**MATERIALS:**

|  |  |  |
| --- | --- | --- |
| (2-21-12) (Rev. 11-22-16) | 1000, 1002, 1005, 1016, 1018, 1024, 1050, 1074, 1078, 1080, 1081, 1086, 1084, 1087, 1092 | SP10 R01 |

Revise the *2012* *Standard Specifications* as follows:

**Page 10-1, Article 1000-1, DESCRIPTION, lines 9-10,** replace the last sentence of the first paragraph with the following:

Type IL, IP, IS or IT blended cement may be used instead of Portland cement.

**Page 10-1, Article 1000-1, DESCRIPTION, line 14,** add the following:

If any change is made to the mix design, submit a new mix design (with the exception of an approved pozzolan source change).

If any major change is made to the mix design, also submit new test results showing the mix design conforms to the criteria. Define a major change to the mix design as:

(1) A source change in coarse aggregate, fine aggregate or cement.

(2) A pozzolan class or type change (e.g. Class F fly ash to Class C fly ash).

(3) A quantitative change in coarse aggregate (applies to an increase or decrease greater than 5%), fine aggregate (applies to an increase or decrease greater than 5%), water (applies to an increase only), cement (applies to a decrease only), or pozzolan (applies to an increase or decrease greater than 5%).

Use materials which do not produce a mottled appearance through rusting or other staining of the finished concrete surface.

**Page 10-1, Article 1000-2, MATERIALS, line 16; Page 10-8, Subarticle 1000-7(A), Materials, line 8; and Page 10-18, Article 1002-2, MATERIALS, line 9,** add the following to the table of item references:

**Item Section**

Type IL Blended Cement 1024-1

**Page 10-1, Subarticle 1000-3(A), Composition and Design, lines 25-27,** replace the second paragraph with the following:

Fly ash may be substituted for cement in the mix design up to 30% at a rate of 1.0 lb of fly ash to each pound of cement replaced.

**Page 10-2, Subarticle 1000-3(A), Composition and Design, lines 12-21,** delete the third paragraph through the sixth paragraph beginning with “If any change is made to the mix design, submit…” through “…(applies to a decrease only).”

**Page 10-5, Table 1000-1, REQUIREMENTS FOR CONCRETE,** replace with the following:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TABLE 1000-1 REQUIREMENTS FOR CONCRETE** | | | | | | | | | | | |
| **Class of Concrete** | **Min. Comp. Strength  at 28 days** | **Maximum Water-Cement Ratio** | | | | **Consistency Max. Slump** | | **Cement Content** | | | |
| **Air-Entrained Concrete** | | **Non Air-Entrained Concrete** | | **Vibrated** | **Non- Vibrated** | **Vibrated** | | **Non- Vibrated** | |
| Rounded Aggregate | Angular Aggre-gate | Rounded Aggregate | Angular Aggre-gate | **Min.** | **Max.** | **Min.** | **Max.** |
| *Units* | *psi* |  |  |  |  | *inch* | *inch* | *lb/cy* | *lb/cy* | *lb/cy* | *lb/cy* |
| AA | 4,500 | 0.381 | 0.426 | - | - | 3.5 | - | 639 | 715 | - | - |
| AA Slip Form | 4,500 | 0.381 | 0.426 | - | - | 1.5 | - | 639 | 715 | - | - |
| Drilled Pier | 4,500 | - | - | 0.450 | 0.450 | - | 5-7 dry  7-9 wet | - | - | 640 | 800 |
| A | 3,000 | 0.488 | 0.532 | 0.550 | 0.594 | 3.5 | 4 | 564 | - | 602 | - |
| B | 2,500 | 0.488 | 0.567 | 0.559 | 0.630 | 1.5 machine-placed  2.5 hand-placed | 4 | 508 | - | 545 | - |
| Sand Light-weight | 4,500 | - | 0.420 | - | - | 4 | - | 715 | - | - | - |
| Latex Modified | 3,000 7 day | 0.400 | 0.400 | - | - | 6 | - | 658 | - | - | - |
| Flowable Fill excavatable | 150 max. at 56 days | as needed | as needed | as needed | as needed | - | Flow-able | - | - | 40 | 100 |
| Flowable Fill non-excavatable | 125 | as needed | as needed | as needed | as needed | - | Flow-able | - | - | 100 | as needed |
| Pavement | 4,500 design, field  650 flexural, design only | 0.559 | 0.559 | - | - | 1.5 slip form  3.0 hand place | - | 526 | - | - | - |
| Precast | See Table 1077-1 | as needed | as needed | - | - | 6 | as needed | as needed | as needed | as needed | as needed |
| Prestress | per contract | See Table 1078-1 | See Table 1078-1 | - | - | 8 | - | 564 | as needed | - | - |

