

## University of Houston Master Specification

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<Insert U of H Proj #>

<Insert Issue Name>  
<Insert Issue Date>

### SECTION 32 1313 – CONCRETE PAVING FOR PEDESTRIAN AREAS

Maintain Section format, including the UH master spec designation and version date in bold in the center columns of the header and footer. Complete the header and footer with Project information

Edit and finalize this Section, where prompted by Editor's notes, to suit Project specific requirements. Make selections for the Project at text identified in bold.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

Delete hidden text after this Section has been edited for the Project.

#### 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.
- B. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
  - 1. The current version of the *Uniform General Conditions for Construction Contracts*, State of Texas, available on the web site of the Texas Facilities Commission.
  - 2. The University of Houston's *Supplemental General Conditions and Special Conditions for Construction*.

##### 1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:

Adjust list below to suit Project.

- 1. Walkways.
- 2. Courtyards.
- 3. Plazas.
- 4. Pedestrian Ramps.

##### 1.3 ACTION SUBMITTALS

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

Retain paragraph and associated subparagraphs below if Project is to be LEED v4 certified.

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### B. LEED Action Submittals (Projects authorized for LEED certification only):

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:
  - a. Leadership Extraction Practices
    - 1) Extended Producer Responsibility (EPR): Submit documentation indicating that manufacturers have a take back or recycling program for the product purchased.
    - 2) Recycled Content: For products having recycled content, indicate percentages by weight of post-consumer and pre-consumer recycled content.
      - a) Include statement indicating costs for each product having recycled content.
  - b. Sourcing of Raw Materials: For products that are required to comply with requirements for regional materials, indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.
    - 1) Include statement indicating distance to Project, cost for each regional material and the fraction by weight that is considered regional.
    - 2) 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 California Department of Public-Health (CDPH) Standard Method V1.1-2010, using the applicable exposure scenario.
  - a. For paints, and coatings, wet applied, include printed statement of VOC content, showing compliance with the applicable VOC limits of the California Air Resources Board (CARB) 2007, Suggested Control Measure for Architectural Coatings or the South Coast Air Quality Management District (SCAQMD) Rule 113-2011.
  - b. Adhesives and Sealants: For wet applied on site products, submit printed statement showing compliance with the applicable chemical content requirements of SCAQMD Rule 1168, effective July 1, 2005 and rule amendment date of January 7, 2005.
    - 1) Product Data: For installation adhesives, indicating VOC content.
  - c. Alternative tests for VOC include ASTM D 2369-10, ISO 11890, ASTM D 6886-03; or ISO 11890-2.
  - d. Methylene Chloride and perchloroethylene may not be added to paints, coating, adhesive or sealants.
  - e. Provide General Emissions Evaluation certificates for adhesives, sealants showing compliance with California Department of Public Health v1.1 emissions testing or equivalent.

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3. Laboratory Test Reports: For installation adhesives indicating compliance with requirements for low-emitting materials

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.

### 1.4 INFORMATIONAL SUBMITTALS

A. 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:

[Retain paragraph and associated subparagraphs below if Project is to be LEED v4 certified.](#)

B. LEED Informational Submittals (Projects authorized for LEED certification only):

1. Building Product Disclosure and Optimization - Sourcing of Raw Materials:

a. Raw Material Sources and Extraction Reporting: Submit Raw materials supplier corporate Sustainability Reports (CSRs); documenting responsible extraction; including extraction locations, long term ecologically responsible land use, commitment to reducing environmental harms from extraction and manufacturing processes, and a commitment to meeting applicable standards or programs that address responsible sourcing criteria.

1) Submit manufacturers' self-declared reports.

2) Submit third party verified corporate sustainability reports (CSR) using one of the following frameworks:

a) Global Reporting Initiative (GRI) Sustainability Report

b) Organization for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises

c) UN Global Compact

d) ISO 26000

e) USGBC approved program.

