
SPECIFICATIONS

GOVERNMENT OF CANADA

HELIPORT

Niagara-on-the-Lake, Ontario

Issued for Tender

29 September 2014

Project No. 201405776

DOCUMENT 0 - INTRODUCTORY INFORMATION
BIDDING REQUIREMENTS, CONTRACT REQUIREMENTS

Document	Title	Pages
	Cover Page	1
00 01 10	Table of Contents	2

DIVISION 1 - GENERAL REQUIREMENTS

Section	Title	Pages
01 11 00	Summary of Work	3
01 14 00	Work Restrictions	3
	- Contractor/Consultant Information Sheet for Facilities Access	2
	- Additional Instructions for Completion of Government of Canada Personnel Screening, Consent and Authorization Form (Form No. TBS 330-23E)	3
	- Personnel Screening, Consent and Authorization Form (Form No. TBS 330-23E)	3
01 29 83	Payment Procedures for Testing Laboratory Services	2
01 31 19	Project Meetings	3
01 32 16.07	Construction Progress Schedule - Bar (Gantt) Chart	3
01 33 00	Submittal Procedures	5
01 35 29	Health and Safety Requirements	5
01 41 00	Regulatory Requirements	2
01 42 13	Abbreviations and Acronyms	10
01 45 00	Quality Control	3
01 56 00	Temporary Barriers and Enclosures	3
01 61 00	Common Product Requirements	6
01 71 00	Examination and Preparation	3
01 73 00	Execution	2
01 74 11	Cleaning	2
01 77 00	Closeout Procedures	1
01 78 00	Closeout Submittals	7
01 79 00	Demonstration and Training	2

DIVISION 26 – ELECTRICAL

Section	Title	Pages
26 05 00	Common Work Results For Electrical	7
26 05 20	Wire And Box Connectors 0-1000 V	2
26 05 21	Wires And Cables (0-1000 V)	2
26 05 22	Connectors And Terminations	2
26 05 29	Hangers And Supports For Electrical Systems	2
26 05 31	Splitters, Junction, Pull Boxes And Cabinets	2
26 05 34	Conduits, Conduit Fastenings And Conduit Fittings	4
26 28 16.02	Moulded Case Circuit Breakers	2
26 50 00	Lighting	4

DIVISION 31 – EARTHWORK

Section	Title	Pages
31 00 00.01	Earthwork - Short Form	6
31 22 13	Rough Grading	4
31 23 33.01	Excavating, Trenching and Backfilling	8

DIVISION 33 – UTILITIES

Section	Title	Pages
33 42 14	Pipe Culverts	6
33 46 16	Subdrainage Piping	5

END OF DOCUMENT

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Title and description of Work.
 - .2 Work sequence.
 - .3 Contractor use of premises.
 - .4 Ground-breaking ceremony.
 - .5 Owner furnished items.
 - .6 Coordination.
 - .7 Fees, permits and certificates.
- 1.2 **PRECEDENCE**
 - .1 Fire SFor Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.
- 1.3 **RELATED SECTIONS**
 - .1 Section 01 33 00 - Submittal Procedures.
- 1.4 **WORK COVERED BY CONTRACT DOCUMENTS**
 - .1 Work of this Contract comprises the construction of a new heliport located in Niagara-on-the-Lake, Ontario.
- 1.5 **WORK SEQUENCE**
 - .1 Coordinate Progress Schedule.
 - .2 Maintain fire access/control.
- 1.6 **CONTRACTOR USE OF PREMISES**
 - .1 Contractor has unrestricted use of site until Substantial Performance.
 - .2 Coordinate use of premises under direction of Departmental Representative.
 - .3 Coordinate Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.7 **GROUND-BREAKING CEREMONY**

- .1 Contractor Accommodate a ground-breaking ceremony which will occur after tender award and the finalizing of security clearances of the General contractor and sub-trades.
- .2 Coordinate use of premises under direction of Departmental Representative.

1.8 **OWNER FURNISHED ITEMS**

- .1 Owner Responsibilities:
 - .1 Arrange for delivery of shop drawings, product data, samples, Manufacturer's instructions, and certificates to Contractor.
 - .2 Deliver supplier's bill of materials to Contractor.
 - .3 Arrange and pay for delivery to site in accordance with Progress Schedule.
 - .4 Inspect deliveries jointly with Contractor.
 - .5 Submit claims for transportation damage.
 - .6 Arrange for replacement of damaged, defective or missing items.
 - .7 Arrange for manufacturer's field services; arrange for and deliver Manufacturer's warranties and bonds to Contractor.
- .2 Contractor Responsibilities:
 - .1 Designate submittals and delivery date for each product in progress schedule.
 - .2 Review shop drawings, product data, samples, and other submittals. Submit to Departmental Representative notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 - .3 Receive and unload products at site.
 - .4 Pay demurrage charges.
 - .5 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
 - .6 Handle products at site, including uncrating and storage.
 - .7 Protect products from damage, and from exposure to elements.
 - .8 Assemble, install, connect, adjust, and finish products.
 - .9 Provide installation inspections required by public authorities.
 - .10 Repair or replace items damaged by Contractor or subcontractor on site (under his control).

1.9 **COORDINATION**

- .1 Contractor Accommodate a ground-breaking ceremony which will occur after tender award and the finalizing of security clearances of the General contractor and sub-trades.
- .2 Cooperate and coordinate with Other Contractors including Other Contractor's employed by Owner. Ensure that Subcontractors and trades cooperate and coordinate their work to have the Work performed expeditiously and to be satisfactory in all respects at completion. Ensure cooperation of workers in laying out and performing Work. Maintain efficient and continuous supervision.

- .3 Ensure that Subcontractors and trades cooperate with other subcontractors and trades whose work attaches to or is affected by their own work. Ensure that minor adjustments are made to make adjustable work fit fixed work..

1.10 **FEES, PERMITS AND CERTIFICATES**

- .1 Provide authorities having jurisdiction with information requested..
- .2 Fire stopping and The Contractor shall obtain and pay for all building permits. Obtain and pay for all other permits, licenses, certificates, fees and governmental inspections or notices required for the performance of the work.
- .3 Furnish certificates and permits..
- .4 Service Submit acceptable certificate stating that suspended ceiling systems provide adequate support for electrical fixtures, as required by current bulletin of Electrical Inspection Department of Ontario Hydro.
- .5 NOTE: Permit drawings are the property of the Owner. Contractor to forward "approved" permit drawings and a copy of the Building Permit to the Departmental Representative prior to the submission of the first request for progress payment.

2 Products

2.1 **Not Used**

- .1 Not used.

3 Products

3.1 **Not Used**

- .1 Not used.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Connecting to existing site services.
 - .2 Special scheduling requirements.
 - .3 Security clearance requirements.
- 1.2 **RELATED SECTIONS**
 - .1 Section 01 32 16.07 - Project Time Management, Planning, Monitoring and Control System - Bar (GANTT) Chart Method.
 - .2 Section 01 56 00 - Temporary Barriers and Enclosures.
- 1.3 **ACCESS AND EGRESS**
 - .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.
- 1.4 **USE OF SITE AND FACILITIES**
 - .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
 - .2 Maintain existing services to building and provide for personnel and vehicle access.
 - .3 Where security is reduced by work provide temporary means to maintain security.
- 1.5 **EXISTING SITE SERVICES**
 - .1 Notify, Departmental Representative utility companies of intended interruption of services and obtain required permission.
 - .2 Unless otherwise indicated, where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
 - .3 Provide for pedestrian and vehicular traffic.
 - .4 Construct barriers in accordance with Section 01 56 00.

1.6 **SPECIAL REQUIREMENTS**

- .1 Submit schedule in accordance with Section 01 32 16.07 - Construction Progress Schedule - Bar (GANNT) Chart.
- .2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.

1.7 **SECURITY CLEARANCE REQUIREMENTS (LAW ENFORCEMENT CHECKS)**

- .1 All personnel employed on this project will be subject to at a minimum, the Facilities Access Level 2 clearance requirements.
- .2 Prior to the commencement of the on-site activities, all personnel engaged in the execution of the work on the exterior or interior of an Government occupied and/or unoccupied building or outside on the grounds, shall have at a minimum, the requisite a Facilities Access Level 2 clearance.
- .3 As a result, immediately upon award of the contract, the Contractor shall prepare and submit the attached requisite forms, provided by the Departmental Representative (or failing that the Departmental Representative Project Manager), for each Contractor employee and sub-contractor employee to be engaged in the work on the exterior or interior of an occupied and/or unoccupied building or outside on the grounds. In addition, Contractor's employees and sub-contractor employees must include with their requisite forms, government issued documents (driver's license/photo identification and birth certificate), for each Contractor employee and sub-contractor employee engaged in the work on the project site as noted above.

To eliminate delays in the clearance process, all clearance documents completed by the Contractor's employees and sub-contractor employees must be reviewed by the Contractor to ensure that all requested information has been provided, prior to submitting documents to the department representative. Incomplete forms will be returned to the Contractor.

The Contractor's employees and sub-contractor employees shall only mobilize on site, once the requisite clearance has been granted.
- .4 The Contractor should batch the fully completed submissions, based on priority work on site and allow for a **minimum twenty (20) working days** processing time in the project schedule for the review to occur (from the date the completed documents are received by the department representative). The inability to submit the fully completed requisite forms and documents will not be reason for an extension to the project schedule or additional compensation.

- .5 Contractor's employees and subcontractor employees with the requisite Facilities Access Level 2 clearance must be escorted at all times by a Commissionaire escort hired by the department representative (at no cost to the Contractor).
- .6 The Contractor shall give the department representative **72 hours' notice for work to be carried out in an occupied buildings during periods outside of the normal working hours of Monday to Friday, from 06:00 to 18:00 hours** (hours subject to change at the discretion of the department representative).

1.8 **BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions.
- .2 Smoking is not permitted on site, unless otherwise approved by the Owner.
- .3 If permitted by the Owner, the Owner will designate a specific outdoor location on site where smoking may occur.

2 Products

2.1 **NOT USED**

- .1 Not used.

3 Execution

3.1 **NOT USED**

- .1 Not used.

END OF SECTION

Contractor/Consultant Information Sheet for Facilities Access

Page 1 of 2

PLEASE PRINT LEGIBLY / ALL INFORMATION MUST BE PROVIDED

<i>CONTRACTORS/CONSULTANTS MUST PROVIDE THE FOLLOWING INFORMATION:</i>

1. Your Complete Legal Name: <i>(First/Middle or "no Middle Name"/ Last Name)</i>	
2. Name of Company That You Work For:	
3. Company Telephone Number:	
4. Project That You Are Working On: <i>(Name of Project/Building/City/Province)</i>	NOAF Project–Construction of a new NOAF facility Niagara-on-the-Lake, Ontario SRCL # 20121114045
5. Project Manager:	Peter Joice, National Project Management Office, Ottawa
6. Access Period (Start & End Dates): <i>(If exact dates unknown, estimated dates)</i>	

<i>CONTRACTORS/CONSULTANTS MUST PROVIDE <u>PHOTOCOPIES</u> OF (Two pieces of ID must be provided):</i>

DOCUMENTS ATTACHED TO TBS 330-23E:	YES / NO
1. Driver's License (clear copy, certified to be a true copy by individual (other than applicant – does not have to be Notary Public) – both front and back of document). <i>Note:</i> If you do not have a Driver's License, please provide other government issued photo identification (passport, treaty card).	
2. Birth Certificate (clear copy, certified to be a true copy by individual (other than applicant – does not have to be Notary Public) – both front and back of document) <i>Note:</i> If you do not have a Birth Certificate, please provide other government issued identification (passport, treaty card, Firearms License).	

