Section 330500: Common work results for utilities
- G. Section 333133.13: Gravity Flow Sanitary Sewers
- H. Section 333915: Manhole Height Adjustment

1.3 REFERENCES

- A. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
- B. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gaskets.
- C. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.
- D. ASTM C923 - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.
- E. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (non-shrink).

#### 1.4 SUBMITTALS

- A. Submittals shall conform to the requirements of the General Conditions of the Contract and the Submittals section of these Specifications.
- B. The Contractor shall submit manufacturer's data and details of the following items for approval:
  - 1. Shop drawings of manhole sections and base units and construction details, including reinforcement, jointing methods, and materials.
  - 2. Summary of criteria used in the manhole design including, as a minimum, material properties, loadings, load combinations, and dimensions assumed.
  - 3. Materials to be used in fabricating drop connections.
  - 4. Materials to be used for pipe connections at manhole walls.
  - 5. Materials to be used for stubs and stub plugs, if required.
  - 6. Materials and procedures for corrosion resistant liner and coatings, if required.
  - 7. Plugs to be used for vacuum testing.
  - 8. Manufacturer's data for pre-mix (bag) concrete, if used for channel inverts and benches.
  - 9. Description of the proposed method of concrete curing.
- C. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:
  - 1. **Delays:** Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
  - 2. **Weather:** Conditions (e.g., rain, sunny, windy, etc.).
  - 3. **Equipment:** On site (e.g., specialty cleaning, by-pass equipment, etc.).
  - 4. **Submittals:** To the Owner's Engineer.
  - 5. **Personnel:** On site by name (e.g., all labor, specialty services, etc.).
  - 6. **Accident:** Report (e.g., all injuries, vehicles, etc.).
  - 7. **Incident:** Report (e.g., damage to property, property owner complaint, etc.).
  - 8. **Major defects encountered:** including collapsed pipe, if any, cave-ins, sink holes, etc.
  - 9. **Visitors:** On site.
  - 10. **Disposals:** Type and quantity of debris (including liquids).

#### 1.5 DESIGN CRITERIA

- A. Manholes shall be constructed of specified materials to the sizes, shapes, and dimensions and at the locations shown on the Plans or as otherwise directed by the Owner's Engineer. The height or depth of the manhole will vary with the locations, but unless shown otherwise on the Plans shall be such that the top of the manhole frame will be at the finished grade of the pavement or higher than the ground surface as shown on the Plans and the invert will be at the designed elevations.
- B. Manholes in wooded or un-maintained easements areas shall be a minimum of twenty-four (24) inches above ground level and a minimum of two (2) feet above the one hundred (100) year flood plain; whichever is greater.

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- C. **Flood Plain Areas:** Manholes located within the one hundred (100) year flood plain shall contain manhole frames that are bolted to the eccentric cone in order to stabilize the manhole adjustment rings.
  - 1. The manhole adjustment rings shall contain pre-drilled holes for the bolts from the pre-cast manufacturer.
  - 2. Manhole concrete rings shall be secured to each other to protect against slide and tilt of rings due to buoyancy.

### 1.6 QUALITY ASSURANCE

- A. Prior to delivery, all basic materials specified in this section shall be tested and inspected by an approved independent commercial testing laboratory or, if approved by the Owner's Engineer, certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable. All materials which fail to conform to these Specifications shall be rejected.
- B. After delivery to the Site of the Work, any materials which have been damaged in transit or are otherwise unsuitable for use in the Work shall be rejected and removed from the Site of the Work.

### 1.7 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the latest Consent Decree.
- B. In the event that the Contractor's activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the Owner's dispatch center and the Owner; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP) approved by Owner. This document can be found on Department of Watershed Management website under the Consent Decree Program or upon request to the Owner.
- C. The Contractor shall indemnify and hold harmless the Owner and Owner's representatives for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the Owner, Owner's employees, and local elected officials in defending such fines and claims.
- D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to municipal or private utilities that is caused by the Contractor's equipment or operation shall be repaired in a manner approved by the Owner at the Contractor's expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor's expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor with



notification to the Owner. Any damage to the Contractor's equipment is the Contractor's responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO and all associated damages.

- E. The Owner reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

## 1.8 SAFETY

- A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

## PART 2 – PRODUCTS

### 2.1 PRECAST CONCRETE MANHOLES

- A. Unless specified otherwise in the Plans or in the Special Conditions of the Contract, all manholes will be precast concrete manholes as specified in this section.
- B. The precast reinforced concrete manholes shall be constructed in accordance with the requirements of ASTM C478. Reinforced concrete manholes shall consist of manhole base sections, riser sections, transition sections, and conical sections as described in this section. The manhole components shall be configured to minimize the number of joints required per manhole (see Detail Drawings). The Owner's Engineer may require any manhole that is not composed of the minimum number of sections to be replaced.
- C. Portland cement concrete used in the precast reinforced concrete manholes shall have a minimum compressive strength of 4,000 psi at twenty-eight (28) days.
  - 1. The concrete shall contain type II Portland cement with a C3A content of five and one-half (5½) percent or less and meet the requirements of ASTM C478.
  - 2. Limestone aggregate for concrete, except for maximum size and gradation, shall be as specified in applicable sections of these Specifications.
  - 3. To aid in achieving the specified concrete compressive strength, newly cast manholes shall be cured in accordance with the requirements of ASTM C478. The method of curing proposed must be submitted to the Owner's Engineer prior to manufacture. Manholes shall be cured for a minimum of seven (7) days prior to shipment to the Site of the Work unless otherwise instructed by the Owner's Engineer.
  - 4. The manhole manufacturer shall test the compressive strength of a minimum of two (2) concrete cylinders per calendar week. Reports verifying the results of the compression tests shall be maintained at the manufacturer's facility. Reports shall be made available for inspection and review by the Owner's Engineer. The manhole manufacturer shall permit the Owner's Engineer to make unannounced reviews of compression test records and inspection of manufacturing facilities at any time during normal business hours.

5. The manhole manufacturer shall notify the Owner's Engineer of all manholes delivered for use in the Owner's Wastewater Collection and Transmission System (WCTS) which were manufactured during a week for which a concrete compressive strength test yielded a result of less than 4,000 psi.
  - a. Such notification shall be in the form of a letter sent to:

City of College Park Department of Watershed Management
  - b. Notification shall include, at a minimum, the project name, Contractor name, date of manhole component manufacture, and description of manhole component(s) affected.
  - c. The Owner's Engineer may require additional testing, repairs, or removal and replacement, at no additional cost to the Owner, of any or all manhole components provided for use in the Owner's WCTS which were manufactured during a calendar week for which a concrete compressive strength test yields a result of less than 4,000 psi.
  - d. Documentation to also be submitted digitally in PDF format to Owner and Owner's Engineer.
- D. Reinforcing steel shall be bars of intermediate grade, open hearth, billet steel, conforming to the requirements of ASTM A615, or Cold-Drawn Steel Wire for Concrete Reinforcement conforming to the requirements of ASTM A82; or of wire fabric conforming to the requirements of ASTM A185. The circumferential reinforcement in the riser and conical top sections shall have an area of not less than 0.12 square inches per linear foot.
- E. The interior and exterior surfaces of the manhole shall have a smooth hard finish, and shall be free from cracks, chips, and spalls.
- F. The maximum allowable absorption of the concrete used for manhole construction shall not exceed eight (8) percent of the dry weight.
- G. Manhole base sections shall be circular, wet cast, and may be supplied in forty-eight (48) inches, sixty (60) inches, and seventy-two (72) inches diameters. Heights shall range from forty-eight (48) inches to ninety-six (96) inches depending on availability with diameter and as specified or approved by the Owner's Engineer. All base sections shall be supplied with Manhole Lift System inserts. Lifting eye bolts shall be supplied to the Contractor upon request. Pipe openings shall be furnished in accordance with Section 3.3.B.
- H. Riser sections shall be circular, wet or dry cast, and may be supplied in forty-eight (48) inches, sixty (60) inches, and seventy-two (72) inches diameters. Heights shall range from sixteen (16) inches to forty-eight (48) inches in sixteen (16) inch multiples depending on availability with diameter and as specified or approved by the Owner's Engineer. All riser sections shall be supplied with Manhole Lift System inserts. Lifting eye bolts shall be supplied to the Contractor upon request.
- I. Transition sections shall be wet or dry cast. Conical transition sections shall be supplied for sixty (60) inches to forty-eight (48) inches diameter transitions. Conical transitions shall be thirty-two (32) inches high. Sixteen (16) inches high conical transitions may only be used when approved

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by the Owner's Engineer. All conical transition sections shall be supplied with a Manhole Lift. Flat slab transitions shall be supplied for base sections seventy-two (72) inches to ninety-six (96) inches in diameter. Flat slab transitions shall be manufactured structurally to meet individual project requirements. Clear access openings shall be provided to accommodate riser sections as shown in the Plans or as detailed in the Detail Drawings.

- J. Conical sections shall be wet or dry cast, concentric only. Eccentric sections will not be allowed. Conical sections shall transition from forty-eight (48) inches diameter to a twenty-seven (27) inches clear access opening and be either twenty-four (24) inches, thirty-six (36) inches, or forty-six (46) inches high. They shall be supplied with a Manhole Lift.
- K. Precast manhole riser joints shall be offset tongue and groove type, supplied with Tylox Super Seal pre-lubricated gasket. Each joint shall also be supplied with Conseal CS-231 waterstop sealant as manufactured by Concrete Sealants, in widths as recommended by the manufacturer. All joints shall be permanently strapped utilizing three (3) bitumastic coated steel strap anchors located one-hundred and twenty (120) degrees apart.
- L. The ends of each reinforced concrete manhole riser section and the bottom end of the manhole top section shall be so formed that when the manhole risers and the top are assembled, they will make a continuous uniform manhole.
- M. Standard manholes of precast concrete construction, and other manholes of precast concrete construction having entering sewers of twenty-four (24) inches diameter or smaller shall have precast openings in the manhole walls for incoming or outgoing sewers as indicated on the Plans.
- N. All components of a manhole for a particular location shall be clearly marked in order that the manhole may be correctly assembled to suit construction conditions existing at that particular location.
- O. All precast concrete manhole base sections and drop manhole bases shall be set on a foundation of #57 compacted stone aggregate, twelve (12) inch minimum thickness, and covering the entire bottom of the excavation for the manhole. Aggregate size may be adjusted by the Owner's Engineer based on field conditions.
- P. Manhole riser rings and/or brick and mortar used to adjust manhole frame to grade, shall conform to Section 333915 – Manhole Height Adjustment.
- Q. Manhole steps shall conform to the requirements of this section.

