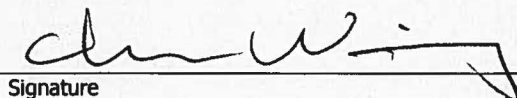




<b>Document Type:</b>	<b>TECHNICAL APPRAISAL FORM Bridges</b>
<b>Submission Name:</b>	B9-HWY 3 East Ramp Underpass near Huron Church Line
<b>Document Number:</b>	285380-03-127-0008

<b>Design Consultant:</b>		<b>HMM</b>
<b>Date</b>	<b>Revision</b>	<b>Description</b>
March 16, 2012	<b>0</b>	IFC Substructure Submission

Issued by: Chun Wang  
NameMarch 16, 2012  
Date  
Signature

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## 1 Design Package Description

This submission contains design drawings and geotechnical recommendations associated with HWY 3 East Ramp Underpass near Huron Church Line. This is the IFC substructure submission for the structure deliverables.

### 1.1 Name and location of structure

HWY 3 East Ramp Underpass near Huron Church Line carries traffic of Highway 3 East Bound Exit Ramp (EBR8) from STA. 9+540 to STA. 9+682 over Highway 401.

### 1.2 Permitted traffic speed

Highway Classification:	UAU for HW3 UFD for HWY 401
Design Speed:	60 km/h for EBR8 over structure 110 km/h for HWY 401 under structure
Posted Speed:	To be determined (Advisory Speed EBR8) 90 km/h for HWY 401 under structure
Laning:	1 over structure for HW3 EBR8 6 under structure for HWY 401
Design Clearance:	Minimum 4.8 m vertical clearance
Bridge Design Vehicle:	CL-625-ONT

## 2 Proposed Structure

### 2.1 Description of Structure

HWY 3 East Ramp Underpass near Huron Church Line is a single cell trapezoidal reinforced concrete box structure carries traffic of Highway 3 East Bound Exit Ramp (EBR8) over Highway 401 with one 4.75 m lane. Varied wide shoulders are accommodated along the north and south side of the bridge.

The proposed three-span post-tensioned concrete box structure is located on curved and associated spiral alignment. The approximate span lengths, from west to east, are 30.0 meters, 48.5 meters and 48.5 meters. The width of bridge deck is 11.3 meters measured perpendicular to the horizontal profile control line. The bridge with conventional abutments and piers is supported on deep pile foundations. PL3 concrete barrier is provided along the outside of each shoulder on top of the deck.

The foundation piles are to be driven on sound bedrock, based on the foundation conditions and recommendations for foundation design provided in Geotechnical Recommendations by AMEC Earth & Environmental Limited.

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**Structure Summary**

Structural Type:	Post-tensioned reinforced concrete box structure
Span Arrangement:	30 m – 48.5 m – 48.5 m perpendicular to road alignment control line
Foundation Type:	Deep foundations
Span Articulation:	Single-cell trapezoidal box
Barrier Type:	PL3 concrete barrier wall on top of deck

**2.2 Proposed arrangements for inspection and maintenance**

All exposed features are inspectable through the use of an inspection platform.

**2.3 Materials and Finishes****2.3.1 Cast-In-Place Concrete**

Substructure: Minimum compressive strength at 28 days: 30 MPa.

Deck: Minimum compressive strength at 28 days: 50 MPa.

**2.3.2 Post-tensioned Concrete**

Deck: Minimum compressive strength at transfer: 42 MPa.

Minimum compressive strength at 28 days: 50 MPa.

**2.3.3 Reinforcing Steel**

Plain and coated reinforcing steel bars: CAN/CSA G30.18-M92; Grade 400W

Stainless steel reinforcing bars: Type 316LN or Duplex 2205 or Type SM-28;  
Grade 500

**2.3.4 Prestressing Steel**

Tendons shall be low-relaxation, seven wire strands, size designation 15, Grade 1860.

**2.3.5 Finishes**

Concrete finishes shall comply with the applicable requirements of Project Agreement, Schedule 15-2.

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### 3 Design/Assessment Criteria

#### 3.1 Live Loading, Clearances

##### 3.1.1 Bridge code loading

Truck load and lane load of CL-625-ONT as per CAN/CSA S6-06 for structural design.

##### 3.1.2 Design vehicle

Vehicle train as defined in CAN/CSA S6-06.

##### 3.1.3 Other live loading

None

##### 3.1.4 Provision for exceptional abnormal loads

None

##### 3.1.5 Any special loading not covered above

None

##### 3.1.6 Minimum clearance provided (vertical and horizontal)

Vertical clearance: Minimum vertical clearance provided is 5.928 m (minimum required is 4.8 m) above Highway 401

Horizontal clearance: 3 m shoulder and traffic/medium barrier along Alignment HWY 401.

##### 3.1.7 Authorities consulted and any special conditions required

None

#### 3.2 List of relevant design documents

Design Criteria in accordance with Part 2 of Project Agreement – Schedule 15-2:

Article 1 – Highway Geometrics Design Criteria

Article 3 – Structural Design Criteria

Article 5 – Geotechnical and Foundation Design Criteria

Referenced Documents as specified in these Articles following the order of precedence as instructed.



