TENDER DOCUMENTS

SUBSECTION 6.64
DECK WATERPROOFING MEMBRANE

TABLE OF CONTENTS

PAGE

SUBSECTION 6.64 DECK WATERPROOFING MEMBRANE

6.64.1 GENERAL

6.64.1.1 This subsection describes the requirements relating to the placement of bridge deck waterproofing membrane and sealing of vertical joints covered by this Contract.

6.64.1.2 Any specific requirements, where applicable, pertaining to the placement of bridge deck waterproofing membrane and sealing of vertical joints covered by this Contract are set out on the drawings and in Section 4 *Special Technical Conditions*.

6.64.1.3 The requirements relating to paving are described in subsection 6.82 *Hot-mix Pavement*.

6.64.2 MEASUREMENT UNITS

6.64.2.1 The measurement units and respective symbols thereof used in this subsection are described as follows:

Measurement Unit	Designation	Symbol
length	millimeter	mm
area	square meter	m^2
volume	cubic centimeter	cm^3
volume	litre	L
mass	kilogram	kg
temperature	Celsius degree	°C
energy, work	joule	J

6.64.3 REFERENCE STANDARDS

6.64.3.1 The **Contractor** shall perform all work related to the placement of waterproofing membranes and sealing of vertical joints in accordance with the requirements of the following standards and documents to which the provisions of this Contract are added:

6.64.3.1.1 (ASTM) ASTM International:

- ASTM D36/D36M *Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)*;
- ASTM E965 *Standard Test Method for Measuring Pavement Macrotexture Depth Using a Volumetric Technique*;
- ASTM D6506 *Standard Specification for Asphalt Based Protection for Below-Grade Waterproofing*.

6.64.3.1.2 (MTQ) Ministère des transports du Québec:

- MTQ – *Cahier des charges et devis généraux* (CCDG);
- MTQ – *Normes – Ouvrages routiers* – Tome VII *Matériaux*, Chapitre 3. *Bétons de ciment et produits connexes :*
    - Norme 3701 *Membrane d'étanchéité*.

6.64.3.1.3 (CGSB) Canadian General Standards Board:

- CAN/CGSB 37.50-M *Hot-Applied Rubberized Asphalt for Roofing and Waterproofing;*
- CGSB 37-GP-9MA *Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.*

6.64.3.1.4 (OPSS) Ontario provincial standards specification:

- OPSS 1215 *Material specification for protection board*.

6.64.4 TYPES OF WATERPROOFING MEMBRANE

6.64.4.1 RUBBERIZED ASPHALT MEMBRANE

6.64.4.1.1 The rubberized asphalt membrane shall comprise:

6.64.4.1.1.1 a cement concrete tack coat;

6.64.4.1.1.2 a layer, 1.5 mm to 2.5 mm thick, of rubberized asphalt;

6.64.4.1.1.3 an interlayer reinforcement sheet;

6.64.4.1.1.4 a second layer, 1.5 mm to 2.5 mm thick, of rubberized asphalt;

6.64.4.1.1.5 an asphalt protection panel placed directly on the second layer of rubberized asphalt.

6.64.4.2 PREFABRICATED MEMBRANE

6.64.4.2.1 The prefabricated membrane shall comprise:

6.64.4.2.1.1 a cement concrete tack coat;

6.64.4.2.1.2 a prefabricated sheet that adheres to the surface by torch fusion.

6.64.4.3 METHYL METHACRYLATE-BASED ELASTOMERIC MEMBRANE

6.64.4.3.1 The methyl methacrylate-based elastomeric membrane shall comprise:

6.64.4.3.1.1 a reactive methyl methacrylate-based resin primer;

6.64.4.3.1.2 a layer of spray-applied elastomeric membrane;

6.64.4.3.1.3 a layer of bitumen-based adhesive.

6.64.4.3.2 The methyl methacrylate-based elastomeric membrane shall be that manufactured by Stirling Lloyd Products or equivalent authorized by the Engineer.

6.64.5 MATERIALS

6.64.5.1 RUBBERIZED ASPHALT MEMBRANE

6.64.5.1.1 Tack coat

6.64.5.1.1.1 The tack coat applied to the concrete deck shall be a styrene-butadiene-styrene (SBS) polymer modified asphalt emulsion whose minimum content shall be 6% by volume in accordance with standard CGSB 37-GP-9MA.

6.64.5.1.2 Rubberized asphalt

6.64.5.1.2.1 The rubberized asphalt shall primarily consist of rubber bitumen and mineral fillers. It shall comply with standard CAN/CGSB 37.50.

6.64.5.1.2.2 The rubberized asphalt shall be delivered to the worksite in pellets ready to be melted and spread, in the original containers labeled and sealed by the manufacturer.