### 2.2 STRUCTURAL MATERIALS AND CASTINGS

- A. Structural steel shall conform to the requirements of ASTM A283, unless otherwise indicated on the Plans.
- B. Steel castings shall conform to the requirements of ASTM A27. The grades to be used will be specified in the Special Conditions of the Contract or indicated on the Plans.
- C. Gray iron castings shall conform to the requirements of ASTM A48. All castings shall be clean and free of scale, adhesions, or inclusions. Gray iron castings for manhole or inlet frames and

covers or gratings shall be cast from Class 30B cast iron. Bearing surfaces between manholes, inlet frames, and covers or gratings shall be such that the cover or grating shall seat in any position onto the frame without rocking. Bearing surfaces for standard manhole frames and covers shall be machined.

- D. Aluminum castings shall conform to the requirements of ASTM B108.
- E. Structural aluminum shall conform to the requirements of either ASTM B209, B221, B308, B241, or B211, as applicable. Finished bolts and nuts shall be given an anodic coating of at least 0.0002 inches in thickness.

### 2.3 FRAMES, COVERS, AND STEPS

- A. New manhole rims, toe pockets, frames, and covers shall be cast iron conforming to the requirements of ASTM A48 for Class 30 Gray Iron Castings. All castings shall be made accurately to the required dimensions, fully interchangeable, sound, smooth, clean, and free from blisters or other defects. Defective castings which have been plugged or otherwise treated shall not be used. All castings shall be thoroughly cleaned and painted or coated with bituminous paint. Each casting shall have its actual weight in pounds stenciled or painted on it in white paint.
- B. Manhole frames and covers shall be as detailed on the Plans, and as manufactured by Vulcan Foundry, or as manufactured by the Griffin Foundry Co., Russell pipe & Foundry Co., or equal.
- C. Sanitary sewer manhole covers shall have the words "MAWSS Sanitary Sewer" cast on the top in letters two (2) inches high.
- D. Where manhole rim elevation is required to be two (2) feet above the ground surface, covers shall be hinged to prevent damage and/or injury.
- E. Manhole inlet steps shall be made of steel reinforced copolymer polypropylene model PS-1 PF. They shall be installed at maximum sixteen (16) inch intervals. Manhole steps shall be as shown in the Detail Drawings with rod and pull ratings meeting OSHA standards.

### 2.4 SPECIALTY ITEMS

- A. One piece manholes shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings. They shall be cast utilizing 4,000 psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less. They shall be manufactured within a minimum eight (8) inches thick base with dowel steel reinforcement and waterstop. They shall be used only in situations which will not accommodate a twenty-four (24) inch base section and twenty-four (24) inch conical section.
- B. 36" x 48" Manhole Tees shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings. They shall be cast utilizing 4,000 psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less.

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- C. Saddle manholes shall be manufactured in accordance with the requirements of ASTM C478 and as shown in the Detail Drawings. They shall be cast utilizing 4,000 psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less.
- D. Drop Manholes (Memphis Tees) shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings. They shall be cast utilizing 4,000 psi concrete containing type II cement with a C3A content of five and one-half (5½) percent or less.
- E. For manholes in corrosive environments that will require special protection, comply with the requirements of Section 333913.14 – Polymer Concrete Manholes.

## 2.5 CONCRETE

- A. Concrete shall conform to the requirements of Section 03300 – Cast-In-Place Concrete.

## PART 3 – EXECUTION

### 3.1 GENERAL

- A. All activities shall be performed in accordance with the manufacturer's recommendations and regulations established by OSHA. Particular attention shall be drawn to those safety requirements involving working with scaffolding and entering confined spaces.
- B. The Contractor shall verify that lines and grades are as specified in the Plans.

### 3.2 INSTALLATION

- A. Manholes shall be constructed to the sizes, shapes, and dimensions as detailed in the Detail Drawings and at the locations shown on the Plans. They shall be constructed of precast concrete sections conforming to the requirements of this section. The manholes shall be assembled with the fewest number of sections to make up required height, thereby reducing the number of joints. The composition of the manhole must be approved by the Owner's Engineer. The Owner's Engineer may require any manhole that is not composed of the minimum number of sections to be replaced. The depth of the manhole will vary with the location but in all cases it shall be such as will place the cover (or lid) at the finished grade of the pavement or ground surface or as otherwise indicate on the Plans. In undeveloped or rural areas, manholes shall be furnished to a height of two (2) feet above ground. The invert shall be placed at the elevation shown on the Plans. Eccentric cone sections and flat top manholes, except for shallow depth where approved by the Owner's Engineer, will not be allowed; only concentric cones will be used.
- B. Precast concrete manholes for reinforced concrete sewers forty-eight (48) inches diameter and larger shall be as specified above, except that they shall be installed on a saddle constructed on the barrel of the sewer. Precast concrete manholes for sewers thirty (30), thirty-six (36), and forty-two (42) inches shall be saddle-types or precast base types as specified in the Plans. Reinforcing steel in the saddle shall be welded to the reinforcing steel of the pipe. The design of these saddles shall be approved by the Owner's Engineer prior to manufacture.

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- C. All joints for precast manhole stacks shall be offset tongue and groove with Tylox Super Seal pre-lubricated gaskets as manufactured by Hamilton Kent. Each joint shall also be sealed with Conseal CS-231 waterstop sealant as manufactured by Concrete Sealants. The width and installation of the joint sealant shall be in accordance with the manufacturer's recommendations. All joints shall be supplied with 3" x 16" x 1/2" inch bitumastic coated steel strap anchors. Three (3) strap anchors, one-hundred and twenty (120) degrees apart shall be required per joint.
- D. Where the difference in the invert elevation of two (2) or more sewers, eighteen (18) inches in diameter or smaller, intersecting in one (1) manhole is two (2) feet or more, a Drop Manhole (Memphis Tee) shall be constructed in the manner shown in the Detail Drawings. They shall be similar in construction to the standard manhole, except that a drop connection of a pipe and fittings of the proper size and material shall be constructed outside the manhole and supported by Class B concrete as indicated on the Plans and in the Detail Drawings. The manhole and the drop connection shall be placed on twelve (12) inch reinforced concrete base as detailed in the Detail Drawings. The drop connection piping assembly shall be bolted to the barrel of the manhole riser using a minimum of four 5/8-inch diameter stainless steel (316) bolts with suitable washers to prevent failure caused by pulling the bolt head through the manhole wall.
- E. Base sections shall be precast with the vertical walls of sufficient height to allow entry of the required pipes as shown on the Plans, and as detailed in the Detail Drawings. Manhole inverts shall be constructed of cement mortar and shall have the same cross-section as the invert of the sewers which they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.
- F. All water standing in the trench shall be removed before placing of concrete is started, and the foundation maintained in a dry condition.
- G. Shallow manholes shall be constructed to the sizes, shapes, and dimensions as detailed in the Detail Drawings, and at the locations shown on the Plans. They shall be constructed of precast concrete sections as shown on the Plan or as directed by the Owner's Engineer.
- H. The top elevation of manhole frames shall be adjusted to grade in areas such as streets, alleys, and parking lots or where indicated on the Plans. A maximum adjustment of twelve (12) inches will be allowed using brick and mortar. Adjustments greater than twelve (12) inches must be made by changing precast riser sections. Brick used will be in accordance with the requirements of this section.

### 3.3 PIPE CONNECTIONS AT MANHOLES

- A. Openings in manhole walls for incoming and outgoing sewers shall be precast or cored and after installation sealed with an approved non-shrink grout. These manholes shall be installed on choked and compacted stone bedding as detailed in the Detail Drawings.
- B. A flexible manhole connector may be approved by the Owner's Engineer as an alternate method of sealing the space between the manhole wall and the pipe. Flexible manhole sleeves shall be required for all pipes eighteen (18) inches and smaller and shall be cast into the manhole by the precast Manufacturer. The manhole connector shall be A-Lok, Z-Lok, or Kor-N-Seal and conform to the requirements of ASTM C923 and shall be made from ethylene propylene rubber

(EPDM) designed to be resistant to ozone, weather elements, chemicals, including acids, alkalis, animal and vegetable fats, oils, and petroleum products. Manhole sleeves shall be secured to pipe by stainless steel clamp and bolt assembly conforming to the requirements of ASTM C923 and ASTM A167.

- C. All stainless steel elements of the manhole connector shall be totally non-magnetic Series 304 Stainless, excluding the worm screw for tightening the steel band around the pipe which shall be Series 305 Stainless. The worm screw for tightening the steel band shall be torqued by a break-away torque wrench available from the precast manhole supplier, and set for 60-70 inch/lb. The connector shall be installed in the manhole wall by activating the expanding mechanism in strict accordance with the recommendation of the connector manufacturer. The connector shall be of a size specifically designed for the pipe material and size being utilized on the Project.

### 3.4 MANHOLE TESTING

- A. All manholes shall be vacuum tested in accordance with Section 330130.13 – Sewer and Manhole Testing.

### 3.5 BACKFILL

- A. The Contractor shall place and compact backfill materials, in the area of excavation surrounding manholes in accordance with the requirements Section 312000 – Earth Moving

### 3.6 CLEANUP

- A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.
- B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The local municipality can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.
- C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Engineer at no additional cost to the Owner. The work site restoration work shall be completed as shown.

### 3.7 DOCUMENTATION

- A. The Contractor shall complete work on each asset as assigned via the Owner's Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/Owner's Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.8 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at any time during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the Owner. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION 333913.13



## SECTION 33 3913.16 – MANHOLE FRAME AND COVER INSTALLATION

### PART 1 – GENERAL

#### 1.1 SECTION INCLUDES

- A. This section includes procedures for Manhole Frame and Cover Installation.

#### 1.2 RELATED SECTIONS

- A. Section 333931.13: Precast Concrete Manholes
- B. Section 333915 - Manhole Height Adjustment.

