700 MATERIAL DETAILS

Materials shall conform to the stated requirements and/or the requirements of the referenced specifications including modifications as noted.

Copies of all Supplemental Specifications referenced in this section are on file with the City of Columbus Transportation Division.

705 - CONCRETE PAVEMENT INCIDENTALS

705.01 Fiber Reinforced Polymer (FRP) Dowel Bars. Provide round and straight fiber reinforced polymer (FRP) dowel bars. Ensure that the resin used to manufacture the FRP bars consists of an acrylic modified epoxy resin with a minimum of 5 percent and a maximum of 7 percent tensile elongation at break. Ensure that the minimum glass fiber content is 70 percent by weight. Provide dowels of a type meeting the dimensional requirements of the standard drawings, and the certified test data specified in 101.10 with each shipment.

705.03 Preformed Fillers. AASHTO M 153 or AASHTO M 213 with the following *modifications:*

5.7. For materials manufactured as described in 4.1.1 and 4.1.2, ensure that the producer certifies to the Engineer that the asphalt content is at least 35 percent by weight of the filler.

705.04 Hot Applied Crack and Joint Sealer. *Provide hot applied crack and joint sealer conforming to* ASTM D 3405.

705.05 Burlap Cloth. *Provide burlap cloth conforming to* AASHTO M 182, Class 2.

705.06 Sheet Materials for Concrete Curing. *Provide sheet materials conforming to* AASHTO M 171, *for* moisture loss and reflectance only.

705.07 Liquid Membrane-Forming Compounds for Curing Concrete. *Provide liquid membrane-forming compounds conforming to* ASTM C 309 with the following *modifications:*

8.1 Packing and Marking. Equip the containers for Type 2 white pigmented liquid membrane forming compounds with mechanical agitators. Assign each container in any batch or lot, a number as the container is being filled.

705.10 Air-Entraining Admixtures. *Provide air-entraining admixtures conforming to* AASHTO M 154.

705.11 Preformed Elastomeric Compression Joint Seal for Concrete.

1. ***General.*** *Provide preformed elastomeric compression joint seal conforming to ASTM D 2628, with the following modifications:*

   5.1 *Ensure that the* size and design *is* as shown on the plans.

   7.2 *Perform* inspection at the project site. *Obtain random* samples from material delivered to the project site, or at other locations designated by the Laboratory.

   7.3 A minimum of 3 linear feet (1.0 m), with all manufacturer's markings, shall constitute one sample.

   8.3 *Lightly dust* low temperature recovery *specimens* with talc on the external surfaces only.

   11.1 In addition, *ensure that the* 1 foot (305 mm) length markings *are* not less than 11 15/16 inches (300 mm) or more than 12 1/8 inches (310 mm) from center to center.

   Use lubricants *recommended by the seal manufacturer to install* preformed compression seals.

2. **Qualification.** *Obtain City approval* of each design, shape, width, depth, web and shell thickness, *before* use. *Submit* drawings of the seals showing all dimensions and dimension tolerances and weight per foot (meter) with the request for design approval. *Submit* a copy of Certified Test Data covering the specified properties of performed elastomeric joint seals *with* the request for approval. *Submit* a *3* foot (1.0 m) length of elastomeric joint sealer concurrently with the request for qualification.

705.12 Chemical Admixture for Concrete. *Provide chemical admixtures conforming to* ASTM C 494. *Ensure that* the minimum relative durability factor *90*.

705.13 Fly Ash for Use in Portland Cement Concrete. ASTM C 618, Class Class C or F, except the maximum loss on ignition shall be 3 percent.

705.14 Ground Granulated Blast Furnace (GGBC) Slag for Use in Portland Cement Concrete. ASTM 989 Grade 100 or 120.

705.15 High Molecular Weight Methacrylate (HMWM) Resin. *Provide low viscosity, non-fuming high molecular weight methacrylate (HMWM) resin conforming to the following:*

Viscosity	*Less than 25 cps (Brookfield viscometer, Model RVT with UL*

	adaptor or Model LVF, # spindle and UL adaptor C @ 77 ºF (25 ºC) (ASTM D 2849)
Density	*Greater than 8.4 lbs/gal Ca 77 ºF (25 ºC) (ASTM D 2849)*
Flash Point	*Greater than 200 ºF (93 ºC) (PenskyMartens CC) (ASTM D 93)*
Vapor Pressure	*Less than 1.0 mm Hg C @ 77 ºF (25 ºC) (ASTM D 323)*
TG (DSC)	*Greater than 135 ºF (58 ºC) (ASTM D3418)*
Shelf Life	*Must be 1 year minimum at manufacturers recommended environmental considerations.*
Gel Time	*Greater than 40 min - 100 g mass (ASTM D 2471) (thin film)*
Percent Solids	*Greater than 90% by weight*
Bond Strength	*Greater than 1500 psi (10.5 MPa) (ASTM C 882)*

Select resin from the approved list in the ODOT Office of Materials Management.

705.20 Non Shrink, Non Metallic Grout. *Provide non shrink, non metallic grout conforming to* ASTM C 881, Type IV, Grade 3, Class A, B, or C; or the following:

1. **Description.** This specification covers the formulation and testing of polyester, vinylester and epoxy grouts for anchoring bars, dowels, bolts, rods and similar materials.

2. **Materials.** *Provide* grout consisting of a two component resin system as follows:

   Component A - Polyester, vinylester or epoxy resin.

   Component B - Hardening agent.

   Add aggregate recommended by the resin manufacturer. Ensure that the proportions of the grout components *are according to* the manufacturer's instructions.

