SECTION 32 13 13.1
CONCRETE PAVING FOR PEDESTRIAN AREAS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

C. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2023.

D. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

E. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

F. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

G. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

H. ASTM E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces; 2011 (Reapproved 2019).

1.02 SECTION INCLUDES

A. This Section includes exterior cement concrete pavement for the following:
   1. Walkways.
   2. Courtyards.
   3. Plazas.
   4. Pedestrian Ramps.

1.03 RELATED SECTIONS

A. Preparation of subgrade to proper grade for concrete, including compaction, is specified in Contract Specifications Section 31 30 00, Earthwork.

B. Portland cement concrete curbs and gutters are specified in Contract Specifications Section 32 16 13, Cast-In-Place Concrete Curbs and Walls.

C. Portland cement concrete, concrete reinforcement, and various materials, services, and incidentals pertaining thereto shall conform with Contract Specifications Section 03 20 00, Concrete Reinforcing, Contract Specifications Section 03 15 00, Concrete Accessories, and Contract Specifications Section 03 30 00, Cast-In-Place Concrete.

D. Requirements for tack coat is specified in Contract Specifications Section 32 12 13, Asphalt Paving.

1.04 MEASUREMENT AND PAYMENT

A. General: Measurement and payment for Portland cement concrete paving will be by the lump-sum method or by the unit-price method as determined by the listing of the bid item for Portland cement concrete paving indicated in the Bid Schedule of the Bid Form.

B. Lump sum: If the Bid Schedule indicates a lump sum for Portland cement concrete paving, the lump-sum method of measurement and payment will be in accordance with Contract Specifications Section 01 20 00, Price and Payment Procedures.

C. Unit Price: If the Bid Schedule indicates a unit price for Portland cement concrete paving, the unit-price method of measurement and payment will be as follows:
   1. Measurement:
      a. Portland cement concrete pavement will be measured for payment by the square yard for each specified class of concrete and thickness.

b. Reinforcing steel, dowels, and tie bars placed with work will be measured separately for payment as specified in Contract Specifications Section 03 20 00, Concrete Reinforcing.
c. Transverse expansion joints, weakened-plane joints, and joints sawed within 5 feet of volunteer cracks, longitudinal and transverse construction joints, and longitudinal weakened-plane joints will not be measured separately for payment, and all costs in connection therewith will be considered included in the measurement of Portland cement concrete pavement.

2. Payment: Portland cement concrete paving will be paid for at the indicated Contract unit prices for the computed quantities as determined by the measurement method specified in Article 1.03.C., herein.

1.05 REFERENCES

A. American Concrete Institute (ACI):
1. ACI 117 Specification Tolerances for Concrete Construction and
2. Materials and Commentary
3. ACI 318 Building Code Requirements for Structural Concrete and
   a. Commentary

B. American Society for Testing and Materials (ASTM):
1. ASTM A615/ Standard Specification for Deformed and Plain Carbon-Steel
   a. A615M Bars for Concrete Reinforcement
2. ASTM C39/ Standard Test Method for Compressive Strength of Cylindrical
   a. C39M Concrete Specimens
3. ASTM C309 Standard Specification for Liquid Membrane-Forming
   a. Compounds for Curing Concrete
4. ASTM C496/ Standard Test Method for Splitting Tensile Strength of
   a. C496M Cylindrical Concrete Specimens
5. ASTM D2628 Standard Specification for Preformed Polychloroprene
   a. Elastomeric Joint Seals for Concrete Pavements

1.06 SUBMITTALS

A. General: Refer to Contract Specifications Section 01 33 00, Submittal Procedures, and Contract Specifications Section 01 33 23, Shop Drawings, Product Data, and Samples, for submittal requirements and procedures.

B. Product Data: Submit the respective manufacturer’s product data for manufactured products.

C. Design Mixtures: For each concrete pavement mixture.

D. Color Pigments: For integral color concrete. Color to be selected by Architect from manufacturer’s full range of pigment colors.

E. LEED Action Submittals (Projects authorized for LEED certification only):
1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:
   a. Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
   b. Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.
   c. Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.
   d. Material Test Reports: From a qualified testing laboratory indicating and interpreting test results for compliance with requirements indicated, based on comprehensive testing of current materials:
   e. Product Certificates: For materials manufactured within 100 miles of Project, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include distance to Project and cost for each raw material.

