CONSTRUCTION SPECIFICATION FOR COLD IN-PLACE RECYCLING

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333.01 SCOPE

This specification covers the requirements for cold in-place reclaiming of existing asphalt pavement, sizing, addition and mixing of emulsified asphalt; and spreading and compacting the recycled cold mixed asphalt material.

333.02 REFERENCES

This specification refers to the following standards, specifications or publications:

Ontario Provincial Standard Specification, Construction:
OPSS 313 Hot Mixed, Hot Laid Asphaltic Concrete Paving, and Hot Mix Patching, including Recycled and Specialty Mixes

Ontario Provincial Standard Specification, Materials:
OPSS 1103 Emulsified Asphalt

Ministry of Transportation Publication:

MTO Laboratory Testing Manual:
LS-291 - Method of Test for Quantitative Extraction of Asphalt Cement and Analysis of Extracted Aggregate from Bituminous Paving Mixtures - Ontario Procedure
LS-300 - Method of Test for Preparation of Marshall Specimens for Cold In-Place Recycled Mixtures

333.03 DEFINITIONS

For the purpose of this specification, the following definition applies:

Cold In-Place Recycled (CIR) Mix: means the mixture of reclaimed existing asphalt pavement and emulsified asphalt.

333.04 SUBMISSION AND DESIGN REQUIREMENTS

For mix design purposes prior to commencing the work, the Contractor shall obtain samples that are representative of the material that will be produced during the milling operation. These samples shall be used to establish the design rate of emulsified asphalt as a percentage by mass of the reclaimed asphalt pavement. The emulsified asphalt by mass of reclaimed asphalt pavement shall be 1.5% ± 0.3%.
A minimum of 10 working days prior to the start of CIR operations, information on the type, manufacturer and supplier of the emulsified asphalt and a copy of all calculations performed to determine the design emulsified asphalt rate shall be submitted to the Contract Administrator.

### 333.05 MATERIALS

#### 333.05.01 Reclaimed Asphalt Pavement

The operation of reclaiming existing asphalt pavement shall ensure that 100% of the material passes the 37.5 mm sieve.

#### 333.05.02 Emulsified Asphalt

Emulsified asphalt shall meet the requirements of OPSS 1103 and be either a mixing grade polymer modified high float emulsified asphalt or a mixing grade high float emulsified asphalt, whichever is specified.

### 333.06 EQUIPMENT

#### 333.06.01 Recycling Train

The existing pavement shall be reclaimed and recycled using a recycling train including the following major units.

- The cold milling unit shall be self-propelled and have a cutting drum capable of reclaiming a full lane width of asphalt pavement to the required depth in one pass.
- The screening and sizing unit shall be capable of reducing the reclaimed asphalt pavement to the specified size.
- The mixing unit shall be equipped with a device which will continuously maintain the amount of emulsified asphalt added to within ± 0.2% by mass of the aggregate feed. The mixing unit shall be capable of producing a uniform thoroughly blended CIR mix.
- The aggregate feed system to the mixing unit shall be equipped with a means of determining the mass of material being deposited into the mixing unit prior to the addition of the emulsified asphalt. The scale shall be calibrated to the manufacturer's tolerance at the start of the Contract and whenever deemed necessary by the Contract Administrator.
- The emulsified asphalt control system shall be equipped with a flow meter and a total delivery meter.

#### 333.06.02 Placing Equipment

Placing of the CIR mix shall be carried out by means of a self-propelled mechanical paver equipped with distributing augers capable of spreading the material evenly in front of the screed in one continuous pass.

#### 333.06.03 Compaction Equipment

The Contractor shall select the appropriate compaction equipment to achieve the required compaction.
333.06.04  **Drying Unit**

In order to achieve the design moisture content prior to the placement of the overlay, the Contractor may elect to use a drying unit specifically designed to provide radiant heat to the CIR mat. No open flame heating is to be used. The entire heater assembly shall be designed to be raised or lowered by a single control. The radiant heater assembly shall be adjustable in width from 3.0 to 4.1 m.

333.06.05  **Pilot Vehicle**

The pilot vehicle shall be equipped with an amber rotating light and a sign mounted with clearance not less than 1 metre above the road. The sign shall be at least 1.5 m in width and 0.75 m in height, orange with black lettering and shall display the words: "Pilot Vehicle, Do Not Pass".

333.07  **CONSTRUCTION**

333.07.01  **Operational Constraints**

The work shall not be carried out when the ambient temperature is less than 10°C or when the overnight low is forecast to be less than 2°C.

The work shall be carried out when the roadway is free of standing water.

The separate wearing surface course shall not be placed until all of the following requirements have been met:

a. The CIR mix has been allowed to cure for a minimum of 14 calendar days;

b. the average in situ moisture content of the CIR mix is 2% or less with no test value greater than 3%;

c. the specified density has been achieved; and

d. all defective areas involving ravelling, flushing, rutting and poor longitudinal and transverse joints have been repaired to the satisfaction of the Contract Administrator.