Contractor/Consultant Information Sheet

Page 2 of 2

CONTRACTORS / CONSULTANTS - PLEASE NOTE THE FOLLOWING:

Should an Access tag/card be issued to you, please note the following;

- 1) You are the sole user of the access tag and it must be visibly worn while working on the site.
- 2) The access tag is non-transferrable / can not be used while working on projects other than the projects it was issued for.
- 3) The access tag **must be returned** to the Department Representative issuing office or site foreman (if approved) at the end of each day.
- 4) No access to areas that you have not been cleared will be allowed and if found in these areas your clearance will be revoked and you will be removed from the site.

Employee Signature:	Signed on Date:
---------------------	-----------------

“EMPLOYER” TO REVIEW (not employee applicant of this form), COMPLETE AND SIGN:

In order to comply with Federal Government policies and guidelines, in relation to the collection of personal information, the employer requesting the security checks must be satisfied that he/she can confirm the identity of the applicant.

The employer (your supervisor or a colleague) MUST:

- 1) Request that their employees attend in person and provided two pieces of Identification.
- 2) ID MUST include full date of birth and name of the individual ie, Driver’s Licence - Birth Certificate, Passport, Firearms Licence. (One piece of ID must include the photograph and if using the Drivers Licence copy both the photo portion as well as the signature portion.)
- 3) If the employee has changed his/her name, ID MUST be provided with both the current as well as past names.

Type of ID: 1) _____ **Number** _____

2) _____ **Number** _____

Employers Name: _____
(First Name and Surname)

Employers Signature: _____

Date of signature: _____

**ADDITIONAL INSTRUCTIONS FOR COMPLETION OF
GOVERNMENT OF CANADA PERSONNEL SCREENING, CONSENT
AND AUTHORIZATION FORM (Form No. TBS 330-23E)**

NOTE:

All information requested on TBS 330-23E MUST be provided (do not leave any "blanks", provide partial information, and do not use any abbreviations - ie. CA for Canada). Failure to provide requested information will result in forms being returned to applicants.

Page 1 of Form:

Section A. Administrative Information: Do not complete (completed by the Department Representative).

Section B. Biographical Information: *To be completed by applicant:*

1. Surname: Your Last Name that you currently use - ie. "Smith"
2. Full Given Names (no initials):
 - a. Your First Name and Middle Name (s) ie. "Cameron John"

**If you do not have a middle name, state "no middle name" on the form.
**Circle or underline your usual name used (whether you go by your first name or middle name).
3. Family Name at Birth: Your Last Name when you were born - ie. "Smith" (do not include "Same")
4. All other names used: Abbreviation(s) of name(s) used (ie. "Dave"/David, "Charlie"/Charles) or nicknames.
5. Sex: Place "x" in box beside male or female.
6. Date of Birth: provide the Year, Month and Day you were born ie. 2012-01-01 (must provide all in this format)
7. Country of Birth: - the Country that you were born in ie. Canada (no abbreviations such as "CA")
8. Date of entry into Canada if born outside Canada: - ie. 2012-01-01 (Year, Month, Day format)
9. Daytime telephone number: Your telephone number that the Department Representative can reach you at in the daytime, including your area code.
10. E-mail address: Your e-mail address at work, or if you do not have one at work, your home e-mail address.
11. Residence(s): provide addresses where you have permanently or temporarily resided for the last five years, starting with the most current home address. Must be consecutive dates - no breaks in time periods.
**Do not fill in address in grey/shaded area beside "Home address"; fill in current address in the boxes under "Home address".

**ADDITIONAL INSTRUCTIONS FOR COMPLETION OF
GOVERNMENT OF CANADA PERSONNEL SCREENING, CONSENT AND
AUTHORIZATION FORM (Form No. TBS 330-23E)**

- a. Apartment Number - fill in if you have one; if you do not live in an apartment, leave blank.
- b. Street Number - your house number ie. "421"
- c. Street Name - ie. "Smith Street/George Avenue; or "4th Street" if no name (no abbreviations)
**If you do not have a street address or you live on a farm/acreage, please provide your legal land descriptions (ie. SW-30-23-45-W4th) - NO POST OFFICE BOX NUMBERS.
- d. From - the year and month that you moved to your current / previous residence(s);
* * If you cannot recall the month, please state above the M - "unknown"
- e. To - "Present" or the year and month that you moved/vacated your previous residences (not current residence).
- f. City - the name of the city or town that you currently and previously resided in.
- g. Province or State - the name of the province or state that you currently and previously resided in (no abbreviations ie. "AB" or "SK").
- h. Postal Code - your current and previous postal codes.
- i. Country - the name of the country that you currently and previously resided in (no abbreviations).
- j. Telephone Number - your current and previous home telephone numbers, including area code.
Note: *If you do not have enough space on the attached form to list addresses for the last five years. please photocopy page J and complete Section B. listing:*
- a.) Your Surname. b.) Full Given Names. c.) Family name at birth, d.) Sex, e.) Date of Birth, j). Country of Birth g.) additional addresses for the last five years (apartment No., Street Number, Street Name, City, Province, dates etc.).

12. Have you previously completed a Government of Canada security screening form?:

- a. "No" or
- b. "Yes" - if "Yes", please provide details. If you cannot recall some or all of the details (ie. year of screening, state "cannot recall").

13. Criminal Convictions:

- a. "No" OR
- b. "Yes" - if "Yes", please provide details. If you cannot recall some or all of the details (ie. date of conviction, state "cannot recall").

**ADDITIONAL INSTRUCTIONS FOR COMPLETION OF
GOVERNMENT OF CANADA PERSONNEL SCREENING, CONSENT AND
AUTHORIZATION FORM (Form No. TBS 330-23E)**

Page 2 of Form:

Top of Page 2: *To be completed by applicant:*

1. Surname (your last name) followed by a comma - ie. Smith,
2. Full given names - your first name and then your middle name
**If you do not have a middle name, state "no middle name" on the form.
**Circle or underline your usual name used (ie. whether you go by your first name or middle name).
3. Date of birth - provide - Year, Month, Day ie. 2012-01-01 (must provide all in this format / no blanks)

Section C. Consent and Verification: *To be completed by applicant:*

1. Initial under "Applicant's Initials" column - **numbers 1. to 5. (you must initial all boxes-1 to 5).**
 2. Read the Privacy Act Statement and sign above "Signature" and "Date (Y *IM/D*)"
- Section D. Review: do not complete (completed by Department Representative).
Section E. Approval: do not complete (completed by Department Representative).



**PERSONNEL SCREENING,
CONSENT AND AUTHORIZATION FORM**

OFFICE USE ONLY		
Reference number	Department/Organization number	File number

NOTE: For Privacy Act Statement refer to Section C of this form and for completion instructions refer to attached instructions. Please typewrite or print in block letters.

A ADMINISTRATIVE INFORMATION (To be completed by the Authorized Departmental/Agency/Organizational Official)

New
 Update
 Upgrade
 Transfer
 Supplemental
 Re-activation

The requested level of reliability/security check(s)

Reliability Status
 Level I (CONFIDENTIAL)
 Level II (SECRET)
 Level III (TOP SECRET)

Other _____

PARTICULARS OF APPOINTMENT/ASSIGNMENT/CONTRACT

Indeterminate
 Term
 Contract
 Industry
 Other (specify secondment, assignment, etc.) _____

Justification for security screening requirement

Position/Competition/Contract number	Title	Group/Level (Rank if applicable)	
Employee ID number/PRJ/Rank and Service number (if applicable)	If term or contract, indicate duration period	From	To
Name and address of department / organization / agency	Name of official	Telephone number ()	Facsimile number ()

B BIOGRAPHICAL INFORMATION (To be completed by the applicant)

Surname (Last name)		Full given names (no initials) underline or circle usual name used			Family name at birth	
All other names used (i.e. Nickname)		Sex <input type="checkbox"/> Male <input type="checkbox"/> Female	Date of birth Y M D		Country of birth	Date of entry into Canada if born outside Canada Y M D
RESIDENCE (provide addresses for the last five years, starting with the most current) Home address			Daytime telephone number ()		E-mail address	
1	Apartment number	Street number	Street name		Civic number (if applicable)	From Y M To present
	City		Province or state	Postal code	Country	Telephone number ()
2	Apartment number	Street number	Street name		Civic number (if applicable)	From Y M To Y M
	City		Province or state	Postal code	Country	Telephone number ()
Have you previously completed a Government of Canada security screening form?			<input type="checkbox"/> Yes <input type="checkbox"/> No		If yes, give name of employer, level and year of screening. Y	

CRIMINAL CONVICTIONS IN AND OUTSIDE OF CANADA (see instructions)

Have you ever been convicted of a criminal offence for which you have not been granted a pardon?			If yes, give details. (charge(s), name of police force, city, province/state, country and date of conviction)			
<input type="checkbox"/> Yes <input type="checkbox"/> No			▼			
Charge(s)		Name of police force			City	
Province/State		Country			Date of conviction Y M D	



PERSONNEL SCREENING, CONSENT AND AUTHORIZATION FORM

Surname and full given names	Date of birth	Y	M	D
------------------------------	---------------	---	---	---

C CONSENT AND VERIFICATION (To be completed by the applicant and authorized Departmental/Agency/Organizational Official)

Checks Required (See Instructions)	Applicant's initials	Name of official (print)	Official's initials	Official's Telephone number
1. <input type="checkbox"/> Date of birth, address, education, professional qualifications, employment history, personal character references				()
2. <input type="checkbox"/> Criminal record check				()
3. <input type="checkbox"/> Credit check (financial assessment, including credit records check)				()
4. <input type="checkbox"/> Loyalty (security assessment only)				
5. <input type="checkbox"/> Other (Law Enforcement Records Checks)				()

The Privacy Act Statement
 The information on this form is required for the purpose of providing a security screening assessment. It is collected under the authority of subsection 7(1) of the *Financial Administration Act* and the *Government Security Policy (GSP)* of the Government of Canada, and is protected by the provisions of the *Privacy Act* in institutions that are covered by the *Privacy Act*. Its collection is mandatory. A refusal to provide information will lead to a review of whether the person is eligible to hold the position or perform the contract that is associated with this Personnel Screening Request. Depending on the level of security screening required, the information collected by the government institution may be disclosed to the Royal Canadian Mounted Police (RCMP) and the Canadian Security Intelligence Service (CSIS), which conduct the requisite checks and/or investigation in accordance with the GSP and to entities outside the federal government (e.g. credit bureaus). It is used to support decisions on individuals working or applying to work through appointment, assignment or contract, transfers or promotions. It may also be used in the context of updating, or reviewing for cause, the reliability status, security clearance or site access, all of which may lead to a re-assessment of the applicable type of security screening. Information collected by the government institution, and information gathered from the requisite checks and/or investigation, may be used to support decisions, which may lead to discipline and/or termination of employment or contractual agreements. The personal information collected is described in Standard PIB PSU 917 (Personnel Security Screening) which is used by all government agencies, except the Department of National Defence PIB DND/PPE 834 (Personnel Security Investigation File), RCMP PIB CMP PPU 065 (Security/Reliability Screening Records), CSIS PIB SIS PPE 815 (Employee Security), and PWGSC PIB PWGSC PPU 015 (Personnel Clearance and Reliability Records) used for Canadian Industry Personnel. Personal information related to security assessments is also described in the CSIS PIB SIS PPU 005 (Security Assessments/Advice).

I, the undersigned, do consent to the disclosure of the preceding information including my photograph for its subsequent verification and/or use in an investigation for the purpose of providing a security screening assessment. By consenting to the above, I acknowledge that the verification and/or use in an investigation of the preceding information may also occur when the reliability status, security clearance or site access are updated or otherwise reviewed for cause under the Government Security Policy. My consent will remain valid until I no longer require a reliability status, a security clearance or a site access clearance, my employment or contract is terminated, or until I otherwise revoke my consent, in writing, to the authorized security official.