2. Indoor Environmental Quality, Low Emitting Materials: Building Products must be tested and compliant with the NYS DEC, using the applicable exposure scenario.
    a. Provide General Emissions Evaluation certificates for adhesives, sealants showing compliance with NYS DEC emissions testing or equivalent.
    b. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants.
    c. Laboratory Test Reports: For installation adhesives indicating compliance with requirements for low-emitting materials

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C94/C94M requirements for production facilities and equipment.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide a minimum Solar Reflectance Index of 0.33 when determined in accordance with the Solar Reflectance Index method in ASTM E1980 using a convection coefficient of 2.1 Btu/h·ft2 ·°F, based on three-year-aged solar reflectance and three-year-aged thermal emittance tested in accordance with ANSI/CRRC S100.

2.02 STEEL REINFORCEMENT

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

B. Deformed-Steel Welded Wire Reinforcement: ASTM A-497, flat sheet.

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

D. Plain Steel Wire: ASTM A 82, as drawn.

E. Deformed-Steel Wire: ASTM A-496.

F. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice."

2.03 CONCRETE MATERIALS

A. Cementitious Material: Provide the following cementitious materials, of the same type, brand, and source throughout the Project:
    1. Portland Cement: ASTM C 150, Type gray.
    2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

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

C. Water: ASTM C94/C94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: ASTM C494/C494M, of type suitable for application, certified by manufacturer to be compatible with other admixtures and to contain no more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

2.04 FIBER REINFORCEMENT

A. Synthetic Fiber: Polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long.

2.05 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.

F. White Waterborne Membrane-Forming Curing Compound: ASTM C309, Type 2, Class B.

2.06 RELATED MATERIALS

A. Expansion-Joint Filler: ASTM D2628, preformed elastomeric joint seal.

B. One-component polyurethane self-leveling sealant, conforming to ASTM C920, Type S, Grade P, Class 25, Use T or M, in the upper 1/2-inch depth of the joint, over the joint filler material.

C. Pre-formed expansion board cap waterstop.
   1. Acceptable products:
      a. Sika G-Seal Modified PVC Paving Cap Seal Model 605
      b. JP Specialties Integrated Cap System Model JPEB375
      c. Tex-Trude Tex-Cap Model T605

2.07 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, with the following properties:
   1. Compressive Strength (28 Days): 3000 psi.
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.50.
   3. Slump Limit: 4 inches, plus or minus 1 inch.
   4. Air Content: 3 to 5 percent.

B. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.

2.08 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M and ASTM C 1116. Furnish batch certificates for each batch discharged and used in the Work.

PART 3 EXECUTION

3.01 EROSION PROTECTION

A. Provide at all times adequate protection to newly graded areas to prevent soil erosion as specified in Section 31 25 13 “Erosion and Sedimentation Control.”

B. Soil erosion that occurs prior to acceptance of the work shall be repaired at no expense to the Owner.

3.02 PREPARATION

A. Proof-roll prepared sub-base surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.

B. Take special care in working in the area of underground electrical and other conduit for pedestrian lights, street lights and security cameras.

3.03 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.04 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.05 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness. If applicable, match jointing of existing adjacent concrete pavement.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 3/16-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.06 CONCRETE PLACEMENT

A. Moisten sub-base to provide a uniform dampened condition at time concrete is placed.

B. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

C. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

D. Screed pavement surfaces with a straightedge and strike off.

E. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

3.07 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.08 CONCRETE PROTECTION AND CURING

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

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by curing compound.

3.09 PAVEMENT TOLERANCES

A. Comply with ADA Standards for Accessible Design.

B. Comply with tolerances of ACI 117 and as follows:
   1. Elevation: 1/4 inch.
   2. Thickness: Plus 3/8 inch, minus 1/4 inch.
   3. Surface: Gap below 10-foot long, unleveled straightedge not to exceed 1/4 inch.
   4. Joint Spacing: 3 inches.
   5. Contraction Joint Depth: Plus 1/4 inch, no minus.
   6. Joint Width: Plus 1/8 inch, no minus.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement.

C. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13.1