TENDER DOCUMENTS

SUBSECTION 6.14

TRAFFIC CONTROL
AND TEMPORARY SIGNAGE

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SUBSECTION 6.14 TRAFFIC CONTROL AND TEMPORARY SIGNAGE

6.14.1 GENERAL

6.14.1.1 This subsection describes the requirements for traffic control and temporary signage to be provided for all interventions affecting traffic on the structures belonging to the **Owner,** which include the Jacques Cartier Bridge, the Champlain Bridge, the federal portion of the Honoré Mercier Bridge and approaches thereto, the Melocheville Tunnel and the federal portion of the Bonaventure Expressway.

6.14.1.2 The **Owner**'s requirements in terms of traffic control and temporary signage take into account the standards covered by Article 6.14.3 *Reference Standards* of this subsection hereafter "*Reference Standards*". The purpose of the **Owner**'s requirements is not to repeat the requirements of these standards, but rather to define the **Owner**'s specific signage requirements on its property, considering the significant flow of vehicles travelling thereon. The objective of the requirements is to minimize the risk of incidents during work periods and to reduce inconveniences to users.

6.14.1.3 This requirements for traffic control and temporary signage take into consideration the particular conditions encountered on the **Owner**'s roadway network. The main adjustments to the minimum Reference Standards requirements take into account, in the first place, the speed used for the purposes of designing the temporary sign. Rather than base the design on the posted speed limit, the actual speed used by drivers (higher in some locations than the posted speed) has been used in order to increase safety in the work zones. This adjustment results in greater perception, stopping visibility and decision sight distances and in greater decision-making opportunities for the drivers. The temporary signage upstream from the work zones has therefore been adjusted and the taper lengths have been increased. Secondly, the distance between the visual markers are or could be reduced in certain locations according to the temporary signage drawings and as directed by the Engineer to avoid traffic infiltration into work zones or buffer zones during road congestion. Finally, the quantity of a number of temporary traffic control devices is increased to account for actual speeds, and to address the reduced visibility resulting from the presence of many heavy vehicles on the **Owner**'s network.

6.14.1.4 Although the Reference Standards apply to this Contract, this subsection describes a significant number of measures that are different and more binding.

6.14.1.4.1 The **Contractor** remains responsible at all times for the temporary signage implemented on its worksite.

6.14.1.4.2 In case of contradiction or discrepancy between the requirements of the Reference Standards and those of this subsection, the most stringent requirements apply.

6.14.1.5 In this subsection, “Traffic Management and Control Plan” means everything that the **Contractor** is required to provide and all work that the **Contractor** is required to carry out under the terms of this Contract and that are related to traffic control and temporary sign.

6.14.1.6 In this subsection, "Global Traffic Management Plan" means the overall measures developed by the Engineer to ensure the coordination of the various construction sites of the **Owner**. The **Contractor**'s Traffic Management and Control Plan shall be integrated into the **Owner**'s Global Traffic Management Plan.

6.14.1.7 The following definitions of work durations, as prescribed by the Reference Standards, apply to this Contract. However, the nature of the temporary signage and the recommended measures may differ significantly from the Reference Standard for each work-duration category:

6.14.1.7.1 Very Short Duration Work: Work completed within a fifteen-minute (15) period.

6.14.1.7.2 Short Duration Work: Work to be completed within a twenty-four-hour (24) period.

6.14.1.7.3 Long Duration Work: Work requiring more than twenty-four (24) hours to be completed.

6.14.1.7.4 Mobile work: Work involving a vehicle moving at a speed of at least 5 km/h and at most 20 km/h (slow-moving work) or of at least 20 km/h and at most 60 km/h (fast-moving work).

6.14.1.8 The expression “Contraflow lane” means any lane in which the direction of the traffic, when the work is carried out, is redirected in the opposite direction.

6.14.1.9 The **Contractor** shall design, supply, install and maintain all temporary signage required to properly and at all times direct vehicular, pedestrian and cyclist traffic on the worksite. The signage shall be primarily carried out in accordance with this subsection, the **Owner**’s signage drawings, the drawings and Section 4 *Special Technical Conditions*, and also in accordance with to the current provisions of the Reference Standards.

6.14.2 MEASUREMENT UNITS

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

Measurement Unit	Designation	Symbol
length	meter	m
length	millimeter	mm
length	kilometer	km
mass	kilogram	kg
volume	liter	L
time	hour	h
time	minute	min

6.14.3 REFERENCE STANDARDS

6.14.3.1 The **Contractor** shall perform all work related to traffic control and temporary signage in accordance with the requirements of the following standards and documents to which the provisions of this Contract are added:

6.14.3.1.1 (MTQ) Ministère des Transports du Québec:

- MTQ – *Cahier des charges et devis généraux* (CCDG);
- MTQ – *Normes – Ouvrages routiers* – Tome V *Signalisation routière*;
- MTQ – *Normes – Ouvrages routiers* – Tome VII *Matériaux*:
    - 14101 *Pellicules rétroréfléchissantes*;
- MTQ – *Normes – Ouvrages routiers* – Tome VIII *Dispositifs de retenue*.

6.14.3.1.2 (NCHRP) National Cooperative Highway Research Program:

- NCHRP Report 350 *Recommended Procedures for the Safety Performance Evaluation of Highway Features*.

6.14.4 TEMPORARY SIGNAGE PLANNING

6.14.4.1 TRAFFIC MANAGEMENT AND CONTROL PLAN

6.14.4.1.1 The Traffic Management and Control Plan shall include, without however being limited thereto:

6.14.4.1.1.1 the drawings of the temporary signage planned for each of the various scenarios involving lane closures, traffic deviation or contraflow roadway operations (vehicles, bicycles and pedestrians) contemplated by the **Contractor** in the course of carrying out its work;

6.14.4.1.1.2 the traffic deviation drawings, including, where needed, the alternative routes and detours or bypasses that are proposed and will be signaled to users;

6.14.4.1.1.3 the protocol (dates, schedules and sequence of operations) for lane closures and reopenings as well as the implementation of signage, markings and traffic control devices;

6.14.4.1.1.4 the restrictions including, without limitation, the weight, speed and dimensions;

6.14.4.1.1.5 the programming of user information including, without limitation, the communication plan and variable message signs;

6.14.4.1.1.6 the means the **Contractor** intends to take to ensure effective management of the temporary signage.

6.14.4.1.2 The **Contractor**'s Traffic Management and Control Plan shall be developed jointly and in coordination with the **Owner** and shall integrate in the **Owner**'s Global Traffic Management Plan. In this regard, the **Contractor** shall co-operate with the Engineer, the other contractors, the MTQ, the concerned municipalities or any other stakeholders involved in road traffic management in the Greater Montreal area. This plan shall be submitted to the Engineer for review at least fourteen (14) days prior to the start of the **Contractor**'s work on the worksite.

6.14.4.1.3 The **Contractor**'s temporary road signage shall be designed and installed so as to guide the user throughout its travel. It shall clearly illustrate the route to follow and give users advance notice of any potential dangers. It shall thus allow users to adapt their driving behavior to the various situations they may encounter, and enable them to anticipate any manoeuver and be prepared for it.