6.64.5.1.2.3 Subject to the requirements prescribed in this subsection, the composition, general properties, preparation, delivery, sampling and testing of the waterproofing membrane shall meet the requirements of standard CAN/CGSB 37.50. The results of the tests on the rubberized asphalt shall respect the limit values indicated in the following table:

Test	Limit Value
Cone penetration at 25°C	Maximum 110 mm
Cone penetration at 50°C	Maximum 200 mm
Flow at 60°C	Maximum 3 mm
Low temperature flexibility at -25°C	Successful (refer to 6.64.5.1.2.4)
Low temperature flexibility after curing in an air proofer at -25°C	Successful (refer to 6.64.5.1.2.4)
Hardness	Minimum 5.5 J
Hardness to peak load ratio	Minimum 0.040

6.64.5.1.2.4 The reference “Successful” means that the membrane shows no signs of delamination, loss of adhesion or cracking after having undergone the test.

6.64.5.1.3 Interlayer reinforcement

6.64.5.1.3.1 The membrane interlayer reinforcement shall be performed using a Reemay 2014 spunbonded non-woven polyester sheet as manufactured by Tremco or equivalent authorized by the Engineer.

6.64.5.1.4 Asphalt protection panels

6.64.5.1.4.1 The asphalt protection panel shall consist of a mixture of asphalt, plasticizers and mineral fillers placed between two (2) layers of felt or fiber glass saturated with asphalt and molded under heat and pressure.

6.64.5.1.4.2 The panel shall be clean and free of matters that could interfere with its adhesion to the rubberized asphalt.

6.64.5.1.4.3 The asphalt protection panel shall be 3 mm thick and shall comply with Type 2, Class B of standard ASTM D6506.

6.64.5.1.4.4 Subject to the requirements prescribed in this subsection, the asphalt protection panels shall comply with the tests defined according to the operating procedures described in standard OPSS 1215. The results of the tests on the asphalt protection panels shall respect the following limits:

6.64.5.1.4.4.1 the panel having undergone the puncture test shall not show any perforation;

6.64.5.1.4.4.2 the panel having undergone the compatibility test shall not show any perforation, delamination of the layers or separation of aggregates, or any other evidence of incompatibility between the panel and the asphalt or rubberized asphalt;

6.64.5.1.4.4.3 the edge of the upper panel having undergone the adhesion test shall not be raised more than 5 mm from its original position and shall not show any delamination of the layers or loss of adhesion to the rubberized asphalt;

6.64.5.1.4.4.4 the panel having undergone the absorption test shall show less than 5% water absorption and shall not show any signs of deterioration, such as loss of emulsion or weight loss.

6.64.5.2 PREFABRICATED MEMBRANE

6.64.5.2.1 Tack coat

6.64.5.2.1.1 The tack coat shall consist of an SBS polymer modified asphalt-based coating whose minimum content shall be 8% by volume.

6.64.5.2.2 Prefabricated sheet

6.64.5.2.2.1 The prefabricated sheet shall consist of the following elements:

6.64.5.2.2.1.1 a non-woven polyester reinforcement;

6.64.5.2.2.1.2 an SBS elastomeric bitumen that coats the synthetic reinforcement on both sides;

6.64.5.2.2.1.3 a top protective layer consisting of grey mineral gravel applied at a maximum rate of 1.2 kg/m^2 and embedded in the asphalt.

6.64.5.2.2.2 The minimum thickness of the prefabricated sheet shall be 4.5 mm when measured in full sheet.

6.64.5.2.3 Flashing

6.64.5.2.3.1 The flashing shall consist of SBS polymer modified asphalt-based plastic cement.

6.64.5.2.3.2 The flashing shall be triangular with a minimum height of 15 mm and a minimum width of 50 mm.

6.64.5.2.4 The results of the tests on the prefabricated membrane shall respect the limits indicated in MTQ standard 3701.

6.64.5.3 METHYL METHACRYLATE-BASED ELASTOMERIC MEMBRANE

6.64.5.3.1 Primer for the waterproofing membrane

6.64.5.3.1.1 The primer for the waterproofing membrane shall be a methyl methacrylate-based two-component resin, capable of achieving complete curing within forty (40) minutes at 20°C, shall be the product “Primer PAR1” manufactured by Stirling Lloyd Products or equivalent authorized by the Engineer.

6.64.5.3.2 Waterproofing membrane

6.64.5.3.2.1 The membrane shall be a joint-free, cold-spray-applied, methyl methacrylate-based elastomeric waterproofing membrane, shall be the “*Eliminator*” system manufactured by Stirling Lloyd Products or equivalent authorized by the Engineer.

6.64.5.3.3 Adhesive for the asphalt pavement

6.64.5.3.3.1 The adhesive for the asphalt pavement shall be a polymer modified asphalt emulsion fully compatible with the methyl methacrylate-based membrane, shall be the product “*Tack Coat SA 1030*” manufactured by Stirling Lloyd Products or equivalent authorized by the Engineer.

6.64.5.4 POLYMER MODIFIED BITUMEN-BASED SEALING STRIP

6.64.5.4.1 Sealing strip primer

6.64.5.4.1.1 The polymer modified bitumen-based sealing strip primer shall be the product “*Denso Primer D*” manufactured by Denso or equivalent authorized by the Engineer.