**Page 10-6, Subarticle 1000-4(I), Use of Fly Ash, lines 36-2,** replace the first paragraph with the following:

Fly ash may be substituted for cement in the mix design up to 30% at a rate of 1.0 lb of fly ash to each pound of cement replaced. Use Table 1000-1 to determine the maximum allowable water-cementitious material (cement + fly ash) ratio for the classes of concrete listed.

**Page 10-7, Table 1000-3, MAXIMUM WATER-CEMENTITIOUS MATERIAL RATIO,** delete the table.

**Page 10-7, Article 1000-5, HIGH EARLY STRENGTH PORTLAND CEMENT CONCRETE, lines 30-31,** delete the second sentence of the third paragraph.

**Page 10-19, Article 1002-3, SHOTCRETE FOR TEMPORARY SUPPORT OF EXCAVATIONS, line 30,** add the following at the end of Section 1002:

**(H) Handling and Storing Test Panels**

Notify the Area Materials Engineer when preconstruction or production test panels are made within 24 hours of shooting the panels. Field cure and protect test panels from damage in accordance with ASTM C1140 until the Department transports panels to the Materials and Tests Regional Laboratory for coring.

**Page 10-23, Table 1005-1, AGGREGATE GRADATION-COARSE AGGREGATE,** replace with the following:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Light-weightC | ABC(M) | ABC | 9M | 14M | 78M | 67 | 6M | 57M | 57 | 5 | 467M | 4 | Std. Size # | **Percentage of Total by Weight Passing** | **TABLE 1005-1 AGGREGATE GRADATION - COARSE AGGREGATE** |
| **A.** See Subarticle 1005-4(A).  **B.** See Subarticle 1005-4(B).  **C.** For Lightweight Aggregate used in Structural Concrete, see Subarticle 1014-2(E)(6). | - | - | - | - | - | - | - | - | - | - | - | 100 | 100 | **2"** |
| - | 100 | 100 | - | - | - | - | - | 100 | 100 | 100 | 95-100 | 90-100 | **1 1/2"** |
| - | 75- 100 | 75-97 | - | - | - | 100 | 100 | 95-100 | 95-100 | 90-100 | - | 20-55 | **1"** |
| - | - | - | - | - | 100 | 90-100 | 90-100 | - | - | 20-55 | 35-70 | 0-15 | **3/4"** |
| 100 | 45-79 | 55-80 | 100 | 100 | 98-100 | - | 20-55 | 25-45 | 25-60 | 0-10 | - | - | **1/2"** |
| 80-100 | - | - | 98-100 | 98-100 | 75-100 | 20-55 | 0-20 | - | - | 0-5 | 0-30 | 0-5 | **3/8"** |
| 5- 40 | 20-40 | 35-55 | 85-100 | 35-70 | 20-45 | 0-10 | 0-8 | 0-10 | 0-10 | - | 0-5 | - | **#4** |
| 0-20 | - | - | 10-40 | 5-20 | 0-15 | 0-5 | - | 0-5 | 0-5 | - | - | - | **#8** |
| - | 0- 25 | 25-45 | - | - | - | - | - | - | - | - | - | - | **#10** |
| 0-10 | - | - | 0-10 | 0-8 | - | - | - | - | - | - | - | - | **#16** |
| - | - | 14-30 | - | - | - | - | - | - | - | - | - | - | **#40** |
| 0-2.5 | 0-12B | 4-12B | A | A | A | A | A | A | A | A | A | A | **#200** |
| AST | Maintenance Stabilization | Aggregate Base Course, Aggregate Stabilization | AST | Asphalt Plant Mix, AST, Structural Concrete, Weep Hole Drains | Asphalt Plant Mix, AST, Structural Concrete, Weep Hole Drains | Asphalt Plant Mix, AST, Structural Concrete | AST | AST, Concrete Pavement | AST, Structural Concrete,  Shoulder Drain Stone, Sediment Control Stone | AST, Sediment Control Stone | Asphalt Plant Mix | Asphalt Plant Mix | **Remarks** |