6.14.4.1.4 The temporary signage shall:

6.14.4.1.4.1 be bilingual (French and English) on the entirety of the **Owner**'s property;

6.14.4.1.4.2 be in French on the property of the MTQ, cities and boroughs;

6.14.4.1.4.3 be uniform, homogeneous and completely integrated with the surrounding road signage;

6.14.4.1.4.4 attract attention;

6.14.4.1.4.5 be perfectly visible and legible at the required standardized distances;

6.14.4.1.4.6 be intelligible, easy to understand;

6.14.4.1.4.7 be in new condition;

6.14.4.1.4.8 be well suited to the dangers and specific situations requiring signage.

6.14.4.1.5 The implementation of the worksite signage shall:

6.14.4.1.5.1 comply with the traffic management and signage requirements described in this subsection in order to ensure the safety of users and workers;

6.14.4.1.5.2 be carried out according to procedures that are well-defined and have been agreed upon by the stakeholders involved, especially the Engineer and the **Contractor**;

6.14.4.1.5.3 Enable to inform users of the dates of the beginning and the end of the work.

6.14.4.2 PREPARATION OF THE TEMPORARY SIGNAGE DRAWINGS

6.14.4.2.1 The temporary signage drawings shall indicate the new signage panels, devices and markings that have been added, the permanent devices that have been temporarily removed or masked as well as the minimum lane width requirements and shall be designed so as to:

6.14.4.2.1.1 warn of dangers;

6.14.4.2.1.2 ensure the safety of users traveling in the lanes affected by the work as well as in the lanes adjacent to the work;

6.14.4.2.1.3 ensure the safety of workers during the performance of the work;

6.14.4.2.1.4 provide users with all relevant indications or information;

6.14.4.2.1.5 take into account the local specifics including, without limitation, the geometry and actual vehicle speed.

6.14.4.2.2 For every necessary configuration, the drawings submitted shall comprise, without limitation, the following information:

6.14.4.2.2.1 the diagram showing the geometry and profile of the structure affected as well as the detour route;

6.14.4.2.2.2 the identification of the planned work area;

6.14.4.2.2.3 the implementation (position, distance, alignment) and symbolic of the traffic signage panels and any other proposed devices;

6.14.4.2.2.4 the sequential grouping of the devices in the order to be followed to install and remove them;

6.14.4.2.2.5 all explanatory notes required for a thorough understanding of the proposed implementation;

6.14.4.2.2.6 where applicable, the operating schedule of each suggested configuration;

6.14.4.2.2.7 a suitable legend compliant with the **Owner**'s standards.

6.14.4.2.3 All the **Contractor**'s temporary signage drawings shall be signed and sealed by a specialized engineer on the subject, member of the *Ordre des ingénieurs du Québec* (OIQ) and has at least five (5) years of relevant experience.

6.14.4.2.4 The **Contractor** shall submit to the Engineer the temporary signage drawings that the **Contractor** intends to install on and in the vicinity of the worksite. The Engineer reserves a period of fourteen (14) days to review the drawings. The **Contractor** shall correct the drawings considering the Engineer's comments. No signage may be implemented by the **Contractor** before a written authorization to proceed is issued by the Engineer.

6.14.4.2.5 The **Contractor**'s temporary signage drawings shall be made to a minimum scale of 1:1000. However, the drawings showing the signage for contraflow lanes or for specific situations that are not described in this subsection or in the Reference Standards shall be made to a minimum scale of 1:500.

6.14.4.2.6 The **Contractor** shall position the workzone signage so that the delineation of the workzone and tapers thereof do not begin in a horizontal curve or in a vertical curve, such as the top of a bridge.

6.14.4.2.7 The tapers are required to begin on a straight segment where the visibility is at least 200 m at all points.

6.14.4.2.8 To assist the **Contractor** in preparing its signage drawings, the **Owner** may, upon request and subject to availability, provide plan templates of the network to be used for that purpose.

6.14.4.3 AUTHORIZED LANE CLOSURES

6.14.4.3.1 Unless otherwise indicated on the drawings, lane closures on the **Owner**'s property are permitted only as indicated in the *Table(s) of Lanes to be Maintained Open* provided by the **Owner**. For purposes of applying these tables, the following statutory holidays shall be considered as Saturdays or Sundays: Victoria Day, Saint-Jean-Baptiste Day, Canada Day, Labour Day and Thanksgiving monday. Furthermore, no lane closures are permitted in the afternoon of the day preceding a statutory holiday or a long weekend. These tables shall be complied with at all times, and no exceptions will be accepted.

6.14.4.3.2 In addition to the requirements mentioned in Article 6.14.4.3.1, for work to be carried out on the structures comprising more than two (2) traffic lanes in one direction and for which the posted speed is higher than 50 km/h, or if indicated on the drawings or if so required by the CNESST, the **Contractor** shall comply with the following specific elements:

6.14.4.3.2.1 In the presence of workers who are not protected by a rigid barrier in a traffic lane, the **Contractor** shall also close the lane adjacent thereto in order to increase the level of safety of the people working on the structure, unless a special authorization has been obtained from the Engineer.

6.14.4.3.2.1.1 Notwithstanding the foregoing, the installation and removal of the traffic control devices shall be carried out by closing only one (1) lane.

6.14.4.3.2.1.2 Notwithstanding the foregoing, when installing construction worksite concrete barriers, the **Contractor** shall close two (2) lanes.

6.14.4.3.2.1.3 These double or single lane closures are allowed only as indicated in the *Table(s) of Lanes to be Maintained Open* provided by the **Owner**.

6.14.4.3.2.1.4 During double lane closures, the amount provided for in the Contract price, as described in Article 6.14.12 *Traffic Hindrance Minimization System*, apply to each lane closed. In such a case, the price for double lane closures within this Contract shall thus be $100/hr/lane x 2 lanes.

6.14.4.3.3 All work, removal of signage and evacuation of workers shall be completed and all lanes opened to traffic according to the schedules specified in the *Table(s) of Lanes to be Maintained Open* provided by the **Owner**. No extensions of these hours will be granted.

6.14.4.3.4 Any closure ahead of the prescribed time, any delay in reopening the traffic lanes, any unauthorized closure as well as any closure resulting from deficient work contrary to the requirements of this Contract will result in the application of Article 5.35.5 *Damages arising from Closure of Vehicular Traffic Lanes* of Section 5 *Standard Administrative Conditions*.

6.14.4.3.4.1 A lane that is open to traffic but considered unsafe for road users, such as traffic on a milled surface, will result in the application of Article 5.35.5 *Damages arising from Closure of Vehicular Traffic Lanes* of Section 5 *Standard Administrative Conditions*.

6.14.4.3.5 In order to minimize the impact of the work on traffic flow, the work shall be carried out so as to minimize hindrances on the **Owner**'s roadway network. The Engineer may refuse the **Contractor**'s sequences of work that unduly penalize the roadway users when other alternatives exist.

