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Design Consultant:		LEA
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Issued by: Per Furst, P.Eng.

Name

05 June 2012

Date


Signature

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1 Design Package Description

This submission contains design drawings and geotechnical recommendations for seventeen (17) overhead static sign support structures. This is the IFC Submission for Phase 1 of the structure deliverables.

1.1 Name and Location of Sign Support Structures

Phase 1 includes seventeen (17) overhead sign support structures located at various locations of Highway 401, Highway 3 and the E.C. Row Expressway.

1.2 Permitted Traffic Speed

Highway Classification:	UFD for alignment HWY 401
Design Speed:	110 km/h for HWY 401 under structures
Posted Speed:	90 km/h HWY 401 under structures
Laning:	6 under structure for alignment HWY401
Design Clearance:	Tri-Chords: Minimum 5250 mm vertical clearance to sign boards. Cantilever: Minimum 5300 mm vertical clearance to sign boards.
Bridge Design Vehicle:	CL-625-ONT

2 Proposed Structures

2.1 Description of Structures

Structural Summary

Structure Type:	Single Static Cantilever Sign Support Structures; Tri-Chord Static Sign Support Structures
Span Arrangement:	Spans vary according to highway geometric requirements provided by the highway design group.
Span Articulation:	Cantilever sign supports: Structural steel framing cantilevering from a single steel tube post supported on a concrete caisson foundation. Tri-Chord sign supports: Structural steel portal type frame supported on two tube posts on concrete caisson foundations.
Barrier Type:	N/A

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

All concrete components (caisson foundations): Minimum compressive strength at 28 days: 30 MPa.

2.3.2 Reinforcing Steel

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

Stainless steel reinforcing bars: N/A

2.3.3. Structural Steel

CAN/CSA-G40.20-04/G40.21-04 Grade 300W or ASTM Specification A500 Grade C or API-5L-X46 for round section of O.D. \geq 508 mm

Non-Stainless Steel bolts, nuts and washers ASTM A325M Galvanized to CAN/CSA-G164-M92.

2.3.4 Finishes

All structural steel to be Galvanized to CAN/CSA-G164-M92

Sign support legs to be coated with an approved paint system

3 Design/Assessment Criteria

3.1 Loading and Clearances

3.1.1 Design Loading

Design wind loads are based on the reference wind pressures for the site specific locations given in the Canadian Highway Bridge Design Code (CHBDC) and included in the Sign Support Manual (Ministry of Transportation of Ontario). Snow loads (on dampers for Cantilever Sign Support Structures) as per CHBDC. Fatigue wind loads based on AASHTO specifications.

3.1.2 Design vehicle - N/A

3.1.3 Other Live Loading - N/A

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 – Cantilever signs: To underside sign boards: 5.3 m
To underside lower arm: 5.6 m
Vertical – Tri-Chords: To underside sign board: 5.25 m
To centreline of lower chord: 5.9 to 6.385 m

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 Sign Support Structures**

The sign support structures are detailed in accordance with the Sign Support Manual of the Ministry of Transportation of Ontario (April 2011 edition). Design and detailing contained in the manual conform to the requirements of the Canadian Highway Bridge Design Code CAN/CSA-S6-06 unless otherwise stated in the manual.

The designs are based on wind pressures (reference wind pressures) specific to the locations of the signs. Design tables are provided in the manual for various ranges of reference wind pressures and sign board areas. In addition to wind loads, factors such as self weight, snow loads on dampers (cantilever signs), ice accretion, torsional effects and fatigue wind loads (AASHTO requirements) have also been included.

4.1.2 Substructure and Foundations

The standard caisson foundations are designed for the minimum soil parameters indicated in the manual. Foundation elements which fall outside of the assumed parameters will be designed individually based on the foundation design recommendations provided in the Geotechnical Investigation reports.

The frost cover for the Windsor area is given in the Geotechnical Investigation Report and is indicated on the drawings. Any resisting earth pressure in the frost depth layer is discounted in the design.

5 Ground Design Considerations

5.1 Subsurface Conditions

Refer to 90% Geotechnical Investigation and Design Report Phase I Sign Structures prepared by AMEC Earth and Environmental for Hatch Mott MacDonald, dated March 2012.

5.2 Development of Geotechnical Designs

Refer to 90% Geotechnical Investigation and Design Report Phase I Sign Structures prepared by AMEC Earth and Environmental for Hatch Mott MacDonald, dated March 2012.

