

## SCHEDULE 20

### SAFETY AND STANDARDS PROTOCOL

#### Definitions:

Unless otherwise specified or the context otherwise requires, for the purposes of this Schedule the following terms have the following meanings:

“**CIM**” means the Confidential Information Memorandum dated December 23, 1998 relating to Highway 407.

“**Concession Agreement**” means the Highway 407 Concession and Ground Lease Agreement between the Crown in Right of Ontario as represented by the Minister without Portfolio with Responsibility for Privatization and Ontario Transportation Capital Corporation pursuant to which the Concessionaire is granted a concession to operate Highway 407.

“**ESAM**” means the explicit safety assessment methodology which is detailed in the Ministry document entitled “1998 Update on Roadside Safety Practice”, available from the Ministry Research and Development Office. (Sample calculations of ESAM are available).

“**Management**” means development, planning, design, construction, operation, maintenance and rehabilitation, and Manage has a corresponding meaning;

“**Minister**” means the Minister of Transportation of Ontario.

“**Ministry**” means the Ministry of Transportation of Ontario.

“**Road Safety Activity**” means monitoring of collisions and potential driver hazards and taking effective, state-of-the-art measures, in the Management of Highway 407, which shall result in the prevention of collisions and/or the mitigation of the severity of collisions.

#### 1. Road Safety Principles

The following principles shall apply to the Management of Highway 407:

- (i) Road Safety Activity is a high priority for the Province on all roads, including Highway 407,
- (ii) the Ministry shall be responsible for setting Ministry Safety Standards,
- (iii) The Concessionaire shall be subject to Ministry Safety Standards in the manner set out in Article 6 of the Concession Agreement, this Schedule and the *Highway 407 Act, 1998*.

- (iv) The Concessionaire may use standards which differ from Ministry Safety Standards only as provided in Section 6.3 of the Concession Agreement;
- (v) the Concessionaire shall establish and implement effective, internal, on-going monitoring and checking processes to ensure compliance with Ministry Safety Standards. The Concessionaire shall act promptly to correct any lack of compliance with Ministry Safety Standards. The safety control processes shall be documented in: a design safety control plan, a construction safety control plan and an operation safety control plan. These processes and plans shall be reviewed and updated annually by the Concessionaire;
- (vi) once each calendar year the Concessionaire shall hire independent auditors to verify and report to the Grantor and to the Concessionaire as set out in this schedule that the Concessionaire has effective safety control processes and safety plans in place and that these processes are being followed by the Concessionaire. The auditors shall be required to provide certification to the Grantor that they do not have a conflict of interest and that they shall carry out their audits in a professional and objective manner;
- (vii) the Concessionaire shall maintain records and archives that document the Concessionaire's ongoing monitoring, checking and correction efforts. The records and archives shall be readily available in an electronic and hard copy format to the Grantor and the firm of independent safety auditors for six (6) years;
- (viii) the Concessionaire shall hire independent, qualified engineers to review the Concessionaire's ongoing Management of Highway 407, at critical milestone points as specified in this schedule and to certify to the Grantor that the Concessionaire's Management of Highway 407 is in accordance with Ministry Safety Standards;
- (ix) the Grantor may from time to time, randomly Audit the Concessionaire's records and the Concessionaire's ongoing Management of Highway 407; and
- (x) policing and commercial vehicle inspection on Highway 407 shall be carried out by the Ontario Provincial Police and the Grantor in accordance with Section 4.1 and Schedules 13 and 15 of the Concession Agreement.

## **2. Concessionaire is Responsible for Road Safety**

The Concessionaire shall be responsible for Road Safety Activity on Highway 407. The Concessionaire shall be required to take anticipatory measures in the Management of Highway 407 to prevent collisions and mitigate the severity of collisions which occur. The Concessionaire shall continuously monitor collision experience and actively seek out potential collision hazards and establish an on-going program of safety improvement.

The Concessionaire must undertake Road Safety Activity on Highway 407 so as to ensure compliance with Ministry Safety Standards and the Concession Agreement.

### 3. Application of Ministry Safety Standards

Ministry Safety Standards change over time as driver profiles and vehicles change, as knowledge of driver behavior grows and as new technologies appear. The Concessionaire shall be responsible for applying the most up-to-date Ministry Safety Standards in the same manner that the Ministry is required to apply such standards on Comparable Controlled Access Highways. At present the Grantor advises that the most up-to-date Ministry Safety Standards are those used in the most current Ministry high volume freeway contracts.

#### 3.1 Current Ministry Safety Standards

For the avoidance of doubt, substantially all of the Ministry Safety Standards which are applicable as at the Effective Date are contained in the documents listed in Table 1 below.

**TABLE 1 - Reference Documents for Ministry Safety Standards:**

<b>Document</b>	<b>Current Distributor</b>
Bridge Clearance and Load Restriction Manual	Ronen House Publishing
Commercial Site Access Policy and Standards Manual	Ronen House Publishing
Concrete Culvert Design and Detailing Manual	Ronen House Publishing
Contract Design Estimating and Documentation Manual	Ronen House Publishing
Design Manual for Highway Illumination – Metric	Sale Data Room
MTO Drainage Manual	Ronen House Publishing
Electrical Engineering Manual – Volume 1 – Electrical Design	Ronen House Publishing
Electrical Eng'g Manual – Volume 2 – Electrical Maintenance	Ronen House Publishing
Electrical Engineering Manual – Volume 3 – C.D.E.D.	Ronen House Publishing
Electrical Engineering Manual – Volume 4 – FTMS – CDED.	Ronen House Publishing
Form-work and False-work Manual	Ronen House Publishing
Geometric Design Standards for Ontario Highways – Metric	Ronen House Publishing
Construction Inspection Tasks Manual	Ronen House Publishing
Highway Engineering Standards Drawings: Structural	Ronen House Publishing
Kings Highway Guide Signing Policy Manual	Ronen House Publishing
Illumination Design Criteria	Sale Data Room
Integral Abutment	Ronen House Publishing
Maintenance Special Provisions	Sale Data Room
Maintenance Quality Standards	Sale Data Room
Manual for Condition Rating of Flexible Pavements (SP-024)	Sale Data Room
Manual for Condition Rating of Rigid Pavements (SP-005)	Sale Data Room
Manual of Uniform Traffic Control Devices	Ronen House Publishing