6.64.5.4.2 Sealing strip

6.64.5.4.2.1 The sealing strip shall be polymer modified bitumen-based shall be the product "*DensoBand*" manufactured by Denso or equivalent authorized by the Engineer.

6.64.5.4.2.2 The sealing strip shall have the following characteristics:

6.64.5.4.2.2.1 thickness: 8 mm;

6.64.5.4.2.2.2 width: 45 mm;

6.64.5.4.2.2.3 softening point > 100ºC according to standard ASTM D36/D36M.

6.64.5.4.2.3 For each batch used, the **Contractor** shall provide the Engineer with a dated statement of conformity containing the following information:

6.64.5.4.2.3.1 the manufacturer's name;

6.64.5.4.2.3.2 the product's trade name;

6.64.5.4.2.3.3 the date of manufacturing;

6.64.5.4.2.3.4 the date on which the tests were conducted;

6.64.5.4.2.3.5 the results of the tests conducted on the batch;

6.64.5.4.2.3.6 the primer's drying time;

6.64.5.4.2.3.7 the recommended application temperature;

6.64.5.4.2.3.8 the maximum heating temperature.

6.64.5.4.2.4 A production batch corresponds to a quantity of product with the same physico-chemical characteristics, manufactured according to the same recipe, from the same constituents and same source of supply, during a maximum period of three (3) days during which there was no interruption of production.

6.64.6 EQUIPMENT AND TOOLS

6.64.6.1 RUBBERIZED ASPHALT KETTLE

6.64.6.1.1 The kettle used to liquefy the rubberized asphalt shall be a double-walled, indirect heating, water bath-type kettle that uses oil with a high flash point as heat transfer medium.

6.64.6.1.2 The kettle shall be equipped with a continuous mechanical stirrer to prevent any localized overheating of the material.

6.64.6.1.3 Dial thermometers shall be permanently affixed to the kettle and be functional in order to measure the temperatures of the rubberized asphalt and of the oil.

6.64.6.1.4 The kettle shall not contain any material upon arrival at the worksite.

6.64.6.2 OTHER EQUIPMENT FOR RUBBERIZED ASPHALT

6.64.6.2.1 The temperature of the asphalt material shall be checked using a calibrated infrared thermometer guaranteeing a level of accuracy of ± 2°C.

6.64.6.2.2 The rubberized asphalt shall be spread using a hand scraper equipped with a heat-resistant reinforced rubber blade varying in length from 450 mm to 900 mm long.

6.64.6.3 HEAVY ROLLER

6.64.6.3.1 The heavy roller shall be of a maximum width of 300 mm and of a minimum weight of 20 kg.

6.64.6.4 OTHER EQUIPMENT FOR PREFABRICATED MEMBRANES

6.64.6.4.1 The authorized equipment for the mechanized placement of the prefabricated membrane are: models MACADEN10, MACADEN11, MACADEN12 or MACADEN20 from Sopréma, models GL-MAC1 to GL-MAC9 from Groupe Lefebvre (M.R.P.) Inc., as well as models R.P.-1 to R.P.-3 from Étanchéité R.P. Inc. or equivalent authorized by the Engineer. If one of the above-mentioned equipment is incapable of placing the membrane within 15 mm of the curbs, the membrane close to the curbs shall be placed by means of a mechanized placement equipment model Mini-Macaden 1000 from Sopréma or equivalent authorized by the Engineer.

6.64.6.4.2 A heavy roller compliant with Article 6.64.6.3 shall be integrated into the mechanized placement equipment.

6.64.7 LABELLING AND STORAGE

6.64.7.1 The products constituting the waterproofing membrane shall be delivered in sealed containers or packages and bear a label mentioning:

6.64.7.1.1 the names of both the manufacturer and the product;

6.64.7.1.2 the application instructions;

6.64.7.1.3 the production lot or batch number;

6.64.7.1.4 the container volume;

6.64.7.1.5 the dimensions of the prefabricated sheet and of the protection panel.

6.64.7.2 The rolls of prefabricated membrane shall be stored upright and protected from adverse weather.

6.64.7.3 The **Contractor** shall provide for a storage area for all components of the methyl methacrylate-based waterproofing system. The components shall be stored in a cool, dry place without direct exposure to sunlight and in accordance with the manufacturer's recommendations.

6.64.8 EXECUTION OF WORK

6.64.8.1 PLANNING

6.64.8.1.1 At least fourteen (14) days prior to ordering any materials or placing any components, the **Contractor** shall submit to the Engineer, for review, the shop drawings, technical data sheets and samples for each material to be used for waterproofing membrane placement work under this Contract.

6.64.8.1.2 The **Contractor** shall not make any changes to the materials or construction details indicated on the technical data sheets and on the shop drawings reviewed by the Engineer without first obtaining written authorization from the Engineer.

