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REVISION OF SECTIONS 106, 601 & 703
OPTIMIZED PCCP MIX

Sections 106, 601 and 703 of the Standard Specifications are hereby revised for this project as follows:

Subsection 106.06 (a) shall include the following:

8. Optimized Gradation. The Contractor will be required to perform quality control testing of the combined aggregate gradation (CAG) when an Optimized Gradation (OG) is used for Class P Concrete. The combined aggregate gradation testing frequency shall be three per day. Test one shall be sampled and tested after full production begins but before production reaches 100 cubic yards. Test two shall be sampled and tested after four hours of continuous production or production reaches 1000 cubic yards, whichever comes first. Test three shall be sampled and tested after seven hours of continuous production or production reaches 1750 cubic yards, whichever comes first. The frequency shall be a minimum of one per day if production is less than 750 cubic yards. When the aggregates are blended prior to charging the mixing drum, the blended aggregate shall be sampled and tested. When the aggregates are batched individually, a sample from each aggregate shall be tested and the combined gradation shall be calculated.

The Department will perform one gradation each day that may be a split of one of the three daily QC samples. This data will not be used to determine acceptability of the material but as information only.

The gradation test data will be used to calculate the coarseness factor (CF) and workability factor (WF) and must plot within the workability box. No corrective action shall be required if the data falls within the workability box.

When gradation test results and the CF and WF fall outside the workability box, the Contractor shall immediately make corrections to bring the aggregate gradation within the workability box and notify the Engineer. If two or more consecutive test results for any single day or two successive days are found to fall outside the workability box, the Contractor shall immediately suspend production and provide a written corrective plan to the Engineer for approval prior to resuming production.

Upon being allowed to resume production, the Contractor shall follow the daily sampling frequency. If the next two consecutive gradation tests indicate the CF and WF plot inside the workability box, the Contractor may continue production. If the first two aggregate samples do not have CF and WF that fall inside the workability box, production shall be suspended.

Prior to resuming production the Contractor shall be required to sample the individual aggregate stockpiles at two or more locations to determine the range of variability within each stockpile, make appropriate adjustments to the percentages for each aggregate component, and discharge and sample the combined aggregates. The combined aggregate gradation shall be tested to determine if the CF and WF fall inside the workability box. Production can resume if the CF and WF plot within the workability box. Production will continue to be suspended for additional evaluation of stockpiles and aggregate feed rates until gradation sampling and testing indicate the CF and WF fall inside the workability box.

All gradation test information during production shall be provided to the Engineer daily. The Contractor shall immediately report all gradation test data to the Engineer for evaluation during periods when production is suspended or upon resuming production. The Contractor will be notified in writing in all cases when production may resume or shall remain suspended.

In subsection 601.02, delete Class E and Class P and replace with the following:

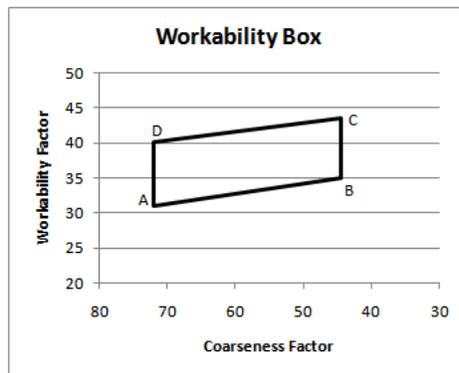
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Class E concrete is used for fast track pavements needing early strength in order to open a pavement to service soon after placement. Class E concrete shall meet the requirements of Class P concrete. ASTM C150 Type III or ASTM C1157 Type HE cement may be used.

Class P concrete is used in pavements. Additional requirements are: The laboratory trial mix shall produce a minimum average 28 day flexural strength of 650 psi. If acceptance is based on flexural strength, the total weight of cementitious material shall not be less than 520 pounds per cubic yard. Two aggregate gradation options are available:

- (a) *Standard Gradation (SG)*. The concrete mix shall consist of a minimum 55 percent AASHTO M 43 size No. 357 or No. 467 coarse aggregate by weight of total aggregate. If all transverse joints are doweled, the concrete mix shall consist of a minimum 55 percent AASHTO M 43 sizes No. 57, No. 6, No. 67, No. 357, or No. 467 coarse aggregate by weight of total aggregate.
- (b) *Optimized Gradation (OG)*. This option may only be used when acceptance is based on flexural strength. Aggregate proportions must be a result of an optimized combined aggregate gradation (CAG) developed by an approved mix design technique such as Shilstone or KU Mix. The amount of aggregate in the CAG passing the 19 mm (¾ inch) sieve and retained on the 12.5 mm (½ inch) sieve shall be a minimum of 8 percent for the trial mix design. The coarseness factor (CF) and workability factor (WF) must plot within the workability box (ABCD) depicted graphically by the following 4 coordinate points:
 - a. Point A > (CF,WF) 72, 31
 - b. Point B > (CF,WF) 44.5, 35
 - c. Point C > (CF,WF) 44.5, 43.5
 - d. Point D > (CF,WF) 72, 40

Figure 601-1



$$CF = (S / T) \times 100$$

Where:

S = Percent Cumulative Retained on 9.5 mm (3/8 inch) Sieve

T = Percent Cumulative retained on 2.36 mm (No. 8) Sieve

WF is the percent passing the 2.36 mm (No. 8) sieve. Increase workability factor by 2.5 percentage points for every 94 pounds per cubic yard of cementitious material used in excess of 564 pounds per cubic yard in the mix design. Decrease workability factor by 2.5 percentage points for every 94 pounds per cubic yard of cementitious material used below 564 pounds per cubic yard in the mix design. Do not adjust the workability factor if the amount of cementitious material is 564 pounds per cubic yard.

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Subsection 601.05 shall include the following in the second paragraph:

- (8) Class P concrete with an OG shall indicate the gradation proportions that results in a combined aggregate gradation corresponding to compliance within the specified CF and WF box and shall include the following charts used to perform aggregate gradation analysis:
 - (i) Coarseness Factor
 - (ii) Workability Factor
 - (iii) 0.45 power
 - (iv) Combined gradation

Delete Subsection 601.06 (10) and (11) and replace with the following:

- (10) Weights of fine and coarse aggregates or combined weight when an OG is pre-blended
- (11) Moisture of fine and coarse aggregates or combined moisture when an OG is pre-blended

Subsection 601.06 (c) shall include the following:

Aggregates for Class P concrete using an OG, a combination of aggregates (stockpiled separately) may be combined prior to the stationary charging drum to meet the approved CAG.

In subsection 703.00, delete the third paragraph and Table 703-2.

In subsection 703.02, delete the second sentence.