Modified Special Provisions and Non-Standard Special Provisions Related to Safety	Sale Data Room
Ont. Hwy Br. Design Code Commentary (3 <sup>RD</sup> edition 1991)	Ronen House Publishing
Ontario Highway Bridge Design Code Update (March 1995)	Ronen House Publishing
Ontario Provincial Standards and Specifications User's Guide	Ronen House Publishing
Ontario Provincial Standards and Specifications – Vol.1	Ronen House Publishing
Ontario Provincial Standards and Specifications – Vol. 2	Ronen House Publishing
Ontario Provincial Standards and Specifications – Vol. 3	Ronen House Publishing
Ontario Provincial Standards and Specifications – Vol. 4	Ronen House Publishing
Ontario Structure Inspection Manual	Ronen House Publishing
Ontario Traffic Signal Control Equipment Specifications	Ronen House Publishing
Pavement Design and Rehabilitation Manual	Ronen House Publishing
Post Tensioned Decks	Ronen House Publishing
Pre-stressed Concrete Manual	Ronen House Publishing
Procedures for the Design of High Mast Pole Foundations	Sale Data Room
Roadside Safety Manual	Ronen House Publishing
Shoulder Rumble Strip Draft Directive	Sale Data Room
Sign Support Manual	Ronen House Publishing
Structural Manual	Ronen House Publishing
Structural Inspection Manual	Ronen House Publishing
Structural Steel Coating Manual	Ronen House Publishing
Structure Rehabilitation Manual	Ronen House Publishing
Traffic Signal Timing & Capacity Analysis for Intersections	Sale Data Room
Traffic Control Manual for Roadway Work Operations	Ronen House Publishing
1993 AASHTO Guide for the Design of Pavement Structures for Rigid and Flexible Pavements	Sale Data Room
Winter Operations for Snow and Ice Control by Contractors	Sale Data Room

Except as set out in the Concession Agreement, the Grantor has no obligation to inform the Concessionaire of any changes to Ministry Safety Standards. Without limiting the operation of clause (ii) of section 6.1 of the Concession Agreement, the Grantor may advise the Concessionaire of changes to Ministry Safety Standards from time to time.

The Concessionaire shall be also be required to comply with the following changes in Ministry Safety Standards that over-ride the requirements of Table I above:

(i) Whenever the extent of the Highway 407 Lands and existing infrastructure allow, the Concessionaire shall use its best efforts to utilize radii greater than minimum ones.

(ii) The Concessionaire shall use inner loop ramp cross-falls of up to 8% depending on the radius of the curve and design speed.

(iii) The Concessionaire shall use hot mix surfaces on inner loops at interchanges, or maintain concrete surfaces with equivalent surface treatment.

(iv) The Concessionaire shall use fully paved right and left shoulders with rumble strips on both shoulders even if there is barrier or guide rail present.

(v) The Concessionaire shall use ESAM and the latest Ministry roadside safety practice when selecting from several possible design alternatives in order to choose the most cost cost-effective design alternatives. A design solution determined by ESAM takes precedence over a Ministry roadside safety warrant, such as a Clear Zone and Embankment Protection Warrant. Design consistency must also be considered and measures found cost effective in most locations shall be introduced on a Project wide basis. In addition the Concessionaire shall:

-use the ESAM to check warranting conditions beyond the existing Clear Zone standard (ten (10) metres on tangents, more on curves) up to a distance 1.5 times the Clear Zone to determine if enhanced protection is warranted ( $B/C > 1$ ). Alternatively, without a calculation, the Concessionaire shall maintain a fifteen (15) metres clear zone instead of the standard Clear Zone. If such clear zones are not achievable because of space limitations, the hazard must be protected with barriers or crash attenuators in accordance with the approach used on Highway 407 Central;

(vi) unprotected fixed objects, such as high mast poles, located beyond the Clear Zone in the vicinity of ramps are subject to additional requirements. Such objects must be located either on the inside of the curve, or if on the outside, a stopping distance reduced by forty (40) metres must be provided when such objects are in the likely path of an errant vehicle that fails to negotiate the first curve;

(vii) the Concessionaire shall use fill side slopes and ditch slopes of 6:1 whenever practical; on steeper fills and where there is limited right-of-way, the Concessionaire shall ESAM to determine if a 4:1 slope or guide rail is more cost effective;

(viii) the Concessionaire shall ensure that the continuity of any guide rail is maintained (i.e. there shall be no short gaps between sections);

(ix) the Concessionaire shall not use any type of cable guide rail;

(x) slopes steeper than 6:1 which are perpendicular to Highway 407 must be protected with a steel beam guide rail when the potential impact point is within fifteen (15) metres from the edge of the pavement; such steel beam guide rail protection shall extend further where a terrain or drainage feature may reasonably be expected to guide an errant vehicle towards such slope;

(xi) cut slopes ( including those under the structures) at any offset not steeper than 2:1 do not require guide rail protection;

(xii) the backside of toll structures must be protected if within fifteen (15) metres; or may be landscaped to guide an errant vehicle back to the mainline of Highway 407;