5.3 Other Geotechnical Recommendations

Refer to 90% Geotechnical Investigation and Design Report Phase I Sign Structures prepared by AMEC Earth and Environmental for Hatch Mott MacDonald, dated March 2012.

The design of dewatering systems (where required) shall comply with OPSS 517 and 518.

5.4 Variance from Geotechnical Design Recommendations

90% Internal Design Review by AMEC indicated caisson depths (as per MTO standards) do not match the Geotechnical report. Caisson depths have been reviewed by LEA Consulting Ltd. and AMEC Earth and Environmental and will be updated in the IFC Submission for the Geotechnical report. There are no known variances.

6 Construction Considerations

Refer to 90% Geotechnical Investigation and Design Report Phase I Sign Structures prepared by AMEC Earth and Environmental for Hatch Mott MacDonald, dated March 2012, for dewatering and construction requirements.

7 Drawings and Documents

7.1 List of Drawings (included in this submission)

Drawing No.	Revision	Drawing Title
285380-03-060-SEG1-8100	0	COVER SHEET , SITE PLAN AND KEY PLAN
285380-03-060-SEG1-8101	0	SINGLE CANTILEVER STATIC SIGN SUPPORT. GENERAL ARRANGEMENT. OHS 28, 32 & 33
285380-03-065-SEG1-8102	0	CANTILEVER STATIC SIGN SUPPORT. SIGN CONNECTION AND DAMPER DETAILS. OHS 28, 32 & 33
285380-03-060-SEG1-8105	0	TRI-CHORD STATIC SIGN SUPPORT. GENERAL ARRANGEMENT. OHS 7-10, 16-19 & 27
285380-03-060-SEG1-8106	0	TRI-CHORD STATIC SIGN SUPPORT. GENERAL ARRANGEMENT 29, 35 & 45-47
285380-03-065-SEG1-8107	0	TRI-CHORD STATIC SIGN SUPPORT. STRUCTURE ASSEMBLY DETAILS. OHS 7-10, 16-19, 27, 29, 35 & 45-47
285380-03-061-SEG1-8108	0	FOOTING DETAILS GROUND MOUNTED. OHS 28, 32, 33, 35, 45 & 47
285380-03-061-SEG1-8109	0	FOOTING DETAILS GROUND MOUNTED. OHS 7-10, 16-19, 27 & 46
285380-03-061-SEG1-8110	0	FOOTING DETAILS SYMMETRICAL MEDIAN MOUNTED. OHS 9, 16, 17 & 19
285380-03-061-SEG1-8111	0	FOOTING DETAILS ASYMMETRICAL MEDIAN MOUNTED OHS 7, 8, 10 & 18
285380-03-061-SEG1-8112	0	FOOTING DETAILS SYMMETRICAL MEDIAN MOUNTED. OHS 29
285380-03-060-SEG1-8113	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 7 & 8
285380-03-060-SEG1-8114	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 9 & 10
285380-03-060-SEG1-8115	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 16
285380-03-060-SEG1-8116	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 18
285380-03-060-SEG1-8117	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 17 & 19
285380-03-060-SEG1-8118	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 27
285380-03-060-SEG1-8119	0	SINGLE CANTILEVER STATIC SIGN SUPPORT – ELEVATIONS OHS 28 & 32
285380-03-060-SEG1-8120	0	SINGLE CANTILEVER STATIC SIGN SUPPORT – ELEVATIONS OHS 33
285380-03-060-SEG1-8121	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 29
285380-03-060-SEG1-8122	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 35

285380-03-060-SEG1-8123	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 45 & 46
285380-03-060-SEG1-8124	0	TRI-CHORD STATIC SIGN SUPPORT – ELEVATIONS OHS 47

7.2 List of Documents (included in this submission)

Document No.	Revision	Description
285380-03-127-0046	0	TAF - Sign Support Structures – Phase 1 IFC Submission – (This document)
285380-04-119-0026	B	90% Geotechnical Investigation and Design Report – Phase I Sign Structures, March 22, 2011

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: _____

8.2 Responsible Design Personnel

Originator: Per Furst

Checker: Patrick Chan

Reviewer: Rick T. Krutzler

The above TAF is submitted for review

Signed:

Designer Manager

Name: Biljana Rajlic

Engineering Qualifications: P.Eng

Date:

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

Certificate(s)

Certificate No.	Revision	Certificate Name

Special Provision(s)

Document No.	Revision	Description