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Issued by: Lokesh Mathur  
Name

Apr. 10, 2013  
Date

  
Signature

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## 1 Design Package Description

This submission contains design drawings and geotechnical recommendations associated with Matchette Road Overpass. This is the IFC Submission for the structure deliverables.

### 1.1 Name and Location of Structure

Matchette Road Overpass carries eastbound and west bound traffic on Highway 401 (HWY 401) from STA. 10+621.787 to STA. 10+656.790 over Matchette Road.

### 1.2 Permitted Traffic Speed

Highway Classification:	UFD for Alignment HWY 401 Municipal Road for Matchette Road
Design Speed:	100 km/h for UFD over structure 60 km/h for municipal road under structure
Posted Speed:	80 km/h for UFD over structure 60 km/h for municipal road under structure
Laning:	8 over structure for Alignment HWY401 2 under structure for Matchette Road
Design Clearance:	Minimum 5.0 m vertical clearance
Bridge Design Vehicle:	CL-625-ONT

## 2 Proposed Structure

### 2.1 Description of Structure

The Matchette Road Overpass is a single span, slab-on-girder bridge carrying four eastbound lanes (three 3.75 m, and one 3.5 m through lanes) and four westbound lanes (three 3.75 m, and one 3.5 m through lanes) on Highway 401 (HWY401) over Matchette Road. The clear width of the westbound and eastbound lanes is 20.1 m which accommodate the specified lanes, a 2.85 m shoulder on the one side of the lanes, and a 2.5 m shoulder on the other side of the lanes. The centerline of Highway 401 (HWY401) is skewed at 26° 37' 19" to the centreline of Matchette Road. On each side of the bridge deck, there is a PL3 concrete barrier wall without railing. There is a noise barrier on the PL3 barrier on the south side of the bridge. Along the centerline of HWY 401 there are back to back PL3 barriers dividing the EBL's and WBL's.

## Structural Summary

Structure Type:	Concrete slab on prestressed concrete NU girders spanning continuously between two concrete Semi integral abutments.
Span Arrangement:	One span with length of 35 m, aligned east-west and parallel to the centreline of HWY 401.
North Abutment:	Reinforced concrete beam supported on HP 310 x 110 steel piles and not integral with slab-on-girder superstructure.
South Abutment:	Reinforced concrete beam supported on HP 310 x 110 steel piles and not integral with slab-on-girder superstructure.
Span Articulation:	Continuous slab-on-girder superstructure is not integral with the abutments.
Barrier Type:	PL-3 concrete parapet wall without railing.

## 2.2 Proposed Means for Inspection and Maintenance

All exposed elements are accessible through the use of scaffolding and / or mobile manlifts.

## 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: 40 MPa.

### 2.3.2 Precast Prestressed Concrete

Girders: Minimum compressive strength at transfer: 42 MPa.  
Minimum compressive strength at 28 days: 60 MPa.

Deck Panels: Minimum compressive strength at 28 days: 40 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 XM-28;  
Grade 500

GFRP bars: Min. Tensile strength ( $F_u$ ) = 655 MPa 16mm  
=620 MPa 19mm  
Min. Tensile modulus of elasticity ( $E$ ) = 40.8 GPa

#### 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.

### 3 Design/Assessment Criteria

#### 3.1 Live Loading and Clearances

##### 3.1.1 Design Live Loading

CL-625-ONT Truck and Lane loading plus dynamic load allowance to CAN/CSA-S6-06.

##### 3.1.2 Design vehicle

HWY 401: CL-625-ONT

Matchette Road: CL-625-ONT

##### 3.1.3 Other Live Loading

None

##### 3.1.4 Provision for Exceptional Abnormal Loads

None

##### 3.1.5 Any Special Loading Not Covered

None

##### 3.1.6 Minimum Clearance Provided

Vertical: 5.0 m for Matchette Road

Not applicable for Highway 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

In the event of discrepancy, the hierarchy of referenced documents shall be as instructed.