#### 1.3 REFERENCES

- A. ASTM A48 / A48M - 03 - Standard Specification for Gray Iron Castings.
- B. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, City of Mobile Department of Watershed Management.

#### 1.4 SUBMITTALS

- A. Submittals shall conform to the requirements of the General Conditions of the Contract and the Submittals section of these Specifications.
- B. The Contractor shall submit shop drawings of manhole frames and covers to the Engineer for approval before installation.
- C. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:
  - 1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
  - 2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
  - 3. Equipment: On site (e.g., specialty cleaning by-pass equipment, etc.).
  - 4. Submittals: To the Owner's Engineer.
  - 5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
  - 6. Accident: Report (e.g., all injuries, vehicles, etc.).
  - 7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
  - 8. Major defects encountered, including collapsed pipe, if any, cave-ins, sink holes, etc.
  - 9. Visitors: On site.
  - 10. Disposals: Type and quantity of debris (including liquids).

1.5 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.
- B. In the event that the Contractor's activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the City dispatch center and the City Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.
- C. The Contractor shall indemnify and hold harmless the Owner for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the City, City employees, and City elected officials in defending such fines and claims.
- D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to City utilities that is caused by the Contractor's equipment or operation shall be repaired in a manner approved by the City Engineer at the Contractor's expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor's expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor's equipment is the Contractor's responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO. The City reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.6 SAFETY

- A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.1 GENERAL

- A. The Contractor shall provide and install complete manhole covers and frames at each new sanitary sewer manhole, and in all other locations shown on the Plans or directed by the City Engineer.

- B. Manhole covers shall be of either Standard Type (non bolted) or Bolt-Down Type, as indicated on the Plans or as otherwise specified. If not otherwise indicated, manhole covers shall be Standard Type.
- C. The Contractor shall provide manhole covers and frames approved by the City.

## 2.2 MATERIALS

- A. Manhole covers and frames shall be constructed of cast iron conforming to the requirements of ASTM A48-83 Class 30, as a minimum. Tensile strength of the cast iron shall be a minimum of 30,000 psi.
- B. Covers and frames shall be "Heavy Duty" type, rated for a minimum of H-20 loading.
- C. All castings shall be sound, smooth and clean, and free of blisters, pits, cracks, and other defects. Castings judged to be defective by the City Engineer will be rejected, and shall be replaced by the Contractor at no additional cost to the Owner.
- D. Casting tolerances shall be  $\pm 1/16$  -inch, with an additional one-sixteenth ( $1/16$ ) inch per foot of dimension.
- E. Manhole covers shall be cast with two (2) non-penetrating type pick-holes, located as indicated in the Detail Drawings. Pick-holes shall conform to the dimensions indicated in the Detail Drawings. Manhole covers shall not have vent holes.
- F. Frames shall have integrally cast, full perimeter mud rings. Frames shall be cast with four (4), one- (1) inch diameter holes in the flange for anchor bolts. Anchor bolt holes shall be located as shown in the Detail Drawings.
- G. The seating surfaces of frames and covers shall be machined flat to ensure contact between the cover and frame along the full perimeter.
- H. Gaskets shall be provided and installed on all manhole frames. Gaskets shall be secured to the seating surface of the frame with non-degrading glue by the manufacturer. Gaskets shall be flat, one-eight- ( $1/8$ ) inch thick, black neoprene, with a tensile strength of 2,000 psi.
- I. For manhole covers indicated as Bolt-Down Type, frames shall be cast and machined to accept four (4) cover bolts, on the pattern shown in the Detail Drawings. Covers shall be cast with four (4) holes, three-quarter ( $3/4$ ) inch diameter, for the bolts on the pattern shown in the Detail Drawings. Bolts shall be stainless steel,  $5/8$ " -  $1\frac{1}{2}$  x 2" hex-head cap screws, and shall be provided with all bolt-down type covers. Bolts shall include stainless steel washers and rubber sealing gaskets.
- J. Covers and frames shall bear the emblem of "MAWSS Sanitary Sewer" as illustrated in the Detail Drawings. No substitute cover designs will be accepted.
- K. Covers shall be cast with four (4) stacking lugs, each five-eight- ( $5/8$ ) inch wide by two (2) inches long, on the bottom of the lid.

- L. Covers and frames shall conform to the following critical dimensions:

	<b>Standard</b>	<b>Bolt-Down</b>
Overall frame height	6 <sup>3</sup> / <sub>4</sub> to 8"	6 <sup>3</sup> / <sub>4</sub> to 8"
Cover diameter	23 <sup>1</sup> / <sub>2</sub> "	23 <sup>1</sup> / <sub>2</sub> "
Cover thickness, min.	1 <sup>3</sup> / <sub>8</sub> "	1 <sup>3</sup> / <sub>8</sub> "
Frame opening for cover	23 <sup>11</sup> / <sub>16</sub> "	23 <sup>3</sup> / <sub>4</sub> "
Frame opening for entry	22"	20 <sup>5</sup> / <sub>8</sub> "
Mud ring O.D.	25 <sup>7</sup> / <sub>8</sub> "	25 <sup>3</sup> / <sub>4</sub> "
Mud ring height, min.	<sup>3</sup> / <sub>4</sub> "	1 <sup>5</sup> / <sub>8</sub> "

**PART 3 – EXECUTION**

**3.1 PROCEDURES FOR MANHOLE FRAME AND COVER INSTALLATION**

- A. The Contractor shall prepare the manhole top cone for frame installation per manhole and manhole cover manufacturer recommendations.
- B. The Contractor shall prepare and install manhole frames and covers per manufacturer recommendations.
- C. The Contractor shall check the installation of gaskets and replace all missing gaskets.
- D. The Contractor shall install new frames and covers to the required elevations shown on the Plans or to the existing grade as directed by the Owner’s Engineer.
- E. The Contractor shall check the manhole covers for fit in the frame. If a manhole cover is either excessively loose or tight in the frame, or rocks, wobbles, or otherwise moves in its frame, the frame and cover shall be removed and replaced by the Contractor at no additional cost to the Owner.
- F. The Contractor shall install and tighten stainless steel bolts on all Bolt-Down Type covers.

**3.2 CLEANUP**

- A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.
- B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

- C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

### 3.3 DOCUMENTATION

- A. The Contractor shall complete work on each asset as completed via the City's Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/City Engineer. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

### 3.4 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at any time during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the Owner. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION 333913.16

SECTION 33 3913.17 – MANHOLE FRAME AND COVER SEALING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. This section covers the materials and methods for sealing leaking manhole frames for sanitary sewers.
- B. Manhole frame sealing includes the sealing of the frame joint area and the chimney above the cone of the manhole with either a manufactured or applied internal or external flexible seal. The seal shall be designed to prevent leakage of water into the manhole through these areas throughout a minimum 50-year design life. The installed seal shall remain flexible, to allow for repeated vertical movements of the frame due to frost lift, ground movement, or other causes of not less than 2 inches and/or repeated horizontal movement of the frame due to thermal movement of pavement or other causes of not less than ½ inch throughout the design life.
- C. Manhole Cover Sealing: Manhole cover sealing includes either the replacement of or sealing of existing manhole covers. All of the methods described require the thorough cleaning of the frame rim surface by wire brushing. Detailed installation procedures shall be in accordance with the manufacturer's instructions.

1.2 RELATED SECTIONS

- A. Section: Delivery, Storage, and Handling

1.3 REFERENCES

- A. ASTM A240 / A240M - 13a Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- B. ASTM C923-00 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
- C. ASTM D412-06a - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- D. ASTM D476-00(2005) - Standard Classification for Dry Pigmentary Titanium Dioxide Products.
- E. ASTM D903 - 98(2010) - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- F. ASTM D1004 - 13 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.

- G. ASTM F594-01 - Standard Specification for Stainless Steel Nuts.

#### 1.4 SUBMITTALS

- A. Submittals shall conform to the requirements of the General Conditions of the Contract and the Submittals section of these Specifications.
- B. The Contractor shall submit manufacturer's Certificate of Compliance certifying compliance with applicable specifications and standards.
- C. The Contractor shall submit certified copies of test reports of factory tests required by the applicable standards and this Section.
- D. The Contractor shall submit manufacturer's installation instructions and procedures and insertion runs.
- E. The Contractor shall submit procedures and materials for manhole frame sealing. Product data to include; material handling and storage, material properties, mixing and proportioning requirements, maximum pot life, film/coating thickness, and certification of all rehabilitation materials.
- F. The Contractor shall submit procedures and materials for manhole cover sealing.
- G. Plan for capturing extraneous debris during rehabilitation process and debris disposal.
- H. The Contractor shall submit Material Safety Data Sheets (MSDS).
- I. The Contractor shall submit Applicator's Qualifications.
- J. The Contractor shall submit Confined Space Entry Plan/Permit.
- K. The Contractor shall submit a Field Test Report.
- L. The Contractor shall submit Construction Photographs.
- M. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:
  - 1. **Delays:** Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
  - 2. **Weather:** Conditions (e.g., rain, sunny, windy, etc.).
  - 3. **Equipment:** On site (e.g., specialty cleaning, by-pass equipment, etc.).
  - 4. **Submittals:** To the Owner's Engineer.
  - 5. **Personnel:** On site by name (e.g., all labor, specialty services, etc.).
  - 6. **Accident:** Report (e.g., all injuries, vehicles, etc.).
  - 7. **Incident:** Report (e.g., damage to property, property owner complaint, etc.).
  - 8. **Major defects encountered:** including collapsed pipe, if any, cave-ins, sink holes, etc.
  - 9. **Visitors:** On site.
  - 10. **Disposals:** Type and quantity of debris (including liquids).

1.5 QUALITY ASSURANCE

A. Applicator's Qualifications

1. Minimum 5 years' experience in application of products to be used.
2. Manufacturer's Certifications:
  - a. Applicator has been trained and approved in the handling, mixing and application of the products to be used.
  - b. Equipment to be used for applying the product has been approved and the applicator personnel have been trained and certified for proper use of equipment.
  - c. Five (5) recent references of applicator (projects of similar size and scope) indicating successful application within the past 10 years.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall be responsible for delivery, storage, and handling of products.
- B. Products shall be kept safe from damage. Damaged products shall be removed from the Site of the Work promptly. Damaged products shall be replaced with undamaged products.
- C. Comply with the requirements of Section – Delivery, Storage, and Handling.

