502-R-713 PORTLAND CEMENT CONCRETE PAVEMENT, PCCP

(Revised 02-20-20)

The Standard Specifications are revised as follows:

SECTION 502, BEGIN LINE 7, DELETE AND INSERT AS FOLLOWS:

MATERIALS

502.02 Materials

Materials shall be in accordance with the following:

Admixtures.....912.03
Coarse Aggregate, Class AP, Size No. 8 904
Fine Aggregate, Size No. 23 904
Fly Ash.....901.02
~~Ground Granulated Blast Furnace Slag.....901.03~~
Portland Cement.....901.01(b)
Rapid Setting Patch Materials.....901.07
Slag Cement 901.03
Water.....913.01

502.03 Concrete Mix Design

A concrete mix design submittal, CMDS, shall be in accordance with 502.04. The CMDS shall be submitted ~~one week prior to production and approved by the Engineer~~*to the DTE*. The CMDS shall be submitted ~~utilizing~~*a minimum of seven calendar days prior to production. The CMDS shall use* the Department provided spreadsheet and shall include the following:

(a) a list of all ingredients
(b) the source of all materials
(c) the fine to total aggregate ratio
(d) the absorption of the aggregates
(e) the SSD bulk specific gravity of the aggregates
(f) the specific gravity of pozzolan
(g) the batch weights
(h) the names of all admixtures
(i) the admixture dosage rates and the manufacturer's recommended range.

The absolute volume of the mix design shall be 27.0 cu ft at the design air content of 6.5%.

Production ~~may commence once the DTE approves the submission as a CMDP.~~*shall not commence until the DTE has assigned a mix number to the CMDS. The mix design will henceforth be identified as a concrete mix design for production, CMDP.*

Any of the following changes or adjustments to an existing CMDP shall require a new CMDS to be submitted to the DTE.

(a) cement source or type
(b) pozzolan source or type
(c) aggregate source or type
(d) admixture source or type
(e) addition or deletion of an admixture
(f) proportioning of the concrete in accordance with 502.04 as follows:

1. cement content or cement reduction
2. pozzolan to cement substitution ratio
3. target water/cementitious ratio
4. proportion of aggregate by weight exceeding ±2%.

A CMDP in accordance with 501.05 or a CMDP in accordance with 502.04 from a previous contract may be submitted for *review for* use ~~upon the approval~~*on the current contract* to the DTE. *The DTE will notify the Contractor when the review is complete and whether or not the previously used CMDP can be used on the current contract.*

502.04 Concrete Mix Criteria

Chemical admixtures type A, type B, type C, type D, type E, and type F may be allowed if shown on the CMDP. The supplied concrete mix shall include one of the following water reducing admixtures: type A, type D, type E, or type F.

The fine aggregate shall be at least ~~35~~*40*% but not more than 45% of the total weight of the aggregate in each cubic yard. Proportions will be based upon saturated surface dry aggregates.

(a) Portland Cement Concrete

The CMD shall produce workable concrete mixtures, with the minimum amount of water, and having the following properties.

~~Portland cement content.....564 lbs/cu yd~~
~~Maximum water/cementitious ratio .....0.450~~
~~Maximum cement reduction for GGBFS replacement .....30%~~
~~Fly Ash/portland cement substitution ratio.....1.25 by weight~~
~~Maximum cement reduction for fly ash replacement .....20%~~
~~GGBFS/portland cement substitution ratio.....1.00 by weight~~
~~Slump, formed.....2 to 6 in.~~
~~Slump, slipformed.....1.25 to 3 in.~~
~~Air .....5.0% to 8.0%~~
~~Minimum flexural strength, third point loading, with fly ash.....550 psi at 28 days~~
~~Relative yield .....0.98 to 1.02~~

Targets for the CMD:

Portland cement content .....564 lbs/cu yd[A]
Maximum portland cement content.....752 lbs/cu yd[A]
Minimum water/cementitious ratio.....0.340[B]
Maximum water/cementitious ratio .....0.435[B]

Maximum portland cement reduction
for slag cement replacement 30%
Slag cement/portland cement substitution ratio .....1.00 by weight
Maximum cement reduction for fly ash replacement.....20%
Fly ash/portland cement substitution ratio.....1.25 by weight
Air Content.....6.5%
Minimum modulus of rupture.....570 psi at 7 days[C]
Relative Yield 1.00

Field Acceptance Properties:
Minimum water/cementitious ratio.....0.320[B]
Maximum water/cementitious ratio .....0.450[B]
Slump.....2 to 6 in.
Air content.....5.0% to 8.0%
Minimum modulus of rupture.....570 psi at 7 days[C]
Relative yield.....0.98 to 1.02

