

# HEAVY USE AREA PROTECTION CONSTRUCTION SPECIFICATION

## 1. SCOPE

The work shall consist of furnishing materials and installing all components of the paved surface treatment areas for heavy use area protection as outlined in this specification and the drawings.

## 2. MATERIALS

All materials used shall conform to the quality and grade noted on the plans, set forth in Section 6, or as otherwise listed below:

**PORTLAND CEMENT** shall be Type I, IA, II, or IIA and conform to ASTM-C150, unless otherwise set forth in Section 6. If Type I or II is used, an air-entrainment agent shall be used.

**CONCRETE AGGREGATE** shall meet the requirements and gradation specified in ASTM-C33. Coarse aggregate shall meet the gradation for size numbers 57 or 67.

**WATER** used in mixing or curing concrete shall be clean and free from injurious amounts of oil, acid, salt, organic matter or other deleterious substances.

**REINFORCEMENT BARS** shall be grade 40 or higher, and shall conform to ASTM-A615, A616, or A617. Welded wire fabric reinforcement shall conform to ASTM-A185 or A497. Reinforcement shall be free from loose rust, oil, grease, curing compound, paint or other deleterious coatings.

**CONCRETE ADMIXTURES** shall conform to ASTM-C260 for air-entrainment, and ASTM-C494, type A, D, F or G, for water-reduction and set-retardation, and type C or E for non-corrosive accelerators.

**POZZOLAN** shall conform to ASTM-C618.

**COAL COMBUSTION BYPRODUCTS (CCB)** shall have a chemical analysis that provides

adequate cementing and safety (toxicity) for the purpose intended.

**CURING COMPOUND** shall meet the requirements of ASTM-C309, Type 2, Class A or B, or as otherwise required in Section 6.

**MASONRY COMPONENTS** shall meet the requirements of ASTM-C90 & C270, and be placed in accordance with ACI-530.

**PRECAST CONCRETE** units shall comply with ACI-525 and 533.

**PREFORMED EXPANSION JOINT FILLER** shall conform to the requirements of ASTM-D1752, Type I, II, or III, unless bituminous type is specified, in which case it shall conform to ASTM-D994 or D1751.

**JOINT SEALERS** shall conform to the requirements for ASTM-C920, Federal Specification SS-S-210A, or Federal Specification TT-S-227, as appropriate for the specific application.

**WATERSTOPS.** Vinyl-chloride polymer types shall be tested in accordance with Federal Test Method Standard No. 601, and shall show no sign of web failure due to brittleness at a temperature of -35 degrees Fahrenheit. Colloidal (bentonite) waterstops shall be at least 75 percent bentonite in accordance with Federal Specification SS-S-210A. Non-colloidal waterstops shall only be used if approved by the Engineer.

**AGGREGATES.** Aggregates shall meet the requirements of Pennsylvania Dirt and Gravel Road Program (DSA), PennDOT Pub. 408, Section 703, for the gradations specified in the drawings or Section 6, or as otherwise set forth in Section 6.

**BITUMINOUS CONCRETE.** Bituminous concrete shall meet the requirements of PennDOT Pub. 408, Sections 401, 420 and 421, for the course(s) specified in the drawing or Section 6, or as otherwise set forth in Section 6.

**WOOD** shall be graded and stamped by an agency accredited by the American Lumber Standards Committee as meeting the required species, grade, and moisture content. In the absence of such a stamp, the Contractor or material supplier shall provide written certification that the wood products meet the designated quality criteria.

**PRESSURE TREATED WOOD PRODUCTS** shall be Douglas Fir, Southern Yellow Pine, or as otherwise specified on the drawings or in Section 6. They shall be treated with preservatives in accordance with the American Wood Preservers Association (AWPA) Standard C16, "Wood Used on Farms, Pressure Treatment." Each piece shall bear the AWPA stamp of quality. In the absence of such a stamp, the Contractor or material supplier shall provide written certification that the pressure treated wood meets the designated quality criteria.

**FASTENERS** for wood structures shall be stainless steel, galvanized, or otherwise protected from corrosion due to contact with moisture, manure and associated gasses. The protective coatings shall be compatible and consistent with the preservative chemicals in the pressure treated wood. Additional guidance can be found in PA367, *Roofs and Covers*.

**GEOTEXTILES.** Geotextiles shall meet the requirements of PennDOT Pub. 408, Sections 212 and 735, for the Type and Class specified in the drawings or Section 6, or as otherwise set forth in Section 6.

**ORGANIC SURFACES.** Materials such as tanbark and saw dust shall be free of contaminants and rot.

### **3. FOUNDATION PREPARATION**

Clear all trees, brush, fences, manure, and rubbish within the area to be protected, including any appurtenances, and borrow areas. All material removed by clearing and excavation operations shall be disposed of as directed by the Owner or his/her Representative. Sufficient topsoil is to be stockpiled in a convenient location for use on disturbed areas to facilitate seeding.

