

Article 16. Survey Control and Mapping..... 16-1

- 16.1 General..... 16-1
- 16.2 Codes and Standards 16-1
- 16.3 Control Survey 16-1
- 16.4 Horizontal Control 16-2
- 16.5 Vertical Control..... 16-3
- 16.6 Miscellaneous Surveys..... 16-3
- 16.7 Right of Access for Surveys..... 16-4

Article 16. Survey Control and Mapping

16.1 General

- (a) This Article 16 [Survey Control and Mapping] specifies the requirements and criteria for the survey control, ground surveys and mapping necessary for the Design and Construction of the Work.
- (b) The Primary Contractor's survey and mapping, and the Design and the Construction shall be based on the Evergreen Project Coordinate System as set out in Article 16.3(b) of this Part 2.
- (c) Without limiting any other provisions of this Agreement, the Primary Contractor shall carry out all surveys, mapping and related activities necessary to perform the Work in accordance with the provisions of this Agreement, including this Article 16 [Survey Control and Mapping].

16.2 Codes and Standards

- (a) The Primary Contractor shall ensure that all survey and mapping requirements set out in this Article 16 [Survey Control and Mapping], and all aspects of the Work comprising or connected with the surveying and mapping for the Design of the Guideway conform to the following codes and standards:
 - (i) Project Control Survey, documented in the Evergreen Project Coordinates Report dated July 2009, prepared by the BC Ministry of Transportation and Infrastructure, Southern Interior Region (the "**Project Control Survey**"); and
 - (ii) Specifications and Recommendations for Control Surveys and Survey Markers, 1978, Natural Resources Canada.

16.3 Control Survey

- (a) The Primary Contractor shall use, as a basis for the Design and Construction of the Work, the Project Control Survey, as referenced in Article 16.2(a)(i) of this Part 2.
- (b) The "**Evergreen Project Coordinate System**" is a local system established by the Project Control Survey and the conversions specified in Article 16.4 [Horizontal Control] and Article 16.5 [Vertical Control], both of this Part 2.
- (c) The Primary Contractor shall evaluate its requirements for a control survey and:
 - (i) satisfy itself as to the adequacy, accuracy, relevance and completeness of the Project Control Survey;

- (ii) determine whether the Project Control Survey is sufficient for the Primary Contractor to complete the Work or if additional monuments or any other supplements, modifications or changes are required;
 - (iii) prepare and implement any supplements, modifications or changes required; and
 - (iv) install all such additional monuments and survey such monuments to tie them into the Evergreen Project Coordinate System.
- (d) The Primary Contractor shall prepare a drawing of each additional survey monument that it installs and provide a copy of the drawing to the Province's Representative within 20 Business Days of the installation.
- (e) The Primary Contractor shall prepare a written description, and drawings where applicable, with respect to each supplement, modification or change the Primary Contractor determines is required in order to carry out the Work, and provide a copy of any such written description or drawings to the Province's Representative within 20 Business Days of the Primary Contractor having determined that any other supplement, modification or change is required.
- (f) The Primary Contractor shall be solely responsible for protecting and maintaining all existing and new control survey monuments, including verification of the coordinates of each monument prior to the commencement of the Work, and on an ongoing basis throughout the performance of the Work.
- (g) Any monuments that for any reason are damaged or require relocation shall be repaired or relocated by the Primary Contractor as part of the Work.

16.4 Horizontal Control

- (a) The Primary Contractor shall ensure that:
- (i) the coordination of horizontal control points will be based on the Project ground coordinate projection; and
 - (ii) conversion to the local system (LocEG) from NAD 83 UTM Zone 10 (UTMz10) will be based on the following calculations:
 - A. multiply UTMz10 coordinates by combined scale factor: 1.000404013,
 - B. then shift northing by -2401.5085,
 - C. then shift easting by -105.6579, and
 - D. then rotate about RTP 2089 (83H6592): -00 00'02", (RTP 2089: N 5454547.386 E 507923.276).
- (b) The Primary Contractor shall ensure that all Design distances will be in Evergreen Project Coordinate System grid distances.

- (c) The Primary Contractor shall use the Evergreen Project Coordinate System to establish a control network (the “**Secondary Control Survey**”) as a basis for all Design and Construction surveys for the Project.
- (d) The Primary Contractor shall ensure that the Secondary Control Survey will have a second order standard of accuracy, in compliance with the Specifications and Recommendations for Control Surveys and Survey Markers, 1978, Natural Resources Canada.
- (e) The Primary Contractor shall ensure that all surveys made for the Project will:
 - (i) be tied into monuments in the Secondary Control Survey and will be adjusted by holding the position of these monuments fixed; and
 - (ii) have a third order standard of accuracy, in compliance with the Specifications and Recommendations for Control Survey Markers, 1978, Natural Resources Canada.

16.5 Vertical Control

- (a) The Primary Contractor shall ensure that all survey work carried out for the Project will be based on the vertical control network described as follows:
 - (i) the vertical control network has been established using the Canadian Spatial Reference System, Geodetic Survey Division, Natural Resources Canada, monumentation;
 - (ii) the vertical control network is based on the NAD83 adjustment; and
 - (iii) the Project Control Survey elevations are 0.080 m higher than the published geodetic elevation.
- (b) The Primary Contractor shall ensure that any additional vertical ground control and supporting surveys performed by the Primary Contractor will have a second order standard of accuracy, in compliance with the Specifications and Recommendations for Control Surveys and Survey Markers, 1978, as referenced in Article 16.2(a)(ii) of this Part 2.

16.6 Miscellaneous Surveys

- (a) In addition to the surveys described elsewhere in this Article 16 [Survey Control and Mapping], the Primary Contractor shall carry out and provide any and all additional surveys required for the Work including:
 - (i) clearance field surveys to identify areas of tight clearance in the horizontal and vertical plane, which surveys shall be carried out and provided on an “as-needed basis”; and
 - (ii) topographic and planimetric field surveys to supplement aerial mapping in areas that need further definition, as determined by the Primary Contractor.

16.7 Right of Access for Surveys

- (a) Prior to carrying out survey work, the Primary Contractor shall prepare or cause to be prepared, all applications, including any required attachments, needed to obtain all necessary Permits and access rights required to carry out the field surveys for the Project.