6.64.8.1.3 The **Contractor** shall notify the Engineer, in writing and at least twenty-four (24) hours in advance, of the date and time of placement. The **Contractor** shall, for the entire duration of the work, plan the performance of the work at times during which no rain is forecasted.

6.64.8.1.4 The **Contractor** shall plan its work so that from the beginning of the cleanup of a new slab or complementary cleanup of an existing slab, there are no vehicles that circulate on the slab, except for the vehicles required for the placement of the membrane.

6.64.8.1.5 The **Contractor** shall plan its work so that there are no vehicles that circulate on the waterproofing membrane.

6.64.8.2 SURFACE PREPARATION

6.64.8.2.1 The concrete surfaces of the deck on which a waterproofing membrane is to be placed shall be prepared in advance so as to obtain sound concrete free of laitance, rust, embedded debris and asphalt residues, according to the following requirements:

6.64.8.2.2 New slab

6.64.8.2.2.1 Less than forty-eight (48) hours prior to the application of the tack coat and, where applicable, after stripping of the temporary asphalt, all concrete surfaces of a new slab shall be thoroughly cleaned by means of a steel shotblasting mounted on wheeled equipment. The equipment shall be adjusted to have a maximum intensity jet.

6.64.8.2.2.2 The slab surface shall be dry at the time of cleaning. The **Contractor** shall provide for the drying of the surfaces.

6.64.8.2.2.3 The cleaning of the surface shall not create a vertical drop between two (2) consecutive passages of the equipment.

6.64.8.2.2.4 The surfaces located along, and on the first 65 mm at the base of the curbs, guardrails and deck joints shall be cleaned by means of dry abrasive blasting; the use of water blasting or wet abrasive blasting is prohibited. The quality of that cleaning shall be at least equivalent to that obtained by the steel shotblasting.

6.64.8.2.3 Existing surface

6.64.8.2.3.1 The **Contractor** shall clean all concrete surfaces of the slab and those of first sixty-five 65 mm at the base of the curbs, guardrails and deck joints in two (2) phases, namely a basic cleaning and a complementary cleaning.

6.64.8.2.3.2 The basic cleaning shall be performed immediately after the asphalt and the existing waterproofing membrane have been removed.

6.64.8.2.3.3 The complementary cleaning shall be performed less than forty-eight (48) hours prior to the application of the waterproofing membrane tack coat, when the curing of the concrete of the slab repairs and that of the mortar used for the correction of the slab surfaces are carried out.

6.64.8.2.3.4 The basic cleaning shall be carried out by means of wet abrasive blasting or high-pressure water blasting. The surfaces thus cleaned shall subsequently be cleared of any debris by water blasting in accordance with subsection 6.21 *Demolition and Removal*.

6.64.8.2.3.5 The **Contractor** shall provide for the drying of the surfaces.

6.64.8.2.3.6 The complementary cleaning shall be carried out in the manner indicated in paragraph 6.64.8.2.2. This cleaning is not required on the slab surfaces corrected by means of hot-mix asphalt.

6.64.8.2.4 Immediately prior to the correction of the existing slab surfaces and prior to the application of the tack coat and placement of the waterproofing membrane of the new and existing slabs, dust and debris shall be removed by means of air blasting. The equipment used for the air blasting shall be equipped with a filter that removes oil. The filter efficiency shall be demonstrated to the Engineer before the equipment is used.

6.64.8.2.5 Once the surface preparation completed, the relief at all points of the slab surfaces shall be jointly evaluated by the **Contractor** and the Engineer according to the volumetric method described in standard ASTM E965. The volume of sand or glass beads used for the test shall be 25 cm^3. The minimum average diameter of the patch of each measurement shall be greater than 200 mm in the case of a new slab and greater than 165 mm in the case of existing slab surfaces. The surfaces that do not meet these minimum requirements will be considered non-compliant.

6.64.8.2.6 Flaws in the concrete surfaces shall be repaired before the waterproofing membrane is placed. Cavities shall be filled and ripples shall be ground until they are level with the surface of the deck.

6.64.8.2.7 The **Contractor** shall notify the Engineer of the surfaces to grind and await his authorization before grinding.

6.64.8.2.8 For the surfaces with cavities and roughness to correct, the **Contractor** shall first delineate the area with a 10 mm deep saw cut executed perpendicular to the concrete surface. The depth of the saw cut can be reduced as necessary to prevent damage to the reinforcing steel. The **Contractor** shall subsequently demolish these surfaces to a depth of 15 mm by means of a handheld pneumatic hammer weighing no more than 7 kg.

6.64.8.2.9 For the surfaces of a new slab, the **Contractor** shall fill the cavities with cementitious mortar in accordance with Article 6.33.4.12 *Cementitious Mortar* of subsection 6.33 *Cast-in-Place Concrete.*

6.64.8.2.9.1 The concrete of the surfaces to be corrected shall have a minimum temperature of 5°C before the mortar is placed.