1.7 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the Consent Decree.
- B. In the event the Contractor's activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the local utility owner's dispatch center and the Owner's Engineer; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP). This document can be found on Department of Watershed Management website under the Consent Decree Program.
- C. The Contractor shall indemnify and hold harmless the Owner for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the Owner, Owner's employees, and local elected officials in defending such fines and claims.
- D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to municipal or private utilities caused by the Contractor's equipment or operation shall be repaired in a manner approved by the Owner's Engineer at the Contractor's expense. Any damage caused by the Contractor to utilities or



property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor's expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor. Any damage to the Contractor's equipment is the Contractor's responsibility. If the equipment stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for the SSO. The Owner reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

## 1.8 SAFETY

- A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

## PART 2 – PRODUCTS

### 2.1 GENERAL

- A. All materials used for manhole frame sealing shall be pre-approved by the Engineer.
- B. The installer shall warrant and save harmless the Owner against all claims for patent infringement and any loss thereof.
- C. The Contractor shall handle and store all materials and shall dispose of all wastes in accordance with applicable Federal, State, and local laws and regulations.
- D. All Work shall be performed in strict observance of OSHA and GDOT regulations, especially those related to confined space entry.
- E. The Contractor shall notify the local Fire Department and the local municipalities' Department of Watershed Management and obtain approval and water meter, if required, before using fire hydrants.

### 2.2 FLEXIBLE RUBBER SLEEVE

- A. Flexible rubber sleeve manhole frame seal shall be manufactured by Cretex Specialty Products or a similar approved product. The pre-approval of another product must be made by the Owner prior to the formal opening of proposals. It is the contractor's responsibility to timely submit information/tests for the Owner to make the determination.
- B. The flexible rubber sleeve, extensions and wedge strips shall be extruded or molded from a high grade rubber compound conforming to the applicable requirements of ASTM C923, with a minimum of 1500 psi tensile strength, maximum eighteen (18) percent compression set and a hardness (durometer) of forty eight (48)  $\pm$  5.

- C. The flexible rubber sleeve shall be either double or triple pleated with a minimum unexpanded vertical height of eight (8) inches and ten (10) inches respectively and a minimum thickness of 3/16 inch. The top and bottom section of the flexible rubber sleeve shall contain an integrally formed expansion band recess and multiple sealing fins.
- D. The top section of the extension shall have a minimum thickness of 3/32 inch and shall be shaped to fit into the bottom band recess of the flexible rubber sleeve under the bottom chimney seal band and the remainder of the extension shall have a minimum thickness of 3/16 inch. The bottom section of the extension shall contain an integrally formed expansion band recess and multiple sealing fins matching that of the flexible rubber sleeve.
  - 1. Any splice used to fabricate the flexible rubber sleeve and extension shall be hot vulcanized and have a strength so the sleeve can withstand a 180 degree bend with no visible separation.
  - 2. The continuous wedge strip used to adapt the flexible rubber sleeve to sloping surfaces shall have the slope differential needed to provide a vertical band recess surface, be shaped to fit into the band recess, and have an integral band restraint. The length of the wedge strip, when its ends are butted together, will cover the entire inside circumference of the band recess needing slope adjustment.
- E. The expansion bands used to compress the sleeve against the manhole shall be integrally formed from sixteen (16) gauge stainless steel conforming to the requirements of ASTM A240, Type 304, with no welded attachments and shall have a minimum width of 1¾ inches.
  - 1. The bands shall have a minimum adjustment range of two (2) diameter inches and the positive locking mechanism used to expand the band shall have the capacity to develop the pressures necessary to make a watertight seal. Any studs and nuts used for this mechanism shall be stainless steel conforming to the requirements of ASTM F-923 and 594, Type 304.

2.3 FLEXIBLE URETHANE RESIN

- A. Flexible urethane resin manhole frame seal shall be Flex-Seal Utility Sealant as manufactured by Sealing Systems, Inc., or an approved equal product.
- B. The flexible urethane resin manhole frame seal shall be used to form a flexible seal to stop inflow/infiltration and provide corrosion protection to the internal wall of a manhole from three (3) inches above the bottom of the frame to three (3) inches below the top of the cone. The finished product shall conform to the minimum requirements listed below:

	Prime Coat		Final Coat	
	Hardness	ASTM-D 2240	85-90	ASTM-D 2240
Elongation	ASTM-D 442	400%	ASTM-D 412	800%
Tensile Strength	ASTM-D 412	3200 psi	ASTM-D 412	1150 psi
Adhesive Strength	ASTM-D 903	400 lb I/in	ASTM-D 903	175 lb I/in
Tear Resistance	ASTM-D 1004	210 lb I/in	ASTM-D 1004	755 lb I/in

2.4 COVER REPLACEMENT

- A. Replace the existing cover with a new approved solid, gasketed cover.

2.5 COVER CONVERSION

- A. Cover conversion only allowed by Owner in writing on a per-manhole basis.
- B. Reuse the existing cover by making it watertight. This is accomplished by installing a gasket between the cover and the cover-bearing surface of the frame and plugging the vent and pick holes. One of the plugs shall be removable to facilitate removal of the cover.
- C. Manhole cover gaskets and plugs shall be molded from a high-quality rubber compound such as Nitrile, EPDM or a blend thereof. The rubber product shall have a minimum tensile strength of 1,500 psi with a hardness (durometer) of  $60 \pm 5$ . The cover gasket shall be provided with an outside rib and have a minimum thickness of 3/32 inch.

2.6 MANHOLE INSERT

- A. The manhole insert shall be manufactured from a corrosion-resistant material able to withstand the environment of a sanitary sewer system, road salts, oil and fuel that it may come in contact with. The material shall be freeze-thaw resistant and withstand a temperature range of -50°F to 245°F. The manhole insert shall have a minimum thickness of 1/8 inch.
- B. The insert shall have an approved system of relieving gas and vacuum pressure and shall be complete with a closed-cell neoprene or polyethylene gasket with adhesive backing installed on the underside of the insert rim by the manufacturer. The insert shall have a corrosion-resistant strap installed within the bowl for ease of installation and removal.

PART 3 – EXECUTION

3.1 GENERAL

- A. All activities shall be performed in accordance with the manufacturer's recommendations and in accordance with the requirements of Federal, State, and local laws and regulations.
- B. Prior to entering manholes, an evaluation of the atmosphere will be conducted to determine the presence of toxic, flammable vapors, or possible lack of oxygen. The evaluation shall be in accordance with Federal, State, and local safety regulations.
- C. Active leaks must be corrected before the installation of any approved product.
- D. The Contractor shall provide traffic control in accordance with the requirements of applicable state and local DOT requirements.

3.2 FLEXIBLE RUBBER SLEEVE

- A. The Contractor shall field measure the manhole to determine the information required on the manufacturer's "Sizing and Ordering" procedure. This information is needed to obtain the proper size of bands, the size and shape of the rubber sleeve and the need for and size of any extensions.
- B. The contact surface for the sleeve and/or extensions shall be reasonable clean and smooth, circular and free from excessive voids or defects.
- C. All manhole frames misaligned from the chimney or cone/corbel by three (3) inches or more shall be excavated and realigned. All existing frames shall be thoroughly cleaned before reinstallation. All realignment work shall be performed in accordance with Section 333920 – Sanitary Sewer Manhole Rehabilitation.
- D. All loose and protruding mortar and brick interfering with the seal's performance shall be removed and the appropriate areas of the manhole frame, chimney, and/or cone/corbel cleaned by wire brushing. All sealing surfaces shall be reasonably smooth and circular, clean, and free of any loose material or excessive voids.
- E. Detailed surface preparation, including providing a vertical surface on a cone when none exists, shall be in accordance with the frame seal manufacturer's instructions.
- F. The Contractor shall install the flexible rubber sleeve in accordance with the manufacturer's instructions.
- G. After any surface preparation is completed and the rubber sleeve has been placed in the proper position, the lower band is positioned in the band recess and expanded as required to provide a water tight seal.
- H. Following the expansion of the lower band a QA/QC test shall be performed to insure effective sealing by pulling the upper section of the seal or extension inward to create a recess behind the seal where water can be poured. Pour the water behind the seal and observe the lower sealing area for any visible leaks. The sealing shall be considered effective if no water leaks behind the seal at the lower sealing area.
- I. If an extension is used; the 3/32" thick extension flap shall be placed into or behind the expansion band recess to allow for the compression of both the extension flap and sleeve against the manhole surface by the expansion band. Continue by placing the upper band or bands in the recess, insuring the seal is properly placed on the manhole cone, chimney and frame and expand as required to provide an effective seal. Installation procedures shall be in accordance with the manufacturer's recommended instructions.
- J. The Contractor shall be properly trained, certified, and licensed in the installation of frame seals by the manufacturer and shall have a manufacturer's recommended expansion tool and all other equipment/tools necessary to install the frame seals.

### 3.3 INSPECTION

- A. Manhole frame seals shall be visually inspected after installation to insure the seal is properly installed, no voids or leakage points exist, and the manhole frame seal will not detach from the manhole. Any seals failing this visual test shall be reworked, as necessary, and retested at no additional cost to the Owner.

### 3.4 TESTING

- A. Any seals not passing this visual inspection may, at the Contractor expense, be tested for leakage using a method approved by the Owner's Engineer.
- B. **Frame Sealing Test:** Manufactured frame seals shall be visually inspected to insure the sleeve is properly positioned, tight against the manhole surfaces, no voids or leakage points exist under the sleeve, and the bands and locking nuts are tight. This inspection shall be made prior to backfilling when an external seal is used.
  - 1. Applied seals shall be visually inspected to insure they have been applied according to the manufacturer's instructions.
  - 2. Manhole frame sealing shall be randomly tested for leakage using a method approved by the Engineer. A minimum of 10 percent of the sealed manholes shall be tested. Failing manholes shall be reworked and retested by the Contractor at no additional compensation. If more than 5 percent of the manholes tested fail the initial test, an additional 10 percent of the sealed manholes shall be tested. This process will continue until the testing is satisfactory, or until all manholes have been tested.
- C. **Cover Sealing Test:** The sealed manhole covers shall be visually inspected to insure the bearing surface was properly cleaned and the products were properly sized and installed according to the manufacturer's instructions.
  - 1. Any manholes leaking, visually unacceptable, or fail the test shall be reworked and retested. The Contractor shall be reimbursed for the cost of this additional work if an inspection by the Contractor and the Engineer shows the work performed by the Contractor was not the reason for the failure of the manhole to pass the leakage test. The Engineer reserves the right to inspect the sealed manholes during the warranty period. Any leakage or defects in the work found by this inspection shall be corrected by the Contractor within an agreed-upon time at no additional cost to the Owner.