 Signature Date (Y/M/D)

D REVIEW (To be completed by the authorized Departmental/Agency/Organizational Official responsible for ensuring the completion of sections A, B and C)

Name and title	Telephone number
Address	Facsimile number

E APPROVAL (To be completed by authorized Departmental/Agency/Organizational Security Official only)

I, the undersigned, as the authorized security official, do hereby approve the following level of screening.

Reliability Status

Approved Reliability Status Not approved

 Name and title

 Signature _____
 Date (Y/M/D)

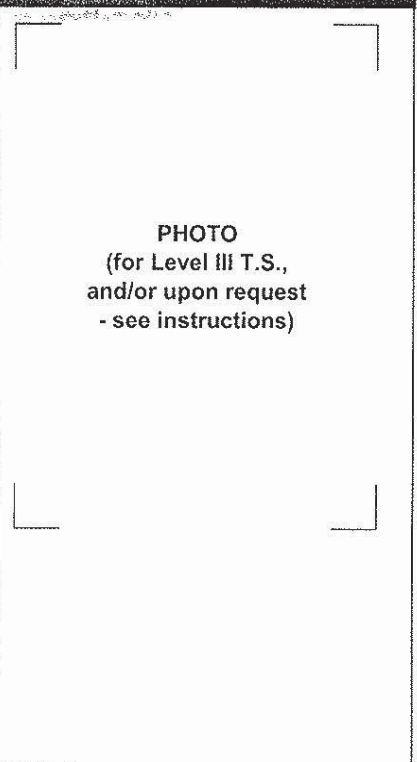
Security Clearance (if applicable)

Level I Level II Level III Not recommended

 Name and title

 Signature _____
 Date (Y/M/D)

Comments





INSTRUCTIONS FOR PERSONNEL SCREENING CONSENT AND AUTHORIZATION FORM TBS/SCT 330-23E (Rev. 2002/02)

Once completed, this form shall be safeguarded and handled at the level of Protected A.

General:

If space allotted in any portion is insufficient please use separate sheet using same format.

1. Section A (Administrative Information) Authorized Departmental/Agency/Organizational Official

The Official, based on instructions issued by the Departmental Security Officer, may be responsible for determining, based on five year background history, what constitutes sufficient verification of personal data, educational and professional qualifications, and employment history. References are to be limited to those provided on the application for employment or equivalent forms.

SUPPLEMENTAL INFORMATION REQUIREMENTS

Persons who presently hold a SECURITY CLEARANCE and subsequently marry, remarry or commence a common-law partnership, in addition to having to update sections of the *Security Clearance Form (TBS/SCT 330-60)*, are required to submit an original *Personnel Screening, Consent and Authorization Form*, with the following parts completed:

Part A - As set forth in each question

Part B - As set forth in each question, excluding CRIMINAL CONVICTIONS IN AND OUTSIDE OF CANADA.

Part C - Applicant's signature and date only are required

"Other". This should be used to identify if the security screening is for Site Access, NATO, SIGINT etc.

2. Section B (Biographical Information)

To be completed by the *applicant*. If more space is required use a separate sheet of paper. Each sheet must be signed.

Country of Birth - For "NEW" requests, if born abroad of Canadian parents, please provide a copy of your Certificate of Registration of Birth Abroad. If you arrived in Canada less than five years ago, provide a copy of the Immigration Visa, Record of Landing document or a copy of passport.

- List only criminal convictions for which a pardon has NOT been granted. Include on a separate attached sheet of paper, if more than one conviction. Applicant must include those convictions outside Canada.
- Offences under the *National Defence Act* are to be included as well as convictions by courts-martial are to be recorded.

3. Section C (Consent and Verification)

A copy of Section "C" may be released to institutions to provide acknowledgement of consent.

Criminal record checks (fingerprints may be required) and credit checks are to be arranged through the Departmental Security Office or the delegated Officer.

Consent: may be given only by an applicant who has reached the age of majority, otherwise, the signature of a parent or guardian is mandatory.

The age of majority is:

19 years in NFLD., N.S., N.B., B.C., Yukon, Northwest Territories and Nunavut;

18 years in P.E.I., Que., Ont., Man., Sask. and Alta.

The applicant will provide initials in the "applicant's initials box".

The official who carried out the verification of the information will print their name, insert their initials and telephone number in the required space.

- Reliability Screening (for all types of screening identified within Section A): complete numbers 1 and 2 and 3 if applicable.
- Security Clearance (for all types of screening identified within Section A): complete numbers 1 to 4 and 5 where applicable.
- Other: number 5 is used only where prior Treasury Board of Canada Secretariat approval has been obtained.

4. Section D (Review)

To be completed by authorized Departmental/Agency/Organizational Official who is responsible for ensuring the completion of sections A to C as requested.

5. Section E (Approval)

Authorized Departmental/Agency/Organizational Security Official refers to the individuals as determined by departments, agencies, and organizations that may verify reliability information and/or approve/not approve reliability status and/or security clearances. Approved Reliability Status and Level I, II and III, as well as the signature of the authorized security official or manager are added for Government of Canada use only. Applicants are to be briefed, acknowledge, and be provided with a copy of the "Security Screening Certificate and Briefing Form (TBS/SCT 330-47)".
Note: Private sector organizations do not have the authority to approve any level of security screening.

Photographs: Departments/Agencies/Organizations are responsible for ensuring that three colour photographs of passport size are attached to the form for the investigating agency. Maximum dimensions are 50mm x 70mm and minimum are 43mm x 54mm. The face length from chin to crown of head must be between 25mm x 35mm. The photographs must be signed by the applicant and an authorized security official. The photographs must have been taken within the last six months. It is required for new or upgrade Level III security clearances for identification of the applicant during the security screening investigation by the investigating agency. The investigating agency may in specific incidents request a photograph for a Level I or II clearances when an investigation is required.

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Title Inspecting and testing by inspecting firms or testing laboratories designated by Departmental Representative.
- 1.2 **RELATED REQUIREMENTS SPECIFIED ELSEWHERE**
 - .1 Particular requirements for inspection and testing to be carried out by testing Laboratory designated by the Departmental Representative are specified under various sections.
- 1.3 **APPOINTMENT AND PAYMENT**
 - .1 Contractor will appoint and pay for services of testing laboratory for all required including the following:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests specified to be carried out by Contractor under supervision of Departmental Representative.
 - .6 Additional tests specified in the following paragraph.
 - .2 Testing agency appointed by Contractor to be approved by the Departmental Representative.
 - .3 Additional independent inspection/testing agencies may be engaged by the Departmental Representative for the purpose of inspecting and/or testing portions of Work.
 - .4 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.
- 1.4 **CONTRACTOR'S RESPONSIBILITIES**
 - .1 Provide labour, equipment and facilities to:
 - .1 Provide access to Work for inspection and testing.
 - .2 Facilitate inspections and tests.
 - .3 Make good Work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

- .2 Notify *the appropriate agency and the* Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
 - .3 Allow the inspection/testing agencies access to all portions of the Work and manufacturing and/or fabrication plants. Co-operate to provide reasonable facilities for such access.
 - .4 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
 - .5 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.
 - .6 Provide copy of all testing and inspection reports to the Departmental Representative within 3 days of test completion.
- 2 Products
- 2.1 **NOT USED**
- .1 Not used.
- 3 Execution
- 3.1 **NOT USED**
- .1 Not used.

END OF SECTION

- 1 General
- 1.1 **ADMINISTRATIVE**
 - .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
 - .2 Prepare agenda for meetings.
 - .3 Distribute written notice of each meeting 4 days in advance of meeting date to Departmental Representative.
 - .4 Provide physical space and make arrangements for meetings.
 - .5 Preside at meetings.
 - .6 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
 - .7 Reproduce and distribute copies of minutes within three days after meetings and transmit to Departmental Representative, meeting participants and affected parties not in attendance.
 - .8 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.
- 1.2 **PRECONSTRUCTION MEETING**
 - .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
 - .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
 - .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
 - .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
 - .5 Provide erosion and sedimentation control plan and construction waste diversion plan to meet requirements, complete with diagrammatic locations and/or details for these items.
 - .6 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Section 01 32 16.07.
 - .3 Schedule of submission of shop drawings, samples, mock-ups, colour chips. Submit submittals in accordance with Section 01 33 00.

- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.
- .5 Meetings to review erosion and sedimentation control measures.
- .6 Delivery schedule of specified equipment in accordance with Section 01 61 00.
- .7 Site security in accordance with Section 01 56 00.
- .8 Health and safety in accordance with Section 01 35 29.06.
- .9 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .10 Owner provided products.
- .11 Record drawings and specifications in accordance with Section 01 33 00.
- .12 Maintenance manuals in accordance with Section 01 78 00.
- .13 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00.
- .14 Monthly progress claims, administrative procedures, photographs, hold backs.
- .15 Appointment of inspection and testing agencies or firms.
- .16 Insurances, transcript of policies.

1.3 **PROGRESS MEETINGS**

- .1 During course of Work and two (2) weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 Notify parties minimum seven (7) days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within five (5) days after meeting.
- .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Meetings to review erosion and sedimentation control log.
 - .7 Corrective measures and procedures to regain projected schedule.
 - .8 Revision to construction schedule.
 - .9 Progress schedule, during succeeding work period.
 - .10 Review submittal schedules: expedite as required.
 - .11 Maintenance of quality standards.
 - .12 Review proposed changes for affect on construction schedule and on completion date.
 - .13 Other business.

- 2 Products
- 2.1 **NOT USED**
 - .1 Not used.
- 3 Execution
- 3.1 **NOT USED**
 - .1 Not used.

END OF SECTION

1 General

1.1 **DEFINITIONS**

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 **REQUIREMENTS**

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately ten (10) working days, to allow for progress reporting.

- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Certificate of Substantial Performance and Certificate of Completion as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Submit to Departmental Representative within ten (10) working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within five (5) working days of receipt of acceptance of Master Plan.

1.4 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within five (5) working days.
- .3 Revise impractical schedule and resubmit within five (5) working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.5 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Excavation.
 - .6 Backfill /Upfill
 - .7 Dry Pond Grading
 - .8 Heliport (TLOF) Pavement
 - .9 Vehicle Access / FATO Paving
 - .10 Drypond Landscaping

1.6 **PROJECT SCHEDULE REPORTING**

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.7 **PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings specified in Section 01 31 19, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

2 Products

2.1 **NOT USED**

- .1 Not used.

3 Execution

3.1 **NOT USED**

- .1 Not used.

END OF SECTION

1 General

1.1 **REFERENCES**

- .1 National Building Code 2010 (NBC):
 - .1 NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
- .2 National Fire Code 2010 (NFC):
 - .1 NFC 2010, Division B, Part 5 Hazardous Processes and Operations, subsection 5.6.1.3 Fire Safety Plan.
- .3 Province of Ontario:
 - .1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.
 - .2 O. Reg. 490/09, Designated Substances.
 - .3 Workplace Safety and Insurance Act, 1997.
 - .4 Municipal statutes and authorities.
- .4 Fire Commissioner of Canada (FCC):
 - .1 FC-301 Standard for Construction Operations, June 1982.
 - .2 FC-302 Standard for Welding and Cutting, June 1982.

Labour Program
Fire Protection Engineering Services
4900 Yonge Street 8th Floor
North York, Ontario M2N 6A8

and copies may be obtained from:

Human Resources and Social Development Canada
Labour Program
Fire Protection Engineering Services
Ottawa, Ontario K1A 0J2

1.2 **SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Submit site-specific Health and Safety Plan: Within seven (7) days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operations found in work plan.
 - .3 Measures and controls to be implemented to address identified safety hazards and risks.

