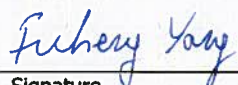




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Issued by: Stephen F. Yang
Name

Signature

June 8, 2012
Date

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Project: Windsor-Essex Parkway
Document: T7 – Villa Borghese Tunnel
Doc No.: 285380-03-127-0021

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Page No.: 1 of 19

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TABLE OF CONTENTS

1	PROJECT DESCRIPTION	5
1.1	NAME AND LOCATION OF TUNNEL	5
1.2	PERMITTED TRAFFIC SPEED.....	5
2	TUNNEL DETAILS.....	5
2.1	BASIC LAYOUT.....	5
2.2	RESTRICTIONS TO TRAFFIC.....	6
3	BRIEF DESCRIPTION OF TUNNEL, TRAFFIC AND TUNNEL GEOMETRY	6
3.1	STRUCTURAL FORM OF TUNNEL.....	6
3.2	STRUCTURAL FORM OF PORTAL STRUCTURES	8
3.3	TRAFFIC AND GEOMETRY	8
3.3.1	Horizontal and vertical alignment of tunnel and tunnel approaches	8
3.3.2	Cross-section	8
3.3.3	Standards used	8
3.3.4	Accommodation of mechanical and electrical services in Tunnel.....	9
3.3.5	Minimum headroom, horizontal clearances	9
3.4	PROPOSED ARRANGEMENTS FOR INSPECTION AND MAINTENANCE	9
3.5	PROVISION TO BE MADE IN THE TUNNEL LAYOUT FOR EMERGENCY COMMUNICATION AND ESCAPE FACILITIES, FIRE, ETC.	9
3.6	LANDSCAPING ABOVE TUNNEL AND PROTECTION OF TUNNEL ROOF	9
3.7	FINISHES	9
4	DESIGN ASSESSMENT CRITERIA	10
4.1	LIVE LOADING.....	10
4.1.1	Loading relating to normal traffic under applicable code loading and regulation	10
4.1.2	Design vehicle	10
4.1.3	Provision for exceptional abnormal loads	10
4.1.4	Any special loading not covered above	10
4.1.5	Heavy or high load route requirements and arrangements being made to preserve the route and any provisions for future heavier loads or future widening	11
4.1.6	Authorities consulted or any special conditions required	11
4.2	OTHER RESTRICTIONS.....	11
4.2.1	Parapet walls	11
5	STRUCTURAL ANALYSIS.....	11
5.1	METHODS OF ANALYSIS PROPOSED	11
5.2	ASSUMPTIONS OF STRUCTURAL ELEMENTS	11
5.2.1	Cast-In-Place Concrete.....	11
5.2.2	Precast Prestressed Concrete.....	11
5.2.3	Reinforcing Steel.....	11
5.2.4	Prestressing Steel	12
5.2.5	Structural Stiffness.....	12
5.3	PROPOSED EARTH PRESSURE COEFFICIENT (K_A , K_O OR K_P).....	12
5.4	PROPOSED FIRE DESIGN INCLUDING PROTECTION OF STRUCTURE AND CABLE.....	12
6	GROUND CONDITIONS.....	12