### 3.5 CLEANUP

- A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.
- B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The local municipality can furnish a letter to the landfill stating the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are

to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.

- C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Engineer at no additional cost to the Owner. The work site restoration work shall be completed as show.

### 3.6 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at anytime during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the Owner. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION 333913.17

## SECTION 33 3915 – MANHOLE HEIGHT ADJUSTMENT

### PART 1 – GENERAL

#### 1.1 SECTION INCLUDES

- A. This section of the specifications provides requirements for the adjustment of height of manholes whose tops are below grade to eliminate the inflow and infiltration of storm or surface water (I&I) into the manhole.

#### 1.2 RELATED SECTIONS

- A. Section 312500: Erosion and Sedimentation Control
- B. Section 333913.16: Manhole Frame and Cover Installation
- C. Section 333913.13: Precast Concrete Manholes

#### 1.3 REFERENCES

- A. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale).
- B. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
- C. ASTM C270 - 12a Standard Specification for Mortar for Unit Masonry

#### 1.4 SUBMITTALS

- A. The Contractor shall submit shop drawings and product data in accordance with the requirements of the Submittals section of these Specifications.
- B. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:
  - 1. **Delays:** Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
  - 2. **Weather:** Conditions [e.g., rain (quantity, time, duration), sunny, windy, etc.].
  - 3. **Equipment:** On site (e.g., specialty cleaning, by-pass equipment, etc.).
  - 4. **Submittals:** To the Owner's Engineer or as directed in the submittals portion of these specifications.
  - 5. **Personnel:** On site by name (e.g., all labor, specialty services, etc.).
  - 6. **Accident:** Report (e.g., all injuries, vehicles, etc.).
  - 7. **Incident:** Report (e.g., damage to property, property owner complaint, etc.).
  - 8. **Major defects encountered:** including, but not limited to, collapsed pipe, if any, cave-ins, sink holes, etc.

- 9. **Visitors:** On site, time in and out.
- 10. **Disposals:** Type and quantity of debris (including liquids).

- C. Ring Product submittal and manufacturer's specifications.
- D. Traffic safety plan and procedures for Right-of-Way work.
- E. DOT Documents for permit.

1.5 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. It shall be the responsibility of the Contractor to schedule and perform the Work in a manner that does not cause or contribute to incidences of sanitary sewer overflows (SSOs) as defined in the latest Consent Decree.
- B. In the event that the Contractor's activities cause or contributes to SSOs, the Contractor shall immediately take appropriate action to immediately notify the Owner's dispatch center and the Owner; contain and/or stop the SSO; document the location, cause, and volume of the SSO; determine and document whether it entered a stream or storm drain (spill); clean up the spillage; and disinfect the area affected by the SSO. For details of spill response refer to the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP) approved by Owner. This document can be found on Department of Watershed Management website under the Consent Decree Program or upon request to the Owner.
- C. The Contractor shall indemnify and hold harmless the Owner and Owner's representatives for any fines or third-party claims for personal or property damage arising out of an SSO that is fully or partially the responsibility of the Contractor, including the legal, engineering, and administrative expenses of the Owner, Owner's employees, and City elected officials in defending such fines and claims.
- D. Any damage to public or private property due to the work performed by the Contractor is the responsibility of the Contractor. Any damage to municipal or private utilities that is caused by the Contractor's equipment or operation shall be repaired in a manner approved by the Owner at the Contractor's expense. Any damage caused by the Contractor to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor's expense. Any equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor within twenty-four (24) hours at the sole expense of the Contractor with notification to the Owner. Any damage to the Contractor's equipment is the Contractor's responsibility. If the equipment that is stuck or left in the sewer line/lateral causes a SSO, then the Contractor is liable for that SSO and all associated damages.
- E. The Owner reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

1.6 SAFETY

- A. All work shall be performed in accordance with OSHA, Local and State DOT standards local, state and federal safety regulations.



- B. No person shall enter a confined space without the documented requisite training, certification, and entry permits/licensing.
- C. The Contractor shall furnish DOT approved barricades around existing manholes to safeguard traffic and pedestrians in accordance with Contractor's approved safety plan.

## PART 2 – PRODUCTS

### 2.1 BRICK

- A. Brick shall conform to the requirements of ASTM C32 for grade SM. Bricks shall conform to the following dimensions, unless otherwise approved by the Owner's Engineer:

	Depth (inches)	Width (inches)	Length (inches)
Standard Size	2¼	3¾	8
Allowable Variation	±¼	±¼	±½

- B. All brick shall be new and whole, of uniform standard size, and with substantially straight and parallel edges and square corners. Bricks shall be of compact textures, burned hard entirely through, tough and strong, free from injurious cracks and flaws, and shall have a clear ring when struck together. No soft or salmon brick shall be used. Brick shall be culled after delivery, if required, and no culls shall be used except at such places, to such extent, and under such conditions as may be approved by the Owner's Engineer.

### 2.2 MORTAR

- A. The Contractor shall use mortar meeting the requirements of ASTM C270 Type S unless directed and approved otherwise by the Owner's Engineer.
- B. The Contractor shall prepare mortar only in quantities needed for immediate use. Mortar which has been mixed for more than thirty (30) minutes or greater than the manufacturers limits, whichever is more strict, which has set, or which has been retempered shall not be used.

### 2.3 METAL RISER RING

- A. **Cast Iron:** New cast iron riser rings shall be of domestic origin, conform to the latest edition of AASHTO M306. Contractor shall use cast iron riser rings for reconstruction and/or adjustment of the manhole frame and cover of less than 4 inches.

PART 3 – EXECUTION

3.1 GENERAL

- A. The Contractor shall take all necessary measures to prevent debris from entering the manhole under reconstruction. A temporary (waterproof) cover shall be required during the reconstruction period.
- B. The Contractor shall take all necessary measures to prevent damage to the existing manhole frame and cover during the adjustment work.
- C. In the event that the existing manhole is being located into a paved area, the Contractor is required to replace existing manhole frame and cover with a traffic manhole frame and cover. The Contractor is also required to provide a traffic safety plan to the Owner if the paved area is within the municipal or state Right-of-Way.
- D. **Riser Rings:** The Contractor shall replace existing, deteriorated riser rings with new precast concrete riser rings and/or cast iron riser rings. All manholes designated to receive casting adjustment and/or alignment shall be adjusted to meet existing finished grade unless an alternative elevation is specified. A cementitious mortar shall be placed in between individual precast concrete riser rings, and precast concrete riser ring and cone joints. The mortar shall be struck smooth with the interior surface of the manhole and floated with a sponge float to a surface profile of 8-10 mils. An epoxy system designed for metal-to-metal adhesion shall be used to connect individual cast iron riser rings and the cast iron riser rings to the frame. Prior to backfilling, rubber external seal wraps shall be applied to the cone and manhole section joint, riser rings and frame.
- E. **Manhole Frame and Cover:** Existing frames and covers which must be removed to facilitate manhole rehabilitation, riser reconstruction, and/or casting alignment or grade adjustments shall be salvaged, cleaned and given two coats of an approved bituminous coating by the Contractor for replacement unless determined to be defective by Engineer. If manhole frame and/or cover are determined to be defective by the Owner, Contractor shall replace with new frame and/or cover. Replacement frames and/or covers shall be furnished and installed in accordance with the Contract Documents. Frames shall be set in full mortar bed. The mortar shall be struck smooth with the interior surface of the manhole and floated with a sponge float to a surface profile of 8-10 mils.

3.2 MANHOLE ENTRY

- A. The Contractor shall exercise extreme caution during any manhole entry operations. Particular attention shall be paid while working on larger diameter sewers. The Contractor shall implement all necessary safety precautions, in accordance with OSHA, local, state, and federal regulations, to give maximum protection at all times to persons or property at or near the Site of the Work.

3.3 PROCEDURES FOR MANHOLE HEIGHT ADJUSTMENT

- A. The Contractor shall utilize maps, surveys, sounding instruments, or information from local residents to determine approximate locations of buried manholes. Manholes shall be exposed utilizing hand techniques or by carefully probing with mechanical equipment. Manhole exposure

in paved areas shall be accomplished by making a square cut in the surface with sufficient width to allow for the excavation of the material around the manhole to expose it to a depth necessary for adequate adjustment.

B. Raising Manholes:

1. The Contractor shall adjust the top elevation of the manhole frame to grade where indicated on the Plans or as directed by the Owner using brick and mortar conforming to the requirements of this section. A maximum adjustment of twelve (12) inches will be allowed using brick and mortar. Mortar shall be applied to create a smooth finish on the interior and exterior prior to backfill. Adjustments greater than twelve (12) inches shall be made by removing the cone section and adding the appropriate precast riser section.
2. In green (grass) areas, vertical height adjustments can be made using cast iron adjustment (riser) rings in lieu of brick and mortar. A maximum adjustment of twelve (12) inches will be allowed using riser rings. Adjustments greater than twelve (12) inches shall be made by removing the cone section and adding the appropriate precast riser section. The number of riser rings shall be limited to the minimum number that is required to achieve grade.
  - a. Joint sealant shall be applied on existing manhole frame and each joint of the riser ring(s) that are required to achieve grade. If the outdoor temperature is below 70 degrees Fahrenheit, the Contractor must heat the joint sealant before application.
  - b. The Contractor shall place concrete (Class B) collar (8 inch at the bottom of the frame to 2 inch at the top of the frame) on exterior of the manhole frame. The concrete collar on exterior of the manhole frame shall receive a broom finish.
3. When a manhole height adjustment is performed in a paved area and the manhole is not to be rehabilitated by any other method, then the Contractor shall install a manhole frame seal in accordance with the requirements of these Specifications.