**Page 10-39, Article 1016-3, CLASSIFICATIONS , lines 27-32, replace with the following:**

Select material is clean, unweathered durable, blasted rock material obtained from an approved source. While no specific gradation is required, the below criteria will be used to evaluate the materials for visual acceptance by the Engineer:

1. At least 50% of the rock has a diameter of from 1.5 ft to 3 ft,
2. 30% of the rock ranges in size from 2” to 1.5 ft in diameter, and
3. Not more than 20% of the rock is less than 2” in diameter. No rippable rock will be permitted.

**Page 10-40, Tables 1018-1 and 1018-2, PIEDMONT, WESTERN AND COASTAL AREA CRITERIA FOR ACCEPTANCE OF BORROW MATERIAL,** under second column in both tables, replace second row with the following:

Acceptable, but not to be used in the top 3 ft of embankment or backfill

**Page 10-46, Article 1024-1, PORTLAND CEMENT, line 33,** add the following as the ninth paragraph:

Use Type IL blended cement that meets AASHTO M 240, except that the limestone content is limited to between 5 and 12% by weight and the constituents shall be interground. Class F fly ash can replace a portion of Type IL blended cement and shall be replaced as outlined in Subarticle 1000-4(I) for Portland cement. For mixes that contain cement with alkali content between 0.6% and 1.0% and for mixes that contain a reactive aggregate documented by the Department, use a pozzolan in the amount shown in Table 1024-1.

**Page 10-46, Table 1024-1, POZZOLANS FOR USE IN PORTLAND CEMENT CONCRETE,** replace with the following:

|  |  |
| --- | --- |
| **TABLE 1024-1 POZZOLANS FOR USE IN PORTLAND CEMENT CONCRETE** | |
| **Pozzolan** | **Rate** |
| Class F Fly Ash | 20% - 30% by weight of required cement content  with 1.0 lb Class F fly ash per lb of cement replaced |
| Ground Granulated Blast Furnace Slag | 35%-50% by weight of required cement content  with 1.0 lb slag per lb of cement replaced |
| Microsilica | 4%-8% by weight of required cement content  with 1.0 lb microsilica per lb of cement replaced |

**Page 10-47, Subarticle 1024-3(B), Approved Sources, lines 16-18,** replace the second sentence of the second paragraph with the following:

Tests shall be performed by AASHTO’s designated National Transportation Product Evaluation Program (NTPEP) laboratory for concrete admixture testing.

**Page 10-65, Article 1050-1, GENERAL, line 41,** replace the first sentence with the following:

All fencing material and accessories shall meet Section 106.

**Page 10-115, Subarticle 1074-7(B), Gray Iron Castings, lines 10-11,** replace the first two sentences with the following:

Supply gray iron castings meeting all facets of AASHTO M 306 excluding proof load. Proof load testing will only be required for new casting designs during the design process, and conformance to M306 loading (40,000 lb.) will be required only when noted on the design documents.

**Page 10-126, Table 1078-1, REQUIREMENTS FOR CONCRETE,** replace with the following:

**TABLE 1078-1**

**REQUIREMENTS FOR CONCRETE**

|  |  |  |
| --- | --- | --- |
| **Property** | **28 Day Design Compressive Strength  6,000 psi or less** | **28 Day Design Compressive Strength  greater than 6,000 psi** |
| Maximum Water/Cementitious Material Ratio | 0.45 | 0.40 |
| Maximum Slump without HRWR | 3.5" | 3.5" |
| Maximum Slump with HRWR | 8" | 8" |
| Air Content (upon discharge into forms) | 5 + 2% | 5 + 2% |

**Page 10-151, Article 1080-4, INSPECTION AND SAMPLING, lines 18-22,** replace (B), (C) and (D) with the following:

(B) At least 3 panels prepared as specified in 5.5.10 of AASHTO M 300, Bullet Hole Immersion Test.

(C) At least 3 panels of 4"x6"x1/4" for the Elcometer Adhesion Pull Off Test, ASTM D4541.

(D) A certified test report from an approved independent testing laboratory for the Salt Fog Resistance Test, Cyclic Weathering Resistance Test, and Bullet Hole Immersion Test as specified in AASHTO M 300.