(xiii) a traversable area roughly thirty (30) metres long and three (3) metres wide, sloping at no more than 4:1, must be provided behind the nose of all guide rail end treatments on the mainline only to allow for gating of the guide rail end treatment;

(xiv) the Concessionaire shall avoid longitudinal drainage features that may guide errant vehicles into fixed objects;

(xv) the Concessionaire shall install hazard protection or splayed treatment for parallel culvert ends, (similar in design to those used on Highway 407 Central and Highway 410 at Highway 407) and for eligible concrete box cross culverts similar to those used on Highway 401 at Bowmanville;

(xvi) the Concessionaire shall use only frangible base poles for conventional lighting, unless the base poles are shielded by a guide rail that was provided for another reason;

(xvii) the Concessionaire shall use chevron signs on the outside of all inner loops and other off-ramp first curves where the difference between the design speeds of the main line and that of the first curve is greater than thirty-five (35) kilometres per hour for freeway-to-freeway ramps and forty-five (45) kilometres per hour for arterial road ramps;

(xviii) the Concessionaire shall not use barrier curbs along the mainline shoulder; mountable curbs must be used only when hydrology necessitates; the use of curbs must be kept to a minimum, especially at bullnoses; and

(xix) all Highway 407 mainline structures shall incorporate shoulders of no less than two point five (2.5) metres.

For the purposes of this Schedule the following shall also be considered Ministry Safety Standards:

A freeway flexible pavement is deemed to be in need of immediate rehabilitation when the Pavement Condition Index reaches 60. A freeway rigid pavement is deemed to be in need of immediate rehabilitation when the Pavement Condition Rating reaches 60. However, when either or both of an individual distress or a distortion reaches a severity rating of severe, regardless of the extent, the Concessionaire shall establish and implement a schedule for immediate mitigation.

For freeway pavements, when the surface friction skid number reaches  $SN_{100}=30$  as measured by a breakforce trailer, conforming to ASTM Standard E-274 and E-501, the Concessionaire shall undertake immediate investigation, and if appropriate, establish and implement a schedule for immediate mitigation. Remedial action is also to be undertaken whenever a surface friction problem is thought to exist irrespective of the surface friction skid number.

The Concessionaire shall implement appropriate improvements within one (1) year of a request by the Grantor in collision prone areas (locations with a disproportionately high number of collisions, whether involving fatal or near fatal injuries or any property damage), or when the collision rate for any section of Highway 407 exceeds 0.9 collisions/million vehicle kilometres of travel.

### **3.2 Higher or Different Ministry Safety Standards**

There may be situations in which the Concessionaire has applied sound engineering judgement in the use of the most up-to-date Ministry Safety Standards, but nevertheless the Grantor instructs the Concessionaire to use a Higher Ministry Safety Standard. In this case, the Grantor shall enter into an agreement to compensate the Concessionaire for the extra costs associated with using the Higher Ministry Safety Standard, in accordance with section 6.5 of the Concession Agreement.

The Concessionaire may voluntarily use a Higher Ministry Safety Standard. No compensation shall be provided to the Concessionaire for the use of such Higher Ministry Safety Standards.

The Concessionaire may request the use of standards that are different from Ministry Safety Standards in accordance with section 6.3 of the Concession Agreement.

### **3.3 Dispute or Contravention of Ministry Safety Standards**

Where a dispute arises between the Concessionaire and the Grantor with respect to compliance with, applicability or interpretation of Ministry Safety Standards the matter shall be dealt with as in section 6.4 of the Concession Agreement.

If a contravention of any Ministry Safety Standard is discovered, the Grantor shall deal with such contravention as in section 6.4(b) of the Concession Agreement.

## **4. Qualifications of Key Personnel**

Without limiting the requirements of sections 4.4(a) and 4.4(b) of the Concession Agreement, but subject to the Management Plan, the Concessionaire shall retain the services of qualified personnel as set out in this section. The Concessionaire shall retain only competent and qualified staff to Manage Highway 407. The Concessionaire shall retain an operations and maintenance manager and a safety control plan manager at all times. The Concessionaire shall retain the following key personnel to Manage the design and construction of any major portion of Highway 407:

- (a) a project manager,
- (b) a design manager,
- (c) a construction manager, and
- (d) an environmental manager

The qualification requirements for key staff are set out in this Schedule. For the avoidance of doubt, any key staff identified in the Management Plan shall be deemed to be qualified personnel meeting the requirements set out in this Schedule.

#### **4.1 Qualifications of Project Management, Design Management and Construction Management Staff**

The Concessionaire shall retain the services of a project manager and key personnel to Manage design and construction on Highway 407.

The project manager and key personnel must have experience in project management and the integration of the various disciplines required on design and construction activities on highway projects.

The project manager must also have experience in the supervision of any one of: a design manager, a construction manager or a maintenance/operations manager (as set forth below in this section) and experience in those areas in which the project manager does not have supervisory experience.

The Concessionaire's design activities shall be managed by a design manager with the following minimum qualifications:

- (i) -professional civil engineer licensed in the Province of Ontario,
- (ii) -minimum of fifteen (15) years experience in highway design, at least half applied in climates similar to Ontario,
- (iii) -design experience on three (3) one hundred thousand (100,000)+AADT freeway projects with construction value over ten million dollars (\$10,000,000) in the last ten (10) years,
- (iv) -five (5) years of experience in direct supervision of design engineers,
- (v) -experience with Ministry Safety Standards, and
- (vi) -experience in consulting with provincial agencies, municipalities, public interest groups, and the public.