6.14.4.3.6 The Engineer may refuse the reopening of the traffic lanes for safety reasons notably because of missing traffic signage panels, poor cleanliness of the worksite, missing or unerased pavement marking, etc. In such a case, any delay in the reopening of traffic lanes will result in the application of Article 5.35.5 *Damages arising from Closure of Vehicular Traffic Lanes* of Section 5 *Standard Administrative Conditions*.

6.14.4.3.7 All lane closures shall be authorized in advance by the Engineer according to the **Owner**'s procedure provided to the **Contractor**. The **Contractor** shall submit its request for closure to the Engineer within the delays specified in the procedure, through the **Owner**'s Intervention Management System.

6.14.4.3.8 The **Owner** reserves the right to refuse the closure or to change the time slots thereof in order to avoid closures that come into conflict with the work of the other contracts that are being carried out at the same time, within the worksite of this Contract or in the vicinity thereof.

6.14.4.3.9 If the **Contractor** wishes to make an intervention on the MTQ's network, it shall, at least fourteen (14) days before the start of each intervention, submit the request according to the requirements and within the prescribed deadlines to the MTQ's department concerned and obtain approval thereof.

6.14.4.3.10 Where the **Contractor** wishes to make an intervention on the network of municipal jurisdiction, it shall obtain, from the borough or municipality concerned, a *Permis d'occupation ou d'obstruction temporaire du domaine public* or any other required permit, before the start of each intervention.

6.14.4.3.10.1 The **Contractor** is responsible for enquiring with the departments concerned about the applicable time limits and documents to be provided for processing the permit application.

6.14.4.3.11 The **Contractor** shall submit to the Engineer, before the start of each intervention, a copy of the authorization or permit provided for in paragraphs 6.14.4.3.9 and 6.14.4.3.10, if applicable.

6.14.4.4 ROAD TRAFFIC MANAGEMENT

6.14.4.4.1 The **Contractor** shall carry out all work covered by this Contract in such a way so as not to interfere with road traffic, except when authorized by the Engineer in exceptional circumstances that are necessary due to the nature of the work.

6.14.4.4.2 The **Contractor** shall always comply with the Engineer's instructions regarding the prompt reopening of a lane when the situation so requires, even during off peak-hours. The **Contractor** may not request compensation for the cost of travel by its work teams from one area of the worksite to another.

6.14.4.4.2.1 The Engineer could request the reopening of the lanes during a peak hour when the progress of the work allows it.

6.14.4.4.3 The **Contractor** shall supply and maintain a sufficient number of traffic signage panels, barriers, light signals, signal arrows, worksite concrete barriers and any other equipment required to direct and control road traffic.

6.14.4.4.4 With respect to all detours and alternate routes, the **Contractor** shall obtain, at its expense, all permits required from the relevant authorities.

6.14.4.4.5 The **Contractor** shall protect road traffic against all damages which may result from its work (including, in particular, when trucks are entering and exiting the worksite) and, where needed, provide the required flagmen and escort vehicles.

6.14.4.4.6 In the event of an accident or incident on or in the vicinity of the worksite, the **Contractor** shall immediately contact the Cartier-Champlain *Sûreté du Québec* station at 450 442-1036 in order to inform the dispatchers of the situation on the site and shall also notify the Engineer thereof.

6.14.4.5 SIGNAGE CREW

6.14.4.5.1 The **Contractor** shall, before the kick-off meeting, appoint and have the Engineer approve a person in charge of signage, who thereby becomes the **Contractor**'s sole representative authorized to have signage installed and make changes thereto.

6.14.4.5.2 The signage manager shall be an employee of the **Contractor** and will be required to actively participate in the planning of lane closures and to attend all worksite meetings as well as all daily planning meetings.

6.14.4.5.3 The signage manager as well as the foremen of the subcontractor in temporary signage, if any, shall have successfully completed courses STC-102 *Supervision et surveillance de la signalisation de chantier routier* and STC-201 *Gestion des impacts des travaux routiers sur la circulation* given by the Association québécoise des transports (AQTr) and shall hold a valid certificate issued by the AQTr for the duration of the work.

6.14.4.5.4 The workers in charge of the temporary signage and traffic control, as well as the worksite flagmen, shall be at least eighteen (18) years old, have successfully completed course STC-102 given by the AQTr and hold a valid certificate issued by the AQTr for the duration of the work.

6.14.4.5.5 The **Contractor** shall provide to the Engineer, at the kick-off meeting, the list of all personnel assigned to the signage and forming its signage crews, as well as a copy of their certificates of successful completion of the required trainings. The submission of the list of personnel and certificates of successful completion is one of the prerequisites to the authorization to commence work.

6.14.4.5.6 The signage manager shall be present on the worksite during all movements of signage equipment and during phase changes.

6.14.4.5.7 The **Contractor**'s signage manager may be replaced by another member of the **Contractor**'s personnel for certain work, but the Engineer shall be notified and give authorization. The replacement personnel shall have successfully completed the same trainings as those listed in paragraph 6.14.4.5.3.

6.14.4.5.8 The **Contractor**'s signage manager shall contact the Engineer prior to starting any signage work in order to obtain approval to commence the work and shall notify him in real time of any changes or developments. In addition, the Engineer must be able to reach the signage manager at all times. To do so, the **Contractor** is required to provide to its signage manager a cell phone, including a message processing service, which shall be operational at all times.

6.14.4.6 TRUCK-MOUNTED ATTENUATOR (TMA)

6.14.4.6.1 During lane closure and reopening operations or for the implementation of a contraflow lane, the **Contractor** shall always equip the upstream vehicle with an impact attenuator. This vehicle shall also be used during very short duration work, mobile work or work near open traffic lanes.

6.14.4.6.2 The attenuator shall be connected to the back of the vehicle, be a TMA type (truck mounted attenuator), approved according to standard NCHRP Report 350 and designed for a minimum speed of 100 km/h (level TL-3).

6.14.4.6.3 Every truck equipped with a TMA shall have a total loaded mass (including the TMA) comply with the recommendations of the manufacturer of the model used, have a flashing luminous signal arrow, rotating beacons and have, on the sides and on the back, Type III retroreflective strips compliant with MTQ standard 14101.

6.14.4.6.4 The persons assigned to drive a TMA equipped truck shall be assigned to this task exclusively.

6.14.4.7 ACCOMPANYING WORK VEHICLE

6.14.4.7.1 The **Contractor** shall, for the entire duration of any closures of one or more lanes, supply, operate and maintain an accompanying work vehicle whose functions are to:

6.14.4.7.1.1 circulate, on a continuous basis, in the traffic lanes at the authorized speed limit when contraflow lanes are in use;

6.14.4.7.1.2 make at least one passage every hour in all other cases.

6.14.4.7.2 The tasks of the accompanying work vehicle operator include, without limitation:

6.14.4.7.2.1 contacting the *Sûreté du Québec* for the towing off the worksite of any disabled vehicle requiring such assistance;

6.14.4.7.2.2 reinstalling and/or replacing any defective signage;

6.14.4.7.2.3 removing any obstacle or debris of any kind and forwarding to the **Contractor**'s Superintendent all information concerning any moved or inoperative signage which could hinder or impair the proper functioning of the traffic lanes;

6.14.4.7.2.4 facilitating the exit and entry of vehicles in the work area.