(E) A certified test report from an approved independent testing laboratory that the product has been tested for slip coefficient and meets AASHTO M253, Class B.

**Page 10-161, Subarticle 1081-1(A), Classifications, lines 29-33,** delete first 3 sentences of the description for Type 2 and replace with the following:

**Type 2 -** A low-modulus, general-purpose adhesive used in epoxy mortar repairs. It may be used to patch spalled, cracked or broken concrete where vibration, shock or expansion and contraction are expected.

**Page 10-162, Subarticle 1081-1(A), Classifications, lines 4-7,** delete the second and third sentences of the description for Type 3A. **Lines 16-22,** delete Types 6A, 6B and 6C.

**Page 10-162, Subarticle 1081-1(B), Requirements, lines 26-30,** replace the second paragraph with the following:

For epoxy resin systems used for embedding dowel bars, threaded rods, rebar, anchor bolts and other fixtures in hardened concrete, the manufacturer shall submit test results showing that the bonding system will obtain 125% of the specified required yield strength of the fixture. Furnish certification that, for the particular bolt grade, diameter and embedment depth required, the anchor system will not fail by adhesive failure and that there is no movement of the anchor bolt. For certification and anchorage, use 3,000 psi as the minimum Portland cement concrete compressive strength used in this test. Use adhesives that meet Section 1081.

List the properties of the adhesive on the container and include density, minimum and maximum temperature application, setting time, shelf life, pot life, shear strength and compressive strength.

**Page 10-163, Table 1081-1, PROPERTIES OF MIXED EPOXY RESIN SYSTEMS,** replace with the following:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Min. Bond Strength Slant Shear Test at 14 days (psi) | Maximum Water Absorption (%) | Min. Compressive Strength of 2" mortar cubes at 7 days | Min. Compressive Strength of 2". mortar cubes at 24 hours | Tensile Elongation at 7 days (%) | Minimum Tensile Strength at 7 days (psi) | Pot Life (Minutes) | Speed (RPM) | Spindle No. | Viscosity-Poises at 77°F ± 2°F | **Property** | **TABLE 1081-1**  **PROPERTIES OF MIXED EPOXY RESIN SYSTEMS** |
| 1,500 | 1.5 | 5,000 (Neat) | 3,000 (Neat) | 30 min. | 1,500 | 20-50 | - | - | Gel | **Type 1** |
| 1,500 | 1.0 | - | 4,000- | 30 min. | 2,000 | 30-60 | 20 | 3 | 10-30 | **Type 2** |
| 2,000 | 1.0 | - | 6,000- | 2-5 | 4,000 | 20-50 | 20 | 4 | 25-75 | **Type 3** |
| 2,000 | 1.5 | - | 6,000 (Neat) | 2-5 | 4,000 | 5-50 | -- | -- | Gel | **Type 3A** |
| 1,500 | 1.0 | - | 3,000 | 5-15 | 1,500 | 40-80 | 10 | 4 | 40-150 | **Type 4A** |
| 1,500 | 1.0 | 5,000 | 3,000 | 5-15 | 1,500 | 40-80 | 10 | 4 | 40-150 | **Type 4B** |
| 1,500 | 1.0 | - | 6,000 | 2-5 | 4,000 | 20-60 | 50 | 2 | 1-6 | **Type 5** |

**Page 10-164, Subarticle 1081-1(E), Prequalification, lines 31-33,** replace the second sentence of the first paragraph with the following:

Manufacturers choosing to supply material for Department jobs must submit an application through the Value Management Unit with the following information for each type and brand name:

**Page 10-164, Subarticle 1081-1(E)(3), line 37,** replace with the following:

(3) Type of the material in accordance with Articles 1081-1 and 1081-4,

**Page 10-165, Subarticle 1081-1(E)(6), line 1,** in the first sentence of the first paragraph replace “AASHTO M 237” with “the specifications”.

**Page 10-165, Subarticle 1081-1(E), Prequalification, line 9-10,** delete the second sentence of the last paragraph.

**Page 10-165, Subarticle 1081-1(F), Acceptance, line 14,** in the first sentence of the first paragraph replace “Type 1” with “Type 3”.