The Concessionaire's construction activities shall be managed by a construction manager with the following minimum qualifications:

- (i) -minimum of ten (10) years experience in highway construction supervision,
- (ii) -construction experience on three (3) one hundred thousand (100,000)+AADT freeway projects with construction value over ten million dollars (\$10,000,000) in the last ten (10) years,
- (iii) -five (5) years of experience in direct supervision of construction field staff,
- (iv) -familiarity with Ontario specifications, standards and practices,
- (v) -experience in the coordination of construction activities in a design/build environment, and
- (vi) -experience on a project that used a quality control plan.



The construction manager must have access on his or her team to a professional engineer, licensed in the Province of Ontario.

#### 4.2 Qualifications of Environmental Manager

The Concessionaire must retain the services of an environment manager and key staff with collective experience in environmental assessment and protection in:

- (i) environmental assessment,
- (ii) obtaining environmental permits and approvals,
- (iii) compliance with Laws and Regulations,
- (iv) familiarity with Ontario specifications and standards
- (v) stream, river and wetland protection,
- (vi) soil erosion control,
- (vii) wildlife habitat protection,
- (viii) wayside pit operation and mitigation measures,
- (ix) emergency response and communication,
- (x) construction noise control, and
- (xi) operating noise control.

The environmental manager must have:

- (i) recent successful experience in the preparation and submission of three environmental study reports or environmental assessments for projects in the Province of Ontario,
- (ii) recent, relevant successful experience in environmental protection and coordinating the identification of environmental constraints, development of environmental design and mitigation elements in the Province of Ontario and implementation and monitoring of associated construction protection for complex highway projects in the Province of Ontario,
- (iii) recent successful experience in securing formal approvals or agreements required for design and construction of complex highway projects in the Province of Ontario, and
- (iv) experience consulting with provincial agencies, municipalities, public interest groups, and individual members of the public.

The environmental manager must ensure that proper consultation is conducted during the design and construction phases, that required reports are submitted in accordance with Laws and Regulations and other pre-approval conditions referred to in the Concession Agreement and the CIM, and that proper environmental measures are part of the design. During construction, the environmental manager will ensure that environmental measures are properly installed and are effective.

#### **4.3 Qualifications of Safety Control Plan Manager**

The Concessionaire shall retain the services of a safety control plan manager, who is a licensed civil engineer in Ontario, with at least five (5) years experience in construction quality control. The safety control plan manager must have recent experience in the administration of a quality control plan for at least one major highway construction project valued at least ten million (\$10,000,000). The safety control plan manager shall manage the safety control plans.

#### **4.4 Qualifications of Design Staff**

The Concessionaire shall retain the services of key design personnel who have experience in the design of major roadways including road design, pavement design, bridges, overpasses, other structures, drainage facilities, hydraulic design of major water crossings and geotechnical work.

#### **4.5 Qualifications of Construction Staff**

The Concessionaire shall retain the services of key construction personnel who have experience in the construction of major roadways (i.e. road design, pavement design, bridges, overpasses, other structures, drainage facilities, hydraulic design of major water crossings and geotechnical work), and the Management of freeway traffic during construction.

#### **4.6 Qualifications of Operations & Maintenance Staff**

The Concessionaire shall retain the services of an operations manager and key operations and maintenance personnel who collectively have experience in:

- (i) -routine one hundred thousand (100,000)+ AADT freeway maintenance (summer and winter),
- (i) -specialty maintenance (bridge repair, striping, illumination, crack sealing, tolling),
- (ii) -maintenance and operations management,
- (iii) -tolling management,
- (iv) -public relations and administration,
- (v) -freeway traffic operations (corridor control and traffic control),
- (vi) -familiarity with Ontario freeway maintenance and operation standards, and
- (vii) -emergency response support (e.g. pothole repair, sign collapse, accident cleanup etc.)

#### **5. Design Safety Control Plan**

The Concessionaire shall implement effective monitoring, checking, testing, correlation and technical review control processes, to ensure that pre-engineering input data and design output products are free from errors and omissions and are in compliance with Ministry Safety Standards.

For the avoidance of doubt, control processes shall include:

- (i) -listing and sign-off on applicable design standards by the design manager prior to the start of the design,
- (ii) -checking of pre-engineering data, supplier drawings and other design input data for accuracy,
- (iii) -laboratory staff, equipment, technician and procedure certification programs,
- (iv) -accuracy, quality checking and double stamping of design products (e.g. reports, drawings, calculations etc)
- (v) -milestone design safety audits and constructability reviews, and
- (vi) -certification by the design manager and project manager that the design products comply with Ministry Safety Standards as each design milestone is completed and prior to proceeding to the next design phase.

The control processes used during design shall be documented in a design safety control plan ("DSCP"). The Concessionaire shall update the DSCP as control processes are changed and improved.

When design activities are being carried out, the Concessionaire shall use the control processes and provide the Grantor with:

- (i) -names and qualifications of staff responsible for ensuring control processes are used,
- (ii) -a diary of monitoring and checking activities,
- (iii) - a list of identified instances of non-compliance with Ministry Safety Standards
- (iv) -the actions and time taken to correct non-compliance with Ministry Safety Standards

Each year the Concessionaire shall hire an independent consulting firm, with expertise in quality control processes, to audit and file a report within forty-five (45) Business Days after the end of the most recent Fiscal Year on the Concessionaire's design control process and DSCP. The independent consultant shall audit the Concessionaire to ensure:

- only qualified project management and design staff are being used,
- design safety control processes are in place, and are functioning effectively,
- design safety control plans are in place which adequately document control processes, and
- record keeping is adequate to document control process activities and compliance with Ministry Safety Standards.

