**FULL-DEPTH RECLAMATION WITH EXPANDED ASPHALT STABILIZATION - Item No.**

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| Special Provision No. 331F02 November 2021 |

**Amendment to OPSS 331, November 2015**

**331.02 REFERENCES**

Section 331.02 of OPSS 331 is amended by the deletion of the following:

**Ministry of Transportation Publications**:

LS-200 Penetration of Bituminous Materials

**American Association of State Highway and Transportation Officials (AASHTO):**

T 40-02 Sampling Bituminous Materials

**Wirtgen GmbH Publication:**

Wirtgen Cold Recycling Technology manual, 1st edition, 2012

Section 331.02 of OPSS 331 is amended with the addition of the following:

**Ministry of Transportation Publications**:

LS-806 Practice for Mix Design of Full-Depth Reclamation Mixtures with Expanded Asphalt

**American Association of State Highway and Transportation Officials (AASHTO)**:

R 66-16 Sampling of Asphalt Materials

**ASTM Publications:**

D5/D5M-20 Standard Test Method for Penetration of Bituminous Materials

D2041/D241M-19 Standard Test Method for Theoretical Maximum Specific Gravity and Density of Asphalt Mixtures

**331.04 DESIGN AND SUBMISSION REQUIREMENTS**

**331.04.01 Design Requirement**

The first paragraph of Subsection 331.04.01 of OPSS 331 is amended by deleting the last sentence in its entirety and replacing it with the following:

The dry tensile strength shall be a minimum of 225 kPa and the tensile strength ratio shall be a minimum of 50%.

The third paragraph of Subsection 331.04.01 of OPSS 331 is amended by deleting the first sentence in its entirety and replacing it with the following:

The mix design shall be carried out according to the LS-806.

The last paragraph of Subsection 331.04.01 of OPSS 331 is amended by deleting point d) and h) in its entirety and replacing it with the following:

d) The optimum moisture content, the mix design bulk relative density, and the air void for the EAM. Air void shall be according to ASTM D2041, Supplemental Procedure for Asphalt Mixtures Containing Porous Aggregate.

h) Recovered penetration for the binder of the existing pavement according to ASTM D5M.

Subsection 331.04.01 of OPSS 331 is amended by the addition of the following:

The design rate of the expanded asphalt shall be as specified in Table 1, which is for bidding purpose only. The Contractor shall prepare a mix design to determine the design rate for the Contract.

**Table 1**

**Design Rate of the Expanded Asphalt at Various Locations**

| **Location in Contract** | **Pulverizing**  **Depth**  **(mm)** | **Average Depth of HMA Layer**  **(mm)** | **Foaming**  **Depth**  **(mm)** | **Design Rate of the Expanded Asphalt**  **(%)** |
| --- | --- | --- | --- | --- |
| \* | \* | \* | \* | \* |

[\* Designer Fill-Ins for Table 1, See Notes to Designer]

**331.05 MATERIALS**

**331.05.01 Performance Graded Asphalt Cement**

The second sentence of Subsection 331.05.01 of OPSS 331 is deleted in its entirety and replaced with the following:

The Additional Testing Requirements and Categories for PGAC table in OPSS 1101 shall not apply.

**331.05.03 Active Filler**

The second paragraph of Subsection 331.05.03 of OPSS 331 is deleted in its entirety and replaced with the following:

When any of the strength requirements as specified in Section 331.04.01 is not met, active filler such as Portland cement, hydrated lime, and/or quick lime can be considered to be added into the EAM. Portland cement shall be according to OPSS 1301. The maximum cement content to added asphalt content ratio shall be 1:2.5 or the maximum quantity of Portland cement is limited to 1.5 % by dry mass of the combined RAP and granular materials, whichever is less.

When the plasticity index of the EAM is less than 10, the maximum quantity of hydrated lime, or quick lime is limited to 1.5 % by dry mass of the combined RAP and granular materials. When the plasticity index is larger than 10, the EAM shall be pre-treated with an amount of hydrated lime based on the result of the initial consumption of lime (ICL) test as per LS-806.

**331.05.05 Expanded Asphalt Mix**

Subsection 331.05.05 of OPSS 331 is deleted in its entirety and replaced with the following:

**331.05.05 Reclaimed Material**

The gradation requirement for reclaimed material shall be 100% passing the 37.5 mm sieve, and 95% to 100% passing the 26.5 mm sieve. The gradation shall be measured based on unextracted washed gradation according to the procedures in LS-602, with full range of gradation sizes provided for information purposes only.