## **4 Structural Analysis**

### **4.1 Methods of Analysis**

Dead and live load distributions on the structure are as per CAN/CSA S6-06. A three-dimensional finite element analysis (3D FEM) and hand calculations are used to design the curved box structure. Two-dimension frame model and hand calculations are used to validate the results from the 3D FEM.

### **4.2 Calculation of Structural Stiffness**

Structural stiffness is calculated according to CAN/CSA S6-06.

### **4.3 Earth Pressure Coefficients**

Refer to Geotechnical Investigation and Design Report – Bridge 9, AMEC Earth and Environmental file dated March, 2012.

## **5 Ground Design Considerations**

### **5.1 Ground Conditions**

Refer to Geotechnical Investigation and Design Report – Bridge 9, AMEC Earth and Environmental file dated March, 2012.

### **5.2 Variance from Geotechnical Report Recommendations**

None.

### **5.3 Geotechnical Design Parameters**

For proposed HP310X110 pile,  
Ultimate geotechnical axial capacity on bedrock: 2000 kN.

Effective angle of soil internal friction,  $\phi'$ , is 30°.

Refer to Geotechnical Investigation and Design Report – Bridge 9, AMEC Earth and Environmental file dated March, 2012.

### **5.4 Differential Settlement**

Refer to Geotechnical Investigation and Design Report – Bridge 9, AMEC Earth and Environmental file dated March, 2012.

### **5.5 Anticipated Ground movements or Settlement**

Refer to Geotechnical Investigation and Design Report – Bridge 9, AMEC Earth and Environmental file dated March, 2012.

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## 5.6 Ground Water and Counter Measure

Ground water control will be required based on timing of construction and prevailing weather conditions. See Geotechnical Investigation and Design Report – Bridge 9, AMEC Earth and Environmental file dated March, 2011.

## 6 Construction Considerations

None or Construction staging required.

## 7 Drawings and Documents

### 7.1 List of Drawings (included in this submission)

Drawing No.	Revision	Drawing Name
285380-03-060-SEG1-0900	0	COVER SHEET, SITE PLAN AND KEY PLAN
285380-03-060-SEG1-0901	0	GENERAL ARRANGEMENT
285380-04-090-SEG1-0902	0	BOREHOLE LOCATIONS AND SOIL STRATA
285380-04-091-SEG1-0903	0	SOIL STRATIGRAPHY
285380-03-061-SEG1-0904	0	FOUNDATION LAYOUT & REINFORCEMENT 1
285380-03-061-SEG1-0905	0	FOUNDATION LAYOUT & REINFORCEMENT 2
285380-03-061-SEG1-0906	0	WEST ABUTMENT DETAILS
285380-03-061-SEG1-0907	0	EAST ABUTMENT DETAILS
285380-03-061-SEG1-0908	0	WEST WING WALL DETAILS
285380-03-061-SEG1-0909	0	PIER REINFORCEMENT
285380-03-062-SEG1-0910	0	BEARING LAYOUT AND DETAILS
285380-03-065-SEG1-0929	0	DETAILS OF CONCRETE SLOPE PAVING
285380-03-066-SEG1-0930	0	STANDARD DETAILS
285380-07-444-SEG1-0931	0	EMBEDDED ELECTRICAL WORK
285380-04-094-SEG1-0932	0	ABUTMENT EXCAVATION AND BACKFILL DETAILS
285380-04-094-SEG1-0933	0	CONSTRUCTION NOTES - BACKFILL AT STRUCTURES
285380-03-061-SEG1-0936	0	EAST WING WALL DETAILS
285380-04-094-SEG1-0937	0	CONSTRUCTION NOTES – LIGHTWEIGHT FILL MATERIAL

### 7.2 List of Documents (included in this submission)

Document No.	Revision	Drawing Name
285380-04-119-0025	0	Geotechnical Investigation and Design Report – Bridge 9, AMEC
285380-03-127-0008	0	Technical Appraisal Form

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### 7.3 List of Reference Drawings and Documents (not included in this submission)

See Appendix A.

## 8 Checking and Review

### 8.1 Independent Check

Independent check is required as per Project Agreement – Schedule 15-2, Part 2, Article 3 3.2 (c) (i).

Independent Checking Team: INTERNATIONAL BRIDGE TECHNOLOGIES.

### 8.2 Responsible Design Personnel

Originator:

Checker:

Reviewer:

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**The above TAF is submitted for review**

Signed:  
Design Manager

*Biljana Rajlic*



Name: BILJANA RAJLIC

Engineering Qualifications: P. Eng.

Date: March 16, 2012

Professional Registration Number: 100041385

Affix Professional Seal

Signed: .....

*Jonas Laga*

Project Co Representative

Name: *Jonas Laga* .....

Date: *April 5, 2012* .....

Professional Registration Number: .....

Affix Professional Seal

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## Appendix A – Referenced Drawings and Documents

### Referenced Drawing(s)

Drawing No.	Revision	Drawing Name

### Certificate(s)

Certificate No.	Revision	Certificate Name

### Special Provision(s)

Document No.	Revision	Document Name