If the independent consultant finds instances of non-compliance with Ministry Safety Standards, the consultant shall include such information in the report to the Grantor and the Concessionaire. Upon receipt of the report, the Concessionaire shall promptly forward to the Grantor a work-plan indicating necessary corrective measures. If the Grantor is not satisfied with the Concessionaire's response, the Grantor may give notice of non-compliance to the Concessionaire requiring it to make specific improvements within a reasonable time period specified by the Grantor. If action is not taken within the specified time period, the Grantor may prohibit further construction until adequate design control processes are in place.

## **6. Safety Audit of Design Products**

The Concessionaire shall hire an independent design safety auditor ("IDSA") licensed to practice civil engineering in Ontario, who shall:

- (i) -be licensed to practice civil engineering in Ontario,
- (ii) -have a minimum of ten (10) years of traffic engineering experience,
- (iii) -have knowledge of human factors theory related to driver performance, and
- (iv) -have formal state of the art training in the quantification of the collision costs alternative engineering decisions and collision prevention and mitigation techniques.

The IDSA shall review the Concessionaire's design at the appropriate stages of completion in accordance with prudent design auditing practice to ensure that the design meets Ministry Safety Standards. Upon completion of that design review, the IDSA shall promptly provide a report to the Concessionaire and the Grantor. If the report indicates that there are design deficiencies or non-compliance with Ministry Safety Standards, the Concessionaire shall promptly forward to the Grantor a work-plan indicating necessary corrective measures. If the Grantor is not satisfied with the Concessionaire's response, the Grantor may give notice of non-compliance to the Concessionaire requiring it to make specific improvements within a reasonable time period specified by the Grantor. If action is not taken within the specified time period, the Grantor may prohibit the start of further construction, until Ministry Safety Standards are met. The Grantor shall provide notice to the Concessionaire, immediately upon the expiry of the specified time period, of the Grantor's decision to prohibit the start of further construction.

For the avoidance of doubt, the IDSA shall review the following design safety elements and any other elements that impact on safety:

### **6.1 Mainline Design Information Required**

- Horizontal and Vertical Alignments
- Related Stopping Sight Distances
- Number of Lanes, Lane and Shoulder Width
- Cross-fall and Super-elevation
- Side and Back-slopes and Roadside Ditch Cross-Section
- Median Barrier Types
- Roadside Barrier and Curb and Gutter Types and Locations
- Hazard Protection for Barrier Ends and Drainage Structures
- Horizontal and Vertical Clearances to Obstructions
- Crash Attenuation Devices at Light Poles, Structures, Overhead Sign Support etc
- Other Roadside Safety Appurtenances
- Fencing and Other Pedestrian Restrictions
- Traffic and Commercial Sign Designs (Including TODS and Logos), Layout, Reflectivity
- Pavement Marking Layout, Reflectivity
- Delineators, Rumble Strips and Other Traffic Control Devices
- Special Design Features (Vehicle Inspection Lay-bys, Highway Toll Infrastructure etc)

## **6.2 Interchange Design Information**

Interchange Type, Layout and Spacing  
Bull Nose Locations and Stopping Sight Distance  
Gore Protection Measures,  
Approaching Side-Road and Ramp Cross-Sections, Barrier Protection, Radii and Alignment  
Deceleration/Acceleration Lane Lengths and Tapers,  
Weave Sections and Lane Continuity  
Sign and Pavement Marking Design and Layout  
Intersection Layout and Turning Lanes at Ramp Junction with Intersecting Side roads

## **6.3 Structural Design Information Required**

Structure Type and Span  
General Arrangement Drawing  
Sidewalk Location and Width  
Barrier Wall and Railing Type on Deck  
Guide-rail and Curb Type on Approaches and Connection to Structure  
Substructure Traffic Clearances At Over/Underpasses with Intersecting Roads

## **6.4 Electrical Design Information Required**

Illumination Type and Layout of Poles (permanent and temporary, full and partial)  
Preliminary Traffic Signal Type and Layout Drawings (PHM 125) and Final  
Traffic Sign Design at Ramp Junction with Intersection Side-Roads  
Locations of Above Ground Electrical Equipment (including Highway Tolling System requirements)

## **6.5 Pavement Structure Design Information Required**

Pavement Skid Resistance  
Strategy To Maintain Skid Resistance and Ride Quality

## **6.6 Traffic Management Information Required**

Traffic Staging Drawings  
Detour Design Speed, Cross-Section, Clearances & Horizontal/Vertical Alignment  
Temporary Signs, Pavement Markings, Signals and Traffic Protection Measures  
Certifications By Professional Engineer That Form-work, False-work, Temporary Protection and Removals Schemes Have Been Designed and Checked In Accordance with Ministry Requirements  
Temporary Closure Communication Plan

Without limiting the operation of clause (ii) of section 6.1 of the Concession Agreement, as design standards and methodologies and as infrastructure and vehicle technologies change, the Grantor may periodically update the list of design safety elements that the IDSA shall be required to review.

## 7. Construction Safety Control Plan

The Concessionaire shall implement effective monitoring, checking, testing, and correlation control processes, to ensure that:

- (i) -the Concessionaire complies with Ministry Safety Standards for construction
- (ii) - the Concessionaire constructs Highway 407 in accordance with the designs reviewed by the IDSA,
- (iii) -original designers and the IDSA review design changes during
- (iv) -traffic is managed safely during construction,
- (v) -construction drawings and reports produced during construction are checked and double stamped,
- (vi) -laboratory staff, equipment and technicians undertake certification programs, and
- (vii) -the construction manager has certified that construction products comply with Ministry Safety Standards as construction milestones are completed and prior to proceeding to the next construction phase.

A construction safety control plan ("CSCP") shall document the control processes used during construction. The Concessionaire shall update the CSCP for each construction project as control processes are changed and improved.