6.1	GROUND CONDITIONS.....	12
6.2	GEOTECHNICAL DESIGN PARAMETERS.....	12
6.3	DIFFERENTIAL SETTLEMENT	12
6.4	ANTICIPATED GROUND MOVEMENTS OR SETTLEMENT	12
6.5	GROUNDWATER CONDITIONS AND MITIGATIVE MEASURES.....	12
6.6	VARIANCE FROM GEOTECHNICAL MEMO RECOMMENDATIONS	13
7	DRAINAGE AND WATERPROOFING	13
7.1	DETAILS OF PROPOSED/EXISTING DRAINAGE.....	13
7.1.1	Ground water seepage and run off.....	13
7.1.2	Accidental spillage, water carried in by vehicles	13
7.1.3	A fire main burst	13
7.1.4	Tunnel washing	13
7.2	DETAILS OF PROPOSED WATERPROOFING.....	14
7.3	LIST SPECIAL REQUIREMENTS OF LOCAL DRAINAGE AUTHORITY	14
8	TUNNEL SUPPORT SYSTEM AND METHOD OF CONSTRUCTION.....	14
8.1	BASIS OF THE DESIGN OF THE TUNNEL SUPPORT SYSTEM FOR TEMPORARY AND PERMANENT CONDITIONS AND ANY PROPOSALS FOR GROUND TREATMENT	14
8.2	SHOW HOW THE PROPOSED METHOD OF CONSTRUCTION, I.E. EXCAVATION AND APPLICABLE GROUND SUPPORT, WILL ENSURE THE CONTINUED SAFE USE OF THE PARKWAY AND PREVENT STRUCTURAL FAILURE	14
8.3	GIVE DETAILS OF PREDICTED SETTLEMENTS ON ADJACENT STRUCTURES.....	15
8.4	STATE METHODS TO BE ADOPTED TO MONITOR AND CONTROL THE EFFECTS OF TUNNEL CONSTRUCTION TO ENSURE COMPLIANCE WITH ANY CRITERIA IMPOSED TO LIMIT SURFACE MOVEMENTS OR VIBRATION (IF APPLICABLE).....	15
9	CHECKING	15
9.1	INDEPENDENT CHECK.....	15
9.2	RESPONSIBLE DESIGN PERSONNEL.....	15
10	DRAWINGS AND DOCUMENTS	16
10.1	LIST OF DRAWINGS (INCLUDED IN THIS SUBMISSION):	16
10.2	LIST OF DOCUMENTS (INCLUDED IN THIS SUBMISSION):.....	17
10.3	LIST OF REFERENCE DRAWINGS AND DOCUMENTS (NOT INCLUDED IN THIS SUBMISSION).....	17
	APPENDIX A – REFERENCED DRAWINGS AND DOCUMENTS.....	19

1 Project Description

This submission contains the final submission issued for construction design drawings and geotechnical recommendations for Villa Borghese Tunnel T7.

1.1 Name and location of tunnel

Villa Borghese Tunnel is designed for the westbound and eastbound traffic of Highway 401 at Marguriet Park, parallel to Highway 3 at the location of this tunnel. The center of the tunnel has a Station 10+568.000. Huron Church Line crosses over the tunnel to connect to HWY3 at grade.

1.2 Permitted traffic speed

Highway Classification:	UFD – HWY 401
Design Speed:	110 km/h for HWY401 under the structure
Posted Speed:	90 km/h for HWY401 under the structure
Lanes:	7 lanes under the structure for HWY401 with 1 SCL (Speed Change Lane) 1 lane in channelized ramp over the structure 3 lanes on Huron Church Line over the structure
Design Clearance:	Provided 5.220 m vertical clearance, 5.0m is required
Bridge Design Vehicle:	CL-625-ONT

2 Tunnel Details

2.1 Basic layout

Villa Borghese Tunnel is 239.6m long, cut and covered tunnel with a two span bridge structure, and the total width of the tunnel is 54.000m. The tunnel has three 3.75m wide lanes on each traffic bound (East and West), and one 3.5m wide eastbound speed change lane (SCL). Minimum 2.5m wide shoulders are accommodated along each side of the travelling bounds. There are dedicated median to divide the westbound and eastbound lanes at the pier. The tunnel follows the centerline of HWY 401 in a curve which is an arc connected to a spiral.