C. Lowering or raising manholes in paved and green areas that require the removal of the manhole cone:

1. If the vertical height adjustment of the existing manhole is greater than 12 inches or the existing manhole must be lowered, the Contractor shall remove the manhole cone section to the straight barrel section of the existing manhole.
2. The manhole frame and cover shall be removed from the existing manhole.
3. The Contractor shall remove of the manhole cone by either the saw cut method or explosive (shot) cord method.
4. The Contractor shall prepare the existing manhole barrel for the re-construction of the cast-in-place manhole as shown on the standard details.
5. The Contractor shall re-construct the cast-in-place concrete manhole as shown on the standard details.
6. If the manhole frame is not reset as part of the cast-in-place concrete manhole pour, the Contractor shall apply a 1½ inch bed of concrete (Class B) for the re-install the manhole frame on the cast-in-place concrete manhole. The Contractor shall also place concrete (Class B) collar (8 inch at the bottom of the frame to 2 inch at the top of the frame) on exterior of the manhole frame. The concrete collar on exterior of the manhole frame shall receive a broom finish.

- A. If no sewage flow is observed through the existing manhole, the Contractor shall perform a visual inspection. If sewage flow is observed through the existing manhole, the Engineer and Owner will perform a visual inspection.

### 3.4 CLEANUP

- A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area in accordance with these specifications.
- B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.
- C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

### 3.5 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final written acceptance of the Owner. If, at any time during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the Owner. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract from the date of repairs' final written acceptance.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated for warranty extensions.

END OF SECTION 333915

SECTION 33 4100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Non-pressure transition couplings.
3. Pressure pipe couplings.
4. Expansion joints and deflection fittings.
5. Backwater valves.
6. Cleanouts.
7. Drains.
8. Encasement for piping.
9. Manholes.
10. Channel drainage systems.
11. Catch basins.
12. Stormwater inlets.
13. Stormwater detention structures.
14. Pipe outlets.
15. Dry wells.
16. Stormwater disposal systems.

1.3 DEFINITIONS

- A. FRP: Fiberglass-reinforced plastic.
- B. HDPE WT: High density polyethylene pipe with water tight joints.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
  1. Manholes: Include plans, elevations, sections, details, frames, and covers.
  2. Catch basins stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.

3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from storm drainage system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.
- B. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet and vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.
- C. Product Certificates: For each type of cast-iron soil pipe and fitting, from manufacturer.
- D. Field quality-control reports.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic manholes, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle manholes according to manufacturer's written rigging instructions.
- D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

#### 1.7 PROJECT CONDITIONS

- A. Interruption of Existing Storm Drainage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  1. Notify Construction Manager no fewer than two days in advance of proposed interruption of service.
  2. Do not proceed with interruption of service without Construction Manager's written permission.

### PART 2 - PRODUCTS

#### 2.1 HDPE Water Tight (WT)

##### **Pipe and Fittings**

ADS N-12 WT IB pipe (per AASHTO) shall have a smooth interior and annular exterior corrugations.

## DALTON PICKLEBALL COMPLEX

DALTON, GA

PROJECT NO. 2024-0283

Prime Engineering, Inc.

February 28, 2025

- 4- through 10-inch pipe shall meet AASHTO M252, Type S.
- 12- through 60-inch (300 to 1500 mm) pipe shall meet AASHTO M294, Type S or ASTM F2306.
- Manning's "n" value for use in design shall be 0.012.

### Joint Performance

Pipe shall be joined using a bell & spigot joint meeting the requirements of AASHTO M252, AASHTO M294, or ASTM F2306. The joint shall be watertight according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable, protective wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. 12- through 60-inch (300 to 1500 mm) diameters shall have an exterior bell wrap installed by the manufacturer.

### Fittings

Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the watertight joint performance requirements of AASHTO M252, AASHTO M294, or ASTM F2306.

### Field Pipe and Joint Performance

To assure watertightness, field performance verification may be accomplished by testing in accordance with ASTM F2487. Appropriate safety precautions must be used when field-testing any pipe material. Contact the manufacturer for recommended leakage rates.

### Material Properties

Virgin material for pipe and fitting production shall be high-density polyethylene conforming with the minimum requirements of cell classification 424420C for 4- through 10-inch (100 to 250 mm) diameters, and 435400C for 12- through 60-inch (300 to 1500 mm) diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch (300 to 1500 mm) virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306 respectively.

### Installation

Installation shall be in accordance with ASTM D2321 and ADS recommended installation guidelines, with the exception that minimum cover in trafficked areas for 4- through 48-inch (100 to 1200 mm) diameters shall be one foot. (0.3 m) and for 60-inch (1500 mm) diameter the minimum cover shall be 2 ft. (0.6 m) in single run applications. Backfill for minimum cover situations shall consist of Class 1 (compacted), Class 2 (minimum 90% SPD) or Class 3 (minimum 95%) material. Maximum fill heights depend on embedment material and compaction level; please refer to Technical Note 2.01. Contact your local ADS representative or visit our website at [www.ads-pipe.com](http://www.ads-pipe.com) for a copy of the latest installation guidelines.

### Pipe Dimensions

1. Inside Diameter 15 inch / Outside Diameter 18 inch
2. Inside Diameter 18 inch / Outside Diameter 22 inch
3. Inside Diameter 24 inch / Outside Diameter 28 inch
4. Inside Diameter 30 inch / Outside Diameter 36 inch

2.2 DUCTILE-IRON, CULVERT PIPE AND FITTINGS

- A. Pipe: ASTM A 716, for push-on joints.
- B. Standard Fittings: AWWA C110, ductile or gray iron, for push-on joints.
- C. Compact Fittings: AWWA C153, for push-on joints.
- D. Gaskets: AWWA C111, rubber.

2.3 DUCTILE-IRON, PRESSURE PIPE AND FITTINGS

- A. Mechanical-Joint Piping:
  - 1. Pipe: AWWA C151, with bolt holes in bell.
  - 2. Standard Fittings: AWWA C110, ductile or gray iron, with bolt holes in bell.
  - 3. Compact Fittings: AWWA C153, with bolt holes in bells.
  - 4. Glands: Cast or ductile iron, with bolt holes and high-strength, cast-iron or high-strength, low-alloy steel bolts and nuts.
  - 5. Gaskets: AWWA C111, rubber, of shape matching pipe, fittings, and glands.

2.4 PVC PIPE AND FITTINGS

- A. PVC Profile Sewer Piping:
  - 1. Pipe: ASTM F 794, PVC profile, gravity sewer pipe with bell-and-spigot ends for gasketed joints.
  - 2. Fittings: ASTM D 3034, PVC with bell ends.
  - 3. Gaskets: ASTM F 477, elastomeric seals.
- B. PVC Gravity Sewer Piping:
  - 1. Pipe and Fittings: ASTM F 679, SDR 26, PVC gravity sewer pipe with bell-and-spigot ends and with integral ASTM F 477, elastomeric seals for gasketed joints.
- C. PVC Pressure Piping:
  - 1. Pipe: AWWA C900, Class 100, Class 150, and Class 200 PVC pipe with bell-and-spigot ends for gasketed joints.
  - 2. Fittings: AWWA C900, Class 100, Class 150 and Class 200 PVC pipe with bell ends
  - 3. Gaskets: ASTM F 477, elastomeric seals.
- D. PVC Water-Service Piping:
  - 1. Pipe: ASTM D 1785, SDR 26 PVC, with plain ends for solvent-cemented joints.
  - 2. Fittings: ASTM D 2467, Schedule 80 PVC, socket type.



2.5 CONCRETE PIPE AND FITTINGS

- A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.
  - 1. Tongue-and-groove ends and gasketed joints with ASTM C 443.

2.6 NONPRESSURE TRANSITION COUPLINGS

- A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Sleeve Materials:
  - 1. For Concrete Pipes: ASTM C 443, rubber.
  - 2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
  - 3. For Fiberglass Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  - 4. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
  - 5. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
- C. Unshielded, Flexible Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Dallas Specialty & Mfg. Co.
    - b. Fernco Inc.
    - c. Logan Clay Pipe.
    - d. Mission Rubber Company; a division of MCP Industries, Inc.
    - e. NDS Inc.
    - f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
  - 3. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
- D. Shielded, Flexible Couplings:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Cascade Waterworks Mfg.
    - b. Dallas Specialty & Mfg. Co.

- c. Mission Rubber Company; a division of MCP Industries, Inc.
  3. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- E. Ring-Type, Flexible Couplings:
1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Fernco Inc.
    - b. Logan Clay Pipe.
    - c. Mission Rubber Company; a division of MCP Industries, Inc.
  3. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

## 2.7 PRESSURE PIPE COUPLINGS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  1. Cascade Waterworks Mfg.
  2. Dresser, Inc.
  3. Ford Meter Box Company, Inc. (The); Pipe Products Div.
  4. JCM Industries, Inc.
  5. Romac Industries, Inc.
  6. Smith-Blair, Inc.; a Sensus company.
  7. Victaulic Depend-O-Lok, Inc.
  8. Viking Johnson.
- C. Description: AWWA C219, tubular-sleeve coupling, with center sleeve, gaskets, end rings, and bolt fasteners.
- D. Metal, bolted, sleeve-type, reducing or transition coupling, for joining underground pressure piping. Include 200-psig minimum pressure rating and ends sized to fit adjoining pipes.
- E. Center-Sleeve Material: Manufacturer's standard.
- F. Gasket Material: Natural or synthetic rubber.
- G. Metal Component Finish: Corrosion-resistant coating or material.

2.8 EXPANSION JOINTS AND DEFLECTION FITTINGS

A. Ductile-Iron Flexible Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. EBAA Iron Sales, Inc.
  - b. Romac Industries, Inc.
  - c. Star Pipe Products.
3. Description: Compound fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections, rated for 250-psig (1725-kPa) minimum working pressure and for offset and expansion indicated.

B. Ductile-Iron Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Dresser, Inc.
  - b. EBAA Iron Sales, Inc.
  - c. JCM Industries, Inc.
  - d. Smith-Blair, Inc.; a Sensus company.
3. Description: Three-piece assembly of telescoping sleeve with gaskets and restrained-type, ductile-iron[ or steel with protective coating], bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for expansion indicated.