[A] *The target cement content during production shall not be adjusted from the value stated on the CMDP.*
[B] *The water cementitious ratio during production shall not deviate more than 0.020 from the target stated in the CMDP and shall not fall outside the limits above.*
[C] *Beams shall be standard cured in a water tank in accordance with AASHTO T 23 and 505.01(a). The water does not need to be saturated with calcium hydroxide. Minimum flexural strength for opening to traffic shall be in accordance with 506.11.*

Class C concrete in accordance with 702 using Class AP coarse aggregate may be substituted in PCCP.

~~Chemical admixtures type A, type B, type C, type D, type E, and type F may be allowed with prior written approval.~~

~~E~~*Blended portland pozzolan cements, f*ly ash*,* or ~~GGBFS used as an additive, or blended cements~~*slag cement* may only be incorporated in the concrete mix ~~between April 1 and October 15 of the same calendar year~~*when the ambient temperature is above 50°F during the entire placement period*. If type IP, type IP-A, type IS or type IS-A cements are to be used, the *minimum* portland cement content shall be increased to 598 lb~~s~~/cu yd. The use of fly ash or ~~GGBFS as an additive~~*slag cement* will not be allowed when blended cement types IP, IP-A, IS, or IS-A are used.

(b) High-Early Strength Concrete

~~The Contractor shall submit, along with the CMDS, all supporting test results for approval to the DTE prior to placing concrete. Testing shall be conducted by an American Concrete Institute, ACI, certified concrete field testing technician, grade 1. The supporting test results shall be signed by the technician and include air content, slump, relative yield, water cement ratio, and the flexural strengths at 1 day, 2 days, and 7 days.~~

~~The CMD shall produce workable concrete mixtures, with the minimum amount of water, and having the following properties.~~

~~Minimum portland cement content (types I, IL or III) ..... 564 lbs/cu yd~~
~~Maximum fly ash addition ..... 10% of cement content~~
~~Maximum water/cementitious ratio (types I or IL)..... 0.42~~
~~Maximum water/cementitious ratio (type III)..... 0.45~~
~~Maximum GGBFS addition ..... 15% of cement content~~
~~Slump, formed..... 2 to 6 in.~~
~~Slump, slipformed..... 1.25 to 3 in.~~
~~Air content ..... 5.0% to 8.0%~~
~~Minimum flexural strength, third point loading ..... 550 psi at 2 days~~
~~Relative yield ..... 0.98 to 1.02~~

~~Fly ash or GGBFS used as an additive may only be incorporated in the concrete mix between April 1 and October 15 of the same calendar year.~~

~~Chemical admixtures type A, type B, type C, type D, type E, and type F may be allowed with prior written approval~~*Patching concrete in accordance with 506.04(b) shall be used.*

502.05 Job Control

Control of PCCP for air content, slump, or relative yield will be determined on the basis of tests performed by the Engineer in accordance with 505. Concrete and necessary labor for sampling shall be furnished as required by the Engineer. Testing will be in accordance with the Frequency Manual.

SECTION 502, BEGIN LINE 338, DELETE AND INSERT AS FOLLOWS:

502.18 Opening to Traffic

~~When fly ash, GGBFS, or cement type IP, type IS, type IP-A, or type IS-A is incorporated into the PCCP, traffic shall not be allowed on the PCCP until the test beams indicate a modulus of rupture of 550 psi or greater. Opening to traffic of PCCP not containing the above additives shall be based on the following.~~

~~(a) Construction~~

~~Construction vehicles or equipment may be allowed on the PCCP after 10 days or when the test beams indicate a modulus of rupture of 550 psi or greater. Any construction vehicle or equipment that may damage the PCCP shall not be used on the PCCP unless adequate protection is provided. Approved joint cutting saws may be operated on the PCCP as determined by the Contractor.~~

~~(b) Non-Construction~~

PCCP may be opened to *equipment and* traffic ~~after 14 days or~~ when *the flexural strength of the* test beams indicate*s* a modulus of rupture of 550 psi or greater. *ITM 402 may be used as an alternate method to determine the flexural strength. If adequate strengths are not achieved, an investigation by the Engineer and the Contractor will be conducted to determine if the PCCP is deficient. Resolutions for all deficiencies will be developed at the completion of the investigation.* Prior to opening to traffic, cracks and joints shall be sealed in accordance with 503.05 and the PCCP shall be cleaned.