Basic Layout Summary

Length	239.6m
Clear Roadway Width	37.25m
Alignment	HWY401 centerline
Lanes	3 – 3.75m wide westbound lanes under 3 – 3.75m wide eastbound lanes under 1 – 3.50m wide eastbound SCL lane under 1 – 5.00m wide exit lane on the exit ramp over 3 – variable wide South and North lanes in total on Huron Church Line over

Shoulder	Minimum 2.5m wide each side of a traffic bound
Median Barrier	Tall wall to protect pier
Road side Barrier	Along shoulders

2.2 Restrictions to traffic

N/A

3 Brief Description of Tunnel, Traffic and Tunnel Geometry

3.1 Structural form of Tunnel

Villa Borghese Tunnel is a cut-and-cover structure; its main bearing structure is composed of 82 lines of NU1900 modified girders, each with two spans of about 25.8m and about 28.2m. These girders are derived from the standard NU1900 girders with 35mm concrete added to each face of the web and 50mm added to the bottom of the bottom flange of the girders to enhance their resistance to RWS tunnel fires according to the Memo "Tunnel Fire Design Criteria". The modified NU girders are precast prestressed concrete girders, transported and erected on-site, then connected together to make them continuous to bear SDL and live loads. Semi-integral abutments over driven deep HP steel piles are used; the central piers consist of 1.5mx1.5m pier caps supported by 1.2m diameter of circular columns over 1.25m deep and 3.2m wide concrete footings, which are in turn also supported by driven deep HP steel piles.

The tunnel has a down slope of 1.7% from North to South, which makes constant haunches possible without worrying about water ponds over the tunnel (positive drainage). Calculation shows that the final deflections of the girders in the tunnel will be -15mm in the North span and -25mm in the South span under all dead loads, including long term creep effects. Negative deflections mean that the girders will rise instead of drop relative to the un-deformed position. The rise of the deck at the mid-spans of both the North and South spans would not reverse the down slope of the tunnel from North to South, which would drop more than 150mm.

The 235mm thick concrete slab on top of the girders with 30mm thickness constant haunches is made of precast panels with cast-in-place concrete and divided into segments of lengths no more than 45m wide, separated by 50mm wide gap expansion joints, due to thermal expansion and contraction resulted from temperature changes from -32°C to +20°C if the construction temperature is set to 15°C. With a maximum 45m wide deck segment, the movement of decks at the expansion joints due to temperature changes would be -14.4mm to +9.0mm, which is good for 47mm thick elastomeric bearings and could be accommodated by the 50mm wide gaps at the expansion joints. The 20mm uneven settlements of the tunnel foundations also need expansion joints in the superstructure for stress release.

The tunnel superstructure is expected to expand and/or contract immediately after construction and during its service life due to creep, shrinkage and thermal movement. Dividing the tunnel superstructure into segments using expansion joints significantly reduces the demand on the bearings caused by these movements, and reduces bending demand on piles perpendicular to the girder center lines, thus resulting in a more efficient design. Most of the strip seals are to be installed 0.85m below soil cover. They are also covered by a metal plate or board for further protection from vertical live load/impact. The expansion joints are not expected to require frequent maintenance. Inspection (e.g. for signs of leakage) can be undertaken from beneath the deck using a lifting platform or similar. The replacement procedure for expansion joints is expected to be similar to that of replacing buried utilities on top of tunnels. For joints exposed to traffic, appropriate standard joints have been specified with input from suppliers.

In addition, a utility corridor with two watermain is located at the east side of the tunnel, close to the east side parapet wall. Two watermain plunge down below the normal deck in two adjacent bays of the tunnel at the north end and penetrate the north abutment and go under HWY 3 to continue their path.

There are no escape facilities proposed for the tunnels.

The laminated elastomeric plate bearings may be melted in case of fire, which will create additional negative moments in the girders over the pier or additional positive moments in the positive moment zones. In the worst case, the bearings at the North abutment are melted, which will create a maximum negative moment of 3100kNm/girder, added to the maximum combined negative moments of 6690kNm in the normal circumstance. The total of these loads is 9790kNm/girder, which could be resisted by the girders which have a resistance under fire of 11575kNm.