6.14.4.7.3 The accompanying work vehicle shall have the following characteristics:

6.14.4.7.3.1 be a pickup truck;

6.14.4.7.3.2 have a total loaded mass of at least 2,700 kg;

6.14.4.7.3.3 have insurance coverage in accordance with Section 11 *Insurance Conditions* of this Contract.

6.14.4.7.4 Every accompanying work vehicle shall contain or be equipped with the following:

6.14.4.7.4.1 one (1) shovel;

6.14.4.7.4.2 one (1) broom (brush);

6.14.4.7.4.3 one (1) first aid kit;

6.14.4.7.4.4 one (1) ABC class fire extinguisher having a minimum size of 5 kg;

6.14.4.7.4.5 twenty-four (24) safety flares;

6.14.4.7.4.6 three (3) 20 kg bags of absorbent;

6.14.4.7.4.7 three (3) 20 kg bags of abrasive;

6.14.4.7.4.8 three (3) 20 kg bags of cold asphalt;

6.14.4.7.4.9 one (1) cellular telephone;

6.14.4.7.4.10 rotating beacons and a directional luminous signal arrow compliant with the Reference Standards;

6.14.4.7.4.11 be equipped, on the side and on the back of the vehicle, with a wide Type III retroreflective strip compliant with MTQ standard 14101;

6.14.4.7.4.12 be identified as "*Patrouille"* at the back (with reflective material).

6.14.4.7.5 Upon written request from the Engineer, the **Contractor** shall, within twenty-four (24) hours, supply any equipment that is missing or to be replaced.

6.14.4.8 WORK ZONE SIGNAGE

6.14.4.8.1 Required signage

6.14.4.8.1.1 The **Contractor** shall use a flashing luminous signal arrow for every lane that is partially or completely closed to traffic. The flashing luminous signal arrows shall be installed to close a lane even if a lane control system makes it possible to see if one or more lanes are closed. The flashing luminous signal arrow shall meet the requirements of this subsection and of the Reference Standards. Its use shall be in compliance with these documents during all phases of performance of the work and in all situations encountered.

6.14.4.8.2 Visual markers

6.14.4.8.2.1 Unless otherwise indicated on the drawings, the only authorized visual markers are T-RV-1 directional chevrons and the non-metallic T-RV-2 beacons or T-RV-7 beacons or equivalent authorized by the Engineer. The use of cones is prohibited.

6.14.4.8.2.2 The visual markers used shall comply with the Reference Standards requirements in form, colour and reflection coefficient of their retroreflective film. They shall be new, in sufficient numbers, clean and well positioned, both in function or off function.

6.14.4.8.2.3 The spacing between visual markers (variable E defined in chapitre 4 *Travaux* of Tome V of MTQ) shall be at most 10 m. The spacing in tapers shall be at most 5 m. The maximum spacing between visual markers for the closure of an entrance or exit ramp is 2 m.

6.14.4.8.2.4 In tapers, the spacing between the directional chevrons shall be at most 10 m for 75 m tapers or at most 20 m for 150 m tapers.

6.14.4.8.2.5 In the tapers used to reduce the number of available lanes, the **Contractor** shall, as visual markers, use T-RV-1 directional chevrons.

6.14.4.8.2.6 At the location of the deviation, the **Contractor** shall, in the curves, install directional chevrons at 10 m intervals. The height of the chevrons, measured from the roadway surface to the lower edge thereof, shall be 1,200 mm.

6.14.4.8.2.7 For all situations encountered, the spacing between the signage panels (variable B, defined in in chapitre 4 *Travaux* of Tome V of MTQ) and between the visual markers shall be as indicated on the **Owner**'s signage drawings and on the drawings.

6.14.4.8.2.8 For information purposes, Table 1 summarizes the spacing indicated on the signage drawings for posted speeds of 50 km/h and 70 km/h.

Table 1: Owner's Requirements for Spacing

		Posted Speed	
		50 km/h	**70 km/h**
D	(Lane width)	3.65 m	3.65 m
L	(Taper length)	75 m	150 m
E	(Visual marker spacing – Lanes)	10 m	10 m
E	(Visual marker spacing – Tapers)	5 m	5 m
E_b	(Spacing between chevrons in 75 m tapers)	10 m	10 m
E_b	(Spacing between chevrons in 150 m tapers)	20 m	20 m
E_c	(Spacing between visual markers in contraflow lanes)	10 m	10 m
B	(Spacing between signage panels)	75 m	125 m

6.14.4.8.2.9 When lanes closures are in effect, acceleration and deceleration lanes shall be provided. These lanes shall be at least twice as long as the tapers (variable L). The tapers shall be delineated in accordance with Tome V *Signalisation routière* of MTQ, but the length thereof shall be as indicated in the signage drawings provided by the **Owner**. These drawings do not relieve the **Contractor** from the obligation to supply its own drawings.

6.14.4.8.3 Workzone signage panels

6.14.4.8.3.1 The workzone signage panels shall have an orange background and shall be equipped with a fluorescent type VII retroreflective film compliant with MTQ standard 14101. They shall be new, clean, in sufficient numbers and well positioned, in accordance with the reference standards, both in function or off function.

6.14.4.8.3.2 The use of pictograms shall be preferred over lettering. The pictograms shall comply with chapitre 4 *Travaux* of Tome V of MTQ.

6.14.4.8.3.3 The lettering on the signage panels shall, in order to comply with the Reference Standards requirements, be bilingual (French and English) and appear on two (2) different signs.

6.14.4.8.3.4 The **Contractor** shall, where required, provide for appropriate signage for motorcyclists, cyclists and pedestrians.

6.14.4.8.3.5 The signage panels shall in no case hide, either completely or partially, the permanent signage in place.

6.14.4.8.3.6 When disabling any signage panel, the **Contractor** shall cover it with a rigid cover compliant with Article 4.44 *Masquage des panneaux* of Tome V *Signalisation routière* of MTQ.

6.14.4.9 INSTALLATION OF TEMPORARY SIGNAGE DEVICES

6.14.4.9.1 The signage devices used for securing work areas shall be:

6.14.4.9.1.1 installed before work begins, starting from the furthest distance and proceeding towards the work area;

6.14.4.9.1.2 installed in sufficient numbers on the basis of their location and in accordance with the **Owner**'s signage drawings, the standardized drawings of Tome V of MTQ and the **Contractor**'s temporary signage drawings, sealed and signed by an engineer member of the OIQ;

6.14.4.9.1.3 in good working order (e.g. reflective power, brightness, etc.);

6.14.4.9.1.4 visible at the decision sight distance or twice the stopping sight distance.