C. Ductile-Iron Deflection Fittings:

1. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. EBAA Iron Sales, Inc.
3. Description: Compound-coupling fitting, with ball joint, flexing section, gaskets, and restrained-joint ends, complying with AWWA C110 or AWWA C153. Include rating for 250-psig minimum working pressure and for up to 15 degrees of deflection.

## 2.9 BACKWATER VALVES

### A. Cast-Iron Backwater Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
  - a. Josam Company.
  - b. Smith, Jay R. Mfg. Co.
  - c. Tyler Pipe.
  - d. Watts Water Technologies, Inc.
  - e. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
  - f. <Insert manufacturer's name>.
2. Description: ASME A112.14.1, gray-iron body and bolted cover, with bronze seat.
3. Horizontal type; with swing check valve and hub-and-spigot ends.
4. Combination horizontal and manual gate-valve type; with swing check valve, integral gate valve, and hub-and-spigot ends.
5. Terminal type; with bronze seat, swing check valve, and hub inlet.

### B. Plastic Backwater Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - a. Canplas LLC.
  - b. IPS Corporation.
  - c. NDS Inc.
  - d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
  - e. Sioux Chief Manufacturing Company, Inc.
  - f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.
3. Description: Horizontal type; with PVC body, PVC removable cover, and PVC swing check valve.

## 2.10 CLEANOUTS

### A. Cast-Iron Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
  - a. Josam Company.
  - b. MIFAB, Inc.
  - c. Smith, Jay R. Mfg. Co.
  - d. Tyler Pipe.
  - e. Watts Water Technologies, Inc.
  - f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

2. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug.
3. Top-Loading Classification(s): Extra-Heavy Duty.
4. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

B. Plastic Cleanouts:

1. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
  - a. Canplas LLC.
  - b. IPS Corporation.
  - c. NDS Inc.
  - d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
  - e. Sioux Chief Manufacturing Company, Inc.
  - f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.
2. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.11 DRAINS

A. Cast-Iron Area Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
  - a. Josam Company.
  - b. MIFAB, Inc.
  - c. Smith, Jay R. Mfg. Co.
  - d. Tyler Pipe.
  - e. Watts Water Technologies, Inc.
  - f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
2. Description: ASME A112.6.3 gray-iron round body with anchor flange and round[ secured] grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
3. Top-Loading Classification(s): Heavy Duty.

B. Cast-Iron Trench Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
  - a. Josam Company.
  - b. MIFAB, Inc.

- c. Smith, Jay R. Mfg. Co.
  - d. Tyler Pipe.
  - e. Watts Water Technologies, Inc.
  - f. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
2. Description: ASME A112.6.3, 6-inch- wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular secured grate. Include units of total length indicated and quantity of bottom outlets with inside call or spigot connections, of sizes indicated.
  3. Top-Loading Classification(s): Extra-Heavy Duty.

## 2.12 MANHOLES

### A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

### B. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.
2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.

4. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
5. Steps: Individual FRP steps, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
6. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch- minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile iron unless otherwise indicated.

2.13 CONCRETE

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

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

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

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

C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.

1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
  - a. Invert Slope: 1 percent through manhole.
2. Benches: Concrete, sloped to drain into channel.
  - a. Slope: 8 percent.

- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water/cementitious materials ratio.
  - 1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
  - 2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.
- E. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
- F. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

## 2.14 CATCH BASINS

- A. Standard Precast Concrete Catch Basins:
  - 1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
  - 2. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
  - 3. Riser Sections: 4-inch minimum thickness, 48-inch diameter, and lengths to provide depth indicated.
  - 4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
  - 5. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
  - 6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
  - 7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
  - 8. Steps: Individual FRP steps, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
  - 9. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- B. Designed Precast Concrete Catch Basins: ASTM C 913, precast, reinforced concrete; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for joint sealants.
  - 1. Joint Sealants: ASTM C 990, bitumen or butyl rubber.
  - 2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
  - 3. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and grate.
  - 4. Steps: Individual FRP steps, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.



5. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.
- C. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
  1. Size: 24 by 24 inches minimum unless otherwise indicated.
  2. Grate Free Area: Approximately 50 percent unless otherwise indicated.
- D. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch- diameter flat grate with small square or short-slotted drainage openings.
  1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

#### 2.15 STORMWATER INLETS

- A. Curb Inlets: Made with vertical curb opening.
- B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.
- D. Frames and Grates: Heavy duty, according to utility standards.

#### 2.16 STORMWATER DETENTION STRUCTURES

- A. Cast-in-Place Concrete, Stormwater Detention Structures: Constructed of reinforced-concrete bottom, walls, and top; designed according to ASTM C 890 for A-16 (AASHTO HS20-44), heavy-traffic, structural loading; of depth, shape, dimensions, and appurtenances indicated.
  1. Ballast: Increase thickness of concrete as required to prevent flotation.
  2. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch total thickness, that match 24-inch- diameter frame and cover.
  3. Steps: Individual FRP steps, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of structure to finished grade is less than 60 inches.
- B. Manhole Frames and Covers: ASTM A 536, Grade 60-40-18, ductile-iron castings designed for heavy-duty service. Include 24-inch ID by 7- to 9-inch riser with 4-inch minimum width flange, and 26-inch-diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."

2.17 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."
  - 1. Average Size: NSSGA No. R-3, screen opening 2 inches.
  - 2. Average Size: NSSGA No. R-4, screen opening 3 inches.
  - 3. Average Size: NSSGA No. R-5, screen opening 5 inches.
- C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton average weight armor stone, unless otherwise indicated.

2.18 DRY WELLS

- A. Description: ASTM C 913, precast, reinforced, perforated concrete rings. Include the following:
  - 1. Floor: Cast-in-place concrete.
  - 2. Cover: Liftoff-type concrete cover with cast-in lift rings.
  - 3. Wall Thickness: 4 inches minimum with 1-inch diameter or 1-by-3-inch- maximum slotted perforations arranged in rows parallel to axis of ring.
    - a. Total Free Area of Perforations: Approximately 15 percent of ring interior surface.
    - b. Ring Construction: Designed to be self-aligning.
  - 4. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch washed, crushed stone or gravel.
- B. Description: Manufactured PE side panels and top cover that assemble into 50-gal. storage capacity units.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product or comparable product by one of the following:
    - a. NDS Inc.
  - 2. Side Panels: With knockout ports for piping and seepage holes.
  - 3. Top Cover: With knockout port for drain.
  - 4. Filter Fabric: As recommended by unit manufacturer.
  - 5. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch washed, crushed stone or gravel.
- C. Description: Constructed-in-place aggregate type. Include the following:
  - 1. Lining: Clay or concrete bricks.

2. Lining: Concrete blocks or precast concrete rings with notches or weep holes.
3. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch washed, crushed stone or gravel.
4. Cover: Precast, reinforced-concrete slab, designed for structural loading according to ASTM C 890 and made according to ASTM C 913. Include slab dimensions that will extend 12 inches minimum beyond edge of excavation, with bituminous coating over entire surface. Cast cover with opening for manhole in center.
5. Manhole: 24-inch- diameter, reinforced-concrete access lid with steel lift rings. Include bituminous coating over entire surface.

## 2.19 STORMWATER DISPOSAL SYSTEMS

### A. Chamber Systems:

1. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
  - a. Advanced Drainage Systems.
  - b. CULTEC, Inc.
  - c. Hancor Inc.
  - d. Infiltrator Systems, Inc.
  - e. StormTech LLC.
  - f. <Insert manufacturer's name>.
2. Storage and Leaching Chambers: Molded PE with perforated sides and open bottom. Include number of chambers, distribution piping, end plates, and other standard components as required for system total capacity.
3. Filtering Material: ASTM D 448, Size No. 24, 3/4- to 2-1/2-inch washed, crushed stone or gravel.
4. Filter Mat: Geotextile woven or spun filter fabric, in one or more layers, for minimum total unit weight of 4 oz./sq. yd..

### B. Pipe Systems: Perforated manifold, header, and lateral piping complying with AASHTO M 252M for NPS 10 and smaller, AASHTO M 294M for NPS 12 to NPS 60. Include proprietary fittings, couplings, seals, and filter fabric.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product or comparable product by one of the following:
  - a. Advanced Drainage Systems.
  - b. Hancor Inc.

### PART 3 - EXECUTION

#### 3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

#### 3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling.
- F. Install gravity-flow, nonpressure drainage piping according to the following:
  - 1. Install piping pitched down in direction of flow.
  - 2. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
  - 3. Install piping with 24-inch minimum cover.
  - 4. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
  - 5. Install hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook."
  - 6. Install ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
  - 7. Install corrugated steel piping according to ASTM A 798/A 798M.
  - 8. Install corrugated aluminum piping according to ASTM B 788/B 788M.
  - 9. Install ABS sewer piping according to ASTM D 2321 and ASTM F 1668.
  - 10. Install PE corrugated sewer piping according to ASTM D 2321.
  - 11. Install PVC cellular-core piping according to ASTM D 2321 and ASTM F 1668.
  - 12. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
  - 13. Install PVC profile gravity sewer piping according to ASTM D 2321 and ASTM F 1668.
  - 14. Install PVC water-service piping according to ASTM D 2321 and ASTM F 1668.

15. Install fiberglass sewer piping according to ASTM D 3839 and ASTM F 1668.
  16. Install nonreinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
  17. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."
- G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
1. Hub-and-spigot, cast-iron soil pipe and fittings.
  2. Hubless cast-iron soil pipe and fittings.
  3. Ductile-iron pipe and fittings.
  4. Expansion joints and deflection fittings.

### 3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join hub-and-spigot, cast-iron soil piping with gasketed joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
  2. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.
  3. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.
  4. Join ductile-iron culvert piping according to AWWA C600 for push-on joints.
  5. Join ductile-iron piping and special fittings according to AWWA C600 or AWWA M41.
  6. Join corrugated steel sewer piping according to ASTM A 798/A 798M.
  7. Join corrugated aluminum sewer piping according to ASTM B 788/B 788M.
  8. Join ABS sewer piping according to ASTM D 2321 and ASTM D 2751 for elastomeric-seal joints.
  9. Join corrugated PE piping according to ASTM D 3212 for push-on joints.
  10. Join PVC cellular-core piping according to ASTM D 2321 and ASTM F 891 for solvent-cemented joints.
  11. Join PVC corrugated sewer piping according to ASTM D 2321 for elastomeric-seal joints.
  12. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasketed joints.
  13. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.
  14. Join fiberglass sewer piping according to ASTM D 3839 for elastomeric-seal joints.
  15. Join nonreinforced-concrete sewer piping according to ASTM C 14 and ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
  16. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.
  17. Join dissimilar pipe materials with nonpressure-type flexible couplings.