- .4 Provide a Fire Safety Plan, specific to the work location, in accordance with NBC, prior to commencement of work. Deliver two copies of the Fire Safety Plan to the Departmental Representative not later than 14 days before commencing work.
 - .5 Contractor's and Sub-contractors' Safety Communication Plan.
 - .6 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations.
- .3 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within ten (10)days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within five (5)days after receipt of comments from Departmental Representative.
 - .4 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
 - .5 Submit names of personnel and alternates responsible for site safety and health.
 - .6 Submit records of Contractor's Health and Safety meetings when requested.
 - .7 Submit two (2) copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative, weekly.
 - .8 Submit copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.
 - .9 Submit copies of incident and accident reports.
 - .10 Submit Material Safety Data Sheets (MSDS).
 - .11 Submit Workplace Safety and Insurance Board (WSIB)- Experience Rating Report.

1.3 **FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to commencement of Work.

1.4 **SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

1.5 **MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.6 **REGULATORY REQUIREMENTS**

- .1 Comply with the Acts and regulations of the Province of Ontario.
- .2 Comply with specified standards and regulations to ensure safe operations at site.

1.7 **GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.
- .3 Relief from or substitution for any portion or provision of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.

1.8 **COMPLIANCE REQUIREMENTS**

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990 Chapter 0.1, as amended.
- .2 Comply with requirements of the Canada Labour Code, Part 2.

1.9 **RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act for the Province of Ontario.

1.10 **UNFORSEEN HAZARDS**

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.

- .2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.11 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have working knowledge of occupational safety and health regulations.
 - .2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .4 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.12 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province of Ontario, and in consultation with Departmental Representative.
 - .1 Contractor's Safety Policy.
 - .2 Constructor's Name.
 - .3 Notice of Project.
 - .4 Name, trade, and employer of Health and Safety Representative or Joint Health and Safety Committee members (if applicable).
 - .5 Ministry of Labour Orders and reports.
 - .6 Occupational Health and Safety Act and Regulations for Construction Projects for Province of Ontario.
 - .7 Address and phone number of nearest Ministry of Labour office.
 - .8 Material Safety Data Sheets.
 - .9 Written Emergency Response Plan.
 - .10 Site Specific Safety Plan.
 - .11 Valid certificate of first aider on duty.
 - .12 WSIB "In Case of Injury At Work" poster.
 - .13 Location of toilet and cleanup facilities.

1.13 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.14 **BLASTING**

- .1 Blasting or other use of explosives is not permitted.

1.15 **POWDER ACTUATED DEVICES**

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

1.16 **WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 Assign responsibility and obligation to Health and Safety Coordinator to stop or start Work when, at Health and Safety Coordinator's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

2 Products

2.1 **NOT USED**

- .1 Not used.

3 Execution

3.1 **NOT USED**

- .1 Not used.

END OF SECTION

- 1 General
- 1.1 **REFERENCES AND CODES**
 - .1 Perform Work in accordance with National Building Code of Canada (NBC) 2010, National Fire Code of Canada (NFC) 2010 and Ontario Building Code (OBC) 2006, including all amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
 - .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.
- 1.2 **HAZARDOUS MATERIAL DISCOVERY**
 - .1 Stop work immediately and notify Departmental Representative if materials which may contain designated substances or PCB's.
- 1.3 **NOT USED**
 - .1 Not Used.
- 1.4 **ACCESSIBLE DESIGN**
 - .1 Comply with CAN/CSA-B651-04(R2010), Accessible Design for the Built Environment, unless specified otherwise. In any case of conflict or discrepancy between the building codes and CAN/CSA-B651, the requirements of CAN/CSA-B651 shall apply.
- 1.5 **TAXES**
 - .1 Pay applicable Federal, Provincial and Municipal taxes.
- 1.6 **EXAMINATION**
 - .1 Examine existing conditions and determine conditions affecting work.
 - .2 Conduct concrete floor moisture testing using Calcium Chloride moisture tests.
 - .1 Submit test results to Departmental Representative for approval prior to installing any flooring. Conduct one test per 100 m² of area being covered.
- 2 Products
- 2.1 **NOT USED**
 - .1 Not used.

- 3 Execution
- 3.1 **NOT USED**
 - .1 Not used.

END OF SECTION

1 General

1.1 **ABBREVIATIONS AND ACRONYMS**

.1 The abbreviations and acronyms are commonly found in the Project Manual and represent the associated organizations or terms.

1.2 **MATERIALS, EQUIPMENT AND METHODS**

.1 **A:**

- .1 AC: acoustic.
- .2 AC PAN: acoustic panel.
- .3 ACU: acoustic unit ceiling.
- .4 AFF: above finished floor.
- .5 AC PLAS: acoustic plaster.
- .6 ACT: acoustic tile.
- .7 ACR CU LVR: acrylic cube louvre.
- .8 ADH: adhesive.
- .9 ADJ: adjustable.
- .10 A/C: air conditioner.
- .11 AL: aluminum.
- .12 AB: anchor bolt.
- .13 ANOD: anodized.
- .14 ARCH: architecture.
- .15 ARCH BLK: architectural block.

.2 **B:**

- .1 B: base.
- .2 BEAST: benthic assessment of sediment.
- .3 BH: bore hole.
- .4 BL: bottom layer.
- .5 BLK: block.
- .6 BLKD: bulkhead.
- .7 BM: beam.
- .8 BOT: bottom.
- .9 BMP: best management practice.
- .10 B PL: base plate.
- .11 BRG: bearing.
- .12 BRK: brick.
- .13 BSMT: basement.
- .14 BTEX: benzene, toluene, ethylbenzene, and xylenes.
- .15 BUR: built-up roof.

.3 **C:**

- .1 CAL: caliper.
- .2 CANTIL: cantilever.
- .3 CB: catch basin.
- .4 CC: centre to centre.
- .5 CCN: contemplated change notice.

- .6 CDF: controlled density fill.
 - .7 CEC: Canadian electrical code.
 - .8 CF: chair fabric.
 - .9 CHAN: channel.
 - .10 CHS: Canadian hydrographic service.
 - .11 CJ: construction joint.
 - .12 CL: centreline.
 - .13 CK: cork.
 - .14 CLG: ceiling.
 - .15 CLR: clear.
 - .16 COL: column.
 - .17 CONC: concrete.
 - .18 CONC BLK: concrete block.
 - .19 CONC BRK: concrete brick.
 - .20 CONT: continuous.
 - .21 CONT J: control joint.
 - .22 COMPL: complete.
 - .23 CM: centimetre. (Nursery stock).
 - .24 CPL: cement plaster.
 - .25 CPM: critical path method.
 - .26 CPT: carpet.
 - .27 CPTT: carpet tile.
 - .28 CT: ceramic tile.
 - .29 CVT: conductive vinyl tile.
 - .30 C/W: complete with.
- .4 **D:**
- .1 D: deep.
 - .2 DD: dutch door.
 - .3 DEG: degree.
 - .4 DF: drinking fountain.
 - .5 DIA: diameter.
 - .6 DIM: dimension.
 - .7 DL: dead load.
 - .8 DMNT: demountable.
 - .9 DP: dampproofing.
 - .10 DR: door.
 - .11 DRP: drapery.
 - .12 DWL: dowel.
- .5 **E:**
- .1 EA: each.
 - .2 ECF: engineered containment facility.
 - .3 EE: each end.
 - .4 EF: each face.
 - .5 EL: elevation.
 - .6 ELEC: electric.
 - .7 ELEV: elevator.
 - .8 EM: expanded metal.

- .9 ENCL: enclosure.
 - .10 EQ: equal.
 - .11 EXH: exhaust.
 - .12 EXIST: existing.
 - .13 EXPJ: expansion joint.
 - .14 EXP STRUCT: exposed structure.
 - .15 EXT: exterior.
 - .16 EW: each way.
- .6 **F:**
- .1 FC: fuel contributed.
 - .2 FD: floor drain.
 - .3 FDN: foundation.
 - .4 FEAT W: feature wall.
 - .5 FEXT: fire extinguisher.
 - .6 FH: fire hose.
 - .7 FHC: fire hose cabinet.
 - .8 FHR: fire hose rack.
 - .9 FIN: finish.
 - .10 FIP: federal identity program.
 - .11 FL: floor.
 - .12 FLD: field.
 - .13 FLUOR: fluorescent.
 - .14 FR: frame.
 - .15 FRR: fire resistance rating.
 - .16 FTG: footing.
- .7 **G:**
- .1 GALV: galvanized steel.
 - .2 GBD: gypsum board.
 - .3 GC: General Conditions.
 - .4 GF: ground floor.
 - .5 GFCI: ground fault circuit interrupter.
 - .6 GL: glass or glazing.
 - .7 GL BLK: glass block.
 - .8 GPC: gypsum plaster ceiling.
 - .9 GPW: gypsum plaster wall.
- .8 **H:**
- .1 HB: hose bib.
 - .2 HC: hollow core.
 - .3 HCWD: hollow core wood door.
 - .4 HDW: hardware.
 - .5 HDWD: hardwood.
 - .6 HM: hollow metal.
 - .7 HOR: horizontal.
 - .8 HOR EF: horizontal each face.
 - .9 HP: hydro pole.
 - .10 HPA: Hamilton Port Authority.

- .11 HRV: heat recovery ventilator.
- .12 HT: height.
- .13 HTR: heater.
- .14 HWT: hot water tank.
- .15 HYD: hydrant.

- .9 **I:**
 - .1 ICF: insulated concrete formwork.
 - .2 ID: inside diameter.
 - .3 INS: insulation.
 - .4 INTLK: interlock.

- .10 **J:**
 - .1 JT: joint.

- .11 **K:**
 - .1 KPL: kick plate.

- .12 **L:**
 - .1 LAV: lavatory.
 - .2 LDG: landing.
 - .3 LG: long.
 - .4 LINO: linoleum.
 - .5 LL: live load.

- .13 **M:**
 - .1 MAS: masonry.
 - .2 MAS FL: masonry flashing.
 - .3 MAX: maximum.
 - .4 MCL: metal cube louvre.
 - .5 MECH: mechanical.
 - .6 MET: metal.
 - .7 MET DK: metal deck.
 - .8 MET FL: metal flashing.
 - .9 MET GRID CLG: metal grid ceiling.
 - .10 MET GRTG: metal grating.
 - .11 MET LIN CLG: metal linear ceiling.
 - .12 MET T PTN: metal toilet partition.
 - .13 MH: maintenance hole.
 - .14 MIN: minimum.
 - .15 MLP: metal lath and plaster.
 - .16 MO: masonry opening.
 - .17 MR: marble.
 - .18 MT: metal threshold.
 - .19 MWP: membrane waterproofing.

- .14 **N:**
 - .1 NBC: national building code.
 - .2 NF: near face.

- .3 NFC: national fire code.
.4 NIC: not in contract.
.5 NRC: noise reduction coefficient.
.6 NRP: non removable pin.
.7 NTS: not to scale.
- .15 **O:**
.1 OBC: Ontario building code.
.2 OC: on centre.
.3 OD: outside diameter.
.4 OPNG: opening.
.5 OPR: operator.
.6 OVHD: overhead.
.7 OWSJ: open web steel joist.
- .16 **P:**
.1 P: prefinished.
.2 PAH: polynuclear aromatic hydrocarbons.
.3 PARG: parging.
.4 PCC: precast concrete.
.5 PCT: porcelain ceramic tile.
.6 PED ACS FLG: pedestal access flooring.
.7 PF: panel fabric.
.8 PL: plate.
.9 PLAM: plastic laminate.
.10 PLAS: plaster.
.11 PLYWD: plywood.
.12 PR: pair.
.13 PREFAB: prefabricated.
.14 PRFL: profile.
.15 PT: paint.
.16 PTN: partition.
.17 PVC: polyvinyl chloride.
- .17 **Q:**
.1 QTB: quarry tile base.
.2 QTF: quarry tile floor.
.3 QTR: quarry tile roof.
- .18 **R:**
.1 R: radius.
.2 RA: return air.
.3 RB: resilient base.
.4 RC: reinforced concrete.
.5 RCPT: receptacle.
.6 RD: roof drain.
.7 REINF: reinforced/reinforcing.
.8 REQD: required.
.9 REQT: requirement.