3. **Acceptance.** *Use* a grout mix formulation accepted by certification. The prequalification based on evaluation of certified test data, *according to* 101.10, showing compliance with the following requirements:

   Compressive strength, 7 days minimum
   ASTM C 579 .....8,000 p.s.i. (55 MPa)

   Tensile strength, 7 days minimum ASTM C 307
   .....1,300 p.s.i. (9.0 MPa)

   Modulus of elasticity, 7 days, + 10% , ASTM C 580

.....500,000 p.s.i. (3450 MPa)

Bond strength, 2 days minimum ASTM C 882,
.....1,800 p.s.i. (12.5 MPa)
Water absorption, ASTM C 413, maximum 1.5%

Pullout resistance, 952.04, 24 hours, minimum .....9,500 lbs. (42.2 kN)

4. **Pullout Resistance Test Specimen.** *Use* a concrete test block or cylinder *having a* minimum 6 inch (150 mm) diameter by 12 inch (300 mm) deep and having a 28 day minimum concrete compressive strength of 4000 psi (27.6 MPa). *Center* a 6 inch (150 mm) deep hole with a minimum diameter of 13/16 inch (20.6 mm) and a maximum diameter of 1 inch (25 mm) in the block or cylinder by drilling or forming.

For the test, a Number 6 (20 M) deformed reinforcing bar 30 inches (762 mm) long, cleaned and degreased. After *thoroughly cleaning* the hole *grout* the bar into the best block or cylinder as recommended by the resin manufacturer. *Hold and center* the bar perpendicular to the concrete surface *in* the grout-filled hole during the curing period.

Cure the resulting specimen at 77° ± 5° F (25° C ± 3° C) for 24 hours. *Apply* an axial pull out load to the bar at a rate of 1/2 inch (12.7 mm) per minute until the bar pulls out of the specimen, or the concrete block or cylinder cracks or spalls. *Record* the failure mode and applied load for reporting.

5. Packaging and Storage. *Supply* the polyester, vinylester and epoxy resins in nonreactive containers with their Material Safety Data Sheet. *Label* containers with the name of the mixture, the manufacturer, the shelf life expiration date, the batch number, quantity, and instructions.

Maintain storage areas - between 40° and 100° F (5° and 38° C).

705.21 Quick Setting Concrete Mortar.

1. ***General.*** *Provide prepackaged mortar material that requires the addition of water only.*

Use materials capable of being extended 50 percent by dry mortar weight with aggregate meeting the following requirements:

A. Gradation requirements of Table 703-1 for No. 8, 89, 9, or a combination thereof.

B. AASHTO M 43, Maximum Passing No. 200 (75 mm) sieve - Not to exceed 0.2 percent.

C. AASHTO T 84 and T 85, Absorption - Not more than 2 percent.

D. AASHTO T 104, Soundness Loss - Not more than 2 percent.

Do not use materials containing more than 50 parts per million of chloride. Do not use any admixture containing more than 50 parts per million of chloride in conjunction with these materials.

2. ***Packing.*** *Provide quick setting concrete mortar packaged in strong moisture resistant paper bags or other suitable containers capable of withstanding shipping, normal handling, and storage without breakage. The package shall protect the material from deterioration when stored in a dry condition for a period of 1 year. Each package or container must display information regarding the minimum nominal yield and instructions for mixing. Calculate volumetric yield determinations using the manufacturers' recommended water content.*

Ensure that the material meets the following requirements:

Test	***Type 1***	***Type 2***
*Compressive Strength ASTM C 109 **		
psi (MPa) @ 1 Hour	*100(0.7)*	*2000 (14)*
@ 3 Hour	*250 (1.7)*	*---*
@ 24 Hours	*2000 (14)*	*5000 (34)*
@ 7 Days	*---*	*7000 (48)*
*Compressive Strength ASTM C 39 * **		
psi (MPa) @ 1 Hour	*100 (0.7)*	*(2000) (14)*
@ 3 Hour	*150 (1.0)*	*---*
@ 24 Hours	*1000 (10)*	*3500 (24)*
@ 7 Days	*---*	*6000 (41)*
*Initial Set Time ASTM C 266 **	*5 Minutes*	*10 Minutes*
*Bond Strength, ASTM C 882 *		
psi (MPa) @ 24 Hours	*1000 (7)*	*1000 (7)*
@ 7 Days	*1500 (11)*	*1500 (11)*
*Flexural Strength ASTM C 78 *		
psi (MPa) @ 4 Hour	*---*	*200 (1.4)*
@ 3 Day	*650 (4.5)*	*500 (3.4)*
Freeze and Thaw ASTM C 666 (use either Procedure B or A)		
*Procedure B (350 Cycles) * Durability Factor*	*80%*	*80%*

Procedure A (300 Cycles) Durability Factor	*79%*	*79%*
* *Extend test specimens 50 percent by dry mortar weight with aggregate.*		
** *Test the mortar as received with the addition of water. Ensure that the amount of water is designated on the packing container by the manufacturer.*		

For Prequalification evaluate material as follows:

1. *Has been in place and evaluated as specified in ODOT Supplement 1070.*

2. *Has a field performance rating of no less than 7.5 at the end of 3 years of testing.*

3. *Have the material manufacturer furnish the Laboratory with a certified copy of test results from a recognized laboratory showing compliance with the requirements of this specification. A recognized laboratory is one that is regularly inspected by the Cement and Concrete Reference Laboratory of the National Bureau of Standards and Technology.*

705.22 Nonshrink Mortar. *Provide nonshrink mortar conforming to ASTM C 1107, with the following modification:*

9.2 In addition, ensure that the fluidity of the grout at the maximum water content is at least equal to a flowable mixture as defined in ASTM C 827, Section 7.2.2 and that the minimum flow is 125 @ 5 drops of the flow table in 3 seconds.