

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 General requirements for building foundations.  
.2 Load testing of building foundation units.
- 1.2 REFERENCES .1 National Research Council Canada  
.1 National Building Code of Canada 2010 (NBCC).  
.2 *User's Guide – NBC 2005 Structural Commentaries (Part 4 of Division B)*  
.2 Canadian Standards Association (CSA International)
- 1.3 SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures including, but not limited to, the following:  
.1 Manufacturer's printed product literature, specifications, and datasheet.  
.2 Schedule of planned sequence of installations.  
.3 Design details.  
.4 Construction tolerances.  
.5 Equipment manufacturer's written data.  
.6 Load testing plan and methods.  
.7 Quality control plan.
- 1.4 DELIVERY, STORAGE AND HANDLING .1 Deliver, store, and handle materials in accordance with manufacturer's instructions.  
.2 Protect materials from damage due to excessive bending stresses, impact, abrasion, or other causes during delivery, storage, and handling.  
.3 Replace damaged materials as directed by the Consultant.
- 1.5 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse, recycling, and disposal in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
- 1.6 EXISTING CONDITIONS .1 Examine geotechnical reports and information located in the Appendices:  
.1 City of Winnipeg – *Former Elmwood / Nairn Landfill Site Final Preliminary Site Condition Assessment Report* as prepared by KGS Group located in Appendix D4.  
.2 City of Winnipeg – letter report dated February 7, 2011, *Public Works East Yards – Geotechnical Investigation*, prepared by AECOM located in Appendix D1.  
.3 Figure 01-C-1002 – *Summary Diagram of Subsurface*

*Investigations*, prepared by AECOM located in Appendix B4.

- .2 The above documents are provided for information purposes. The information provided is considered accurate at the location and time of investigation as outlined in the Appendices. However, variations in soil conditions may exist between test holes and fluctuation in groundwater levels can be expected seasonally and may occur as a result of construction activities. The nature and extent of variations may not become evident until construction commences. Design Build Team shall satisfy himself with the subsurface conditions and conduct their own assessment including additional investigation to verify the subsurface conditions.
- .3 Refer to the geotechnical reports listed above for a description of the fill on this site; obstructions for building foundation installation are to be anticipated and coring through or cutting concrete and other debris may be required.
- .4 Refer to the geotechnical reports listed above for a description of the groundwater conditions on this site.
- .5 The subsoil and the groundwater conditions on this site may necessitate use of sleeves for the installation of the building foundations.

#### 1.7 DESIGN REQUIREMENTS

- .1 Structures to be designed to the NBCC, Part 4, Post-Disaster Importance Category.
- .2 Design dead and live loads to meet requirements of the NBCC, Part 4.
- .3 Design of structures shall conform to City of Winnipeg requirements in *Standards and Guidelines for the Mitigation of Methane Gas at Buildings and Utilities and Guidelines for Construction on Landfill Sites*; refer to Appendix D5.
- .4 The Consultant to provide the allowable design load capacity of building foundations.
- .5 The Main office, garage, shops and storage building superstructures shall be supported on structural pile foundations. The main building Administrative and Staff Component shall have structural concrete floor slabs.
- .6 Shallow foundations bearing on the existing fill material on this site will not be acceptable. Shallow foundations, if used, must bear on engineered fill placed on competent material.
- .7 Unheated building superstructures, and concrete floor slabs for both heated and unheated garage, shop and storage buildings, shall be designed to meet the standards and tolerances referenced in the National Building Code of Canada 2010, Division B, Part 4, as well as the accompanying User's Guide – NBC 2005 Structural

Commentaries (Part 4 of Division B); in particular as per, "Commentary K: Foundations", "Total and Differential Settlements" on pages K-16 and K-17.

- .1 The intent is to forestall an ultimate or serviceability limit state, such as unacceptable cracking of the concrete floor slab, or jamming of doors in the support structure.
- .2 Serviceability design in the case of the Public Works East Yards Heated and Unheated Garage, Shop and Storage Components, in particular, shall also address the limits imposed by multiple large overhead doors and the movements of heavy vehicles into and from structures. The weather seal all around the overhead doors shall not be compromised due to any structure movements.
- .8 Design foundations of all heated and unheated garage/shop/storage spaces to accommodate heaviest vehicle and equipment loading.
- .9 The Structural Consultant shall consider maximum loaded vehicle weights in the design of building aprons, grade beams and garage and shop floors.
- .10 All concrete aprons in front of overhead doors shall be designed as transition slabs.
- .11 Where deep foundations are used, no shaft resistance from the existing fill should be accounted for in pile capacity calculations.
- .12 Where deep foundations are used, it is the responsibility of the Design Build Team to determine the length of deep foundation units.
- .13 Minimum safety factors for foundation design shall be as follows:
  - .1 Shallow foundations: minimum safety factor of 3.0 for bearing capacity with maximum 25 mm settlement.
  - .2 Deep foundation units: minimum safety factor of 2.25 for load capacity.
- .14 Design for quality and durability in accordance with Section 01 47 13, LEED Requirements.

## 1.8 SCHEDULING

- .1 Provide schedule of planned sequence of foundation installation to the Consultant for review prior to commencement of installation.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- .1 Material requirements for building foundations to meet the NBCC and applicable referenced codes and standards therein.
- .2 Materials to be selected to conform to local industry standards and practices and to be locally proven products.

- 2.2 EQUIPMENT
- .1 Provide equipment sized for the installation of the building foundations.
  - .2 Non-impact methods of installation such as augering, jacking, vibratory hammers, or other means: provide full details of characteristics necessary to evaluate performance.
  - .3 Impact methods of installation: provide full details of characteristics necessary to evaluate performance.

PART 3 - EXECUTION

- 3.1 PREPARATION
- .1 Protection:
    - .1 Protect adjacent structures, services, and work of other sections from hazards due to building foundation installation operations.
    - .2 Arrange sequencing of building foundation installation operations and methods to avoid damages to adjacent existing structures.
    - .3 When damages occur, remedy damaged items to restore to original or better condition at own expense.
  - .2 Ensure that ground conditions at building foundation unit locations are adequate to support pile driving operation and load testing operation.
  - .3 Pre-boring of holes is acceptable to facilitate alignment control.
- 3.2 MANUFACTURER'S INSTRUCTIONS
- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage, and installation instructions and datasheets.
- 3.3 INSTALLATION
- .1 The Consultant to provide installation methods and procedures for the installation of the building foundation units.
- 3.4 OBSTRUCTIONS
- .1 Where obstruction is encountered that causes sudden unexpected change in penetration resistance or deviation from specified tolerances, remove obstruction to facilitate construction activities or proceed as directed by the Consultant.
- 3.5 FIELD QUALITY CONTROL
- .1 If shallow foundations are used, perform compaction testing on sub grade, engineered fill, sub base, and base courses.

- .2 If driven piles are used for foundations, PDA testing of 2% to 5% of the total number of piles is required.
- .3 If the required test results are not achieved, the Design Build Team shall propose remedial measures and submit to the Contract Administrator.
- .4 A qualified Geotechnical Engineer to interpret results for predicting building foundation unit performance and capacity.
- .5 The Consultant to verify and submit test results to the Contract Administrator.

3.6 CLEANING

- .1 Clean up in accordance with Section 01 74 11, Cleaning.