Structure Summary

Structural Type:	Prestressed concrete NU1900 modified girders, semi-integral abutments and frame piers.
Span Arrangement:	Two span structure with modified NU girders spaced at 3.0m, except at expansion joint which is 2.4 m and at utility corridor which is 2.5m or 2.7m due to watermain utility plunges. Span length is 25.80 for the north spans and 28.28m for the south spans.
Foundation Type:	Concrete footings on deep HP steel piles
North Abutment	Semi-integral abutment (1.7m width and 1.5m depth) supported on deep HP 310x110 steel piles spaced at 2.3m.
South Abutment	Semi-integral abutment (1.7m width and 1.5m depth) supported on deep HP 310x110 steel piles spaced at 2.2m.
Central Pier	1.5mx1.5m Cap beam supported on 1.2m diameter of columns over 3.2m wide and 1.25m deep concrete

	footings. Columns on footing supported on two rows of deep HP 310x110 steel piles spaced at 1.87m.
Span Articulation:	Semi-integral support at abutments, fixed at central piers. Girders are supported by laminated plate bearings with un-conventional dimensions due to high bearing loads of 0.85m soil fill on top of the tunnel, and the longitudinal translation of girders is supposed to be fixed at the central pier. 5 expansion joints parallel to girders are provided on the deck along the full length of the tunnel.
Deck:	235mm thick concrete deck comprising 90mm thick precast panels and cast-in-place concrete topping with 30mm thickness of haunches; 1.8mx0.45m parapet wall at each end of the tunnel. 1m or 0.85m maximum soil fill is over the concrete deck where no roadway is present, and the soil fill could be replaced with 0.5m asphalt and concrete pavement for normal traffic use. The 0.85m soil fill could be reduced to 0.5m to facilitate landscaping. 0.5m in total of concrete pavement plus asphalt over the concrete deck where roadways are required is considered.

3.2 Structural form of portal structures

N/A.

3.3 Traffic and geometry

3.3.1 Horizontal and vertical alignment of tunnel and tunnel approaches

Tunnel: 3 lanes in each traffic bound in east- and west-directions.

Horizontal alignment: the tunnel is at a curve of an arc with a radium R=1100m connected to a spiral; the centerline of the tunnel is at STA. 10+568.000.

Vertical alignment: 0.6% down slope from East to West, 4.4% up slope from North to South at the ground level of HWY401; 0.5% down slope from East to West and 1.7% down slope from North to South at the top slab level of the tunnel.

Above tunnel: One ramp and one straight road over the tunnel to access Huron Church Line and HWY 3; two sidewalks and one trail are also provided for pedestrian.

3.3.2 Cross-section

Tunnel satisfied 5.0 m minimum vertical clearance; 5.22 m vertical clearance is provided.

3.3.3 Standards used

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 4 – Tunnel Design Criteria
Article 5 – Geotechnical and Foundation Design Criteria
Referenced Documents as specified in these Articles following the order of precedence as instructed.

No deviation from the standards used including design traffic flows and speeds.

3.3.4 Accommodation of mechanical and electrical services in Tunnel

Accommodation of light fixtures is designed with two options for contractors to choose. Electrical cables and conduits to host them are carefully designed. The electrical cables come from behind the South abutment and penetrate through the diaphragm and are distributed into the tunnel through electrical board on the diaphragm and carried by luminaire supporting structures underneath the tunnel and between the girders.

3.3.5 Minimum headroom, horizontal clearances

Minimum headroom (vertical clearance) is 5.220 m. Horizontal clearances between road side barriers and the driving lanes vary from 10.135 to 10.142m in the north side (10m are required) and 7.234m to 8.035m in the south (7m are required) under the tunnel, dependent on the longitudinal location.

3.4 **Proposed arrangements for inspection and maintenance**

All exposed structure elements will be accessible for inspection and maintenance. Some elements may require use of an inspection platform.

3.5 **Provision to be made in the Tunnel layout for emergency communication and escape facilities, fire, etc.**

Emergency communication details are shown on ATMS New Construction drawings which is not included in this submission.

No escape facilities will be provided.

3.6 **Landscaping above Tunnel and protection of Tunnel roof**

Landscaping above tunnel is shown on Landscape Construction drawings which is not included in this submission. Tunnel has been designed with 0.85 m soil layer on top deck to accommodate the requirement for drainage and landscaping.