Set all base course material on undisturbed soil or non-yielding compacted material. Geosynthetics may be used, if approved by the Engineer, to further separate and/or stabilize the foundation. Over-excavation must be corrected as noted on the drawings or as directed by the Engineer or his/her designated Representative.

Surface and subsurface drainage systems shall be installed and operating adequately to remove water from the foundation to allow for proper placement of base and surface materials.

Drainfill upon which concrete is to be placed shall be covered with a geosynthetic that has an AOS between 20 and 100, inclusive.

### **4. BASE COURSE**

The base course shall be placed on the area to the grades and thicknesses shown on the plans. The base material shall be as set forth in Section 6 and/or as shown on the drawings. The material shall be wetted and compacted by rollers or other construction equipment approved by the Engineer.

### **5. SURFACE TREATMENTS**

- a. Portland Cement Concrete

## CONCRETE MIX

Unless otherwise specified in Section 6, concrete shall be proportioned to provide a minimum compressive strength at 28 days of 4,000 psi. The Contractor shall be responsible for the design of the mix and certification of the necessary strength, in accordance with ACI 301. Acceptance and certification of design mixes by PennDOT within the past year may be accepted in lieu of additional testing.

## REINFORCING STEEL PLACEMENT

Reinforcement shall be accurately placed and secured in position in a manner that will prevent its displacement during the placement of concrete.

Steel shall be supported by precast concrete bricks (not clay bricks), metal or plastic chairs, or hard fieldstone. Except for dowel rods, placing steel reinforcement into concrete already in place shall not be permitted.

The following tolerances will be allowed in the placement of reinforcing bars shown on the drawings:

- (1) Maximum reduction in cover:
  - from exposed surfaces -1/4 inch
  - from earth surfaces -1/2 inch
- (2) Maximum variation from indicated spacing:
  - 1/12th of indicated spacing

Splices of reinforcing bars shall be made only at the locations shown on the drawings, unless otherwise approved by the Engineer. Unless otherwise required, welded wire fabric shall be spliced by overlapping sections at least one full mesh dimension plus two inches. All reinforcement splices shall be in accordance with ACI 318.

Reinforcing steel shall not be welded unless approved by the Designer.

The ends of all reinforcing steel shall be covered with at least 1-1/2 inches of concrete.

## MIXING AND HANDLING CONCRETE

In general, concrete shall be transported and placed in accordance with ACI-304, of which some specific interpretations are set forth below.

For concrete mixed at the site, the mixing time after all cement, aggregates and water are in the mixer drum shall be at least 1-1/2 minutes. Concrete shall be conveyed from the mixer as rapidly as practical by methods that will prevent segregation of the aggregates or loss of mortar. Concrete shall be placed within 1-1/2 hours after the introduction of cement to the aggregate unless an approved set-retarding admixture is used in the mix. During periods of hot weather, it may be necessary to reduce this time.

For each load of concrete delivered to the site, a batch ticket shall be provided to the Owner or Technician by the Supplier. As a minimum, this ticket shall show the design strength, time out, admixtures (if any), and amount of water that may be added (if any) on site and still be within the design mix limits.

The Contractor shall test slump and air entrainment as necessary to insure that the concrete meets the requirements of this specification. The slump shall be three to six inches (without superplasticizers) and the air content shall be five to seven percent of the volume of the concrete. Admixtures such as superplasticizers, water-reducers and set-retarders may be used provided they are approved by the Engineer prior to concrete placement and are used in accordance with the manufacturer's recommendations. Superplasticizers (ASTM C494, Type F or G) may be added to concrete that has a 2 to 4 inch slump before the addition, and that is not warmer than 95° F. The slump

shall not exceed 7½ inches with the addition of superplasticizer.

Concrete shall be uniform and thoroughly mixed when delivered to the job site. Variations in slump of more than one inch within a batch will be considered evidence of inadequate mixing and shall be corrected or rejected. No water in excess of the amount called for by the job design mix shall be added to the concrete.

Immediately after placement, concrete shall be consolidated by spading and vibrating, or spading and hand tamping. It shall be worked into corners and around all reinforcement and embedded items in a manner which prevents segregation. Excessive vibration which results in segregation of materials will not be allowed. Vibration must not be used to make concrete flow in forms, slabs, or conveying equipment.

If the surface of a layer in place will develop its initial set, i.e., will not flow and merge with the succeeding layer when vibrated, a construction joint shall be made. Construction joints shall be made by cleaning the hardened concrete surface to exposed aggregate by sandblasting, air/water jetting, or hand scrubbing with wire brush, and keeping the concrete surface moist for at least one hour prior to placement of new concrete.