Areas which are not accessible to the reclaiming equipment shall have the asphalt pavement removed and replaced with binder course mix to a depth which is equal to the cold in-place recycled depth.

Prior to cold in-place recycling work being carried out after September 1st, written approval must be obtained from the Contract Administrator.

333.07.01.01  **Preparation of Longitudinal and Transverse Joints**

All deleterious and loose milled material shall be removed from the milled surfaces at longitudinal and transverse joints.

333.07.02  **Mixing**

The emulsified asphalt shall be added to the reclaimed bituminous pavement at the design emulsified asphalt rate. The emulsified asphalt rate shall be adjusted as required to produce a uniform thoroughly coated CIR mix that can achieve the required density.

Water may be added to or concurrent with the milled material or emulsified asphalt to facilitate uniform mixing.
333.07.03  Compaction

The compacted CIR mix shall be smooth and true to the specified crown and grade. Immediately after compaction, the surface of the CIR mat shall be free from deviations exceeding 6 mm as measured in any direction with a 3 m straight edge.

The CIR asphalt pavement shall be compacted to a minimum of 96% of the laboratory density determined by the Contract Administrator according to LS-300. After initial compaction, the CIR asphalt pavement shall be opened to public traffic and allowed to cure for a minimum of 14 calendar days.

Mix which cannot be compacted to the specified density shall be removed and replaced with hot mix asphalt as specified.

Prior to overlay, a minimum of two samples of the compacted CIR asphalt pavement shall be obtained by the Contractor, at random locations as determined by the Contract Administrator, for each full day of production. When production is less than a full day the amount of testing will be determined by the Contract Administrator.

The Contractor shall ensure that the samples are removed intact in sufficient quantity to carry out testing according to the MTO Laboratory Testing Manual. The samples shall be delivered by the Contractor in good condition to the designated testing laboratory within 24 hours. If a sample condition is found to be unsuitable for testing by the laboratory, the Contractor will be notified immediately by the Contract Administrator to resample that location.

Ravelled sections shall be repaired according to OPSS 313.

333.07.04  Moisture Content

The moisture content shall be determined in accordance with LS-291. Duplicate samples of the CIR mix shall be obtained by the Contractor for each 0.5 lane-km of production. The Contractor shall test one of the duplicate samples and the other shall be delivered to the designated testing laboratory.

Each sample shall be dry cut 150 x 150 mm and removed intact from the pavement. It shall be packaged to protect sample integrity, appropriately labelled, and delivered by the Contractor in good condition to the designated testing laboratory within 24 hours of sampling. If a sample condition is found to be unsuitable for testing by the laboratory, the Contractor will be notified immediately by the Contract Administrator to resample that location.

333.07.05  Drying

If the CIR material does not meet the moisture content requirements 14 days after placement, the CIR material may be heated with the drying units. Overheating or charring of the emulsified asphalt and aggregates shall not be allowed.

333.07.06  Protection of Work and Traffic Control

Traffic, including construction traffic, shall be kept off the freshly placed CIR pavement until such time as it is able to carry traffic without damage.

333.07.07  Repair of Unacceptable Pavement

CIR pavement that is unacceptable shall be removed and replaced with hot mix asphalt as specified at no cost to the Owner. Removal shall be for the full depth and lane width of recycling.
333.08 QUALITY ASSURANCE

333.08.01 Sampling of Emulsified Asphalt

Samples of the mixing grade polymer modified high float or mixing grade high float emulsified asphalt used in the mix, shall be obtained, labelled and delivered within five working days of sampling to the designated testing laboratory. Each sample of material shall be a minimum of two full 4 litre portions and shall be properly identified.

Samples shall be taken at the job site from each tanker load of material. Each sample shall be taken after a minimum of 4000 kg has been drawn from the tanker, from a sampling spigot on the transfer line, if available, or from the end of the transfer line.

The sample containers as supplied by the Contractor shall be triple tight epoxy lined pails or suitable leak proof plastic containers which can be closed to prevent leakage. The sample labels will be supplied by the Contract Administrator.

333.08.02 Compliance

The supplied emulsified asphalt samples shall conform to OPSS 1103 for the particular type and grade when tested in conformance to the test methods designated therein.

333.09 MEASUREMENT FOR PAYMENT

333.09.01 Actual Measurement

333.09.01.01 Cold In-Place Recycled Mix

Measurement of the area of cold in-place recycled mix placed will be made in square metres.

333.09.02 Plan Quantity Measurement

333.09.02.01 Cold In-Place Recycled Mix

When measurement is by Plan Quantity, such measurement will be based on the units shown in the clause under Actual Measurement.

333.10 BASIS OF PAYMENT

333.10.01 Cold In-Place Recycled Mix - Item

Payment at the contract price for the above item shall be full compensation for all labour, equipment and material including the emulsified asphalt to do the work.

No additional payment will be made for hot mix required to replace material which cannot be compacted to the specified density or is used to replace ravelled sections.

The removal of existing pavement, placement and compaction of hot mix asphalt required in areas due to limitations of equipment shall be paid for as CIR mix.