

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. Related Sections include, but are not limited to:
 - 1. Section 01 33 00 - Submittal Procedures
 - 2. Section 01 45 00 - Quality Control
 - 3. Section 01 60 00 - Product Requirements
 - 4. Section 03 30 00 - Cast-in-Place Concrete
 - 5. Section 31 20 00 - Earth Moving
 - 6. Section 32 11 23 - Aggregate Base Courses
 - 7. Section 32 92 00 - Turf and Grasses
 - 8. Section 32 17 23 - Concrete Curbs and Sidewalks

1.2 REFERENCES, CODES AND STANDARDS

- A. American Concrete Institute (ACI)
 - 1. ACI 301 - Specifications for Structural Concrete
 - 2. ACI 302.1R-04 - Guide for Concrete Floor and Slab Construction
 - 3. ACI 305R - Hot Weather Concreting
 - 4. ACI 306R - Cold Weather Concreting
- B. American Society for Testing and Materials (ASTM)
 - 1. ASTM C33 - Specification for Concrete Aggregates
 - 2. ASTM C94/C94M - Specification for Ready-Mixed Concrete
 - 3. ASTM C143/C143M - Test Method for Slump of Hydraulic-Cement Concrete
 - 4. ASTM C150/C150M - Specification for Portland Cement
 - 5. ASTM C157/C157M - Test Method for Length Change of Hardened Hydraulic-Cement Concrete
 - 6. ASTM C172 - Practice for Sampling Freshly Mixed Concrete
 - 7. ASTM C260 - Specification for Air-Entraining Admixtures for Concrete
 - 8. ASTM C494/C494M - Specification for Chemical Admixtures for Concrete
 - 9. ASTM C595/C595M - Specification for Blended Hydraulic Cements
 - 10. ASTM C618 - Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
 - 11. ASTM C682 - Test Method for Length Change of Concrete Due to Alkali-Silica Reaction
 - 12. ASTM C642 - Test Method for Density, Absorption, and Voids in Hardened Concrete
- C. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. AASHTO M 85 - Standard Specification for Portland Cement

- 2. AASHTO M 145 - Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
- D. Portland Cement Association (PCA)
- E. U.S. Green Building Council (USGBC)
- F. Occupational Safety and Health Administration (OSHA)
 - 1. OSHA 29 CFR 1926 - Safety and Health Regulations for Construction

1.3 QUALITY ASSURANCE

- A. Perform concrete paving work in accordance with ACI 301 and ACI 302.1R and other referenced standards.
- B. Concrete mix design shall be developed and approved by a qualified testing agency experienced in concrete paving.
- C. Testing laboratory shall be independent and certified in accordance with ASTM C1077 and ASTM E329.
- D. Installer qualifications: Experienced in similar concrete paving projects with documented successful installations.
- E. Mock-up: Provide a mock-up panel of concrete paving, minimum 100 square feet, to demonstrate surface finish, jointing, and coloration.
- F. Conduct pre-paving conference to review procedures, quality control, and safety measures.

1.4 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for cementitious materials, admixtures, curing compounds, joint fillers, and sealers.
- B. Mix Designs: Submit proposed concrete mix designs including materials, proportions, and admixtures with supporting test data.
- C. Samples: Submit physical samples of curing compounds, joint sealants, and surface finish treatments.
- D. Shop Drawings: Submit layout drawings showing joint spacing, patterns, thickness, reinforcement, and edge treatments.
- E. Certificates: Submit certification of compliance for cement, aggregates, admixtures, and other materials as specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Test Reports: Submit test reports for aggregates, cementitious materials, and trial batch concrete.
- B. Installation Instructions: Manufacturer's recommended installation instructions for products used in concrete paving.
- C. Maintenance Data: Submit maintenance instructions for concrete paving, including cleaning and repair.

- D. Warranties: Submit manufacturer and installer warranties as specified.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver cement, aggregates, admixtures, and other materials in original unopened containers with labels intact.
- B. Store cement and cementitious materials in a dry, moisture-proof area. Protect from contamination and moisture damage.
- C. Store aggregates to prevent segregation, contamination, and moisture accumulation.
- D. Store admixtures in accordance with manufacturer's recommendations and protect from freezing or overheating.
- E. Handle materials to prevent damage or contamination. Use equipment and methods to prevent segregation or loss of materials.

1.7 WARRANTY

- A. Provide a minimum 1-year warranty on concrete paving against defects in materials and workmanship from date of final acceptance.
- B. Provide manufacturer's warranties on chemical admixtures, curing compounds, sealants, and other proprietary materials as applicable.
- C. Warranty shall include repair or replacement of defective paving including removal and replacement of unsatisfactory concrete.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Portland Cement: ASTM C150, Type I or II, or ASTM C595 blended hydraulic cement as approved.
- B. Aggregates: ASTM C33, clean, hard, durable, and graded aggregates. Coarse and fine aggregates free of deleterious substances.
- C. Water: Clean, potable, free from impurities that may affect setting, strength or durability.
- D. Admixtures: ASTM C494 compliant chemical admixtures, including water reducers, air-entraining agents, retarders, and accelerators as required.
- E. Reinforcement: If required, use welded wire fabric or steel reinforcing bars conforming to ASTM A615 or ASTM A1064.
- F. Joint Materials:
 - 1. Joint Fillers: ASTM D1751 bituminous fiber expansion joint fillers or preformed elastomeric joint fillers.
 - 2. Joint Sealants: Polyurethane or silicone sealants compatible with concrete, ASTM C920 compliant.
- G. Curing Compounds: ASTM C309, clear or translucent, designed for curing concrete pavements.