- .10 RFT: rubber floor tile.
- .11 RM: room.
- .12 RO: rough opening.
- .13 RP: radiant panel.
- .14 RRS: recycled rubber sheet.
- .15 RRT: recycled rubber tile.
- .16 RSD: rolling steel door.
- .17 RSF: rubber sheet flooring.
- .18 RWL: rain water leader.

- .19 **S:**
 - .1 SAN SEW: sanitary sewer.
 - .2 SCHED: schedule.
 - .3 SC: solid core.
 - .4 SCRNL: screen.
 - .5 SCWD: solid core wood door.
 - .6 SD: smoke developed.
 - .7 SDT: static dissipative tile.
 - .8 SECT: section.
 - .9 SL: sliding.
 - .10 SLR: sealer.
 - .11 SPEC: specification.
 - .12 SS: stainless steel.
 - .13 STD: standard.
 - .14 STL: steel.
 - .15 STL BM: steel beam.
 - .16 STC: sound transmission class.
 - .17 STL FL DK: steel floor deck.
 - .18 STL PL: steel plate.
 - .19 STN: stone.
 - .20 STR: structure or structural.
 - .21 ST SEW: storm sewer.
 - .22 S&U: stain and urethane.
 - .23 S&V: stain and varnish.
 - .24 SVT: solid vinyl tile.

- .20 **T:**
 - .1 T: top.
 - .2 T&B: top and bottom.
 - .3 TCB: turbidity control plan.
 - .4 TEL: telephone.
 - .5 TER: terrazzo.
 - .6 TERT: terrazzo tile.
 - .7 THKNS: thickness.
 - .8 THR: threshold.
 - .9 TMPD: tempered.
 - .10 TOPG: topping.
 - .11 TRANSV: transverse.
 - .12 TYP: typical.

- .21 **U:**
- .1 U: urethane.
 - .2 UCUT: undercut.
 - .3 UGRD: underground.
 - .4 UOS: unless otherwise specified.
 - .5 U/S: underside.
 - .6 UR: urinal.
- .22 **V:**
- .1 VCF: vinyl coated fabric.
 - .2 VCT: vinyl composition tile.
 - .3 VERT: vertical.
 - .4 VERT B: vertical blinds.
 - .5 VERT EF: vertical each face.
 - .6 VSF: vinyl sheet flooring.
 - .7 VT: vinyl tile.
 - .8 VWC: vinyl wall covering.
- .23 **W:**
- .1 WC: water closet.
 - .2 W-C: wall connectors.
 - .3 WD: wood.
 - .4 WDV: wood veneer.
 - .5 WH: wall hydrant.
 - .6 WHMIS: workplace hazardous materials information system.
 - .7 WP: waterproofing.
 - .8 WR: washroom.
 - .9 WSIB: workplace safety and insurance board.
 - .10 WT: weight.
 - .11 WTP: water treatment plant.

1.3 **STANDARDS ORGANIZATIONS**

- .1 Standards writing organizations:
- .1 AA - Aluminum Association.
 - .2 ACPA - American Concrete Pipe Association.
 - .3 ANSI - American National Standards Institute.
 - .4 ASHRAE - American Society of Heating and Refrigerating and Air-Conditioning Engineers.
 - .5 ASTM - American Society for Testing and Materials.
 - .6 AWI/AWMAC - Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada.
 - .7 AWPA - American Wood Preservers' Association.
 - .8 AWWA - American Water Works Association.
 - .9 BHMA - Builders Hardware Manufacturers Association.
 - .9 CaGBC: Canadian Green Building Council.
 - .10 CCDC - Canadian Construction Documents Committee.
 - .11 CCMPA - Canadian Concrete Masonry Producers Association.
 - .12 CGSB - Canadian General Standards Board.

- .13 CNTA - Canadian Nursery Trades Association.
- .14 CPCA - Canadian Painting Contractors Association.
- .15 CRCA - Canadian Roofing Contractors Association.
- .16 CSA - Canadian Standards Association.
- .17 CSC - Construction Specifications Canada.
- .18 CSDMA - Canadian Steel Door Manufacturers Association.
- .19 CSI - Construction Specifications Institute.
- .20 CSSBI - Canadian Sheet Steel Building Institute.
- .21 CRCA - Canadian Roofing Contractors Association.
- .22 DHI - Door and Hardware Insitute.
- .23 EEMAC - Electrical and Electronic Manufacturer's Association of Canada.
- .24 ESA - Electrical Safety Authority.
- .25 FCC - Fire Commissioner of Canada.
- .26 FSC - Forest Stewardship Council.
- .27 GANA - Glass Association of North America.
- .28 HMMA - Hollow Metal Manufacturers Association.
- .29 IEEE - Institute of Electrical and Electronics Engineers Inc.
- .30 ISO - International Organization for Standardization.
- .31 IWFA - International Window Film Association.
- .32 LEED - LEED Canada, Leadership in Energy and Environmental Design.
- .33 MPI - Master Painters Insitute.
- .34 NAAMM - National Association of Architectural Metal Manufacturers.
- .35 NCPI - National Clay Pipe Institute.
- .36 NEMA - National Electrical Manufacturers Association.
- .37 NFPA - National Fire Protection Association.
- .38 OPSD - Ontario Provincial Standard Drawings.
- .39 OPSS - Ontario Provincial Standard Specifications.
- .40 PPI - Plasctics Pipe Institute.
- .41 SDI - Steel Door Intitute.
- .42 SCAQMD - South Coast Air Quality Management District.
- .43 TIA - Telecommunications Industry Association.
- .44 TIAC - Thermal Insulation Association of Canada.
- .45 TTMAC - Terrazzo Tile and Marble Association of Canada.
- .46 UL - Underwriters Laboratories.
- .47 ULC - Underwriters Laboratories of Canada.
- .48 US EPA - United States Environmental Protection Agency.
- .49 WH - Warnock Hersey.

1.4 FEDERAL GOVERNMENT DEPARTMENTS AND AGENCIES

- .1 Departments, agencies and crown corporations.
 - .1 CEAA - Canadian Environmental Assessment Agency.
 - .2 CSC - Correctional Service Canada.
 - .3 CRA - Canada Revenue Agency.
 - .4 DND - Department of National Defence.
 - .5 EC - Environment Canada.
 - .6 FHBRO - Federal Heritage Buildings Review Office.
 - .7 HC - Health Canada.
 - .8 HCD - Heritage Conservation Directorate.

- .9 LC - Labour Canada.
- .10 PC - Parks Canada.
- .11 PWGSC - Public Works and Government Services Canada.
- .12 RCMP - Royal Canadian Mounted Police.
- .13 TBS - Treasury Board Secretariat.
- .14 TC - Transport Canada.

1.5 **PROVINCIAL GOVERNMENT DEPARTMENTS AND AGENCIES**

- .1 MOEE - Ontario Ministry of Environment and Energy.
- .2 MOL - Ontario Ministry of Labour.
- .3 MTO and MOT - Ontario Ministry of Transportation.
- .4 TSSA - Technical Standards and Safety Authority.

1.6 **INTERNATIONAL GOVERNMENT DEPARTMENTS AND AGENCIES**

- .1 DOHMH - New York City Department of Health and Mental Hygiene, USA.
- .2 GSA - Government Services Administration, USA.

1.7 **UNITS OF MEASURE METRIC**

- .1 The following abbreviations of units of measure are commonly found in the Project Manual:
 - .1 C: Celsius.
 - .2 cm: centimetre.
 - .3 kg: kilogram.
 - .4 kg/m³: kilogram per cubic metre.
 - .5 kN: kilonewton.
 - .6 kPa: kilopascals.
 - .7 kw: kilowatts.
 - .8 l/s: litre per second.
 - .9 m: metre.
 - .10 m³: cubic metre.
 - .11 mg/kg: milligrams per kilogram.
 - .12 mg/L: milligrams per litre.
 - .13 mm: millimetres.
 - .14 MPa: megapascal.
 - .15 NTU: nephelometric turbidity unit.
 - .16 ppm: parts per million.
 - .17 ug/L: micrograms per litre.
 - .18 ug/m³: micrograms per cubic metre.

1.8 **UNITS OF MEASURE IMPERIAL**

- .1 The following abbreviations of units of measure are commonly found in the Project Manual:
- .1 F: Fahrenheit.
 - .2 ft: foot/feet.
 - .3 ga: guage.
 - .4 gpm: gallons per minute.
 - .5 in: inches.
 - .6 lbs: pounds.
 - .7 NTU: nephelometric turbidity unit.
 - .8 psi: pounds-force per square inch.
 - .9 ppm: parts per million.

1.9 **LEED TERMS**

- .1 Acronyms specific to LEED:
- .1 CI: commercial interiors.
 - .2 EQ: environmental quality.
 - .3 MR: material and resources.
 - .4 NC: new construction.

2 Products

2.1 **NOT USED**

- .1 Not used.

3 Execution

3.1 **NOT USED**

- .1 Not used.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Mock-ups and sample units.
- .4 Mill tests.
- .5 Equipment and system adjust and balance.

1.2 **INSPECTION**

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.3 **INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.4 **ACCESS TO WORK**

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.5 **PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 **REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative may deduct from Contract Amount difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Departmental Representative.

1.7 **REPORTS**

- .1 Submit 4 copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.8 **TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as may be requested.
- .2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Departmental Representative and may be authorized as recoverable.

1.9 **MOCK-UPS AND SAMPLE UNITS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in all locations acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing a schedule fixing dates for preparation.

2 Products

.2.1 **NOT USED**

- .1 Not Used.

3 Execution

.3.1 **NOT USED**

- .1 Not Used.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Barriers.
 - .2 Environmental Controls.
 - .3 Traffic Controls.
 - .4 Fire Routes.
- 1.2 **RELATED SECTIONS**
 - .1 Section 01 51 00 - Temporary Utilities.
 - .2 Section 01 52 00 - Construction Facilities.
- 1.3 **INSTALLATION AND REMOVAL**
 - .1 Provide temporary controls in order to execute Work expeditiously.
 - .2 Remove from site all such work after use.
- 1.4 **HOARDING**
 - .1 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.
 - .2 Erect temporary site enclosure using modular freestanding fencing: galvanized, minimum 1.8 m high, chain link or welded steel mesh, pipe rail. Provide two lockable truck entrance gates and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys. Maintain fence in good repair.
- 1.5 **GUARD RAILS AND BARRICADES**
 - .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
 - .2 Provide as required by governing authorities.
- 1.6 **NOT USED**
 - .1 Not Used

1.7 **NOT USED**

.1 Not Used

1.8 **ACCESS TO SITE**

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.9 **PUBLIC TRAFFIC FLOW**

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

1.10 **FIRE ROUTES**

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.11 **PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

2 Products

2.1 **NOT USED**

- .1 Not used.

- 3 Execution

- 3.1 **NOT USED**

- .1 Not used.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Product quality, availability, storage, handling, protection, and transportation.
 - .2 Manufacturer's instructions.
 - .3 Quality of Work, coordination and fastenings.
 - .4 Existing facilities.
- 1.2 **RELATED SECTIONS**
 - .1 Section 01 45 00 - Quality Control.
- 1.3 **REFERENCES**
 - .1 Within text of specifications, reference may be made to reference standards.
 - .2 Conform to these standards, in whole or in part as specifically requested in specifications.
 - .3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
 - .4 The cost for such testing will be born by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.
 - .5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.
 - .6 OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings quoted in these specifications are available online at <http://www.raqsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage>.
- 1.4 **QUALITY**
 - .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
 - .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.5 **AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.
- .3 Items with long lead times are as follows:
 - .1 Hollow metal doors and frames with acoustic ratings.
 - .2 Additional items as indicated by the Departmental Representative.