When construction activities are being carried out, the Concessionaire shall use the control processes set out in this schedule and provide the Grantor with:

- (i) -names and qualifications of staff responsible for ensuring control process are used,
- (ii) -a diary of monitoring and checking activities,
- (iii) -a list of identified instances of non-compliance with Ministry Safety Standards
- (iv) -the actions and time taken to correct non-compliance with Ministry Safety Standards

In each year the Concessionaire shall hire an independent consulting firm, with expertise in quality control processes, to audit and file a report within forty-five (45) Business Days following the end of the most recent Fiscal Year with respect to the Concessionaire's constructions safety control plan. The independent consultant shall audit the Concessionaire to ensure that:

- (i) only qualified construction staff are being used,
- (i) construction safety control processes are in place, and functioning effectively,
- (i) construction safety control plans are in place that adequately document control processes, and
- (i) record keeping is adequate to document control process activities and compliance with Ministry Safety Standards.

If the independent consultant finds that the processes are not in place or are not effective, the consultant shall include such information in the report to the Concessionaire and the Grantor. If the report indicates that adequate control processes are not in place or not effective, the Concessionaire shall promptly forward the Grantor a work-plan indicating necessary corrective measures. If the Grantor is not satisfied with the Concessionaire's response, the Grantor may

give notice of non-compliance to the Concessionaire requiring it to make specific improvements within a reasonable time period specified by the Grantor. If action is not taken within the specified time period, the Grantor may prohibit further construction until adequate control processes are in place.

## **8. Safety Audits of Construction Activities**

The Concessionaire shall hire an independent structure safety auditor ("ISSA"), licensed to practice civil engineering in the Province of Ontario, with a minimum of ten (10) years of structural engineering experience.

The ISSA shall review the following structural operations at key milestones during construction established by the Grantor to ensure compliance with the design documents and Ministry Safety Standards:

- Removal of Structure
- Concrete Structures
- Reinforcing Steel
- Structural Steel
- Structural Wood Systems
- Steel Barrier Rail and Pedestrian Handrail
- Pre-stressed Concrete - Precast Members
- Post tensioning of Concrete
- Sign Support Structures
- Formwork and Falsework
- Temporary Modular Bridges
- Deck Joints
- Bearings
- Retained Soil System
- Shoring and Bracing
- Roadway Protection
- Concrete Footings for High Mast Poles
- Excavating & Backfilling for Structure
- Piling and Caissons
- Anchors
- Rock and Earthwork
- Blasting
- Tunnelling
- Large Culverts
- Grounding
- Girder Fabrication and Erection

The Concessionaire shall also hire an independent construction safety auditor ("ICSA") to monitor traffic control and other construction activities throughout construction operations on Highway 407. The ICSA must be licensed to practice civil engineering in the Province of Ontario, with a minimum of ten (10) years of freeway traffic engineering experience,

The ICSA shall monitor all aspects of the Concessionaire's construction operations including the following traffic control activities for compliance with design documents and Ministry Safety Standards:

- Traffic Staging
- Detours,
- Clearances,
- Temporary Signs,
- Temporary Pavement Markings,
- Temporary Illumination,
- Traffic Signals Operations at Ramp Terminals
- Traffic Protection Measures, and
- Temporary Closures and Communication Plan

If the ISSA or the ITSA observes any safety deficiency or non-compliance with Ministry Safety Standards the ISSA or the ITSA shall provide a report to the Grantor and the Concessionaire indicating immediate corrective actions that need to be taken. If the Concessionaire does not remedy the non-compliance within a reasonable period of time, the ISSA or ITSA shall advise the Grantor. The Grantor may, not later than thirty (30) days after the expiry of the specified time period, give notice to the Concessionaire to stop construction until the matter is resolved.

Upon completion of construction of each element subjected to the safety review, the ISSA and the ICSA shall provide a report to the Concessionaire and the Grantor stating that the work was performed in accordance with the design reviewed by the IDSA and in accordance with Ministry Safety Standards.

## **9. Pre-Opening Audit**

Prior to the completion of construction of any section of Highway 407 and before such section is opened to traffic the Grantor shall complete a pre-opening audit to determine if obvious safety deficiencies exist or if there is obvious non-compliance with Ministry Safety Standards or with the Concession Agreement. In addition, safety deficiencies that result from using particular combinations of design elements, not previously detected, shall be brought to the attention of the Concessionaire for correction, within a reasonable time period specified by the Grantor. Until the Concessionaire corrects such deficiencies or non-compliance, the Grantor shall have no obligation to give the Concessionaire notice pursuant to the Concession Agreement that such section of Highway 407 is Commissioned and Opened. Any field safety review conducted by the Grantor shall not relieve the Concessionaire of any of its obligations under the Concession Agreement.



## 10. Operations Safety Control Plan

The Concessionaire shall implement effective information management and control processes, to ensure compliance with Ministry Safety Standards for the operations and maintenance of Highway 407.

For the avoidance of doubt, control processes shall include, but shall not be limited to the following:

Weather Forecasting System,  
Inspection and Reporting Systems

- Work Operations,
- Weather Conditions,
- Roadway Conditions (ice, snow, rain),
- Patrolling to Locate Problems Requiring Immediate Action Per Ministry of Transportation Quality Standard,
- Debris on Driving Surface or Shoulders,
- Pavement Potholes, Joint Failures and Drop-offs,
- Flooding and Washouts,
- Damaged or Missing Fences or Signs
- Malfunctioning Illumination, Signals or Traffic Control Devices,
- Faded Pavement Markings,
- Damaged Barriers or Bridge Rail,
- Trespassers or Unauthorized Use of Right of Way,
- Stranded or Abandoned Vehicles,
- Dangerous Goods Spills, and
- Structure Failures

Road Safety Activity

Collisions Reporting and Response,  
Communications System Among Field Staff,  
Communication System to Emergency Services (OPP, Ambulance, Fire & Tow Trucks),  
Call Out Procedures and Response Times,  
Material Storage,  
Training Programs,  
Compliance with the Occupational Health and Safety Act,  
Collision Clean-up and Operations Restoration, and  
Emergency Responses Procedures.

