SECTION 32 13 20
CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. The work required under this Section consists of furnishing all labor, materials, equipment, services and related items necessary to complete all Dry-shake colored hardener applied to pavements where indicated on Drawings AND curing of colored concrete.

1.2 RELATED SECTIONS

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

B. The following related items of work are included under other sections:

1. Section 03 30 00 - Cast-In-Place Concrete

2. Section 07 92 10 - Joint Sealants

3. Section 31 10 00 – Site Preparation

4. Section 31 20 10 - Earthwork

5. Section 32 23 10 – Excavation, Backfill and Subgrade Preparation for Pavement

1.3 QUALITY ASSURANCE

A. All definitions, details, or other factors entering into this work shall conform to the "Philadelphia Building Code Requirements Reinforced Concrete" (ACI-301 and "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI-315) of the American Concrete Institute, except where otherwise specified herein. Where these regulations or specifications conflict, the more stringent requirements will govern.

B. Codes and Standards

1. Comply with local governing regulations if more stringent than herein specified.
2. Comply with applicable standards of the American Concrete Institute.

C. Submittals

1. Furnish samples, submit data for all materials and items, including forming accessories, admixtures, patching compounds, joint systems, curing compounds, dry-shake finish materials, and others as required by the Owner.

D. Job Conditions

1. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs and warning lights as required.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms for Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use plywood with smooth plastic facing, “Finnply”, Class I, Exterior Grade or better, edge-sealed.

B. Form Coatings: Provide commercial formulation form-coating compounds on non-plastic faced plywood, that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.2 MATERIALS

A. Portland Cement: ASTM C 150, Type I, unless otherwise acceptable to the Project Consultant. The cement used in concrete below grade shall have a tricalcium aluminate content (C3A) of between 4% (min.) and 10% (max.).

1. Use one brand of cement throughout project, unless otherwise acceptable to the Project Consultant.

B. Normal Weight Aggregates: ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Project Consultant.

C. Water: Potable.

D. Air-Entraining Admixture: ASTM C 260.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   a. "WRDA 19"; W.R. Grace.
   b. "Super P"; Anti-Hydro.
   c. "Sikament"; Sika Chemical Corp.

d. "Eucon Super 37"; Euclid Chemical Corp.
e. "Pozzolith 400"; Master Builders.

E. Water Reducing, Non-Chlorine Accelerator Admixture: ASTM C 494, Type E, and contain not more than 0.05% chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   a. "Accelguard 80"; Euclid Chemical Co.
   b. "Pozzolith 500"; Master Builders.

F. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, and contain not more than 0.05% chloride ions.

1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
   a. "Pozzolith 300-R"; Master Builders.
   b. "Eucon Retarder 75"; Euclid Chemical Co.
   c. "Daratard"; W.R. Grace.
   d. "Plastiment"; Sika Chemical Co.

G. Bonding compound: Acrylic or Styrene Butadiene

1. Products: Subject to compliance with requirements provide one of the following:
   a. J-40 Bonding Agent; Dayton Superior Corp
   b. Everbond; LM Construction Chemicals
   c. Hornweld; A.C. Horn, Inc.
   d. Sonocrete, Sonneborn-Rexnord
   e. Acrylic Bondcrete; The Burke Co
   f. SBR Latex; Euclid Chemical
   g. Daraweld C; W.R. Grace
2. Prohibited admixtures: Calcium chloride thyocyanates or admixtures containing more than 0.1 per cent chloride ions.

H. Certifications: Provide admixture manufacturer's written certification that chloride ion content complies with specified requirements.

I. Calcium chloride.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Remove loose material from compacted gravel base course surface immediately before placing concrete.

B. Proof-roll prepared gravel base course surface to check for unstable areas and need for additional compaction. Do not begin paving work until such conditions have been corrected and are ready to receive paving.

C. All subgrades under paving and other work of this Section must be brought to maximum density before placement of any paving work or materials. Do not place any paving materials until all subgrades over which they are to be installed have been brought to satisfactory density.

3.2 FORM CONSTRUCTION

A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Formwork for curved surfaces shall be set to form smooth continuous curves as indicated on the plans. Contractor shall score back of formwork, if required, to achieve and form smooth radii and curves as indicated on the plans. Contractor shall request approval from Landscape Architect of finished curved formwork prior to concrete pour. Contractor shall provide Landscape Architect a minimum of 24 hours notice.

C. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8" in 10'.
2. Vertical face on longitudinal axis, not more than 1/4" in 10'.

D. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.3 CONCRETE PLACEMENT

A. Pre-placement Inspection: Notify the owner's representative at least 24 hours before placing concrete, allow inspection and complete form work installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.

B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

C. General: Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as herein specified.

D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid included construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practice.

G. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

H. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operations, within limits of construction joints, until the placing of a panel or section is completed.

I. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

J. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

K. Maintain reinforcing in proper position during concrete placement operations.

L. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. When air temperature has fallen to or is expected to fall below 40 F (4 C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 F l0 C), and not more than 80 F (27 C) at point of placement.

M. Do not use frozen materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

N. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.

O. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

P. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 F (32 C). Mixing water may be chilled, or chopped ice may be used to control temperature

provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.

Q. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

R. Use water-reducing retarding mixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

S. Do not place concrete until gravel base course and forms have been checked for line and grade. Moisten gravel base course if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

T. Place concrete using methods which prevent segregation of mix.

U. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocation of dowels and joint devices.

V. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

W. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

3.4 JOINTS

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete.

Construct transverse joints at right angles to the centerline, unless otherwise indicated. When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finish edges with a jointer.

C. Construction Joints: 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. Construct joints as shown or, if not shown, use standard metal keyway-section forms.

D. Expansion Joints:

1. Provide closed cell polyethylene foam expansion joint filler and sealant backers for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.
2. Place expansion joints at 20'o/c maximum in sidewalk areas.
3. Extend joint fillers full-width and depth of joint, and trim to be slightly below finished concrete surface.
4. Furnish and install joint fillers as per manufacturer's recommendations.
5. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

3.5 CONCRETE FINISHING

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10' straight-edge. Distribute concrete as required to relieve surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, with a magnesium float finish. Provide steel trowel edging where shown on drawings.

E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Project Consultant.

3.6 CONCRETE CURING AND PROTECTION

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

l. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 30l procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods:
   a. Keep concrete surface continuously wet by covering with water.
   b. Continuous water-fog spray.
   c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Use membrane-forming curing and sealing compound or approved moist curing methods.

3.7 REPAIRS AND PROTECTIONS

A. Repair and replace broken or defective concrete, as directed by Project Consultant.
B. Drill test cores where directed by Project Consultant, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.
C. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
D. Sweep concrete pavement and wash free of stains, discoloration’s, dirt and other foreign material just prior to final inspection.

- END -