6.64.8.2.9.2 Curing shall be performed by means of a membrane-forming curing compound in accordance with paragraph 6.33.6.18 of subsection 6.33 *Cast-in-Place Concrete*. After curing, and with the **Contractor** present, the Engineer will check, using a hammer, the surfaces covered with cementitious mortar. Surfaces that produce a hollow sound, which is a sign of poor adhesion, shall be demolished and reconstructed, at the expense of the **Contractor**.

6.64.8.2.9.3 Curing of the cementitious mortar shall be completed before the start of the membrane placement operations.

6.64.8.2.10 For existing slab surfaces, Type EC-5 corrective asphalt shall be used in replacement of bagged cementitious mortar when an important portion of the surfaces of an existing slab must be corrected.

6.64.8.2.10.1 An asphalt emulsion shall be applied at the residual rate of 0.20 L/m^2 on all surfaces to be covered with asphalt.

6.64.8.2.10.2 The asphalt shall be applied so as to fill the depressions and obtain a minimum asphalt thickness of 15 mm at any point.

6.64.8.2.10.3 Compactness shall be obtained with a minimum of four (4) passages with a steel wheel static roller.

6.64.8.2.11 The duration of the period preceding the application of the tack coat shall meet the following requirements, without however being limited thereto:

6.64.8.2.11.1 in the case of a new slab, the tack coat shall be applied after a minimum period, following concreting of the slab, of fourteen (14) days broken down as follows: seven (7) days of concrete curing followed by six (6) days after complete removal of the curing compounds and a period of twenty-four (24) hours without rain;

6.64.8.2.11.1.1 The six-day period after complete removal of the curing compounds may however be reduced to three (3) days after the removal of any standing water following a rainfall, if no rainfall occurs during these three (3) consecutive days.

6.64.8.2.11.1.2 In no case shall the period be less than ten (10) days following concreting;

6.64.8.2.11.2 when temporary asphalt has been placed, the tack coat shall be applied after a period of twenty-four (24) hours without rain following removal thereof and cleaning of the surfaces;

6.64.8.2.11.3 in the case of repairs to existing slab surfaces, including the concreting of a deck joint, the tack coat shall be applied after a minimum period of eight (8) days following the concreting of the surfaces to repair, as follows: seven (7) days of concrete curing followed by a period of twenty-four (24) hours without rain;

6.64.8.2.11.4 in the case of repairs carried out with concrete consisting of a proportion of 15% of styrene-butadiene latex, the tack coat may be applied after a minimum period of three (3) days following concreting of the surfaces, as follows: twenty-four (24) hours of concrete curing followed by a period of forty-eight (48) hours without rain;

6.64.8.2.11.5 in the case of corrections of existing slab surfaces, the tack coat shall be applied after a period of forty-eight (48) hours following mortar placement, as follows: twenty-four (24) hours for mortar curing and twenty-four (24) hours without rain. Where asphalt is used to correct the surfaces, the asphalt shall be placed after a period of eight (8) days following concreting of the slab surfaces to be repaired and proceeded as follows: seven (7) days for curing followed by a period of twenty-four (24) hours without rain. In the case of a slab where no surface repairs were carried out, the correction to the asphalt shall be carried out after a period of twenty-four (24) hours without rain;

6.64.8.2.11.6 in the case of construction or repair of curbs, borders or guardrails, the tack coat shall be applied after a period of twenty-four (24) hours without rain following the end of the curing period.

6.64.8.2.12 The period of twenty-four (24) hours without rain required in paragraph 6.64.8.2.11.1 begins after the curing compounds and any standing water have been removed from the slab. However, when the surfaces are corrected with hot-mix asphalt, the period of twenty-four (24) hours without rain preceding the application of the tack coat is not necessary as long as the surfaces are clean and dry.

6.64.8.2.13 The application of the tack coat or placement of the waterproofing membrane cannot be carried out as long as the ambient temperature and that of the concrete, measured in the shade, are not above 5°C.

6.64.8.2.14 The application of the tack coat or placement of the waterproofing membrane shall not begin when it rains. If it starts raining during the application or placement, the **Contractor** shall stop the work.

6.64.8.2.15 The vertical surfaces on which the sealing strip is to be applied shall be prepared in advance so as to obtain a sound material (concrete, steel and asphalt) free of laitance, rust, embedded debris and asphalt residues.

6.64.8.3 IMPLEMENTATION OF THE RUBBERIZED ASPHALT MEMBRANE

6.64.8.3.1 Implementation of the tack coat

6.64.8.3.1.1 The tack coat shall be applied with equipment that allows a uniform coverage at the residual application rate of 0.20 L/m^2.

6.64.8.3.1.2 None of the equipment used to place the waterproofing membrane shall be present on the tack coat until the tack coat is fully cured.

6.64.8.3.2 Implementation of the rubberized asphalt

6.64.8.3.2.1 The membrane shall not be implemented until the tack coat is fully cured and any dust or moisture has been removed from the surface thereof.

