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Issued by: Lokesh Mathur
Name

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Date


Signature

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1 Design Package Description

This submission contains design drawings and geotechnical recommendations associated with Realigned E.C. Row EBL – Malden Road Overpass. This is the IFC submission for the structure deliverables.

1.1 Name and Location of Structure

Realigned E.C. Row EBL – Malden Road Overpass carries eastbound traffic on Realigned E.C. Row EBL from STA. 11+704.0 to STA. 11+736.0 over Malden Road.

1.2 Permitted Traffic Speed

Highway Classification:	UFD for Alignment Realigned E.C. Row EBL Municipal Road for Malden 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:	2 over structure for Alignment Realigned E.C. Row EBL 2 under structure for Malden Road
Design Clearance:	Minimum 5.0 m vertical clearance
Bridge Design Vehicle:	CL-625-ONT

2 Proposed Structure

2.1 Description of Structure

The Realigned E.C. Row EBL – Malden Road Overpass is a single span, slab-on-girder bridge carrying two 3.75 m lanes on Realigned E.C. Row EBL over Malden Road. The clear width of the roadway is 11.0 m which accommodates the specified lanes, a 2.5 m shoulder on the south side of the bridge, and a 1.0 m shoulder on the north side of the bridge. The centerline of Malden Road is skewed at 16° 14' 35" to the centreline of Realigned E.C. Row EBL. On each side of the bridge deck, there is a PL3 concrete parapet wall without railing.

Structural Summary

Structure Type:	Concrete slab on prestressed concrete NU girders spanning continuously between two concrete integral abutments.
Span Arrangement:	One span with a length of 32.0 m, aligned east-west and parallel to the centreline of Realigned E.C. Row EBL.
North Abutment:	Reinforced concrete beam supported on HP 310 x 110 steel piles and integral with slab-on-girder superstructure.

South Abutment:	Reinforced concrete beam supported on HP 310 x 110 steel piles and integral with slab-on-girder superstructure.
Span Articulation:	Continuous slab-on-girder superstructure is integral with the abutments.
Barrier Type:	PL-3 concrete parapet wall without steel 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

HWY401: CL-625-ONT

Malden 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 Malden Road
not applicable for Realigned E.C. Row EBL

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

frame analysis. Concise Beam Version 4.57 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 prepared by AMEC Earth and Environmental, dated Dec. 18, 2012.

5 Ground Design Considerations

5.1 Ground Conditions

Refer to Geotechnical Investigation and Design Report prepared by AMEC Earth and Environmental, dated Dec. 18, 2012.

5.2 Geotechnical Design Parameters

Refer to Geotechnical Investigation and Design Report prepared by AMEC Earth and Environmental, dated Dec. 18, 2012.

5.3 Differential Settlement

Refer to Geotechnical Investigation and Design Report prepared by AMEC Earth and Environmental, dated Dec. 18, 2012.

5.4 Anticipated Ground Movements or Settlement

Refer to Geotechnical Investigation and Design Report prepared by AMEC Earth and Environmental, dated Dec. 18, 2012.

5.5 Groundwater Conditions and Mitigative Measures

Refer to Geotechnical Investigation and Design Report prepared by AMEC Earth and Environmental, dated Dec. 18, 2012.

5.6 Variance from Geotechnical Memo Recommendations

None.

6 Construction Considerations

Refer to Geotechnical Investigation and Design Report prepared by AMEC Earth and Environmental, dated Dec. 18, 2012 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-SEG3-0500	0	COVER SHEET, SITE PLAN, AND KEY PLAN
285380-03-060-SEG3-0501	0	GENERAL ARRANGEMENT
285380-04-090-SEG3-0502	0	BOREHOLE LOCATIONS AND SOIL STRATA
285380-04-091-SEG3-0503	0	SOIL STRATIGRAPHY
285380-03-061-SEG3-0504	0	FOUNDATION LAYOUT
285380-03-061-SEG3-0505	0	WEST ABUTMENT LAYOUT
285380-03-061-SEG3-0506	0	EAST ABUTMENT LAYOUT
285380-03-061-SEG3-0507	0	ABUTMENT REINFORCEMENT
285380-03-061-SEG3-0508	0	WEST WINGWALL DETAILS
285380-03-061-SEG3-0509	0	EAST WINGWALL DETAILS
285380-03-061-SEG3-0510	0	RSS WALL PLAN AND SECTION
285380-03-061-SEG3-0511	0	RSS WALL ELEVATIONS
285380-03-063-SEG3-0512	0	PRESTRESSED GIRDERS I
285380-03-063-SEG3-0513	0	PRESTRESSED GIRDERS II
285380-03-063-SEG3-0514	0	PRESTRESSED GIRDERS III
285380-03-064-SEG3-0515	0	PRESTRESSED DECK PANEL
285380-03-064-SEG3-0516	0	DECK LAYOUT & SCREED ELEVATIONS
285380-03-064-SEG3-0517	0	DECK REINFORCEMENT
285380-03-064-SEG3-0518	0	ABUTMENT DIAPHRAGM REINFORCEMENT
285380-03-065-SEG3-0519	0	BARRIER WALL W/O RAILING NORTH
285380-03-065-SEG3-0528	0	BARRIER WALL W/O RAILING SOUTH
285380-03-065-SEG3-0520	0	BARRIER WALL PL3 GRASSLAND TREATMENT
285380-03-065-SEG3-0521	0	NOISE BARRIER WALL
285380-03-065-SEG3-0522	0	6000 mm APPROACH SLABS
285380-03-066-SEG3-0523	0	STANDARD DETAILS

285380-07-444-SEG3-0524	0	EMBEDDED ELECTRICAL WORK
285380-04-094-SEG3-0525	0	ABUTMENT EXCAVATION AND BACKFILL DETAILS
285380-04-094-SEG3-0526	0	CONSTRUCTION NOTES – BACKFILL AT STRUCTURES
285380-04-094-SEG3-0527	0	CONSTRUCTION NOTES – LIGHTWEIGHT FILL MATERIAL

7.2 List of Documents (included in this submission)

Document No.	Revision	Description
285380-04-119-0115	0	Geotechnical Investigation & Design Report, dated Dec. 18, 2012
285380-03-127-0004	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.

8.2 Responsible Design Personnel

Originator: Lokesh Mathur

Checker: Khaled Almaaz

Reviewer: Biljana Rajlic

The above TAF is submitted for review

Signed: *Biljana Rajlic*
Design Manager

Name: BILJANA RAJLIC

Engineering Qualifications: P. Eng.

Date: March 8, 2013

Professional Registration Number: 100041385

Affix Professional Seal:



Signed: *Jon Maco*
.....

Project Co Representative

Name: *Jon Maco*
.....

Date: *March 25, 2013*
.....

Professional Registration Number:

Affix Professional Seal:

9 Appendix A - Referenced Drawings and Documents

Referenced Drawing(s)

Drawing No.	Revision	Drawing Title
OPSD 911.130	0	GUIDE RAIL SYSTEM, CONCRETE BARRIER CAST-IN-PLACE, TYPE A INSTALLATION
OPSD 911.381	1	GUIDE RAIL SYSTEM, CONCRETE BARRIER PERMANENT TRANSITION INSTALLATION CONCRETE BARRIER TO STRUCTURE
OPSD 980.101	2	PEDESTRIAN BARRICADE INSTALLATION
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 3360.100	1	DECK LIGHT POLE BASES STRUCTURES WITH BARRIER 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