3.7 **Finishes**

Concrete finishes on exterior of the parapet wall will have grassland pattern. All remaining finishing is specified in the General Notes, Doc No. 285380-03-060-SEG1-2702.

4 Design Assessment Criteria

4.1 Live Loading

4.1.1 Loading relating to normal traffic under applicable code loading and regulation

One truck of CL-625-ONT or one emergency truck applied anywhere over the tunnel is used as vehicle load and 4kPa of uniform pressure load is used as pedestrian loads in the design of T7, which are as per the Canadian Highway and Bridge Design Code (CHBDC) S6-06 for the parts of the structure where no traffic lanes are present. This conforms to the requirement defined in Clause 3.3 of the Project Agreement – Schedule 15.2. The DLA with reduced load effect is considered as per Clause 3.8.5.4.2 of CHBDC S6-06 for structures with 0.85m soil fill; load intensity on deck is reduced with wheel load spreading effects defined in CHBDC Clause 6.9.6 if the truck travels over the part of the tunnel where the earth fill on top of the structure is more than 0.6m thick.

Normal live loads and pedestrian loads are considered as per CHBDC S6-06 for the parts of the structure where traffic lanes are present.

The pedestrian load used in the design of T-7 is as per Clause 3.8.9 of the CHBDC S6-06. The equivalent load pressure from the pedestrian load is 4kPa.

Lateral pressure induced by the traffic loads or pedestrian loads is also considered when designing the parapet walls.

4.1.2 Design vehicle

One CHBDC CL-625-ONT truck applied anywhere on the tunnel was used in the design of T7 for the parts where there is no designated traffic lanes on the tunnel but with 0.85m soil fill, or 1m soil fill over portion of the tunnel in cases where there are utility corridors passing through the tunnel top .

Normal CL-625-ONT traffic live loads, including multilane loads of CHBDC CL-25-ONT trucks and CL-625-ONT lane loads, are used in designing the parts of the structure where normal traffic lanes are present.

The 0.85m maximum soil fill over the tunnel could be replaced with total 0.5m of concrete and asphalt pavement, and multilane traffic could be placed on top of this pavement.

4.1.3 Provision for exceptional abnormal loads

N/A

4.1.4 Any special loading not covered above

N/A

- 4.1.5 Heavy or high load route requirements and arrangements being made to preserve the route and any provisions for future heavier loads or future widening

N/A

- 4.1.6 Authorities consulted or any special conditions required

N/A

4.2 Other restrictions

- 4.2.1 Parapet walls

1.8m x 0.45m parapet walls plus 2.3m fence over the parapet wall at the overhangs of exterior girders are considered; the fence has an assumed equivalent weight of 1kN/m for this submission

5 Structural Analysis

5.1 Methods of analysis proposed

T7 has been analysed in accordance with CHBDC S6-06 and S6S1-10 (Supplement No. 1 to CAN/CSA-S6-06). Following software design aids are used:

- Canadian Bridge Analysis System (CANBAS) version 2.0.1,
- STAAD Pro 2007 version 20.07.02.15
- Microsoft Office Excel 2003
- Response 2000 1.0.5
- pcaColumn 2.6

5.2 Assumptions of structural elements

- 5.2.1 Cast-In-Place Concrete

Minimum compressive strength at 28 days: 30MPa (substructure)

Minimum compressive strength at 28 days: 40MPa (deck slab and diaphragms)

- 5.2.2 Precast Prestressed Concrete

Minimum compressive strength at transfer: 42MPa (girders)

Minimum compressive strength at 28 days: 60MPa (girders)

Minimum compressive strength at transfer: 24MPa (deck panels)

Minimum compressive strength at 28 days: 40MPa (deck panels)

- 5.2.3 Reinforcing Steel

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

Coated reinforcing steel bars: CAN/CSA G30.18-M92; Grade 400W/500W

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

5.2.4 Prestressing Steel

Strands shall be low-relaxation, size designation 15, Grade 1860 in accordance with CSA Standard G279.