6.64.8.3.2.2 The **Contractor** shall heat the rubberized asphalt on the worksite in a kettle as described in article 6.64.6.1 *Rubberized asphalt kettle*. The **Contractor** shall respect the minimum and maximum temperatures recommended by the manufacturer.

6.64.8.3.2.3 The **Contractor** shall check the temperature of the rubberized asphalt in the kettle every fifteen (15) minutes with an infrared thermometer and shall take the necessary measures to ensure that the temperature of the asphalt does not exceed the maximum temperature recommended by the manufacturer.

6.64.8.3.2.4 The rubberized asphalt shall be continuously stirred in the kettle until it is applied. The minimum heating time of the asphalt is thirty (30) minutes and the maximum heating time is five (5) hours.

6.64.8.3.2.5 The rubberized asphalt shall be spread in two (2) layers using a hand scraper.

6.64.8.3.2.6 Each layer of the membrane shall consist of an even film of rubberized asphalt between 1.5 mm and 2.5 mm thick.

6.64.8.3.2.7 The placement shall be carried out continuously and, if it is impossible to avoid breaks, the seams shall overlap over at least 150 mm.

6.64.8.3.2.8 The membrane shall be raised against the drains and the wall of concrete safety barriers, curbs, sidewalks and deck joint shoulders up to the level corresponding to the top of the asphalt concrete pavement.

6.64.8.3.2.9 The total thickness of the two layers of the waterproofing membrane shall be greater than 3.0 mm but less than 5.0 mm.

6.64.8.3.3 Implementation of the interlayer reinforcement sheets

6.64.8.3.3.1 The membrane interlayer reinforcement sheets shall be placed directly on the first layer of the waterproofing membrane and sunk therein while it is still tacky. The membrane layer shall not contain any air bubbles.

6.64.8.3.3.2 The interlayer reinforcement sheets shall be raised against the wall of the safety barriers, curbs, sidewalks and deck joint shoulders up to the level corresponding to the top of the asphalt concrete pavement.

6.64.8.3.3.3 The interlayer reinforcement sheets shall be placed side by side or end to end with a permissible spacing tolerance of ± 5 mm between the edges thereof and shall subsequently be covered with a second layer of rubberized asphalt.

6.64.8.3.4 Implementation of the asphalt protection panels

6.64.8.3.4.1 The asphalt protection panels shall be placed directly on the second layer of rubberized asphalt and sunk therein while it is still tacky. The **Contractor** shall take such measures as are needed to ensure that no air bubbles are trapped under the asphalt protection panels.

6.64.8.3.4.2 The membrane asphalt protection panels shall be placed in such a manner that the joints are staggered by at least 150 mm and overlap is limited to values ranging between 10 mm and 25 mm.

6.64.8.3.5 Repair of the rubberized asphalt membrane

6.64.8.3.5.1 The existing membrane that is damaged during the milling of the deck shall be removed in accordance with subsection 6.21 *Demolition and Removal*. The edge of that damaged membrane shall be conditioned with a propane torch before the tack coat is applied. In the locations where the membrane needs repairs, the **Contractor** shall overlap the rubberized asphalt on the peripheral milled pavement over a width of 300 mm.

6.64.8.4 IMPLEMENTATION OF THE PREFABRICATED MEMBRANE

6.64.8.4.1 Implementation of the tack coat

6.64.8.4.1.1 The first tack coat shall be applied using equipment that will ensure a uniform coverage of the binder at an application rate of 0.15 L/m^2 and as specified by the prefabricated membrane manufacturer.

6.64.8.4.1.2 The **Contractor** shall use tarps or other appropriate material to protect the sidewalks, curbs, safety barriers, guardrails, drains and deck joints from splatters. Along these elements, over a minimum width of 600 mm, a roller shall be used to apply the tack coat. Any soiled surfaces shall be cleaned by the **Contractor** to the satisfaction of the Engineer.

6.64.8.4.1.3 For the surfaces of the existing slabs and those of the new slabs that have been covered with a temporary coating, the tack coat shall be water-based.

6.64.8.4.2 Implementation of the prefabricated membrane

6.64.8.4.2.1 The prefabricated membrane shall be implemented at least twelve (12) hours but not more than twenty-four (24) hours after the tack coat has been applied.

6.64.8.4.2.2 The membrane shall be placed using mechanical equipment or a propane torch.

6.64.8.4.2.3 The welding parameters shall be adjusted in function of the relief of the surfaces to be covered and to the weather conditions in order to obtain a stream of melted asphalt at least 20 mm wide in front of the membrane roll and an overflow of asphalt along the joints.

6.64.8.4.2.4 The membrane shall be placed from the low points of the surfaces to be covered to the high point of the transverse profile. The transverse joints shall be staggered so that there are no more than three (3) thicknesses of membrane at any point. The strips shall be unrolled in the direction of traffic.