1.6 **METRIC SIZED MATERIALS**

- .1 SI metric units of measurement are used exclusively on the drawings and in the specifications for this project.
- .2 The Contractor is required to provide metric products in the sizes called for in the Contract Documents except where a valid claim can be made that a particular product is not available on the Canadian market.
- .3 Claims for exemptions from use of metric sized products shall be in writing and fully substantiated with supportive documentation. Promptly submit application to Departmental Representative for consideration and ruling. Non-metric sized products may not be used unless Contractor's application has been approved in writing by the Departmental Representative.
- .4 Difficulties caused by the Contractor's lack of planning and effort to obtain modular metric sized products which are available on the Canadian market will not be considered sufficient reasons for claiming that they cannot be provided.
- .5 Claims for additional costs due to provision of specified modular metric sized products will not be considered.

1.7 **STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.

1.8 **TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.

1.9 **MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.10 **QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.11 **CO-ORDINATION**

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.12 **NOT USED**

- .1 Not Used

1.13 **REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.14 **LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

1.15 **FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.16 **FASTENINGS – EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No.304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.17 **NOT USED**

- .1 **Not Used.**

1.18 **EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

- 2 Products
- 2.1 **NOT USED**
 - .1 Not used.
- 3 Execution
- 3.1 **NOT USED**
 - .1 Not used.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Field engineering survey services to measure and stake site.
 - .2 Survey services to establish and confirm inverts for Work.
 - .3 Recording of subsurface conditions found.
- 1.2 **REFERENCES**
 - .1 Owner's identification of existing survey control points and property limits.
- 1.3 **QUALIFICATIONS OF SURVEYOR**
 - .1 Qualified registered land surveyor, licensed to practice in Place of Work, acceptable to Departmental Representative.
- 1.4 **SURVEY REFERENCE POINTS**
 - .1 Existing base horizontal and vertical control points are designated on drawings.
 - .2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
 - .3 Make no changes or relocations without prior written notice to Departmental Representative.
 - .4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
 - .5 Require surveyor to replace control points in accordance with original survey control.
- 1.5 **SURVEY REQUIREMENTS**
 - .1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
 - .2 Establish lines and levels, locate and lay out, by instrumentation.
 - .3 Stake for grading, fill and topsoil placement and landscaping features.
 - .4 Stake slopes.
 - .5 Establish pipe invert elevations.
 - .6 Stake batter boards for foundations.

.7 Establish foundation column locations and floor elevations.

.8 Establish lines and levels for mechanical and electrical work.

1.6 **EXISTING SERVICES**

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.

.2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.7 **LOCATION OF EQUIPMENT AND FIXTURES**

.1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.8 **RECORDS**

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 Record locations of maintained, re-routed and abandoned service lines.

1.9 **SUBMITTALS**

.1 Submit name and address of Surveyor to Departmental Representative.

.2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

.3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.10 **SUBSURFACE CONDITIONS**

.1 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

2 Products

2.1 **NOT USED**

.1 Not used.

3 Execution

3.1 **NOT USED**

.1 Not used.

END OF SECTION

1 General

1.1 **SUBMITTALS**

.1 Submittals: in accordance with Section 01 33 00.

.2 Submit written request in advance of cutting or alteration which affects:

- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Owner or separate contractor.

.3 Include in request:

- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of Owner or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.2 **MATERIALS**

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00.

1.3 **PREPARATION**

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.4 **EXECUTION**

.1 Execute cutting, fitting, and patching to complete Work.

- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Submit proposed materials, finishes and installation method for patching to Departmental Representative for approval, prior to patching.
- .11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21.

2 Products

2.1 NOT USED

- .1 Not used.

3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

-
- 1 General
 - 1.1 **SECTION INCLUDES**
 - .1 Progressive cleaning.
 - .2 Final cleaning.
 - 1.2 **PROJECT CLEANLINESS**
 - .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
 - .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
 - .3 Clear snow and ice from access to work , bank/pile snow in designated areas only.
 - .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
 - .5 Provide on-site containers for collection of waste materials and debris.
 - .6 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 21.
 - .7 Remove waste material and debris from site at end of each working day.
 - .8 Dispose of waste materials and debris off site.
 - .9 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
 - .10 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
 - 1.3 **FINAL CLEANING**
 - .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

2 Products

.
2.1 **NOT USED**

.
.1 Not Used.

.
3 Execution

.
3.1 **NOT USED**

.
.1 Not Used.

.
END OF SECTION

- 1 General
- 1.1 **INSPECTION AND DECLARATION**
 - .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Departmental Representative's Inspection.
 - .2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
 - .3 Completion: Submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by Fire Commissioner, Utility companies, other Authorities having Jurisdiction have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Work is complete and ready for Final Inspection.
 - .4 Final Inspection: when items noted above are completed, request final inspection of Work by the Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.
- 2 Products
 - 2.1 **NOT USED**
 - .1 Not used.
- 3 Execution
 - 3.1 **NOT USED**
 - .1 Not used.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 As-built, samples, and specifications.
 - .2 Equipment and systems.
 - .3 Product data, materials and finishes, and related information.
 - .4 Operation and maintenance data.
 - .5 Spare parts, special tools and maintenance materials.
 - .6 Warranties and bonds.
 - .7 Final site survey.
- 1.2 **SUBMISSION**
 - .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
 - .2 Copy will be returned after final inspection, with Departmental Representative's comments.
 - .3 Revise content of documents as required prior to final submittal.
 - .4 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of maintenance manuals and commissioning documentation in English.
 - .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
 - .6 If requested, furnish evidence as to type, source and quality of products provided.
 - .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
 - .8 Pay costs of transportation.
- 1.3 **FORMAT**
 - .1 Organize data in the form of an instructional manual.
 - .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on CD.

1.4 **CONTENTS – EACH VOLUME**

- .1 Table of Contents: provide title of project;
 - .1 date of submission; names,
 - .2 addresses, and telephone numbers of Contractor with name of responsible parties;
 - .3 schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00.

1.5 **AS-BUILTS AND SAMPLES**

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Amendments.

- .4 Change Orders and other modifications to the Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
-
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
 - .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
 - .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
 - .5 Keep record documents and samples available for inspection by Departmental Representative.
 - .6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work.
 - .7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.6 **RECORDING ACTUAL SITE CONDITIONS**

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.

- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Amendments and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records, required by individual specifications sections.

1.7 **FINAL SURVEY**

- .1 Submit final site survey certificate in accordance with Section 01 71 00, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.8 **EQUIPMENT AND SYSTEMS**

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Not Used.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Not Used.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Not Used.

- .12 Not Used.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Not Used.
- .15 Additional requirements: As specified in individual specification sections.

1.9 **MATERIALS AND FINISHES**

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional Requirements: as specified in individual specifications sections.

1.10 **SPARE PARTS**

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.11 **MAINTENANCE MATERIALS**

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

- .5 Obtain receipt for delivered products and submit prior to final payment.

1.12 **SPECIAL TOOLS**

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to location as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

1.13 **STORAGE, HANDLING AND PROTECTION**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

1.14 **WARRANTIES AND BONDS**

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Certificate of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

- 2 Products
- 2.1 **NOT USED**
 - .1 Not used.
- 3 Execution
- 3.1 **NOT USED**
 - .1 Not used.

END OF SECTION

- 1 General
- 1.1 **DESCRIPTION**
 - .1 Demonstrate operation and maintenance of equipment and systems to Departmental Representative's personnel two weeks prior to date of substantial performance.
 - .2 Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.
- 1.2 **QUALITY CONTROL**
 - .1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.
- 1.3 **SUBMITTALS**
 - .1 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
 - .2 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
 - .3 Give time and date of each demonstration, with list of persons present.
 - .4 Record in video all instructions given, and include 2 digital copies with the maintenance manuals.
 - .5 Circulate attendance sheet with printed name, signature, and position of each attendee, including the instructor. Include copies with maintenance manuals.
- 1.4 **CONDITIONS FOR DEMONSTRATIONS**
 - .1 Equipment has been inspected and put into operation in accordance with appropriate Section.
 - .2 Testing, adjusting, and balancing has been performed in accordance with Section 01 91 00 and equipment and systems are fully operational.
 - .3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.
- 1.5 **PREPARATION**
 - .1 Verify that conditions for demonstration and instructions comply with requirements.

- .2 Verify that designated personnel are present.

1.6 **DEMONSTRATION AND INSTRUCTIONS**

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the designated location.
- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

1.7 **TIME ALLOCATED FOR INSTRUCTIONS**

- .1 Ensure amount of time required for instruction of each item of equipment or system as follows:
 - .1 Section 08 71 11 – Finish Hardware – General 1 hour of instruction.

- 2 Products

2.1 **NOT USED**

- .1 Not used.

- 3 Execution

3.1 **NOT USED**

- .1 Not used.

END OF SECTION

- 1 General
- 1.1 **RELATED SECTIONS**
 - .1 Section 00 01 10 – Table of Contents.
 - .2 Section 01 32 00 – Construction Schedule.
 - .3 Section 01 33 00 – Submittal Procedures.
 - .4 Section 01 35 18 – LEED Requirements and Procedures.
 - .5 Section 01 45 00 – Quality Control.
 - .6 Section 01 61 00 – Product Requirements.
 - .7 Section 01 74 00 – Cleaning and Waste Processing.
 - .8 Section 01 78 10 – Closeout Submittals.
- 1.2 **REFERENCES**
 - .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-06, Canadian Electrical Code, Part 1 (20th Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No. Canadian Electrical Code, Handbook.
 - .3 CSA Bulletins and Local Bylaws.
 - .4 CSA C23.3 No.1-M 1979 Installation of Overhead and Underground Systems.
 - .5 CSA 282-05 Emergency Electrical Power Supply for Buildings.
 - .6 CSA Z32-04 Electrical Safety and Essential Electrical Systems in Health care Facilities.
 - .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- 1.3 **DEFINITIONS**
 - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- 1.4 **DESIGN REQUIREMENTS**
 - .1 Operating voltages: to CAN3-C235.
 - .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.5 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for review single line electrical diagrams in glazed frames and locate in the main electrical room on the ground floor.
- .3 Shop drawings:
 - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .4 Submit two copies of 600 x 600 mm minimum size drawings to authority having jurisdiction and inspection authorities at the Town of Niagara-on-the-Lake.
 - .5 If changes are required, notify Consultant of these changes before they are made.
- .4 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide CSA-certified equipment and material.
 - .2 Where CSA-certified equipment and material is not available, submit such equipment and material to authority having jurisdiction or inspection authorities for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.
- .5 Manufacturer's Field Reports: submit to Consultant the manufacturer's written report, within three (3) days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in Section 01 45 00 - Quality Control.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor licenses or apprentices, as per the

conditions of Provincial Act respecting manpower vocational training and qualifications.

- .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
- .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Site Meetings:
 - .1 In accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM) and Section 01 32 16.07 - Construction Progress Schedule - Bar (GANNTT) Charts.
 - .2 Site Meetings: as part of Manufacturer's Field Services described in Section 01 45 00 - Quality Control, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 **DELIVERY, STORAGE AND HANDLING**

- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 00 - Construction/Demolition Waste Management and Disposal.

1.8 **SYSTEM STARTUP**

- .1 Instruct Consultant and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

1.9 **OPERATING INSTRUCTIONS**

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.