2. Building Product Disclosure and Optimization - Material Ingredients

a. Material Ingredient Optimization: Submit manufacturer's Environmental Product Declaration (EPD) or at least one of the following:

1) GreenScreen V1.2 Benchmark: Third party report prepared by a licensed GreenScreen List Translator, or a full GreenScreen Assessment.

2) Cradle to Cradle: Manufacturer's published literature for the product bearing the Cradle to Cradle logo.

3) International Alternative Compliance Path - REACH Optimization

4) Declare: Manufacturer's completed Product Declaration Form

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- 5) Other programs approved by USGBC
- b. Product Manufacturer Supply Chain Optimization: Submit documentation from manufacturers for products that go beyond material ingredient optimization as follows:
  - 1) Are sourced from product manufacturers who engage in validated and robust safety, health, hazard, and risk programs which at a minimum document at least 99 percent (by weight) of the ingredients used to make the building product or building material, and
  - 2) Are sourced from product manufacturers with independent third party verification of their supply chain that at a minimum verifies:
    - a) Processes are in place to communicate and transparently prioritize chemical ingredients along the supply chain according to available hazard, exposure and use information to identify those that require more detailed evaluation
    - b) Processes are in place to identify, document, and communicate information on health, safety and environmental characteristics of chemical ingredients
    - c) Processes are in place to implement measures to manage the health, safety and environmental hazard and risk of chemical ingredients
    - d) Processes are in place to optimize health, safety and environmental impacts when designing and improving chemical ingredients
    - e) Processes are in place to communicate, receive and evaluate chemical ingredient safety and stewardship information along the supply chain
    - f) Safety and stewardship information about the chemical ingredients is publicly available from all points along the supply chain.
- C. Material Certificates: Signed by manufacturers certifying that each of the following materials that are part of this Project complies with requirements:
  1. Cementitious materials.
  2. Steel reinforcement and reinforcement accessories.
  3. Admixtures.
  4. Curing compounds.
  5. Applied finish materials.
  6. Bonding agent or epoxy adhesive.
  7. Joint fillers.

### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

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### PART 2 - PRODUCTS

#### 2.1 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·ft<sup>2</sup> ·°F, based on three-year-aged solar reflectance and three-year-aged thermal emittance tested in accordance with ANSI/CRRC S100.

#### 2.2 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 A 615/A 615M, 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."

#### 2.3 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.
    - a. 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 C 94/C 94M.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Chemical Admixtures: ASTM C 494/C 494M, 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.

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### 2.4 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.

### 2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth.
- B. Moisture-Retaining Cover: ASTM C 171, 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 C 309, Type 1, Class B, dissipating.
- F. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.

### 2.6 RELATED MATERIALS

- A. One-component polyurethane self-leveling sealant, conforming to ASTM C 920, 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.
- B. Pre-formed expansion board cap water stop.
  - 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
- C. Truncated dome unit pavers
  - 1. Comply with Section 32 1400 "Truncated Dome Unit Paving."

### 2.7 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.

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

Select paragraph below only if color pigment is required for Project.

- C. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions.

### 2.8 CONCRETE MIXING

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

## PART 3 - EXECUTION

### 3.1 EROSION PROTECTION

- A. Provide at all times adequate protection to newly graded areas to prevent soil erosion as specified in Section 31 2513 "Erosion and Sedimentation Control."
- B. Soil erosion that occurs prior to acceptance of the work shall be repaired at no expense to the Owner.

### 3.2 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.

### 3.3 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

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### 3.4 STEEL REINFORCEMENT

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

### 3.5 JOINTS

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

### 3.6 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.

### 3.7 FLOAT FINISHING

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

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- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

### 3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
- B. Comply with ACI 306.1 for cold-weather protection.
- C. 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.

### 3.9 PAVEMENT TOLERANCES

- A. Comply with the Texas Architectural Barriers Act and applicable provisions in the latest editions of Texas Accessibility Standards and 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.

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- 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 1313

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