

TENDER DOCUMENTS

SUBSECTION 6.91 HAND AND MECHANICAL PATCHING WITH HOT-MIX ASPHALT

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SUBSECTION 6.91 HAND AND MECHANICAL PATCHING WITH HOT-MIX ASPHALT

6.91.1 GENERAL

- 6.91.1.1 This subsection sets out the requirements related to hand and mechanical patching with hot-mix asphalt in order to correct minor flaws in the existing road surface under this Contract.
- 6.91.1.2 Any specific requirements related to hand and mechanical patching with hot-mix asphalt carried out under this Contract are set out in Section 4 *Special Technical Conditions*.

6.91.2 REFERENCE STANDARDS

- 6.91.2.1 The **Contractor** shall perform all hot-mix paving work in conformity with the following standards and documents to which the provisions of the Contract are added:

6.91.2.1.1 (ASTM) ASTM International

- ASTM D995-95b (2002) *Standard specification for mixing plants for hot-mixed, hot-laid bituminous paving mixture.*

6.91.2.1.2 Ministère des transports du Québec (MTQ)

- MTQ *Cahier des charges et devis généraux (CCDG);*
- MTQ *Normes – Ouvrages routiers – Tome VI Entretien;*
- MTQ *Normes – Ouvrages routiers – Tome VII Matériaux, Chapitre 4 Liants et enrobés bitumineux;*
- Norme 1101 *Rapiéçage manuel à l'enrobé à chaud;*
- Norme 2102 *Matériaux granulaires pour fondation, sous-fondation, couche de roulement granulaire et accotement;*
- Norme 4101 *Bitumes;*
- Norme 4105 *Émulsions de bitume;*
- Norme 4201 *Enrobés à chaud formulés selon le principe de la méthode Marshall.*

6.91.2.1.3 Ministère des transports du Québec, Laboratoire des chaussées (LC)

- LC 21-040 *Analyse granulométrique;*
- LC 21-065 *Détermination de la densité et de l'absorption du granulat fin;*

- LC 21-066 *Détermination de la densité et de l'absorption du granulat fin de classe granulaire d/D;*
- LC 21-067 *Détermination de la densité et de l'absorption du gros granulat;*
- LC 26-001 *Tenue à l'eau;*
- LC 26-003 *Détermination de l'aptitude au compactage des enrobés à chaud à la presse à cisaillement giratoire;*
- LC 26-004 *Formulation des enrobés à l'aide de la presse à cisaillement giratoire selon la méthode du Laboratoire des chaussées;*
- LC 26-005 *Échantillonnage;*
- LC 26-040 *Détermination de la densité brute et de la masse volumique des enrobés à chaud compactés;*
- LC 26-045 *Détermination de la teneur en bitume;*
- LC 26-060 *Méthode Marshall de détermination de la résistance à la déformation d'éprouvettes;*
- LC 26-100 *Détermination de la teneur en bitume;*
- LC 26-110 *Détermination de la masse du filler dans le produit de l'extraction;*
- LC 26-150 *Détermination du facteur de correction à utiliser pour le calcul de la teneur en bitume;*
- LC 26-510 *Détermination de la masse volumique in situ des enrobés à l'aide d'un nucléodensimètre ;*
- LC 26-900 *Détermination de caractéristiques par calcul de divers facteurs.*

6.91.3 MATERIALS

6.91.3.1 HOT-MIX ASPHALT

6.91.3.1.1 The mixes used by the **Contractor** shall conform to Table 4201-1 *Properties of hot-mix asphalt made using the Marshall method* in MTQ standard 4201.

6.91.3.1.2 The mixes used by the **Contractor** shall conform to Table 4202-1 *Properties of hot-mix asphalt made using the Laboratoire des chaussées method* in MTQ standard 4202.

6.91.3.1.3 Unless otherwise indicated in the *Special Technical Conditions*, for patching of areas with a finished thickness of less than 20 mm, the **Contractor** shall use EB-10C or EB-5 hot-mix asphalt.