- .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction, as recommended by manufacturer of each system or item of equipment.
 - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
 - .4 Post instructions where directed.
 - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
 - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.
 - .7 Equipment and systems accessible to inmate population must be constructed to withstand a high level of vandalism and tampering, based on the designation of the area.
- 2 Products
- 2.1 **MATERIALS AND EQUIPMENT**
- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Material and equipment to be CSA-certified; where CSA-certified material and equipment is not available, obtain special approval from authority having jurisdiction and inspection authorities before delivery to site and submit such approval, as described in Section 01 33 00 – Submittal Procedures.
 - .3 Factory-assembled control panels and component assemblies.
- 2.2 **ELECTRICAL EQUIPMENT**
- .1 Verify installation and co-ordination responsibilities related to equipment as indicated.
- 2.3 **WIRING TERMINATIONS**
- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.4 **WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.5 **FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint outdoor electrical equipment "equipment green" finish.

3 Execution

3.1 **INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1, except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1, except where specified otherwise.

3.2 **NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 **CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 **LOCATION OF CONDUIT BOXES**

- .1 Locate boxes in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

- .2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3,000 mm, or as indicated on drawings, and information is given before installation.

3.5 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings. Equipment supplier is to provide study with approval from their professional engineer (P.Eng.).

3.7 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes (within 10%).
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1,000 V instrument.
 - .3 Check resistance to ground before energizing.
 - .4 Provide a record of all tests.
- .3 Carry out tests in presence of Consultant.

- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports, as described in Section 01 33 00 – Submittal Procedures.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in Section 01 45 00 – Quality Control.

3.8 **CLEANING**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Materials and installation for wire and box connectors.
- 1.2 **RELATED SECTIONS**
 - .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- 1.3 **REFERENCES**
 - .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2No.65-93(R1999), Wire Connectors.
 - .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
 - .3 National Electrical Manufacturers Association (NEMA)
- 1.4 **WASTE MANAGEMENT AND DISPOSAL**
 - .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bin for recycling in accordance with Waste Management Plan.
 - .4 Divert unused wiring materials from landfill to metal recycling facility as approved by Client.
- 2 Products
- 2.1 **MATERIALS**
 - .1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors as required.
 - .2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
 - .3 Bushing stud connectors to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.

- .2 Clamp for stranded copper conductors
 - .3 Stud clamp bolts.
 - .4 Bolts for copper conductors.
 - .5 Bolts for aluminum conductors.
 - .6 Sized for conductors as indicated.
- .4 Clamps or connectors for mineral insulated cable, flexible conduit as required to:
CAN/CSA-C22.2No.18.
- 3 Execution
- 3.1 **INSTALLATION**
- .1 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2No.65.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with NEMA.

END OF SECTION

- 1 General
- 1.1 **RELATED REQUIREMENTS**
 - .1 Section 26 05 00 – Common Work Results for Electrical.
 - .2 Section 26 05 20 – Wire and Box Connectors 0 – 1000 V.
 - .3 Section 26 05 22 – Connectors and Terminations.
- 1.2 **REFERENCES**
 - .1 CSA C22.1-09 Canadian Electrical Code, part 1.
 - .2 CSA X32 – Safety Standard for Electrical Installations.
- 1.3 **PRODUCT DATA**
 - .1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
- 1.4 **DELIVERY, STORAGE AND HANDLING**
 - .1 Packaging Waste Management: remove for reuse of pallets, crates and packaging materials in accordance with Section 01 35 11 - Construction/Demolition Waste Management and Disposal.
- 2 Products
- 2.1 **BUILDING WIRES**
 - .1 Conductors: stranded for 8 AWG and larger. Minimum size: 12 AWG.
 - .2 Copper conductors: size as indicated, with 600 and 1,000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Jacketed.
 - .3 Copper conductors used in slab, under slab and below grade to be RWU90, jacketed.
- 2.2 **TECK 90 CABLE**
 - .1 Teck cable is not permitted.
- 3 Execution
- 3.1 **FIELD QUALITY CONTROL**
 - .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

- .2 Perform one test using method appropriate to site conditions and to approval of Consultant and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.2 **GENERAL CABLE INSTALLATION**

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

3.3 **INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Materials and installation for connectors and terminations.
- 1.2 **RELATED SECTIONS**
 - .1 Section 01 33 00 - Submittal Procedures.
 - .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
 - .3 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings
- 1.3 **REFERENCES**
 - .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.41-M1987(R1999), Grounding and Bonding Equipment.
- 1.4 **PRODUCT DATA**
 - .1 Submit product data in accordance with Section [01 33 00 - Submittal Procedures].
- 1.5 **WASTE MANAGEMENT AND DISPOSAL**
 - .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by client.
- 2 Products
- 2.1 **CONNECTORS AND TERMINATIONS**
 - .1 Copper long barrel compression connectors to CSA C22.2No. as required sized for conductors.
 - .2 2, 3, 4 way joint boxes dry location type in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings

3 Execution

3.1 **INSTALLATION**

- .1 Install, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2No.41.

END OF SECTION

- 1 General
- 1.1 **RELATED SECTIONS**
 - .1 Section [01 74 19 - Construction/Demolition Waste Management And Disposal].
- 1.2 **WASTE MANAGEMENT AND DISPOSAL**
 - .1 Separate and recycle waste materials in accordance with Section [01 74 19 - Construction/Demolition Waste Management And Disposal].
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .4 Divert unused metal materials from landfill to metal recycling facility as approved by Client
 - .5 Fold up metal banding, flatten and place in designated area for recycling.
- 2 Products
- 2.1 **SUPPORT CHANNELS**
 - .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended and/or set in poured concrete walls and ceilings.
- 3 Execution
- 3.1 **INSTALLATION**
 - .1 Secure equipment to hollow and/or solid masonry, tile and plaster surfaces with nylon shields.
 - .2 Secure equipment to poured concrete with expandable inserts.
 - .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
 - .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
 - .5 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
 - .2 Two-hole steel straps for conduits and cables larger than 50 mm.

- .3 Beam clamps to secure conduit to exposed steel work.
- .6 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .7 For surface mounting of two or more conduits use channels at 1.5m on centre spacing.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .10 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

- 1 General
- 1.1 **RELATED SECTIONS**
 - .1 26 05 00 – Common Work Results – Electrical.
- 1.2 **REFERENCES**
 - .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1, Canadian Electrical Code, Part 1, 2009.
- 1.3 **SUBMITTALS**
 - .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Provide drawings stamped and signed by an independent professional engineer registered or licensed in Province of Ontario, Canada.
- 1.4 **DELIVERY, STORAGE AND HANDLING**
 - .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 35 11 - Construction/Demolition Waste Management and Disposal.
- 2 Products
- 2.1 **JUNCTION AND PULL BOXES**
 - .1 Construction: welded steel enclosure.
 - .2 Covers Flush Mounted: 25 mm minimum extension all around.
 - .3 Covers Surface Mounted: screw-on flat covers.
 - .4 All junction & pull boxes shall have provision for padlocks which shall be supplied & installed by others.
- 3 Execution
- 3.1 **JUNCTION AND PULL BOXES INSTALLATION**
 - .1 Install pull boxes in inconspicuous but accessible locations.

- .2 Install terminal block as indicated.
- .3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 **IDENTIFICATION**

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated (junction boxes to be colour coded only).

END OF SECTION

- 1 General
- 1.1 **RELATED SECTIONS**
 - .1 26 05 00 – Common Work Results – Electrical.
- 1.2 **REFERENCES**
 - .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).
- 1.3 **SUBMITTALS**
 - .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
 - .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.
- 1.4 **WASTE MANAGEMENT AND DISPOSAL**
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 35 11 - Construction/Demolition Waste Management and Disposal.
 - .2 Place materials defined as hazardous or toxic waste in designated containers.
 - .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- 2 Products
- 2.1 **CONDUITS**
 - .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .6 Polyethylene flexible plastic medium density conduit, CSA certified, in continuous coil of suitable length with joints where absolutely necessary, made with couplings and stainless steel gear type clams and brass spring-tooth washers inside and outside the box or standard rigid conduit threadless connectors at terminations.

2.2 **CONDUIT FASTENINGS**

- .1 One hole straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 **CONDUIT FITTINGS**

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Steel connectors and couplings (in dry area) for EMT.
 - .1 Standard fittings are acceptable.
 - .2 Set screws are acceptable.

3 Execution

3.1 **MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 **INSTALLATION**

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms.

- .3 Horizontal conduit runs in the walls are not permitted.
- .4 Surface mount conduits except where concealed.
- .5 Use rigid galvanized steel threaded conduit except where specified otherwise.
- .6 Use electrical metallic tubing (EMT) except in cast concrete.
- .7 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without prewired outlet box and connection to surface or recessed fluorescent fixtures.
- .8 Minimum conduit size for lighting and power circuits: 21 mm.
- .9 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 21 mm diameter.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .13 Dry conduits out before installing wire.

3.3 **SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 **CONCEALED CONDUITS**

- .1 Run parallel or perpendicular to building lines.

3.5 **CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.

- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Materials for moulded-case circuit breakers, circuit breakers, and ground-fault circuit-interrupters, and accessory high-fault protectors.
- 1.2 **RELATED SECTIONS**
 - .1 Section 01 33 00 - Submittal Procedures.
 - .2 Section 01 35 11 - Construction/Demolition Waste Management and Disposal.
- 1.3 **REFERENCES**
 - .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).
- 1.4 **SUBMITTALS**
 - .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- 1.5 **WASTE MANAGEMENT AND DISPOSAL**
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 35 11 - Construction/Demolition Waste Management and Disposal.
 - .2 Collect and separate for disposal paper, plastic, polystyrene and corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .3 Separate for reuse and recycling and place in designated containers Steel, Metal and Plastic waste in accordance with Waste Management Plan.
- 2 Products
- 2.1 **BREAKERS GENERAL**
 - .1 Moulded-case circuit breakers, circuit breakers, and ground-fault circuit-interrupters, and accessory high-fault protectors: to CSA C22.2 No. 5 at 42 kA.
 - .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
 - .3 Common-trip breakers: with single handle for multi-pole applications.
 - .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

- .1 Trip settings on breakers with adjustable trips to range from 5-10 times current rating (for MCCB-S larger than 225A).
 - .5 Circuit breakers with interchangeable trips as indicated.
 - .6 Circuit breakers to have minimum 10 kA symmetrical rms interrupting capacity rating.
- 2.2 **THERMAL MAGNETIC BREAKERS**
- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- 2.3 **SOLID STATE TRIP BREAKERS**
- .1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for phase ground fault short circuit protection.
- 2.4 **ENCLOSURE**
- .1 As required.
- 3 Execution
- 3.1 **INSTALLATION**
- .1 Install circuit breakers as indicated.

END OF SECTION

- 1 General
- 1.1 **RELATED REQUIREMENTS**
 - .1 Section 26 05 00 – Electrical Requirements.
- 1.2 **REFERENCES**
 - .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
 - .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
 - .3 ASTM International Inc.
 - .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
 - .4 Canadian Standards Association (CSA International)
 - .5 ICES-005-07, Radio Frequency Lighting Devices.
 - .6 Underwriter's Laboratories (UL)
 - .7 Underwriters' Laboratories of Canada (ULC)
 - .8 Illuminating Engineering Society of North America (IESNA)
- 1.3 **ACTION AND INFORMATIONAL SUBMITTALS**
 - .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Departmental Representative.
 - .3 Photometric data to include: VCP Table where applicable and spacing criterion.
 - .3 Samples:
 - .1 Provide samples as indicated
 - .4 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.

- .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.4 **QUALITY ASSURANCE**

- .1 Provide mock-ups in accordance with Section 01 45 00 - Quality Control.