- H. Surface Finishes: Broom finish or as indicated on drawings.
- I. Subbase and Base Materials: As specified in Section 32 11 23 - Aggregate Base Courses.

2.2 MANUFACTURERS

- A. 2.2.1 Cement and Admixtures:
 - 1. LafargeHolcim
 - 2. CEMEX
 - 3. BASF Construction Chemicals
 - 4. Sika Corporation
- B. Aggregates:
 - 1. Local approved quarries or suppliers meeting ASTM C33 requirements.
- C. Joint Fillers and Sealants:
 - 1. W.R. Meadows
 - 2. Pecora Corporation
 - 3. Sonneborn (Grace Construction Products)
- D. Curing Compounds:
 - 1. Euco (Euclid Chemical Company)
 - 2. W.R. Meadows
- E. Reinforcement:
 - 1. Nucor Steel
 - 2. CMC Rebar

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade and base course have been installed and compacted to required density and tolerances.
- B. Ensure that subgrade is free of soft spots, debris, frost, or frozen material.
- C. Verify layout, elevations, and grades are established and conform to drawings and specifications.
- D. Notify Architect/Engineer of any conditions detrimental to quality or performance of concrete paving. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Grade and compact subgrade and base course in accordance with Section 31 20 00 and Section 32 11 23.
- B. Moisten subgrade and base to uniform dampness without standing water immediately before placing concrete.
- C. Set and secure forms to lines and grades with adequate strength to withstand concrete placement and finishing operations.

- D. Provide joint layout and insert joint materials as specified.

3.3 CONCRETE MIXING AND DELIVERY

- A. Mix concrete in accordance with ASTM C94 and approved mix designs.
- B. Maintain slump between 3 and 5 inches unless otherwise directed.
- C. Use air-entrained concrete with air content between 5% and 8% for freeze-thaw durability.
- D. Deliver concrete to site promptly and discharge into forms or placing equipment without segregation.
- E. During hot or cold weather, comply with ACI 305R and ACI 306R respectively.

3.4 PLACING CONCRETE

- A. Place concrete continuously between expansion joints to prevent cold joints.
- B. Deposit concrete as close as possible to final position to minimize segregation.
- C. Consolidate concrete with internal vibrators without over-vibration.
- D. Screed to grade and strike off to produce a uniform surface.
- E. Perform initial surface finishing as soon as bleed water disappears, using bull float or darby.

3.5 JOINTING

- A. Install contraction joints at maximum spacing of 15 feet or as indicated on drawings.
- B. Form joints with saw-cut or formed joints as approved.
- C. Install expansion joints at intervals indicated on drawings with compressible filler.
- D. Seal joints with approved sealant after curing period, ensuring joints are clean and dry.

3.6 FINISHING

- A. Apply broom finish perpendicular to traffic direction for slip resistance.
- B. Edges: Round edges with edging tool to 1/4 inch radius unless otherwise indicated.
- C. Remove surface defects and repair minor imperfections immediately.

3.7 CURING

- A. Begin curing immediately after finishing operations.
- B. Use curing compound applied uniformly at manufacturer's recommended rate.
- C. Alternatively, use wet curing methods such as wet burlap or polyethylene sheeting for a minimum of 7 days.
- D. Protect concrete from rapid moisture loss, freezing, rain, and contamination during curing period.

3.8 PROTECTION AND CLEANING

- A. Protect newly placed concrete from traffic and construction loads until it attains sufficient strength.
- B. Remove forms and joint filler carefully without damaging concrete edges.
- C. Clean concrete surfaces of stains, dirt, and curing residues using methods approved by Architect/Engineer.
- D. Repair or replace defective or damaged concrete paving as directed.

3.9 FIELD QUALITY CONTROL

- A. Testing Agency Responsibilities:
 - 1. Perform slump tests, air content, temperature, and casting of test specimens in accordance with ASTM C172, ASTM C143, and ASTM C231.
 - 2. Test concrete compressive strength at 7 and 28 days per ASTM C39.
 - 3. Perform additional tests as required to verify compliance with mix design and performance criteria.
- B. Monitor joint spacing, depth, and sealant installation for compliance.
- C. Document all quality control tests and submit reports promptly.

3.10 REPAIRS AND PATCHING

- A. Repair minor surface defects with approved patching mortar compatible with existing concrete.
- B. For major defects or failures, remove defective concrete and replace with new concrete as specified.
- C. Ensure repairs match adjoining concrete in finish, texture, and color.

3.11 MAINTENANCE

- A. Clean concrete paving periodically with water and mild detergents.
- B. Inspect and maintain joint sealants to prevent infiltration of water and debris.
- C. Repair surface damage promptly to maintain durability and appearance.

END OF SECTION 32 13 13