## **4 Structural Analysis**

### **4.1 Methods of Analysis**

#### **4.1.1 Superstructure**

A combination of hand calculations, 3-D frame model, and spreadsheets was used to analyse and design the slab-on-girder superstructure for safe support of the loads prescribed by CAN/CSA-S6-06. The commercial software, S-Frame, was used for the grillage analysis. Concise Beam Version 4.42c was used for the final analysis and design of the prestressed concrete NU girders.

#### **4.1.2 Substructure and Foundations**

Analysis and design of the abutments and supporting piles were carried out by including these components in the 3-D frame model noted above. A combination of hand calculations and spreadsheets was used to determine reinforcing steel requirements and for checking stresses in steel H-piles.

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

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

### **4.3 Earth Pressure Coefficients**

Refer to Geotechnical Investigation and Design Report (IFC) prepared by AMEC Earth and Environmental, dated March 21, 2013.

## **5 Ground Design Considerations**

### **5.1 Ground Conditions**

Refer to Geotechnical Investigation and Design Report (IFC) prepared by AMEC Earth and Environmental, dated March 21, 2013.

### **5.2 Geotechnical Design Parameters**

Refer to Geotechnical Investigation and Design Report (IFC) prepared by AMEC Earth and Environmental, dated March 21, 2013.

### **5.3 Differential Settlement**

Refer to Geotechnical Investigation and Design Report (IFC) prepared by AMEC Earth and Environmental, dated March 21, 2013.

### **5.4 Anticipated Ground Movements or Settlement**

Refer to Geotechnical Investigation and Design Report (IFC) prepared by AMEC Earth and Environmental, dated March 21, 2013.

## 5.5 Groundwater Conditions and Mitigative Measures

Refer to Geotechnical Investigation and Design Report (IFC) prepared by AMEC Earth and Environmental, dated March 21, 2013.

Further details of temporary and permanent dewatering needs will be determined when updated soils information becomes available for this particular bridge site. The design of dewatering systems (where required) shall comply with OPSS 517 and 518.

## 5.6 Variance from Geotechnical Investigation and Design Report Recommendations

None.

# 6 Construction Considerations

Refer to Geotechnical Investigation and Design Report (IFC) prepared by AMEC Earth and Environmental, dated March 21, 2013 for excavation, temporary cut slopes, backfilling, and frost protection.

# 7 Drawings and Documents

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

Drawing No.	Revision	Drawing Title
285380-03-060-SEG3-0200	0	COVER SHEET, SITE PLAN, AND KEY PLAN
285380-03-060-SEG3-0201	0	GENERAL ARRANGEMENT
285380-04-090-SEG3-0202	0	BOREHOLE LOCATIONS & SOIL STRATA
285380-04-091-SEG3-0203	0	SOIL STRATIGRAPHY
285380-03-061-SEG3-0204	0	FOUNDATION LAYOUT
285380-03-061-SEG3-0205	0	WEST ABUTMENT LAYOUT
285380-03-061-SEG3-0206	0	EAST ABUTMENT LAYOUT
285380-03-061-SEG3-0207	0	ABUTMENT REINFORCEMENT
285380-03-061-SEG3-0208	0	WEST WINGWALL DETAILS
285380-03-061-SEG3-0209	0	EAST WINGWALL DETAILS
285380-03-061-SEG3-0210	0	RSS WALL PLAN AND SECTION
285380-03-061-SEG3-0211	0	RSS WALL ELEVATION
285380-03-063-SEG3-0212	0	PRESTRESSED GIRDERS I
285380-03-063-SEG3-0213	0	PRESTRESSED GIRDERS II