6.91.3.1.4 Unless otherwise indicated in the *Special Technical Conditions*, for patching of areas with a finished thickness equal to or greater than 20 mm, the **Contractor** shall use ESG-10 hot-mix asphalt

6.91.3.1.5 Unless otherwise indicated in the *Special Technical Conditions*, the **Contractor** shall use performance grade PG 64-34 asphalt. The asphalt shall conform to MTQ standard 4101.

6.91.3.2 TACK COAT

6.91.3.2.1 The tack coat shall be an asphalt emulsion compatible with the base materials of the hot-mix asphalt conforming to MTQ standard 4105.

6.91.3.2.2 The **Contractor** shall apply to all surfaces to be patched a RS-1 or SS-1 tack coat conforming to the requirements in the following table:

Type of Binder ¹	RS-1	SS-1
Suggested temperature for use ²	Above 10°C	Above 10°C
Curing or breaking time ³	15 min	30 min or less, depending on the manufacturer
Application rate (L/m ²) ⁴	0.20	0.20

1. Any other type of binder deemed equivalent by the Engineer may be used.
2. Binder may not be applied to a wet or frozen surface.
3. Curing or breaking time, depending on the type of binder used, the air temperature, the weather, the humidity, the rate of application and the manufacturer's recommendations.
4. The rate indicated is the residual bitumen rate.

6.91.3.2.3 For patching carried out on section 6 of the Champlain Bridge (orthotropic deck), the **Contractor** shall use an RC-30 tack coat.

6.91.4 EQUIPMENT AND TOOLS

6.91.4.1 BACKHOE

6.91.4.1.1 The **Contractor** shall use a backhoe with a bucket not more than 600 mm wide to remove damaged surfaces and the waterproof membrane on section 6 of the Champlain Bridge (orthotropic deck).

6.91.4.2 FINISHER

6.91.4.2.1 Where the size of the area to be patched so requires, the **Contractor** shall spread the asphalt mechanically using an automatic finisher capable of placing the asphalt to match the alignment, slope and camber of the existing pavement.

6.91.4.3 COMPACTING ROLLER

6.91.4.3.1 Compacting rollers shall make it possible to achieve the compaction and surface properties required by this subsection.

6.91.4.3.2 The **Contractor** shall be especially careful when using vibrating rollers so as not to damage any underlying or adjacent structures or pipes; where there is any doubt, vibrating is prohibited. The Engineer may prohibit the use of vibrating rollers.

6.91.4.3.3 Use of a vibrating roller is strictly prohibited on bridge and viaduct decks and within 2 m of an abutment or retaining wall.

6.91.4.4 HAND TOOLS

6.91.4.4.1 The tampers used to pack asphalt in areas the rollers cannot reach shall weigh at least 10 kg and have a surface area not larger than 300 cm². Mechanical compactors (vibrating plates) may be used instead of tampers with prior authorization from the Engineer.

6.91.4.4.2 Shovels and picks may be needed to remove damaged asphalt surfaces and the waterproofing membrane on section 6 of the Champlain Bridge (orthotropic deck).

6.91.5 EXECUTION OF WORK

6.91.5.1 GENERAL

6.91.5.1.1 Hand and mechanical patching shall be carried out in accordance with this subsection and Volume VII *Matériaux* of the MTQ standard.

6.91.5.2 TECHNICAL DATA SHEETS

6.91.5.2.1 The **Contractor** is responsible for proportioning the hot-mix asphalt and shall provide the Engineer fourteen (14) calendar days prior to spreading with descriptive sheets showing the theoretical and final formulas, including the following:

6.91.5.2.1.1 the identifier, number or code of the mix;

6.91.5.2.1.2 for cold aggregate, the aggregate grades, type, source, particle size, percentage used, bulk density and percentage water absorption for each aggregate grade;

6.91.5.2.1.3 the intrinsic, fabrication and complementary properties for fine aggregate overall based on the theoretical method for each grade of fine aggregate and each grade of coarse aggregate;