5.2.5 Structural Stiffness

Structural stiffness is calculated according to CAN/CSA S6-06 Clause 5.9.1 grillage model and finite element method.

5.3 Proposed earth pressure coefficient (K_a , K_o , or K_p)

Refer to Geotechnical Report prepared by AMEC Earth and Environmental, dated April 5, 2012

5.4 Proposed fire design including protection of structure and cable

For proposed fire design refer to the following fire protection documents:

- Tunnel Structural Fire Assessment, Doc. No. 285380-03-126-0045;
- Tunnel Structural Fire Assessment – Deck Slab, Doc. No. 285380-03-126-0049;
- Tunnel Fire Design Criteria, Doc. No. 285380-03-109-0004.

Only non-combustible materials are used in tunnel for electrical and ATMS works.

6 Ground Conditions

6.1 Ground Conditions

Refer to "Geotechnical Investigation and Design Report – Tunnel T-7", Doc. No. 285380-04-119-0028, dated May 17, 2012

6.2 Geotechnical Design Parameters

Refer to "Geotechnical Investigation and Design Report – Tunnel T-7", Doc. No. 285380-04-119-0028, dated May 17, 2012

6.3 Differential Settlement

Refer to "Geotechnical Investigation and Design Report – Tunnel T-7", Doc. No. 285380-04-119-0028, dated May 17, 2012

6.4 Anticipated Ground Movements or Settlement

Refer to "Geotechnical Investigation and Design Report – Tunnel T-7", Doc. No. 285380-04-119-0028, dated May 17, 2012

6.5 Groundwater Conditions and Mitigative Measures

Refer to "Geotechnical Investigation and Design Report – Tunnel T-7", Doc. No. 285380-04-119-0028, dated May 17, 2012

6.6 Variance from Geotechnical Memo Recommendations

N/A

7 Drainage and Waterproofing

7.1 Details of proposed/existing drainage

7.1.1 Ground water seepage and run off

Refer to Highway and Roadway Drainage Design Report, Doc No. 285380-70-119-0001 for Phase 1 and Phase 2.

7.1.2 Accidental spillage, water carried in by vehicles

Drainage structures have been placed along the tunnel to collect runoff from vehicles and any accidental spills. These liquids would then be conveyed to the spill containment units located upstream of each pumping station. See Highway New Construction Drawings for more details.

7.1.3 A fire main burst

The runoff from a fire main burst would be less than the 100yr storm flow, which the storm system is designed for. The flow would be collected within two or three inlets. Watermains crossing HWY 401 and HWY 3 will be installed in steel casings per MTO requirements. Casing material will be stronger than the watermain material to be used. Additionally, the casing void (area between outside of watermain pipe and casing pipe) will be fill with cement based grout. Grouting the void area will provide added strength to the pipe system crossing the Highways, and minimize the potential for watermain breaks underneath a travel lane. Should a break occur under the travelled portion of the Highway, the casing will direct water flow to the shoulder areas where the subdrains and catchbasins will direct the water into the storm system. Water valves are placed along the watermain along HWY 401. This will permit the watermain to be isolated in the area of a break. Once the valves are closed, the water flow will be shut off.

7.1.4 Tunnel washing

The runoff from tunnel washing would be less than the 100yr storm flow, which the storm system is designed for. The flow would be collected within two or three inlets. Watermains crossing HWY 401 and HWY 3 will be installed in steel casings per MTO requirements. Casing material will be stronger than the watermain material to be used. Additionally, the casing void (area between outside of watermain pipe and casing pipe) will be fill with cement based grout. Grouting the void area will provide added strength to the pipe system crossing the Highways, and minimize

the potential for watermain breaks underneath a travel lane. Should a break occur under the travelled portion of the Highway, the casing will direct water flow to the shoulder areas where the subdrains and catchbasins will direct the water into the storm system. Water valves are placed along the watermain along HWY 401. This will permit the watermain to be isolated in the area of a break. Once the valves are closed, the water flow will be shut off.