The control processes used during the operation of highway 407 shall be documented in an operations safety control plan ("OSCP"). The Concessionaire shall update the OSCP annually.

When operations with respect to Highway 407 are being carried out, the Concessionaire shall use the control processes and provide to the Grantor:

- (i) -names and qualifications of staff responsible for ensuring control process are used,

- (ii) -a diary of monitoring and checking activities,
- (iii) -non-compliance with Ministry Safety Standards detected, and
- (iv) -the actions and time taken to correct non-compliance with Ministry Safety Standards.

In each year of the Term the Concessionaire shall hire an independent consulting firm, with quality control experience, to audit and file with the Grantor and the Concessionaire a report within forty-five (45) Business Days following the end of the most recent Fiscal Year with respect to the Concessionaire's OSCP. The independent consultant shall audit the Concessionaire to ensure that:

- (i) only qualified operations and maintenance staff are being used,
- (ii) operations and maintenance safety control processes are in place, and functioning effectively,
- (iii) operations and maintenance Safety control plans are in place which adequately document control processes,
- (iv) the Concessionaire's record keeping is adequate to document control process activities and compliance with Ministry Safety Standards.

If the independent consultant finds that the processes are not in place or are not effective, the consultant shall include such information in the report. If the report indicates processes are not in place or not effective, the Concessionaire shall promptly forward the Grantor a work-plan indicating necessary corrective measures for the Grantor's Approval. If the Grantor does not Approve the work-plan, the Grantor may give notice of non-compliance to the Concessionaire requiring it to make specific improvements within a reasonable time period specified by the Grantor. If action is not taken within the specified time period, the Grantor may, until adequate control processes are in place, (i) prohibit further construction and/or (ii) perform necessary operation and maintenance activities and bill the Concessionaire for its costs, together with an administration fee of fifteen per cent (15%).

## **11. Safety Audits of Operations Activities**

In each year of the Term, the Concessionaire shall hire an independent operations safety auditor ("IOSA") to complete random field reviews during operations and maintenance activities at times specified by the Grantor to monitor compliance with Ministry Safety Standards. The IOSA must have a minimum of ten (10) years experience in on hundred thousand (100,000)+ AADT freeway operations and maintenance in climates similar to the Province of Ontario. The IOSA shall audit the Concessionaire's field operations randomly throughout the year and provide periodic Safety audit reports to the Concessionaire and to the Grantor.

Upon completion of the audits, the IOSA shall provide a report to the Concessionaire, with a copy to the Grantor within 45 Business Days following the end of the most recent Fiscal year. If the safety audit report indicates that the processes are not in place or are not effective, the Concessionaire shall promptly forward the Grantor a work-plan indicating necessary corrective measures. If the Grantor is not satisfied with the Concessionaire's response, the Grantor may give notice of non-compliance to the Concessionaire, requiring it to make specific improvements

within a reasonable time period specified by the Grantor. If action is not taken within the specified time period, the Grantor may, until adequate control processes are in place, perform necessary operation and maintenance activities, and bill the Concessionaire for its costs, together with an administration fee of fifteen per cent (15%).

## **12. Annual Safety Improvement and Rehabilitation Program**

For each year of the Term the Concessionaire shall, using qualified staff, undertake a detailed annual inspection and evaluation program of Highway 407 to take inventory the physical condition of pavements (surface), structures (load carrying capacity and barriers) and traffic control devices (signs, pavement markings, traffic signals and devices, barriers, crash attenuation devices etc). In addition, the Concessionaire shall also undertake an annual traffic volume counting program and investigate collisions that occur on Highway 407.

In order to provide comparability with other Provincial Highways, the physical condition, traffic volume and collision inventories shall be in a format similar to that required to be used by the Grantor. Subject to the Concessionaire entering into a license agreement with the Grantor, infrastructure condition software shall be available, at no charge to the Concessionaire, to be used only with respect to Highway 407. The Concessionaire shall use the inventory information to establish condition indices and performance measures comparable to those required to be used by the Ministry.

These inventories and predetermined criteria shall be used by the Concessionaire to establish an annual rehabilitation and safety improvement program. Triggers for rehabilitation works and safety improvements are as follows:

### **12.1 Pavement Rehabilitation**

A freeway flexible pavement is deemed to be in need of immediate rehabilitation when the Pavement Condition Index reaches a value greater than considered safe by Ministry Safety Standards. However, when either or both of an individual distress or a distortion reaches a severity rating of severe, regardless of the extent, the Concessionaire shall establish a schedule for immediate mitigation.

For freeway rigid pavements, when the surface friction skid number reaches a value greater than considered safe by Ministry Safety Standards, the Concessionaire shall undertake immediate investigation, and if appropriate, establish a schedule for immediate mitigation.

### **12.2 Structure Rehabilitation**

Structures are deemed to be in need of rehabilitation when Ministry Safety Standards are not met for safe loading, roadway width, vertical clearance, deck condition or structure components. Rehabilitation needs and timing shall be determined through periodic inspections under the direction of a professional engineer and in accordance with the Ontario Structure Inspection Manual or its successor.

### **12.3 Safety Improvements:**

The Concessionaire shall consider making improvements in response to concerns associated with the number and severity of collisions, coroner's recommendations or public complaints. The Concessionaire shall implement improvements within one (1) year of a request by the Grantor in collision prone areas (locations with a disproportionately high number of collisions, whether involving fatal or near fatal injuries or any property damage), or when the collision rate for any section of Highway 407 exceeds the level prescribed by Ministry Safety Standards.