6.91.5.2.1.4 the performance grade of the asphalt;

6.91.5.2.1.5 density at 25°C in grams per cubic centimetre (g/cm³);

- 6.91.5.2.1.6 particle size, bulk density, percentage water absorption and total particle size distribution for the combination, the optimum asphalt content proposed to obtain a void content between 3.0% and 4.0%, and the stability, deformation and bulk and maximum density at the proposed asphalt content;
- 6.91.5.2.1.7 the percentage of voids, the percentage of voids between aggregate particles filled with asphalt, the percentage of voids between aggregate particles, the total specific surface and the compactability of the hot-mix asphalt, the effective asphalt percentage, and the average thickness of the effective asphalt film at the proposed asphalt content;
- 6.91.5.2.1.8 retained stability at the proposed asphalt content based on test method LC 26-001;
- 6.83.5.2.1.9 five-point physical property curves of the asphalt for the following properties:
- stability;
 - flow index;
 - density;
 - percentage of voids;
 - percentage of filled voids between aggregate particles;
 - effective asphalt film.
- 6.91.5.2.2 The fact that the documents or items referred to in this subsection are examined by the Engineer does not relieve the **Contractor** from its responsibility to supply appropriate materials and equipment, use suitable work methods and ensure quality workmanship in accordance with the **Contractor's** procedures.
- 6.91.5.2.3 The mix formulas shall be reviewed by the **Owner's** laboratory and approved before work begins. The **Owner** reserves the right to demand changes to the formula so that it conforms to the specification requirements.
- 6.91.5.3 CERTIFICATION OF CONFORMITY
- 6.91.5.3.1 At least fourteen (14) calendar days prior to ordering any materials, the **Contractor** shall submit to the Engineer certificates of conformity for each of the products that will be used in performing work under this subsection.
- 6.91.5.3.2 More specifically, for each shipment of asphalt, the certificates of conformity shall include without being limited to, the following information :
- the name of the manufacturer and the place of fabrication;
 - the manufacturer's storage site and the place from which the asphalt is shipped to the **Contractor**;
 - the performance grade of the asphalt;
 - the batch number;
 - the date of manufacture;

- the date of determination of properties;
- the following test results:
 - density at 25°C in g/cm³;
 - Brookfield viscosity at 135°C and 165°C;
 - storage stability and average softening point;
 - the elasticity recovery when required in Table 4101-1 of standard 4101;
 - ash content;
 - RTFOT mass variation;
 - high characterization temperature;
 - low characterization temperature;
 - stiffness modulus and slope measured on initial asphalt;
 - monitoring date;
 - minimum and maximum storage temperatures;
 - minimum and maximum mixing temperatures.

6.91.5.4 PROPORTIONING AND MANUFACTURE OF HOT-MIX ASPHALT

6.91.5.4.1 The **Contractor** shall obtain its supply from a manufacturer capable of certifying that the facilities, equipment and materials used in manufacturing and all operations related to manufacturing of the hot-mix asphalt conform to standard ASTM D995.

6.91.5.4.2 The hot mix produced by the plant shall conform to the final formula approved by the Engineer.

6.91.5.5 DELIVERY SLIP

6.91.5.5.1 Before spreading the hot-mix asphalt, the **Contractor** shall present the Engineer with a delivery slip containing the following information:

- the name of the hot-mix asphalt manufacturer and identification of the asphalt plant;
- the formula number and type of hot-mix asphalt;
- the loading date and the delivery slip identification number;

- the **Contractor's** name;
- the name or number of each roadway infrastructure or the number of the **Contractor's** contract;
- the quantity being delivered and the quantity delivered to date.