### 3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
  - 1. Use Light-Duty, top-loading classification cleanouts in earth or unpaved foot-traffic areas.
  - 2. Use Medium-Duty, top-loading classification cleanouts in paved foot-traffic areas.
  - 3. Use Extra-Heavy-Duty, top-loading classification cleanouts in roads.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

### 3.5 DRAIN INSTALLATION

- A. Install type of drains in locations indicated.
  - 1. Use Light-Duty, top-loading classification drains in earth or unpaved foot-traffic areas.
  - 2. Use Medium-Duty, top-loading classification drains in paved foot-traffic areas.
  - 3. Use Extra-Heavy-Duty, top-loading classification drains in roads.
- B. Embed drains in 4-inch minimum concrete around bottom and sides.
- C. Fasten grates to drains if indicated.
- D. Set drain frames and covers with tops flush with pavement surface.
- E. Assemble trench sections with flanged joints.
- F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

### 3.6 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants according to ASTM C 891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 inches above finished surface elsewhere unless otherwise indicated.

3.7 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.8 STORMWATER INLET AND OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.9 CONCRETE PLACEMENT

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

3.10 CHANNEL DRAINAGE SYSTEM INSTALLATION

- A. Install with top surfaces of components, except piping, flush with finished surface.
- B. Assemble channel sections to form slope down toward drain outlets. Use sealants, adhesives, fasteners, and other materials recommended by system manufacturer.
- C. Embed channel sections and drainage specialties in 4-inch minimum concrete around bottom and sides.
- D. Fasten grates to channel sections if indicated.
- E. Assemble channel sections with flanged or interlocking joints.
- F. Embed channel sections in 4-inch minimum concrete around bottom and sides.

3.11 STORMWATER DISPOSAL SYSTEM INSTALLATION

- A. Chamber Systems: Excavate trenches of width and depth, and install system and backfill according to chamber manufacturer's written instructions. Include storage and leaching chambers, filtering material, and filter mat.
- B. Piping Systems: Excavate trenches of width and depth, and install piping system, filter fabric, and backfill, according to piping manufacturer's written instructions.

### 3.12 CONNECTIONS

- A. Connect drainage piping in building's storm building drains specified in division.
- B. Make connections to existing piping and underground manholes.
  - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
  - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
  - 3. Make branch connections from side into existing piping, NPS 21 or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.
    - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
    - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
  - 4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- C. Connect to sediment interceptors specified in Section 221323 "Sanitary Waste Interceptors."
- D. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
  - 1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
    - a. [Unshielded] [Shielded] flexible couplings for same or minor difference OD pipes.
    - b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
    - c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.
  - 2. Use pressure-type pipe couplings for force-main joints.



3.13 IDENTIFICATION

- A. Materials and their installation are specified in Section 312000 "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
1. Use[ warning tape or] detectable warning tape over ferrous piping.
  2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.14 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
1. Submit separate reports for each system inspection.
  2. Defects requiring correction include the following:
    - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    - d. Infiltration: Water leakage into piping.
    - e. Exfiltration: Water leakage from or around piping.
  3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
  4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
  2. Test completed piping systems according to requirements of authorities having jurisdiction.
  3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
  4. Submit separate report for each test.
  5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
    - a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
    - b. Option: Test plastic piping according to ASTM F 1417.
    - c. Option: Test concrete piping according to ASTM C 924.

- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.15 CLEANING

- A. Clean interior of piping of dirt and superfluous materials. Flush with potable water.

END OF SECTION 334100

SECTION 334113 – REINFORCED CONCRETE PIPE FOR STORM DRAINS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary to install reinforced concrete pipe and fittings as shown on the drawings and required by the Specifications.

1.2 SHOP DRAWINGS

- A. Submit shop drawings showing piping and drainage structure layout and details of reinforcement, joint and method of construction and installation of reinforced concrete pipe, specials, and fittings required.

1.3 RELATED WORK

- A. Section 312000: Excavation, Backfill, Fill and Grading for Pipe
- B. Section 017420: Miscellaneous Work and Clean-up
- C. Division 3: Concrete
- D. Division 4: Mortar

PART 2 - PRODUCTS

2.1 REINFORCED CONCRETE PIPE

- A. Except as otherwise specified within, pipe shall conform to ASTM Standard Specifications for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe, Designation C76, Class III, Wall B. The tabulated reinforcement given in the tables in ASTM Standard C76 shall be the minimum required.
- B. The pipe shall be capable of withstanding construction equipment loading which may be encountered during the progress of work. Any pipe damage during construction operations shall be promptly and satisfactorily repaired.
- C. Non-air-entraining Portland cement conforming to ASTM Specification C150, Type I shall be used, except as otherwise approved in writing. The use of a non-bleeding, water-reducing, dispersing agent may be permitted subject to the specific approval. The use of any other admixture will not be permitted.

- D. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM Specification C33, except for gradation, with a maximum loss of 5% when subjected to 5 cycles of the soundness test using magnesium sulfate.
- E. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM Specification C33, with a maximum loss of 5% when subjected to 5 cycles of the soundness test using magnesium sulfate.
- F. The 28-day compressive strength of the concrete, as indicated by cores cut from the pipe shall be not less than 4,000 psi. The pipe interior shall comprise a continuous integral cement skin and shall be smooth and even, free from roughness, projections, indentations, offsets or irregularities. The concrete mass shall be dense and uniform. The average absorption shall not exceed 5.3%. Reinforcement shall be circular for all concrete pipe. Reinforcement in the bell and spigot shall be adequate to prevent damage to concrete during shipping, handling and installation. Cores indicating reinforcing steel having less than 85% bond shall be cause for rejection of the lot of pipes.
- G. The pipe shall be clearly marked as required by ASTM C76. The markings may be at either end of the pipe for the convenience of the manufacturer, but for any one size shall always be at the same end of each pipe length. Pipe shall not be shipped until compressive strength of the concrete has attained 3,000 psi and not before 5 days after manufacture and/or repaired, whichever is the longer.
- H. Pipes shall have a minimum laying length of approximately 8', except for closure and other special pieces. The length of the incoming and outgoing concrete pipe at each structure shall not exceed 4', except where the joint is cast flush with the exterior wall of the structure. Maximum laying length shall not exceed 16', but the installation of 16' lengths will depend upon the ability of the Contractor to handle such lengths of pipe. In deep sheeted trenches comply with trench width requirements, maintain the integrity of the sheeting and avoid disturbance to adjacent ground. If in the opinion of the Owner's Representative the use of 16' lengths is impracticable, shorter lengths shall be used.
- I. The quality of all materials and the finished pipe shall be subject to inspection and approval of a representative of the Owner. Such inspection may be made at both places, and the pipe shall be subject to rejection at any time because of failure to meet any of the specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.
- J. At the time of inspection, the pipe will be carefully examined for compliance with the appropriate ASTM and project specification, and inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, and other features. All pipes will be checked for soundness by being tapped and scratched over a reasonable portion of the area, at least once on every 20 sq. inches of pipe surface. The surface shall be dense and close-textured. Cores shall also serve as a basis for rejection of pipe, particularly if lamination or poor bond of reinforcement is apparent.
- K. The manufacturer shall inspect all pipe joints for out-of-roundness and pipe ends for squareness. The manufacturer shall furnish a notarized affidavit stating all pipes meet

the requirements of ASTM C76, these specifications, and the joint design with respect to square ends and out-of-round joint surfaces.

- L. Unsatisfactory or damaged pipe will be either permanently rejected or returned for minor repairs. Only that pipe actually conforming to the specifications and accepted will be listed for approval, shipment and payment. Approved pipe will be so stamped or stenciled on the inside before it is shipped. All pipe which has been damaged after delivery will be rejected, and if such pipe already has been laid in the trench, it shall be acceptably repaired, if permitted, or removed and replaced.
- M. Pits, blisters, rough spots breakage and other imperfections may be repaired, subject to the approval of the Owner's Representative, after demonstration by the manufacturer that strong permanent repairs result. Repairs shall be carefully inspected before final approval. Non-shrink cement mortar used for repairs shall have a minimum compressive strength of 6,000 psi at the end of 7 days and 7,000 psi at the end of 28 days, when tested in 3" cylinders store in the standard manner. Epoxy mortar may be utilized for repairs.

## 2.2 JOINTS FOR CONCRETE PIPE

- A. Joints for concrete pipe shall be the tongue and groove or bell and spigot type of joint with provisions for using a round rubber "O-Ring" gasket in recess in the spigot end of the pipe. The bevel on the bell of the pipe shall be between 1-1/2 degree and 2-1/2 degree and the annular open spaced at the gasket when the joint is made up and pipes are centered in line shall not exceed 1/8". The faces of pipe in contact with the gasket shall be true, and free of irregularities. Joints for drain pipe may be made with mortar.
- B. The round rubber "O-Ring" gaskets for either joint shall conform to ASTM C443 Specifications for joints for Circular Concrete Sewer and Culvert Pipe using rubber gaskets.

## PART 3 - EXECUTION

### 3.1 LAYING REINFORCED CONCRETE PIPE FOR DRAINS

- A. Bell and spigot pipe joints shall be made by caulking all around with twisted jute of proper size to give proper alignment of the pipe. Inner surfaces of abutting sections shall be flush and on a smooth grade. Brush and wet the jointing surfaces and fill the annular opening with mortar to a minimum depth of 2", sufficient to form a bead around the outside face of the bell.
- B. Mortar for jointing shall consist of one part Portland cement and two parts sand, using a minimum amount of water-sufficient to make a workable mortar.
- C. Joints shall be immediately protected from freezing or excessive drying by covering with earth, burlap or other approved material.

3.2 CLEANING

- A. At the conclusion of the work, thoroughly clean all of the new pipe lines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the lowest outlet. If, after this outlet cleaning, obstructions remain, they shall be removed.

END OF SECTION 334113