6.64.8.4.2.5 The width of the overlaps shall be 75 mm for longitudinal joints and 150 mm for transverse joints. The granular surface shall be removed from the membrane over a width of 150 mm in order to execute the transverse joints.

6.64.8.4.2.6 The maximum distance between the membrane and elements such as the curbs, sidewalks, guardrails, drains and deck joint shoulders shall be 15 mm.

6.64.8.4.2.7 After the membrane is placed, a flashing shall be installed along the curbs, sidewalks, barriers and deck joint shoulders, taking care not to block the drain holes located near the deck drains.

6.64.8.4.2.8 The minimum temperature of the plastic cement for the flashing at the time of placement shall be 20°C.

6.64.8.5 IMPLEMENTATION OF THE METHYL METHACRYLATE-BASED MEMBRANE SYSTEM

6.64.8.5.1 Implementation of the primer

6.64.8.5.1.1 The primer shall be applied only when the air and the substrate temperatures range between 0°C and 40°C and when the substrate is above the dew point.

6.64.8.5.1.2 The primer shall not be implemented until the slab surface is free of dust, moisture or other contaminants.

6.64.8.5.1.3 The primer shall be applied in a single layer at the rate of 3.0 m²/L.

6.64.8.5.1.4 The primer shall be applied using a roller or a single component spray system approved by the manufacturer.

6.64.8.5.1.5 In locations where the first layer is absorbed by the porous concrete, a second layer of primer shall be applied so as to obtain a shiny surface.

6.64.8.5.2 Implementation of the Methyl methacrylate-based membrane system

6.64.8.5.2.1 The membrane shall be applied only when the air and the substrate temperatures range between 0°C and 40°C and when the substrate is above the dew point.

6.64.8.5.2.2 The membrane shall not be implemented until the primer is fully cured and before the surface thereof is free of dust, moisture or other contaminants.

6.64.8.5.2.3 The membrane shall be applied in one (1) layer using a spray system approved by the manufacturer.

6.64.8.5.2.4 The membrane layer shall consist of a uniform film with a wet film thickness of 2.0 mm.

6.64.8.5.2.5 The membrane shall be raised by 75 mm against the drains and the wall of the concrete safety barriers and deck joint shoulders up to the level corresponding to the top of the asphalt concrete pavement next to the deck joint shoulder.

6.64.8.5.3 Implementation of the adhesive for the asphalt pavement

6.64.8.5.3.1 The adhesive for the asphalt pavement shall be applied only when the air and the substrate temperatures range between 0°C and 40°C and when the substrate is above the dew point.

6.64.8.5.3.2 The adhesive for the asphalt pavement shall not be implemented until the membrane is fully cured and before the surface thereof is free of dust, moisture or other contaminants.

6.64.8.5.3.3 The adhesive for the asphalt pavement shall be applied in a single layer at the rate of 0.8 m^2/L.

6.64.8.6 IMPLEMENTATION OF THE POLYMER MODIFIED BITUMEN-BASED SEALING STRIP

6.64.8.6.1 Implementation of the primer

6.64.8.6.1.1 The primer shall be applied only when the air and the substrate temperatures range between 0°C and 40°C and when the substrate is above the dew point.

6.64.8.6.1.2 The primer shall be applied on the vertical surface of the joint with a roller or a brush at the rate required by the manufacturer.

6.64.8.6.1.3 The primer shall dry until it has a tacky consistency to the touch.

6.64.8.6.2 Implementation of the sealing strip :

6.64.8.6.2.1 the bitumen-based strip shall be spread along the vertical joint and the interleaving paper shall be removed;

6.64.8.6.2.2 using a propane torch, the surface of the material shall be heated until it develops a bright luster;

6.64.8.6.2.3 the side of the material that has been heated shall be placed against the face of the vertical joint, leaving the strip protruding from the face surface by 5 mm and firmly press in place;

6.64.8.6.2.4 the hot-mix asphalt shall be placed and compacted along the vertical joint: the heat of the asphalt will make the new asphalt fuse with the exposed face of the sealing strip;

6.64.8.6.2.5 the **Contractor** shall apply the product within twenty (20) to thirty (30) minutes before placing the hot-mix asphalt to prevent the product from being ripped or soiled.

6.64.9 QUALITY CONTROL

6.64.9.1 THICKNESS OF THE RUBBERIZED ASPHALT MEMBRANE

6.64.9.1.1 The deck coated with a rubberized asphalt membrane shall be divided into multiple lots. Each lot shall not exceed a surface area of 300 m^2 and the membrane thickness shall be checked on each lot.

6.64.9.1.2 Each lot shall, in turn, be subdivided into ten (10) equal parcels.

6.64.9.1.3 On each parcel, three (3) membrane thickness measurements shall be taken for testing purposes: one at each corner of an imaginary triangle having as its centre a test site randomly selected in that parcel.

6.64.9.1.4 The test sites will be determined by the Engineer in the presence of the **Contractor**, who shall subsequently accept them.