6.14.4.9.2 During the installation and removal of the temporary signage, the **Contractor** shall ensure to meet the occupational health and safety requirements and the **Owner**'s safety requirements. The signage crew shall be protected by a vehicle equipped with an impact attenuator in accordance with Article 6.14.4.6 *Truck Mounted Attenuator (TMA)* positioned upstream from traffic.

6.14.4.9.2.1 The **Contractor** shall further supply, install, clean and maintain all appropriate signage panels, construction worksite concrete barriers and visual markers to the satisfaction of the Engineer.

6.14.4.9.2.2 The **Contractor** shall provide for the advance warning signage panels to be installed outside of the traffic lanes. With respect to signage panels on bridges, the **Contractor** shall install them on the lateral barriers or on fixed elements outside of the traffic lanes. The fasteners and supports shall be able to withstand the force of the wind and the turbulence created by the passage of trucks. The type of fasteners used shall be the object of a certificate of installation signed by an engineer member of the OIQ. The anchors shall be made of stainless steel.

6.14.4.9.2.2.1 The **Contractor** shall install the signage panels taking into account the passage of special vehicles such as buses.

6.14.4.9.2.3 The signage panels, guardrails, barriers, light signals and signal arrows shall be installed and maintained by the **Contractor**, and the worksite flagmen shall be present, for the entire duration of work to ensure the protection of the public, workers and structures, to the satisfaction of the Engineer.

6.14.4.9.2.4 The **Contractor** shall provide, in and outside of its work area, for the sequence of operations for the installation of the temporary signage, as well as for the safety measures and information signs that ensure users' safety.

6.14.4.9.2.5 The **Contractor** shall stabilize the signage devices using only the weights made for this purpose. A minimum of two (2) weights shall be used to hold each device in place.

6.14.4.9.2.6 All compliant signage measures and devices specified in the **Contractor**'s Traffic Management and Control Plan shall be completely implemented before any construction work may begin.

6.14.4.10 MAINTENANCE OF TEMPORARY SIGNAGE DEVICES

6.14.4.10.1 The **Contractor** shall take the necessary measures to replace or reinstall any signage device removed, dirty, vandalized, displaced, or damaged within a maximum period of thirty (30) minutes after having been notified of the problem by the *Sûreté du Québec*, the Engineer, an employee of the **Owner** or any other person. Should the **Contractor** fail to comply with these requirements or should the **Owner** be unable to reach the representative of the **Contractor** within the same delay, corrective measures will be taken by the **Owner**, the Engineer or the *Sûreté du Québec* at the **Contractor**'s expense and the costs incurred by the **Owner** in that respect will be deducted from the amounts payable to the **Contractor** under this Contract.

6.14.4.10.2 The **Contractor** shall clean, repair or replace, as the case may be, the signs in order to maintain the clarity and reflective power thereof.

6.14.4.10.3 When temporary signage equipment is in place, whether in function or off function, the **Contractor** shall provide the labor and supply the equipment necessary to maintain it and to keep it in the right place and in good condition.

6.14.4.11 MASKING OF SIGNAGE DEVICES DURING WORK

6.14.4.11.1 The permanent signage devices installed along or above a traffic lane which, for the entire duration or part of the duration of the work, are not useful for signage or give messages contradictory to those of the temporary signage, shall be removed or masked by means of materials that are totally opaque, both during the day and at night.

6.14.4.11.2 The temporary signage devices that were previously installed along or above a traffic lane, for the entire duration or part of the duration of the work, that give messages contradictory to those of the signage planned for the current work phase shall be removed or masked by means of materials that are totally opaque, both during the day and at night.

6.14.4.12 REMOVAL OF TEMPORARY SIGNAGE DEVICES

6.14.4.12.1 The temporary signage devices shall be removed in the reverse order of their installation or according to the specific sequence provided in the Traffic Management and Control Plan.

6.14.4.12.2 The **Contractor** shall thoroughly clean closed lanes before reopening them to traffic.

6.14.4.12.3 The signage crew shall be protected by an impact attenuator vehicle positioned upstream from traffic.

6.14.4.12.4 It is prohibited to leave any temporary signage equipment, including signage panels and other devices, on traffic lanes or shoulders outside of work hours. The indications appearing on temporary signage equipment moved to authorized locations shall not be visible from the traffic lanes.

6.14.4.12.5 No removed signage device shall be left on the **Owner**'s road network, including on the shoulders.

6.14.4.13 MAINTENANCE OF TRAFFIC LANES

6.14.4.13.1 The **Contractor** is responsible for maintaining the traffic lanes used by road users, within the site limits, during the work period. More explicitly, the **Contractor** is responsible for:

6.14.4.13.1.1 patching the holes that are 25 mm deep and more, on traffic lanes and shoulders;

6.14.4.13.1.2 cleaning the paved areas where traffic is maintained and keeping them free of any debris, liquid or solid material, whether this material comes from the worksite or not;

6.14.4.13.1.3 taking all means to prevent the deposit of these materials on the roadway and, where necessary, take immediate action to remove them;

6.14.4.13.1.4 maintaining the work area and traffic lanes so that there are no dust emissions;

6.14.4.13.1.5 ensuring the proper drainage of the roadways;

6.14.4.13.1.6 any other work necessary for traffic maintenance.

6.14.4.14 ENTRIES AND EXITS FROM THE WORK AREAS

6.14.4.14.1 The vehicles accessing the work area shall be equipped with a retating beacon, failing which they shall be followed by at least one accompanying work vehicle.

6.14.4.14.2 The vehicles exiting the work area shall do so downstream from that zone and in the extension of the lane closed for construction. An accompanying work vehicle, as defined in Article 6.14.4.7 *Accompanying Work Vehicle*, shall be used to slow down or stop traffic in order to ease the merging of the vehicle into the lane that is open to traffic.

6.14.4.14.3 In function of the worksite configuration, the drivers' visibility and the **Contractor**'s Traffic Management and Control Plan, coordination between the vehicles entering and exiting the work area, the flagmen and the accompanying work vehicle is necessary. For every situation, a description of the tasks and coordination mechanisms, accompanied by the signage drawings provided for that purpose shall govern the use of that practice. The accompanying work vehicles shall be equipped with specific signals to inform road users of slowdowns, or bypass manoeuvres.

6.14.4.14.4 The **Contractor** shall provide for the use of accompanying work vehicle(s) to escort any vehicle entering or exiting a work area adjacent to a lane that is open to traffic. The **Contractor** shall also provide this service to the Engineer's and **Owner**'s teams. These entering and exiting operations shall be safe and carried out so as to ensure full protection to workers and road users.

6.14.4.14.5 The **Contractor** shall ensure safe access to the worksite to all stakeholders. To this end, the **Contractor** is required to comply with the directives issued by the Engineer and to provide adequate signage. The entries and exits shall be numbered and the numbering shall be distinct from that of the other worksites. The **Contractor** shall in no case modify the configuration in place without authorization.

6.14.4.14.6 During work periods, the access may be kept open to facilitate the entry and exit of the authorized vehicles. However, the **Contractor** shall in no case carry out work at worksite accesses.