7.2 Details of proposed waterproofing

The entire area of the T7 deck will be sealed with a waterproofing system as per Project Agreement requirement. Details are provided in the "Tunnel Watertightness" memo in the appendix.

7.3 List special requirements of local drainage authority

None

8 Tunnel Support System and Method of Construction

8.1 Basis of the design of the Tunnel support system for temporary and permanent conditions and any proposals for ground treatment

Structural form as described on Section 3.1 is one of the effective support system commonly used to carry roadway above for highway underpass. This support system is also able to satisfy the design requirements for permanent conditions of the WEP tunnels.

Refer to to "Geotechnical Investigation and Design Report – Tunnel T-7", Doc. No. 285380-04-119-0028, dated May 17, 2012, for the basic of permanent ground treatment design.

Design for temporary conditions is not addressed in this submission.

8.2 Show how the proposed method of construction, i.e. excavation and applicable ground support, will ensure the continued safe use of the Parkway and prevent structural failure

Permanent design is based on the Construction Sequence provided on the Foundation Plan, Abutment Layout and Ground Improvements Plan. Instrumentation and monitoring of the temporary works during construction should be implemented by the Contractor in addition to the limited instrumentation already installed during the geotechnical investigation.

(Construction methodology, staging and temporary works design are not appressed in this submission.

8.3 Give details of predicted settlements on adjacent structures

Refer to "Geotechnical Investigation and Design Report – Tunnel T-7", Doc. No. 285380-04-119-0028, dated May 17, 2012 for anticipated deformation of the ground around the structure.

8.4 State methods to be adopted to monitor and control the effects of tunnel construction to ensure compliance with any criteria imposed to limit surface movements or vibration (if applicable)

A program of site instrumentation and monitoring will be developed and implemented during construction, but is not part of this submission.

9 Checking

9.1 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.

9.2 Responsible Design Personnel

Originator: Stephen Fuheng Yang, P. Eng.

Checker: Matthias Yu, P.Eng.

Reviewer: Biljana Rajlic, P.Eng.