6.91.5.6 SURFACE PREPARATION

- 6.91.5.6.1 Make saw cuts around the areas identified by the Engineer. The depth of the saw cuts shall be verified and approved by the Engineer before sawing begins.
- 6.91.5.6.2 The **Contractor** shall remove the deteriorated pavement and/or concrete carefully so as not to enlarge the area identified by the Engineer. Surfaces demolished in excess of the areas identified by the Engineer shall be repaired at no additional cost to the **Owner**.
- 6.91.5.6.3 The **Contractor** shall take measures to avoid damaging the existing waterproof membranes on the bridge and viaduct decks. However, in the case of work on section 6 of the orthotropic steel deck of the Champlain Bridge, the **Contractor** shall remove the existing waterproof membrane.
- 6.91.5.6.4 The **Contractor** shall ensure that the method used to cut and remove the existing pavement from section 6 of the Champlain Bridge does not damage the steel of the orthotropic deck. The **Contractor** shall note the following characteristics of the orthotropic deck:
- 6.91.5.6.4.1 The existing pavement on the orthotropic deck comprises a base layer made of an epoxy tack coat impregnated with aggregate and a top coat of bituminous asphalt with polymer.
- 6.91.5.6.4.2 The thickness of the base layer varies from 5 mm to 10 mm (including the aggregate). The total thickness of the pavement is approximately 50 mm.
- 6.91.5.6.5 The surface to be paved shall be dried, and any loose asphalt, hardened mud, dust and other materials that could prevent the asphalt from adhering shall be removed using air blasting.
- 6.91.5.6.6 The **Contractor** shall apply a tack coat to all surfaces to be patched, including the vertical walls of the surface, the concrete curbs, the inspection holes, the sumps and any other surfaces that will be in contact with the new asphalt.
- 6.91.5.6.7 Where repairs are being made over granular materials, the **Contractor** shall apply the tack coat on the walls only.
- 6.91.5.6.8 The rate of application of the tack coat shall be 0.20 L/m².
- 6.91.5.6.9 The **Contractor** shall not lay the hot-mix asphalt until the tack coat is fully cured or broken.

6.91.5.7 MONITORING OF MIX TEMPERATURE

- 6.91.5.7.1 The temperature of the mix shall not exceed 165°C at any time during the production process.
- 6.91.5.7.2 Asphalt shall not be overheated to compensate for cooling during transport, regardless of the travel time. The drop in the temperature of the asphalt between mixing and placement on site shall not exceed 15°C.
- 6.91.5.7.3 In no case shall the temperature be below 135°C immediately after spreading and before the first pass of the roller.
- 6.91.5.7.4 The air temperature shall remain above 10°C at all times during placement of asphalt the thickness of which after compacting is less than 50 mm. For thicknesses of 50 mm or more, the air temperature shall be above 2°C.

6.91.5.8 PAVING

- 6.91.5.8.1 The **Contractor** shall spread the hot-mix asphalt by hand or mechanically, depending on the size of the area being repaired, in even layers, taking care to ensure that the mix does not separate.
- 6.91.5.8.2 Compact the hot-mix asphalt as soon as possible after spreading, starting with joints and the edges of the pavement, from the bottom of slopes to the top. This process shall continue until the asphalt is compacted to the Engineer's satisfaction.
- 6.91.5.8.3 Compact the hot-mix asphalt without vibration where the thickness of the mix is less than 25 mm.
- 6.91.5.8.4 The **Contractor** shall clear any work debris from the patched area before removing the temporary signage, to the Engineer's satisfaction. Debris shall be taken to an authorized disposal site in accordance with subsection 6.13 *Environmental Protection*.

6.91.6 QUALITY CONTROL

- 6.91.6.1 The following properties will be checked by the Engineer when the job is completed in order to determine the quality of the work:
- continuity of the profile (± 5 mm over the 2 m straightedge);
 - perfect, continuous, waterproof joints;
 - even surface texture with no separation or bleeding;
 - edges of pavement straight and clearly defined (avoid jagged edges);
 - international roughness index (IRI) improved.

6.91.6.2 If the verified properties do not meet the specified requirements, the **Contractor** shall redo the patching work at its own expense and to the satisfaction of the Engineer.

END OF SUBSECTION