**331.06 EQUIPMENT**

**331.06.03 Pilot Vehicle**

Subsection 331.06.03 of OPSS 331 is deleted in its entirety.

**331.07 CONSTRUCTION**

**331.07.04 Expanded Asphalt Stabilization**

Subsection 331.07.04 of OPSS 331 is amended with the addition of the following clause:

**331.07.04.01 Longitudinal Joints**

For achieving continuity and integrity in the paved area, the minimum overlap between two successive lanes in longitudinal joints shall be 150 mm. In addition, the face of the joints shall be inspected between the milling unit and paving unit to make sure it is free of excessive loose material or any build-up dust generated by the milling machine.

**331.07.04.02 Mixing**

The expanded asphalt shall be added at the design rate. Expanded asphalt expansion ratio and half-life shall be checked using the test nozzle on the recycling unit or mixer for each load of asphalt delivered to the site, where appropriate. The rate of addition of expanded asphalt shall be field adjusted as required to within 0.30% of the design rate and mixed to produce a uniformly coated mix that can be compacted to the specified density.

**331.07.06 Traffic Control with Moving Vehicles**

Subsection 331.07.06 of OPSS 331 is deleted in its entirety and replaced with the following:

**331.07.06 Traffic Control with Pilot Vehicles**

Traffic shall be controlled with pilot vehicles according to OTM, Book 7.

The pilot vehicles shall guide one-way traffic through or around construction. The maximum speed of the moving vehicles shall be 30 km/h. Traffic control with moving vehicles shall be maintained until the EAM mat is able to carry traffic without damage.

**331.08 QUALITY ASSURANCE**

**331.08.01 General**

Under subsection 331.08.01, bullet point g) is deleted in its entirety and replaced by the following:

g) Reclaimed Material Gradation.

**331.08.02 Sampling**

Subsection 331.08.02 of OPSS 331 is amended by the addition of the following clause:

**331.08.02.06 Reclaimed Material Gradation**

For the purpose of determining the reclaimed material gradation, 30 kg of reclaimed material samples shall be taken from each of five randomly selected sublots for every lot.

**331.08.02.02 Performance Graded Asphalt Cement**

Clause 331.08.02.02 of OPSS 331 is amended by deleting its first sentence and replaced by the following:

Samples of PGAC to be used in the mix shall be taken from the storage tank at the terminal according to the Tank Tap Method specified in AASHTO R66 and the terminal’s health and safety plan in the presence of the Contract Administration at a frequency of three sets of samples per Contract for PGAC providing to three different lots.

**331.08.02.05 Expanded Asphalt Mix**

Clause 331.08.02.05 of OPSS 331 is amended by deleting its second paragraph.

**331.08.03 Acceptance Criteria**

**331.08.03.03 Tensile Strength**

Clause 331.08.03.03 of OPSS 331 is amended by addition of the following clause:

**331.08.03.03.01 Referee Testing**

A written request may be made to the Contract Administrator for referee testing within 3 Business Days of receiving a rejectable tensile strength test result. Referee testing shall be carried out by a laboratory designated by the Owner from a roster maintained for this purpose.

The referee testing shall be conducted by taken slab samples at random locations within the sublot as directed by the Contract Administrator. The total of six slab sample shall be dry cut 150 mm x 150 mm and removed intact from the EAM mat. The tensile strength test shall follow either the Method A or Method B procedure, as per LS-297.

The results of the referee test shall be used for acceptance determination and shall be binding on both parties.

If the referee testing results in rejection of the tensile strength, the referee testing shall be at no addition cost to the Owner. If the referee testing results in the material passing all test criteria, the referee testing charge shall be paid by the Owner.

**331.10 BASIS OF PAYMENT**

Section 331.10 of OPSS 331 is amended by the addition of the following subsection:

**331.10.02 Traffic Control with Pilot Vehicles**

Traffic control with pilot vehicles shall be included under the Temporary Traffic Control Signs item.

NOTES TO DESIGNER:

**\*** Designer Fill-Ins for Table 1

In the first column, insert the location of EAM with various pulverizing depths, foaming depths, and design rate of the expanded asphalt. This could be a highway number, or a particular feature of the contract, such as chainage.

In the second column, insert the pulverizing depth, i.e. the total reclaimed depth.

In the third column, insert the average thickness of the HMA layer for the location.

In the fourth column, insert the proposed foaming depth, i.e. the depth to which expanded asphalt is added.

In the fifth column, insert the design rate of the expanded asphalt according to the design rate of the pre-engineering mix design as prepared by the Owner, or calculated by the formula as defined in the Contract Design, Estimating and Documentation (CDED) manual.

WARRANT: Always with this tender item.