Concrete surfaces do not require extensive finishing work; however, the surface shall be smooth and even, with no depressions that would result in surface water ponding. Careful screeding (striking-off) and/or wood float finishing shall be required. Any additional desired finishing of the surface (such as roughening for improved traction) shall be accomplished after an initial stiffening of the concrete has taken place. These requirements will be stated in Section 6 or on the drawings. Exposed edges should be chamfered, either with form molding or molding tools.

The addition of dry cement or water to the surface of screeded concrete to expedite

finishing is not allowed. If concrete placing is discontinued prior to completion of the entire structure, the unfinished end of the concrete shall be formed to create a proper construction or expansion/contraction joint.

### **EXPANSION/CONTRACTION JOINTS**

When required in Section 6 or on the drawings, expansion/contraction joints shall contain a six-inch, Type B, vinyl waterstop with a minimum web thickness of 1/8-inch, or an approved joint sealer.

### **FORM REMOVAL AND CONCRETE REPAIR**

Forms for walls and columns shall not be removed for at least 24 hours after placing the concrete. When forms are removed in less than seven days, the exposed concrete shall be sprayed with a curing compound or be kept wet continuously for the remainder of the curing period. Forms which support beams or covers shall not be removed for at least seven days, or 14 days if they are to support forms or shoring.

Forms shall be removed in such a way as to prevent damage to the concrete. Forms shall be removed before walls are backfilled. Columns shall be at least seven days old before any structural loads are applied.

Concrete that is damaged or otherwise defective shall be removed and replaced, or where feasible, repaired. The Engineer will determine the required extent of removal, replacement or repair. The plan for accomplishing the repair must be approved by the Engineer prior to beginning the repair work. Where minor areas of the concrete surface are "honeycombed," damaged or otherwise defective, the area may be cleaned, wetted and then filled with a dry-pack mortar. Dry-pack mortar shall consist of one part Portland cement and three parts

sand with just enough water to produce a workable paste.

### **CONCRETING IN COLD WEATHER**

Concreting in cold weather shall be performed in accordance with ACI-306R-88. In addition, the contractor shall provide a written plan at least 24 hours in advance of placing concrete in cold weather, and shall have the necessary equipment and materials on the job site before the placement begins.

### **CONCRETING IN HOT WEATHER**

Concreting in hot weather shall be performed in accordance with ACI 305, of which some specific interpretations are set forth below.

The supplier shall apply effective means to maintain the temperature of concrete below 90 degrees) Fahrenheit during mixing and conveying. Exposed surfaces shall be continuously moistened by means of fog spray or otherwise protected from drying during the time between placement and finishing, and during curing. Concrete with a temperature above 90 degrees Fahrenheit shall not be placed.

### **CURING**

In general, concrete shall be cured in accordance with ACI-308. Specifically, it shall be prevented from drying for at least seven days after it is placed. Exposed surfaces shall be kept continuously moist during this period by covering with moistened canvas, burlap, straw, sand or other approved material unless they are sprayed with a curing compound.

Concrete, except at construction joints, may be coated with a curing compound in lieu of continuous application of moisture. The compound shall be sprayed on moist concrete surfaces as soon as free water has disappeared but shall not be applied to any

surface until patching, repairs and finishing of that surface are completed.

Curing compound shall not be allowed on any rebars.

Curing compound shall be applied in a uniform layer over all surfaces requiring protection at a rate of not less than one gallon per 150 square feet of surface. Surfaces subjected to heavy rainfall or running water within three hours after the curing compound has been applied, or otherwise damaged, shall be resprayed. Any construction activity which disturbs the curing material shall be avoided. If the curing material is subsequently disturbed, it shall be reapplied immediately.

#### **b. Bituminous Concrete**

Bituminous concrete shall be installed in accordance with PennDOT Pub. 408, Sections 305, 320, & 400, as appropriate, and/or as otherwise set forth in Section 6.

#### **c. Compacted Stone Aggregate**

Compacted stone aggregate surfaces shall consist of the material specified in the drawing or Section 6. The material shall be moist and uniformly placed on the prepared base. The loose material shall be placed to an adequate thickness so that when compacted the finished thickness is as specified. The stone aggregate shall be compacted with a vibratory smooth wheeled roller or other approved equipment to form a dense, smooth surface.

#### **d. Other Materials and Structures**

Surface treatments, such as saw dust, coal combustion byproducts, soil cement, etc., shall be placed as set forth in Section 6, and to the grades and thicknesses shown on the drawings.

### **6. ADDITIONAL CONDITIONS WHICH APPLY TO THIS PROJECT ARE:**