6.64.9.1.5 The imaginary triangle shall measure approximately 100 mm on each side. The average of the three measurements taken on each parcel of a lot shall be calculated and rounded to the nearest millimetre (1 mm) and recorded as test result.

6.64.9.1.6 The average and the standard deviation for the ten (10) test results obtained for each lot shall be calculated.

6.64.9.1.7 The membrane thickness shall subsequently be assessed as follows:

6.64.9.1.7.1 Scenario 1 – Average membrane thickness less than 3.0 mm

6.64.9.1.7.1.1 If the average calculated for a lot is less than 3.0 mm, the entire lot will be rejected, regardless of the standard deviation used. In such a case, the entire lot shall be corrected as prescribed in Article 6.64.9.1.8 *Correction of unacceptable lots*.

6.64.9.1.7.2 Scenario 2 - Average membrane thickness between 3.0 mm and 5.0 mm

6.64.9.1.7.2.1 If the average calculated for a lot ranges between 3.0 mm and 5.0 mm, the average and standard deviation shall be rounded to the nearest 0.1 mm and 0.05 mm respectively. The lot in question will be accepted or rejected after comparison with the data contained in Appendix 6.64-I *Decision-Making Grid for Acceptance of a Lot for the Rubberized Asphalt Membrane* of this subsection.

6.64.9.1.7.3 Scenario 3 – Average membrane thickness greater than 5.0 mm

6.64.9.1.7.3.1 If the average calculated for a lot is greater than 5.0 mm, the entire lot will be rejected, regardless of the standard deviation used. In such a case, the entire lot shall be corrected as prescribed in Article 6.64.9.1.8 *Correction of unacceptable lots*.

6.64.9.1.8 Correction of unacceptable lots

6.64.9.1.8.1 The **Contractor** shall propose a repair method and shall make all the required corrections, to the satisfaction of the Engineer and at no additional cost to the **Owner**. Once the corrections are made, the entire lot shall be retested.

6.64.9.2 PREFABRICATED MEMBRANE

6.64.9.2.1 Once it has been placed, the prefabricated membrane shall be inspected visually by the Engineer to ensure that it adheres fully to the entire slab surface.

6.64.9.2.2 The **Contractor** shall correct any flaws identified by the Engineer. Air pockets and wrinkles shall be punctured and covered with a piece of membrane extending at least 100 mm beyond the perimeter of the area to be repaired. Poorly welded joints in the membrane shall be welded again.

6.64.9.3 METHYL METHACRYLATE-BASED WATERPROOFING MEMBRANE

6.64.9.3.1 The deck coated with a methyl methacrylate-based waterproofing membrane shall be divided into multiple lots. Each lot shall not exceed a surface area of 300 m^2 and the membrane thickness shall be checked on each lot.

6.64.10 WARRANTY

6.64.10.1 Notwithstanding the provisions of Section 8 *General Conditions* of this Contract, the **Contractor** shall, in addition to the warranty referred to in GC32 *Warranty and Rectification of Defects in Work*, provide the **Owner** with a written warranty, issued in the name of the **Owner**, certifying that the membrane will remain waterproof for a minimum period of five (5) years from the date of issuance of the Interim Certificate of Completion.

END OF SUBSECTION

APPENDIX 6.64-I

DECISION-MAKING GRID FOR ACCEPTANCE OF A LOT FOR THE RUBBERIZED ASPHALT MEMBRANE

(1 PAGE)

DECISION-MAKING GRID FOR ACCEPTANCE OF A LOT
FOR THE RUBBERIZED ASPHALT MEMBRANE

LOT AVERAGE

STANDARD DEVIATION OF THE LOT	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	
0.00																						0.00
0.05																						0.05
0.10																						0.10
0.15																						0.15
0.20																						0.20
0.25																						0.25
0.30																						0.30
0.35											ACCEPTABLE											0.35
0.40																						0.40
0.45																						0.45
0.50																						0.50
0.55	X																					0.55
0.60		X																				0.60
0.65			X																			0.65
0.70				X																		0.70
0.75					X																	0.75
0.80						X																0.80
0.85																						0.85
0.90							X															0.90
0.95								X														0.95
1.00									X													1.00
1.05										X												1.05
1.10											X											1.10
1.15												X										1.15
1.20													X									1.20
1.25														X								1.25
1.30															X							1.30
1.35																X						1.35
1.40																	X					1.40
1.45																		X				1.45
1.50																						1.50
1.55																			X			1.55
1.60					UNACCEPTABLE															X		1.60
1.65																					X	1.65
1.70																						1.70
1.75																						1.75
1.80																						1.80
1.85																						1.85
1.90																						1.90
1.95																						1.95
2.00																						2.00

Lots whose results fall in the “unacceptable” range of the table shall be corrected in accordance with article 6.64.9.1.8 *Correction of unacceptable lots*. Lots whose results fall in the boxes marked with an “X” in the table will be deemed unacceptable.