6.14.4.15 USE OF THE T-20 "CONSTRUCTION AHEAD" SIGN

6.14.4.15.1 One (1) T-20 sign shall be installed 1 km upstream from the work area in accordance with the long duration signage drawings of Tome V of MTQ, regardless of the duration of the work. The T-20 sign shall be installed at all intervals indicated on the drawings for the structure on which the work is being carried out.

6.14.4.15.2 For work on the Champlain Bridge, the **Contractor** shall install T-20 signs every kilometer and at every entry and exit access ramp leading to the bridge within a 3 km radius from the worksite. One (1) or more T-20 signs shall be installed in all highway lanes leading to the bridge within that radius.

6.14.4.15.3 For work on the Jacques Cartier Bridge, T-20 signs shall be installed at every major intersection leading to the bridge within a 500 m radius from the worksite.

6.14.4.15.4 For work on the Honoré Mercier Bridge, T-20 signs shall be installed every kilometer and at every entry and/or exit access ramp leading to the bridge within a 2 km radius from the worksite.

6.14.4.15.5 For work in the Melocheville Tunnel, T-20 signs shall be installed on every major intersection leading to the tunnel within a 1 km radius from the tunnel's entry point.

6.14.4.15.6 For work on the Bonaventure Expressway and the "S" and "T" lanes, the **Contractor** shall install T-20 signs every kilometer as well as at every entry and/or exit access ramp leading to this highway or these lanes within a 3 km radius from the worksite. One (1) or more T-20 signs shall be installed in all highway and bridge lanes leading to this highway or these lanes within that radius. Furthermore, T-20 signs shall be installed at every major intersection leading to the Bonaventure Expressway from downtown Montreal within a 500 m radius from the worksite.

6.14.4.16 SPECIAL REQUIREMENTS FOR VERY SHORT DURATION WORK AND MOBILE WORK

6.14.4.16.1 During very short duration work and mobile work, the **Contractor** shall position an TMA equipped vehicle compliant with Article 6.14.4.6 *Truck Mounted Attenuator (TMA)* upstream from the work.

6.14.5 SPECIFIC SIGNAGE REQUIREMENTS FOR CONTRAFLOW TRAFFIC

6.14.5.1 GENERAL

6.14.5.1.1 The **Contractor** shall make sure that the signage work for contraflow traffic meets the Reference Standards and the peculiarities indicated on the signage drawings and on the drawings for the various deviation scenarios.

6.14.5.1.2 The **Contractor** shall note that Lane #3 of the Jacques Cartier Bridge (center lane) has no predominant traffic flow direction since it is reversible and equipped with a lane control signal system that makes it possible to indicate if a lane is open or closed. Therefore, when the **Contractor** carries out work in Lane #1 (right lane towards the South Shore) or in Lane #5 (right lane towards Montreal) of the Jacques Cartier Bridge, or in Lanes #1 and #5 at the same time, using Lane #3 for the traffic in one of the two directions, special signage is not required for that center lane.

6.14.5.1.3 For work requiring contraflow traffic lanes, the **Contractor** shall submit to the Engineer, for review, the sequence for the installation and removal of the sign. The signage drawings provided by the **Owner** indicate the minimum requirements for contraflow traffic implementation and for signage. The **Contractor** remains responsible at all times for the temporary signage implemented on its worksite.

6.14.5.2 IMPACT ATTENUATOR AT THE END OF THE RIGID BARRIER MOVED FOR CONTRAFLOW TRAFFIC

6.14.5.2.1 When central rigid barriers are moved to allow for contraflow traffic, the **Contractor** shall install impact attenuators at the end thereof (please refer to the signage drawings for more information).

6.14.5.2.2 The impact attenuator shall be a frontal restraint system compliant with standard NCHRP Report 350 and be designed for a minimum speed of 70 km/h (level TL-2).

6.14.5.2.3 The impact attenuator shall be on the MTQ approved products list. The impact attenuator shall be of temporary use, easy to install, easy to move and easy to remove.

6.14.5.3 ADDITIONAL SIGNAGE REQUIREMENTS

6.14.5.3.1 T-D-80 “Two-Way Traffic Ahead” signs indicating that there are two (2) adjacent lanes with traffic moving in opposite directions, and P-140-1 “No Passing” signs shall be installed every 250 m in zones consisting of adjacent lanes.

6.14.5.3.2 The **Owner’s** general requirements concerning the use of visual markers are presented in Table 1 “*Owner’s Requirements for Spacing*” in paragraph 6.14.4.8.2.8.

6.14.5.3.3 When certain lanes are used as contraflow lanes both outside the work area and on distances longer than 1 km and which, for safety reasons, require changes in the temporary sign, the distance between the visual markers shall be 5 m over a distance of 500 m before and after the deviation and of 25 m for the beaconing in the deviation, in accordance with Article 4.5 *Repères visuels* of chapter 4 of Tome V of MTQ.

6.14.6 TEMPORARY PAVEMENT MARKING

6.14.6.1 The **Contractor** shall design, supply, implement, maintain and remove the temporary pavement marking required to properly direct traffic at all times.

6.14.6.2 Before starting the pavement marking work, the **Contractor** shall provide pavement marking drawings, signed and sealed by an engineer member of the OIQ, for all planned traffic configurations. The pavement marking drawings shall comply with the Reference Standards.

6.14.6.3 When temporary pavement marking is necessary, the existing marking shall be removed and replaced by the marking required due to the work. Upon completion of the work, the temporary marking shall be removed and replaced with the appropriate permanent marking before the lanes are reopened to traffic. The removal of the temporary marking (alkyd paint) shall be done by sandblasting, steel shot blasting or other. The use of abrasive rollers is prohibited.

6.14.6.4 Masking temporary or permanent markings with black paint or black color marking tape is prohibited.

6.14.6.5 The **Contractor** shall make sure that the pavement of the lanes that are open to traffic is appropriately marked; if the use of paint is impossible, the **Contractor** shall temporarily install reflective lane delineators for a period not exceeding fifteen (15) days.

6.14.6.6 As long as the final pavement marking is not in place, the **Contractor** shall ensure that the temporary pavement marking is adequate at all times. The use of delineators shall constitute a temporary measure.

6.14.6.7 When used, the delineators shall be installed 3 m apart for continuous lines, broken edge lines, gores and when approaching obstacles, and every 2 m for double yellow lines. For double lines, the delineators shall be installed in pairs in order to take the shape of the double lines. The colour of the delineator shall comply with the Reference Standards.

6.14.6.8 The temporary delineators shall be replaced by temporary or permanent marking, in accordance with the indications on drawing, as soon as possible.

6.14.6.9 When work concerns the replacement of a deck section, bridge approaches or a roadway whose base is made of concrete, the temporary marking shall be done on a black base in order to emphasize the marking.

6.14.7 LANE CONTROL SYSTEM AND AUTOMATED GATES

6.14.7.1 The Jacques Cartier and Champlain Bridges are equipped with lane control light systems. These systems, operated by the *Sûreté du Québec*, offer relatively limited indication possibilities.