10 Drawings and Documents

10.1 List of Drawings (included in this submission):

Drawing No.	Revision	Drawing Name
285380-03-060-SEG1-2700	0	COVER SHEET, SITE PLAN AND KEY PLAN
285380-03-060-SEG1-2701	0	GENERAL ARRANGEMENT
285380-03-060-SEG1-2702	0	GENERAL NOTES
285380-04-090-SEG1-2703	0	BOREHOLE LOCATION & SOIL STRATA
285380-04-091-SEG1-2704	0	SOIL STRATIGRAPHY
285380-03-061-SEG1-2705	0	FOUNDATION LAYOUT
285380-03-061-SEG1-2706	0	FOUNDATION DETAILS
285380-03-060-SEG1-2707	0	GROUND IMPROVEMENTS - PLAN
285380-03-061-SEG1-2708	0	ABUTMENT LAYOUT I
285380-03-061-SEG1-2709	0	ABUTMENT LAYOUT II
285380-03-061-SEG1-2710	0	ABUTMENT REINFORCEMENT
285380-03-061-SEG1-2711	0	WINGWALL DETAILS
285380-03-065-SEG1-2730	0	FENCE DETAILS
285380-03-061-SEG1-2713	0	RSS WALLS LAYOUT
285380-03-061-SEG1-2714	0	RSS WALLS DETAILS
285380-03-061-SEG1-2715	0	PIER LAYOUT
285380-03-061-SEG1-2716	0	PIER REINFORCEMENT
285380-03-062-SEG1-2717	0	BEARING LAYOUT
285380-03-062-SEG1-2718	0	BEARING DETAILS
285380-03-063-SEG1-2719	0	PRESTRESSED GIRDER LAYOUT
285380-03-063-SEG1-2720	0	PRESTRESSED GIRDER ELEVATIONS
285380-03-063-SEG1-2721	0	PRESTRESSED GIRDER DETAILS
285380-03-064-SEG1-2722	0	INTERIOR PRECAST DECK PANELS
285380-03-064-SEG1-2723	0	PRECAST PANELS AT EXPANSION JOINTS
285380-03-064-SEG1-2724	0	DECK LAYOUT AND REINFORCEMENT
285380-03-064-SEG1-2725	0	ABUTMENT DIAPHRAGM LAYOUT AND REINF.
285380-03-064-SEG1-2726	0	PIER DIAPHRAGM LAYOUT AND REINF.
285380-03-064-SEG1-2727	0	DECK DETAILS
285380-03-064-SEG1-2753	0	REINFORCEMENT FOR UTILITY PENETRATION
285380-03-065-SEG1-2728	0	PARAPET WALL FINISH (GRASSLAND FINISH)
285380-03-065-SEG1-2729	0	6000 mm APPROACH SLAB
285380-03-065-SEG1-2731	0	DETAILS OF CONCRETE SLOPE PAVING
285380-03-066-SEG1-2732	0	STANDARD DETAILS
285380-07-444-SEG1-2733	0	EMBEDDED ELECTRICAL WORK I
285380-07-444-SEG1-2734	0	EMBEDDED ELECTRICAL WORK II
285380-07-444-SEG1-2735	0	EMBEDDED ELECTRICAL WORK III
285380-07-444-SEG1-2736	0	EMBEDDED ELECTRICAL WORK IV
285380-07-067-SEG1-2750	0	LUMINAIRE STRUCTURAL SUPPORT OPTION 1
285380-07-067-SEG1-2751	0	LUMINAIRE STRUCTURAL SUPPORT OPTION 2
285380-07-067-SEG1-2752	0	WIREWAY STRUCTURAL SUPPORT
285380-03-060-SEG1-2740	0	GROUND IMPROVEMENTS - SECTIONS I
285380-03-060-SEG1-2741	0	GROUND IMPROVEMENTS - SECTIONS II

285380-03-060-SEG1-2742	0	GROUND IMPROVEMENTS - SECTIONS III
285380-04-094-SEG1-2743	0	CONSTRUCTION NOTES - BACKFILL AT STRUCTURES
285380-04-094-SEG1-2744	0	CONSTRUCTION NOTES - LIGHTWEIGHT FILL MATERIAL
285380-04-094-SEG1-2745	0	CONSTRUCTION NOTES - EXPANDED POLYSTYRENE
285380-03-061-SEG1-2746	0	LIGHT/SIGNAL/COMMUNICATION FOUNDATIONS
285380-03-080-SEG1-2747	0	FIRE SUPPRESSION PLAN
285380-03-080-SEG1-2748	0	FIRE SUPPRESSION PROFILE
285380-03-080-SEG1-2749	0	FIRE SUPPRESSION DETAILS

10.2 List of Documents (included in this submission):

Document No.	Revision	Document Name
285380-04-119-0028	0	Geotechnical Investigation and Design Report – Tunnel T-7
285380-03-126-0039	D	Tunnel Watertightness
285380-03-127-0021	0	Technical Appraisal Form

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

See Appendix A.

The above design and construction proposals are submitted for review

Signed: *Biljana Rajlic*

Design Manager

Name: Biljana Rajlic

Engineering Qualifications: P. Eng.

Date: JUNE 08, 2012

Professional Registration Number: 10041385

Affix Professional Seal



Signed: *[Signature]*

Project Co Representative

Name: *CONCRETO CASA*

Date: *July 24, 2012*

Professional Registration Number:

Affix Professional Seal

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
285380-70-119-0001	C	Highway and Roadway Drainage Design Report
285380-03-126-0045	D	Tunnel Structural Fire Assessment
285380-03-126-0049	A	Tunnel Structural Fire Assessment – Deck Slab
285380-03-109-0004	0	Tunnel Fire Design Criteria
285380-83-119-0013	B	Tunnel Top Soil – Proposed Soil Profiles and Corresponding Unit Weight