285380-03-063-SEG3-0214	0	PRESTRESSED GIRDERS III
285380-03-064-SEG3-0215	0	PRESTRESSED DECK PANEL
285380-03-064-SEG3-0216	0	DECK LAYOUT & SCREED ELEVATIONS
285380-03-064-SEG3-0217	0	DECK REINFORCEMENT
285380-03-064-SEG3-0218	0	ABUTMENT DIAPHRAGM REINFORCEMENT
285380-03-065-SEG3-0219	0	BARRIER WALL W/O RAILING TYPE I
285380-03-065-SEG3-0220	0	BARRIER WALL W/O RAILING TYPE II
285380-03-065-SEG3-0221	0	BARRIER WALL W/O RAILING TYPE III
285380-03-065-SEG3-0222	0	BARRIER WALL PL3 GRASSLAND TREATMENT
285380-03-065-SEG3-0223	0	NOISE BARRIER WALL
285380-03-065-SEG3-0224	0	6000 mm APPROACH SLABS
285380-03-066-SEG3-0225	0	STANDARD DETAILS
285380-07-067-SEG3-0226	0	EMBEDDED ELECTRICAL WORK
285380-04-094-SEG3-0227	0	ABUTMENT EXCAVATION AND BACKFILL DETAILS
285380-04-094-SEG3-0228	0	CONSTRUCTION NOTES – BACKFILL AT STRUCTURES
285380-04-094-SEG3-0229	0	CONSTRUCTION NOTES - LIGHTWEIGHT FILL MATERIAL
285380-04-094-SEG3-0230	0	CONSTRUCTION NOTES - EXPANDED POLYSTYRENE

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

Document No.	Revision	Description
285380-04-119-0118	0	Geotechnical Investigation and Design Report (IFC), Mar. 21, 2013.
285380-03-127-0001	0	Technical Appraisal Form

## 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.

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## 8.2 Responsible Design Personnel

Originator: Lokesh Mathur

Checker: Khaled Almaaz

Reviewer: Biljana Rajlic

**The above TAF is submitted for review**

Signed: 

Design Manager

Name: Biljana Rajlic

Engineering Qualifications: P. Eng.

Date: April 10, 2013

Professional Registration Number: 100041385


Affix Professional Seal:



Signed: .....

Project Co Representative

Name: .....

Date: .....

Professional Registration Number: .....

Affix Professional Seal:

## 9 Appendix A - Referenced Drawings and Documents

### Referenced Drawing(s)

Drawing No.	Revision	Drawing Title
OPSD 3000.100	2	FOUNDATION, PILES, STEEL H-PILE DRIVING SHOE
OPSD 3000.150	1	FOUNDATION, PILES, STEEL H-PILE SPLICE
OPSD 3101.150	1	WALLS, ABUTMENT, BACKFILL, MINIMUM GRANULAR REQUIREMENT
OPSD 3121.150	1	WALLS, RETAINING, BACKFILL, MINIMUM GRANULAR REQUIREMENT
OPSD 3190.100	1	WALLS, RETAINING AND ABUTMENT, WALL DRAIN
OPSD 3360.200	0	DECK LIGHT POLE BASES STRUCTURES WITH PARAPET WALLS
OPSD 3370.100	2	DECK, WATERPROOFING, HOT APPLIED ASPHALT MEMBRANE WITH PROTECTION BOARD
OPSD 3370.101	2	DECK, WATERPROOFING, HOT APPLIED ASPHALT MEMBRANE AT ACTIVE CRACKS GREATER THAN 2 mm WIDE AND CONSTRUCTION JOINTS
OPSD 3390.100	1	DECK DRIP CHANNEL
OPSD 3419.100	1	BARRIERS AND RAILINGS, STEEL GUARDRAIL AND CHANNEL ANCHORAGE
OPSD 3941.200	1	FIGURES IN CONCRETE, SITE NUMBER AND DATE, LAYOUT
OPSD 3950.100	0	JOINTS, CONCRETE EXPANSION AND CONSTRUCTION, ON STRUCTURE

### Certificate(s)

Certificate No.	Revision	Certificate Name

### Special Provision(s)

Document No.	Revision	Description