6.14.7.2 Table 2 “Jacques Cartier Bridge System Characteristics” and Table 3 “Champlain Bridge System Characteristics” set out the system characteristics of the Jacques Cartier Bridge and Champlain Bridge.

Table 2: Jacques Cartier Bridge System Characteristics

Lanes	Possible displays*	
	Towards Montreal	Towards the South Shore
1 (upstream)	Closed	Open or Closed
2	Closed	Open or Closed
3	Open or Closed	Open or Closed
4	Open or Closed	Closed
5 (downstream)	Open or Closed	Closed

*Uniform indication over the entire length of the lane.

Table 3: Champlain Bridge System Characteristics

Lanes	Possible displays*	
	Towards Montreal	Towards the South Shore
1 (upstream)	None	Open or Closed
2	None	Open or Closed
3	Open or Closed	Open or Closed
4	Open or Closed	Open or Closed
5	Open or Closed	None
6 (downstream)	Open or Closed	None

6.14.7.3 At the Jacques Cartier Bridge north entry, the automated gates shall be enabled or disabled on the basis of the work being carried out.

6.14.7.4 While developing its Traffic Management and Control Plan, the **Contractor** shall take these lane control light system and automated gates system into consideration. The **Contractor** shall consult the **Owner** and the *Sûreté du Québec* for operational specifics. The Traffic Management and Control Plan shall be developed and work in perfect coordination with the operation of the lane control light system and automated gates system in place.

6.14.8 INFORMATION SIGNAGE

6.14.8.1 PERIPHERAL ROAD SIGNAGE

6.14.8.1.1 The **Owner** may enter into contracts with other contractors for the development, implementation and maintenance of any peripheral road signage made necessary by the carrying out of several projects, including the signage of the proposed alternate routes during lane closures. The administration of these contracts falls under the Engineer’s responsibility.

6.14.8.1.2 The **Contractor** shall coordinate, operate, integrate and, where applicable, modify its temporary road signage in order to ensure an effective interface thereof with the peripheral road signage and to make it compatible with that of other contractors. The **Contractor** may be required to supply and operate mobile variable message signs (VMS) so as to manage lane closure and reopening operations as efficiently as possible.

6.14.8.2 COMPLEMENTARY SIGNAGE PANELS

6.14.8.2.1 As a complement to the **Owner**'s signage drawings, MTQ's standardized drawings and traffic maintenance drawings provided by the **Contractor**, the Engineer may require complementary signage panels in order to satisfy the traffic management scenarios, ensure the safety of, and inform the road users. The complementary signage panels are also required to signal the detour routes, as well as the required information or routing signs.

6.14.8.2.2 Following a request from the Engineer, the **Contractor** has seventy-two (72) hours to fabricate complementary signage panels compliant with drawings and specifications and install them in the designated locations.

6.14.8.2.3 The letters and numbers appearing on the complementary signage panels shall comply with the *Metric Edition Standard Alphabets for Highway Signs and Pavement Markings* published by the U.S. Department of Transportation and approved by the Transportation Association of Canada.

6.14.8.2.4 These signs shall have an orange background and shall be equipped with a fluorescent type III or IV reflecting film. They shall be rectangular and compliant with Tome V of MTQ. The letters shall be at least 150 mm high and of the C, D and E series. The shop drawings shall, before the fabrication of the signage panels, be submitted to the Engineer for review. The messages on these signage panels shall be bilingual (French and English) and the characters shall be the same height in both languages.

6.14.8.2.5 The complementary signage panels shall be fabricated on plywood panels (19 mm thick) or aluminium panels, whose thickness varies with the size, in accordance with the Reference Standards. Each panel shall consist of one single piece, compliant with Tome V of MTQ, or according to the specifications transmitted to the **Contractor** by the Engineer.

6.14.8.2.6 At the request of the Engineer, the signs shall be fabricated on "coroplast" if they are intended to be installed on existing panels.

6.14.8.2.7 The complementary signage panels remain the property of the **Contractor** and shall be available for the entire duration of the Contract.

6.14.8.2.8 The name and phone number of the company shall be written on the back of the signage panels.

6.14.9 MOBILE VARIABLE MESSAGE SIGNS (VMS)

6.14.9.1 SCOPE

6.14.9.1.1 This article covers the supply and use of mobile VMS where required. These signs are used, in particular, to convey to users and motorists, information relating to lane closure schedules, traffic lanes that are open in each direction, roadway conditions, potential dangers and distance separating them from the work area.

6.14.9.2 SPECIFIC STANDARDS AND REQUIREMENTS

6.14.9.2.1 The **Contractor** shall notify the Engineer, in real time, of the installation of the VMS and shall provide the Engineer with the following information regarding the VMS at the time of installation thereof:

6.14.9.2.1.1 the name of the owner;

6.14.9.2.1.2 the identification number;

6.14.9.2.1.3 the exact location (with reference to a stationing);

6.14.9.2.1.4 the phone number, including the area code.

6.14.9.2.2 Every time a VMS are moved, modified, changed or dismantled, the **Contractor** shall provide the Engineer with the same information as that listed in paragraph 6.14.9.2.1.

6.14.9.2.3 At the time of installation at the designated location, a representative of the **Contractor** shall remain on site and ensure that the sign functions properly.

6.14.9.2.4 At the kick-off meeting, the **Contractor** shall submit to the Engineer, for review, the exact location of the VMS that the **Contractor** shall install at least seven (7) days before the first closure.

6.14.9.2.5 It shall be possible to move the mobile VMS upon request from the Engineer. They shall remain operational throughout the duration of the work.

6.14.9.2.6 The logistics pertaining to the operation of these VMS shall be included in the **Contractor**'s Traffic Management and Control Plan.

6.14.9.2.7 When signs are installed on the **Owner**'s property, the messages thereon shall be bilingual (French-English) and the characters shall be the same height in both languages.

6.14.9.2.8 Each VMS shall be of a matrix type allowing a display of at least three (3) lines of twelve (12) characters each. The lettering shall be at least 300 mm high. The matrix shall be made of at least 27 x 72 pixels. The housing of the VMS shall be at least 3.0 m wide by 1.2 m high. The VMS shall display several successive (alternating) messages in a clear and visible manner. Each VMS shall be numbered according to its identification.

6.14.9.2.9 The VMS shall be mounted on a trailer that allows a stable and safe installation. The VMS shall be mounted on a hydraulic mast, allowing it to be raised once installed. It shall also be possible, in order to improve the visibility of the message, to orient the VMS without having to move the trailer.

6.14.9.2.10 The VMS light intensity shall be capable of adapting automatically to ambient light, so that the messages are always perfectly legible at a distance of 250 m.