### **13. Annual Safety Improvement and Rehabilitation Program Audit**

In each year of the Term the Concessionaire shall hire an independent safety auditor ("ISA") to review the adequacy of the Concessionaire's Annual Safety Improvement and Rehabilitation Program processes and program, to ensure that the program is adequate to ensure road user safety.

The ISA must:

- (i) -be licensed to practice civil engineering in the Province of Ontario,
- (ii) -have a minimum of ten (10) years of traffic engineering experience,
- (iii) -have knowledge of human factors theory related to driver performance, and
- (iv) -have formal state of the art training in the quantification of the collision costs of alternative engineering decisions and collision prevention and mitigation techniques.

Upon completion of the annual audit, and within forth-five (45) Business Days following the end of the most recent Fiscal Year the ISA shall provide a report to the Concessionaire, with a copy to the Grantor. If the report indicates that the safety improvement and rehabilitation program is not in place or is not effective, the Concessionaire shall promptly forward the Grantor a work-plan indicating necessary corrective measures. If the Grantor is not satisfied with the Concessionaire's response, the Grantor may give notice of non-compliance to the Concessionaire requiring it to make specific improvements within a reasonable time period specified by the Grantor. If action is not taken within the specified time period, the Grantor may, until the Concessionaire has an adequate program in place, perform safety improvement or rehabilitation activities, and bill the Concessionaire for the costs including an administrative fee of fifteen per cent (15%).

### **14. Safety Audits**

At any time or times during the Term the Grantor may perform random audits of the Concessionaire's design, construction, operation, maintenance and annual work programming activities, safety control processes or safety control plans in relation to Highway 407, to determine if the Concessionaire's efforts meet Ministry Safety Standards and are adequate to ensure Road Safety. The Grantor may order the Concessionaire to institute corrective action within a reasonable time period specified by the Grantor if (1) Ministry Safety Standards are not being met, (2) adequate control systems are not in place, (3) control systems are not functioning adequately or (4) safety control plan documentation is lacking. If the Concessionaire fails to institute corrective action in the specified time period, the Grantor may, until the Concessionaire demonstrates an ability to adequately and safely perform the work, complete any work the

Grantor reasonably deems necessary and bill the Concessionaire together with an administration fee of fifteen per cent (15%).

### 15. Start-up Requirements

Prior to the start of construction on any portion of Highway 407 the Concessionaire shall first have completed the following tasks:

- (i) retained the services of qualified project management, design, construction, quality staff,
- (ii) developed and implemented design and construction safety control processes,
- (iii) prepared design and construction safety control plans,
- (iv) retained the services of independent consultant firms and ensured such firms have completed audits of the design and construction safety control processes and control plans of the Concessionaire,
- (v) corrected any deficiencies in the Concessionaire's safety control process or plan to the satisfaction of the Grantor,
- (vi) retained the services of independent design, structural and traffic safety auditors,
- (vii) engaged the independent design safety auditor in the review of the Concessionaire's design products, and
- (viii) corrected any design deficiencies to the satisfaction of the Grantor.

Subject to the exception set out below, at all times throughout the Term the Concessionaire must,

- (i) retain the services of qualified operations and maintenance staff,
- (ii) develop and implement operations and maintenance safety control processes,
- (iii) prepare operations and maintenance safety control plans,
- (iv) retain the services of an independent consultant firm to audit the operations and maintenance safety control processes and control plans of the Concessionaire,
- (v) correct any deficiencies in the Concessionaire's safety control process or plan to the satisfaction of the Grantor,
- (vi) retain the services of an independent operations safety auditor,
- (vii) engage the independent operations safety auditor to audit field operations, and
- (viii) demonstrate to the Grantor that sufficient operation and maintenance equipment, manpower and material resources are in place and available to take over operations.

Exception: The Concessionaire shall have until six (6) months after the Effective Date to effect initial performance of the obligations in items (ii) through (vii) above.

Within one year following the Effective Date, the Concessionaire must:

- (i) produce an inventory of the physical condition of the Highway 407 infrastructure,
- (ii) set up a collision monitoring and investigation system,
- (iii) develop a safety improvement and rehabilitation plan, and
- (iv) retain the IDSA to review the adequacy the Concessionaire's annual safety improvement and rehabilitation program processes and program, to ensure that the processes and programs are adequate to ensure road user safety.

If the Concessionaire replaces the facility operator, the Concessionaire must first have performed either of the following prior to the new facility operator taking over operations of Highway 407:

- A.
  - (i) retained the services of qualified operations and maintenance staff.
  - (ii) developed and implement operations and maintenance safety control processes,
  - (iii) prepared operations and maintenance safety control plans,
  - (iv) retained the services of an independent consultant firm to audit the operations and maintenance safety control processes and control plans of the Concessionaire,
  - (v) corrected any deficiencies in the Concessionaire's safety control process or plan to the satisfaction of the Grantor,
  - (vi) retained the services of an independent operations safety auditor to audit field operations, and
  - (vii) demonstrated to the Grantor that sufficient operation and maintenance equipment, manpower and material resources are in place and available to take over operations; or
  
- B. Developed an acceptable transition plan with the Grantor for the smooth transition of operating responsibility to a new facility operator.

## **16. Dispute Resolution**

To the extent that the dispute resolution process contained in Article 25 of the Concession Agreement is available with respect to Ministry Safety Standards, such dispute resolution process may only be used if the notice to be given pursuant to section 25.2 of the Concession Agreement is given within one hundred and eighty (180) days of the occurrence of the latter of (a) the incident giving rise to the dispute and (b) any auditor's report referencing any matter subject to dispute resolution with respect to Ministry Safety Standards.