**Page 10-169, Subarticle 1081-3(G), Anchor Bolt Adhesives,** delete this subarticle.

**Page 10-170, Article 1081-3, HOT BITUMEN, line 9,** add the following at the end of Section 1081:

**1081-4 EPOXY RESIN ADHESIVE FOR BONDING TRAFFIC MARKINGS**

**(A) General**

This section covers epoxy resin adhesive for bonding traffic markers to pavement surfaces.

**(B) Classification**

The types of epoxies and their uses are as shown below:

**Type I –** Rapid Setting, High Viscosity, Epoxy Adhesive. This type of adhesive provides rapid adherence to traffic markers to the surface of pavement.

**Type II –** Standard Setting, High Viscosity, Epoxy Adhesive. This type of adhesive is recommended for adherence of traffic markers to pavement surfaces when rapid set is not required.

**Type III –** Rapid Setting, Low Viscosity, Water Resistant, Epoxy Adhesive. This type of rapid setting adhesive, due to its low viscosity, is appropriate only for use with embedded traffic markers.

**Type IV –** Standard Set Epoxy for Blade Deflecting-Type Plowable Markers.

**(C) Requirements**

Epoxies shall conform to the requirements set forth in AASHTO M 237.

**(D) Prequalification**

Refer to Subarticle 1081-1(E).

**(E) Acceptance**

Refer to Subarticle 1081-1(F).

**Page 10-173, Article 1084-2, STEEL SHEET PILES, lines 37-38,** replace first paragraph with the following:

Steel sheet piles detailed for permanent applications shall be hot rolled and meet ASTM A572 or ASTM A690 unless otherwise required by the plans. Steel sheet piles shall be coated as required by the plans. Galvanized sheet piles shall be coated in accordance with Section 1076. Metallized sheet piles shall be metallized in accordance to the Project Special Provision “Thermal Sprayed Coatings (Metallization)” with an 8 mil, 99.9% aluminum alloy coating and a 0.5 mil seal coating. Any portion of the metallized sheet piling encased in concrete shall receive a barrier coat. The barrier coat shall be an approved waterborne coating with a low-viscosity which readily absorbs into the pores of the aluminum thermal sprayed coating. The waterborne coating shall be applied at a spreading rate that results in a theoretical 1.5 mil dry film thickness.  The manufacturer shall issue a letter of certification that the resin chemistry of the waterborne coating is compatible with the 99.9% aluminum thermal sprayed alloy and suitable for tidal water applications.

**Page 10-174, Subarticle 1086-1(B)(1), Epoxy, lines 18-24,** replace with the following:

The epoxy shall meet Article 1081-4.

The 2 types of epoxy adhesive which may be used are Type I, Rapid Setting, and Type II, Standard Setting. Use Type II when the pavement temperature is above 60°F or per the manufacturer’s recommendations whichever is more stringent. Use Type I when the pavement temperature is between 50°F and 60°F or per the manufacturer’s recommendations whichever is more stringent. Epoxy adhesive Type I, Cold Set, may be used to attach temporary pavement markers to the pavement surface when the pavement temperature is between 32°F and 50°F or per the manufacturer’s recommendations whichever is more stringent.

**Page 10-175, Subarticle 1086-2(E), Epoxy Adhesives, line 27,** replace “Section 1081” with “Article 1081-4”.

**Page 10-177, Subarticle 1086-3(E), Epoxy Adhesives, line 22,** replace “Section 1081” with “Article 1081-4”.

**Page 10-179, Subarticle 1087-4(A), Composition, lines 39-41,** replace the third paragraph with the following:

All intermixed and drop-on glass beads shall not contain more than 75 ppm arsenic or 200 ppm lead.

**Page 10-180, Subarticle 1087-4(B), Physical Characteristics, line 8,** replace the second paragraph with the following:

All intermixed and drop-on glass beads shall comply with NCGS § 136-30.2 and 23 USC § 109(r).

**Page 10-181, Subarticle 1087-7(A), Intermixed and Drop-on Glass Beads, line 24,** add the following after the first paragraph:

Use X-ray Fluorescence for the normal sampling procedure for intermixed and drop-on beads, without crushing, to check for any levels of arsenic and lead. If any arsenic or lead is detected, the sample shall be crushed and repeat the test using X-ray Fluorescence. If the X-ray Fluorescence test shows more than a LOD of 5 ppm, test the beads using United States Environmental Protection Agency Method 6010B, 6010C or 3052 for no more than 75 ppm arsenic or 200 ppm lead.