6.14.9.2.11 The VMS shall have the following operating characteristics:

6.14.9.2.11.1 no external connection shall be required to ensure the energy supply thereof. It shall be of the stand-alone type and be powered by a diesel generator or by one or more solar panels, whichever is best suited to worksite conditions. Furthermore, the VMS shall be capable of operating twenty-four (24) hours a day;

6.14.9.2.11.2 for the VMS powered by solar energy, the **Contractor** shall take into account the shadows created by surrounding structures and ensure that the VMS are working properly in bad weather or on cloudy days. The **Contractor** shall remedy all defective power supply at its expense;

6.14.9.2.11.3 for the VMS powered by a diesel generator, the **Contractor** shall take into account the impact of the noise generated by such generators and, if necessary, obtain a permit and in accordance with the requirements of subsection 6.13 *Environmental Protection*;

6.14.9.2.11.4 the VMS shall be capable of storing the messages to be displayed. It shall also be programmable using a compatible computer. The VMS communication language shall be NTCIP (National Transportation Communications for ITS Protocol). The VMS shall be programmable on-site and via cellular communication;

6.14.9.2.11.5 in case of a breakdown, the VMS shall automatically display a general message selected by the **Owner** to ensure the safety of road users.

6.14.9.2.12 The communication costs for VMS equipped with a mobile device shall be paid by the **Contractor**.

6.14.9.2.13 The **Contractor** shall supply the software allowing the communication between the computer and the VMS.

6.14.9.2.14 The **Owner** owns permanent VMS that display information to users. The **Contractor** may not use these signs for its own purposes or for its sign needs. Furthermore, the **Contractor** shall, where required, provide for, own and operate its own VMS.

6.14.9.2.15 The **Contractor** shall provide the **Owner** with all assistance required to enable the latter to change and control, at all times, the displayed messages. The **Contractor** shall ensure that the **Owner** has full control of the messages.

6.14.9.2.16 The **Contractor** shall clear the VMS of snow after each snowfall and shall make sure that the messages are visible by the users at all times.

6.14.10 WORKSITE CONCRETE BARRIERS

6.14.10.1 The worksite concrete barrier sections shall comply with standardized drawings VIII-5-001, VIII-5-002 and VIII-5-009 of Tome VIII of MTQ.

6.14.10.2 All concrete barriers shall be new. The barriers that were damaged during handling or damaged and deemed unusable by the Engineer shall be repaired or replaced by the **Contractor**, at its expense. The worksite concrete barrier sections deemed inefficient or non-compliant by the Engineer shall be replaced within twenty-four (24) hours from his verbal notice. The concrete barriers shall meet the following criteria, failing which they will be refused:

6.14.10.2.1 The worksite concrete barriers shall be free of cracks extending on either side of the ends thereof;

6.14.10.2.2 The worksite concrete barriers shall have connections that are free of detachments at the ends;

6.14.10.2.3 The worksite concrete barriers shall be positioned so that the end of the barrier, at the curb facing traffic, does not present any obstacles likely to allow a tire to enter.

6.14.10.3 The **Contractor** shall supply and install T-RV-11 visual markers (mini-beacons), in accordance with the Tome V of MTQ, on the top of every other section of the worksite concrete barrier sections. The mini-beacons installed on a same chain of barriers shall be of the same type, same dimensions and fabricated with the same films.

6.14.10.4 At each end of a chain of worksite concrete barriers that represent an obstacle to traffic, the **Contractor** shall install a worksite impact attenuator.

6.14.11 WORKSITE IMPACT ATTENUATOR

6.14.11.1 At each end of a chain of worksite concrete barriers that represent an obstacle to traffic, the **Contractor** shall install a worksite impact attenuator of performance level TL-2 or TL-3, depending on the location and traffic speed.

6.14.11.2 The device used shall be part of MTQ's HOM-5660-102 *Atténuateurs d'impact* approved list and meet the speed of 70 km/h for a TL-2 and of 100 km/h for a TL-3.

6.14.11.3 The worksite impact attenuator shall not be anchored to the surface on which it is installed and shall cover the end of the chain of barriers without however encroaching on the traffic lane or adjacent shoulder. A chevron made of Type V film compliant with MTQ standard 14101 shall be installed on the front of the impact attenuator.

6.14.11.4 The installation of a temporary impact attenuator shall be subject to a certificate of conformity, signed by an engineer member of the OIQ, certifying that the impact attenuator is installed in accordance with the manufacturer's recommendations. This certificate shall be submitted to the Engineer by the **Contractor** within twenty-four (24) hours following the installation.

6.14.11.5 Between October 15 and April 15 of each year, the **Contractor** shall, at its expense, take the necessary measures to ensure that the liquid inside the impact attenuator does not freeze. The liquid used shall be non-toxic and of density more or less equal to that of water. The use of a calcium chloride solution is recommended, with a mass concentration of 29% (1.29 kg/L). The product shall come from a natural source or be factory mixed. A certificate confirming that characteristic shall be provided to the Engineer by the **Contractor**.

6.14.11.6 Following an impact against one of the impact attenuators, the **Contractor** has twenty-four (24) hours to repair it or replace it with a fully functional device. In addition, if the damaged impact attenuator partially or completely obstructs one or more traffic lanes, the **Contractor** has thirty (30) minutes from the verbal notice from the Engineer to free the obstructed lane(s).

6.14.12 TRAFFIC HINDRANCE MINIMIZATION SYSTEM

6.14.12.1 Unless otherwise indicated on the drawings, the **Contractor** may, in order to carry out the work covered by this Contract, close one or more traffic lanes pursuant to *the Table(s) of Lanes to be Maintained Open* provided by the **Owner**.

6.14.12.2 Even if such closures are allowed under this Contract, they are still disruptive to traffic flow during the periods concerned and therefore affect the level of service provided to users. In an effort to minimize the impact on users, the **Owner** hereby implements a program to minimize lane closures.

6.14.12.3 The parties therefore agree that the price of this Contract will be reduced when the **Contractor** performs lane closures. For each lane closed within the periods authorized in the *Table(s) of Lanes to be Maintained Open*, the Contract price will be reduced by an amount of one hundred dollars ($100) per hour, before taxes.

6.14.12.4 The Traffic Hindrance Minimization System applies to all types of work (mobile work, very short duration work, short duration work and long duration work) that requires lane closures.

6.14.12.5 The number of hours of lane closures falling under the Hindrance Minimization System shall be compiled jointly by the **Contractor** and the Engineer. When the lanes are controlled by a lane light signals, the hours during which the lanes are closed shall be counted from the time the lane signal of each lane concerned turns red until the time the lane signal returns to green. When there are no lane signals, the hours during which the lanes are closed shall be counted from the exact time when the flow of traffic on each lane is interrupted until the exact time when the flow of traffic resumes.

6.14.12.5.1 For the purposes of calculating the amount of reduction in the price of this Contract, every fraction of an hour during which a lane is closed shall be rounded up to the next half hour.

6.14.12.6 If at the time of preparing its tender, the **Contractor**, in its work planning, deems that it will be necessary to perform lane closures, it shall include in its tender price, under the relevant Pay Item(s) *Traffic Control, Temporary Signage and Traffic Hindrance Minimization System* of the Price Table, the total amount required to reflect any reduction in the price of this Contract applicable under the Traffic Hindrance Minimization System.

6.14.12.7 The reduction in the Contract price will be applied by the **Owner** at the time of processing any progress claim submitted by the **Contractor**, as work progresses.

END OF SUBSECTION