1.5 **DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return pallets, crates, padding and packaging materials in accordance with Section 01 35 41 - Construction/Demolition Waste Management and Disposal.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

2 **Products**

2.1 **FINISHES**

- .1 Light fixture finish and construction to meet cUL listing and/or CSA certification related to intended installation.

2.2 **LUMINAIRE CONSTRUCTION**

- .1 Exterior Luminaire:
 - .1 All exterior luminaires shall be listed for wet locations with a minimum Ingress Protection rating of IP65.
 - .2 Exterior luminaires shall have cast aluminum housing free of welds, butt joints and lapped corners. All internal materials shall have a corrosion resistant finish.
 - .3 All hardware shall be stainless steel.
 - .4 Luminaire optical system Shall be protected by a neoprene gasket to keep out dust and moisture.
 - .5 Luminaire optical system shall meet the IESNA definition for full cutoff optics and reduce high angle brightness.
 - .6 All cast aluminum exterior luminaire finishes shall be corrosion resistant, polyester, powder coat.

2.3 LED LUMINAIRES

- .1 Led luminaires shall have an integrated cast aluminium thermal management system and an electronic constant current Class II LED driver with built-in 3 KV surge protection and thermal protection. Fixture to have a 70% lumen maintenance after 60,000 hours based on LM-80 and manufactured with RoHS compliant components.
- .2 Lamps shall be LED board with LEDs (4000K) c/w end of life isolation for individual LEDs.
- .3 Luminaire sides must be rugged casting with integral weather tight LED driver compartments and high performance heat sinks specifically designed for LED lighting applications.
- .4 The LED luminaire manufacturer must be able to provide a certified photometric report (per IESNA LM-79) from an approved DOE lab that validates the manufacturer's performance claims. The LED luminaire manufacturer must be able to provide a LED chip manufacturer's IESNA LM-80 test data. LED luminaire lumen depreciation data with the correct light loss factor for the application. The manufacturer must be able to evaluate the lumen depreciation value for the expected life of the LEDs.
- .5 Replace burned out LED fixtures based on 70% lumen maintenance within a 5 years warranty period from the date of issuance of certificate of substantial completion.

3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.4 CLEANING

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

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 35 41 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

1 General

1.1 **WORK INCLUDED**

- .1 Excavation and backfilling for mechanical, electrical and site services work is included in this Section. This work to be laid out and supervised by trade concerned.

1.2 **REFERENCES**

- .1 ASTM International (ASTM):
- .1 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .2 ASTM D751-06, Standard Test Methods for Coated Fabrics.
 - .3 ASTM D5034-09, Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
- .2 CSA International (CSA):
- .1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA A3000-08, Cementitious Materials Compendium.
- .3 Ontario Provincial Standard Specifications (OPSS)/Ontario Ministry of Transportation:
- .1 OPSS 514 April 2008, Ontario Provincial Standard Specification, Construction Specification for Trenching, Backfilling, and Compacting.
 - .2 OPSS 1004 November 2006, Ontario Provincial Standard Specification, Material Specification for Aggregates - Miscellaneous.
 - .3 OPSS 1010 April 2004, Ontario Provincial Standard Specification, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

1.3 **ADMINISTRATIVE REQUIREMENTS**

- .1 Co-ordination: arrange with authority having jurisdiction for relocation of buried services that interfere with execution of work.
- .1 Pay costs of relocating services.
 - .2 Before commencing work establish location of buried services on and adjacent to site.
 - .3 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .4 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
- .2 Examine soil report appended to this Document, report No.124-P041600-100 prepared by LVM Inc. dated September 29, 2011.

1.4 **ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.

- .2 Samples: submit to designated testing agency, 23 kg sample of backfill for fill and unshrinkable fill material proposed for use, no later than 1 week before backfilling or filling work.
- .3 Site Quality Control Submittals: submit in accordance with Section 01 45 00.
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article.
 - .2 Submit testing results and report as described in PART 3 - FIELD QUALITY CONTROL.
- .4 LEED submittals: Submit applicable supporting documentation for approval of the Departmental Representative.

2 Products

2.1 **MATERIALS**

- .1 Granular material: to OPSS 1010.
 - .1 Granular A, maximum size 19.0 mm.
 - .2 Granular B, Type II, maximum size 150 mm.
- .2 19 mm crusher-run limestone: In accordance with OPSS-1004, containing 100% crushed aggregates, free of organic matter.
- .3 19 mm clear crushed limestone: In accordance with OPSS 1004, free of organic material.
- .4 Sand: clean, washed, minimum 100% passing 4.75 mm sieve, maximum 5% passing 0.075 mm sieve to OPSS 1004.05.07.
- .5 Drainage material: 19 mm crushed stone or 19 to 63 mm clean gravel to OPSS 1004.05.02.
- .6 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum Portland cement content of 25 kg/m³.
 - .3 Minimum strength of 0.07 MPa at 24 hours.
 - .4 Concrete aggregates: to CSA A23.1/A23.2.
 - .5 Cement: to CSA A3000, Type GU.
 - .6 Slump: 160 to 200 mm.
- .7 Filter fabric:
 - .1 Synthetic fibre: rot-proof, unaffected by action of oil or salt water and not subject to attack by insects or rodents.
 - .2 Fabric: woven construction supplied in rolls of minimum 3.8 m width, 130 m length, minimum thickness of 0.5 mm and minimum weight of 160 g/m².
 - .3 Seams: sewn or overlapped in accordance with manufacturer's recommendations.

- .4 Physical properties:
 - .1 Breaking load and elongation: to ASTM D5034, Grab Test Method 25 mm square jaws, constant rate of travel 300 mm per minute.
 - .2 Stronger principal direction, 800 N.
 - .3 Elongation minimum 22 percent.
 - .4 Bursting strength: To ASTM D751, using Diaphragm Bursting Tester 1500 N.
 - .5 Permeability: 2.2 x 10.

3 Execution

3.1 **EXAMINATION**

- .1 Evaluation and Assessment:
 - .1 Examine soil report appended to this Document.
 - .2 Before commencing work establish locations of buried services on and adjacent to site.

3.2 **PREPARATION**

- .1 Protection of in-place conditions:
 - .1 Protect excavations from freezing.
 - .2 Keep excavations clean, free of standing water, and loose soil.
 - .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative's approval.
 - .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
 - .5 Protect buried services that are required to remain undisturbed.

3.3 **EXCAVATION**

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations whichever is more stringent.
- .2 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
 - .1 Stockpile topsoil on site for later use.
- .3 Excavate as required to carry out work.
 - .1 Do not disturb soil or rock below bearing surfaces.
 - .2 Notify Departmental Representative when excavations are complete.
 - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
 - .4 Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.

- .5 Excavation, backfilling and compacting for installation of storm pipe sewers, pipe culverts and end sections, pipe subdrains and other underground utilities in accordance with OPSS 514.
- .4 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
 - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .5 Excavate for slabs and paving to subgrade levels.
 - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.4 **BACKFILLING**

- .1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Departmental Representative.
- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures. Backfill simultaneously each side of walls and other structures greater than 1.3 m deep to equalize soil pressures.
- .4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as fill.
 - .1 Fill excavated areas with selected subgrade material compacted as specified for fill.
- .5 Placing:
 - .1 Place backfill, fill and base course material in 150 mm lifts: add water as required to achieve specified density.
 - .2 Place unshrinkable fill in areas as indicated: consolidate and level unshrinkable fill with internal vibrators.
- .6 Compaction: in accordance with Geotechnical Report providing the following as a minimum:
 - .1 Imported fill: 98% standard Proctor maximum dry density (SPMDD).
 - .2 Under slabs, walks and pavements: 100% (SPMDD).
 - .3 Elsewhere: 95%, unless otherwise indicated on Contract Drawings.
- .7 Backfill against foundations with excavated material.
- .8 Place 150 mm compacted thickness of 19 mm clear crushed stone material below slab on grade.
- .9 Place Granular A material below paving and walls, unless otherwise indicated.

- .10 Place 150 mm compacted thickness of Granular material over perimeter insulation
- .11 Restore surface of excavation with material and finish to match existing adjoining surfaces.
- .12 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .13 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material
- .14 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

3.5 GRADING

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative.
 - .1 Grade to be gradual between finished spot elevations shown on drawings.
- .2 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil. Stockpile topsoil on site for later use.
- .3 Fill and grade site to achieve elevations indicated.
- .4 Place excavated material in 300 mm lifts.
- .5 Compact to 80% Standard Proctor Density.
- .6 Grade to a uniform slope with a tolerance of 1:120.

3.6 FIELD QUALITY CONTROL

- .1 Testing of materials and compaction of backfill, fill and unshrinkable fill will be carried out by testing laboratory designated by Departmental Representative.
- .2 Not later than 1 week minimum before backfilling or filling, submit to designated testing agency, samples of backfill as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Departmental Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Departmental Representative to allow compaction tests to be carried out by designated testing agency.

3.7 **SHORTAGE AND SURPLUS**

- .1 Supply necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 Dispose of surplus material off site.

3.8 **CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.
 - .2 Dispose of cleared and grubbed material off site daily.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse, recycling and organics in accordance with Section 01 74 20.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 31 00 00 - Earthwork.
- .2 Section 31 23 33-01 – Excavating, Trenching and Backfilling.

1.2 REFERENCES

- .1 ASTM D698-07e1 - Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft³ (600 kN-m/m³)).

1.3 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.

1.4 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Record Documentation: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.5 QUALITY ASSURANCE

- .1 Perform Work to ASTM D698 and Town of Niagara on the Lake standards.

Part 2 Products

2.1 MATERIALS

- .1 Topsoil: Type S1 as specified in Section 31 00 00 and Section 31 23 33-01.
- .2 Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by The Departmental Representative.
- .3 Fill material: In accordance with Section 31 23 33-01 - Excavating, Trenching and Backfilling.

Part 3 Execution

3.1 EXAMINATION

- .1 Section 01 70 00: Verify existing conditions before starting work.
- .2 Verify that survey bench mark and intended elevations for the Work are as indicated.

3.2 PREPARATION

- .1 Identify required lines, levels, contours, and datum.
- .2 Stake and flag locations of known utilities.
- .3 Locate, identify, and] protect utilities that remain, from damage.
- .4 Notify utility company to remove and relocate utilities as required and as approved by The Departmental Representative.
- .5 Protect above and below grade utilities that remain.
- .6 Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- .7 Protect bench marks, survey control point, existing structures, fences, sidewalks, paving, and curbs to remain from excavating equipment and vehicular traffic.

3.3 STRIPPING OF TOPSOIL

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by The Departmental Representative.
- .2 Commence topsoil stripping of areas as indicated after area has been cleared of brush, weeds, and grasses and removed from site.
- .3 Strip topsoil to depths as indicated. Rototill and retain as topsoil on site. Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as directed by The Departmental Representative. Stockpile height not to exceed 2 m.
- .5 Dispose of unused topsoil off site.

3.4 SUBSOIL EXCAVATION

- .1 Excavate subsoil from areas to be further excavated, re-landscaped, or re-graded as noted on the drawings and as directed by The Departmental Representative.
- .2 Do not excavate wet subsoil or excavate and process wet material to obtain optimum moisture content.
- .3 When excavating through roots, perform work by hand and cut roots with sharp axe.
- .4 Remove subsoil from site.

3.5 FILLING

- .1 Install Work in accordance with Town of Niagara on the Lake standards.
- .2 Fill areas to contours and elevations with unfrozen materials.

- .3 Place fill material on continuous layers and compact in accordance with the schedule at end of this section.
- .4 Maintain optimum moisture content of fill materials to attain required compaction density.
- .5 Slope grade away from building minimum 1.5:100, unless noted otherwise.
- .6 Make grade changes gradual. Blend slope into level areas.
- .7 Remove surplus fill materials from site.

3.6 TOLERANCES

- .1 Top Surface of Subgrade: Plus or minus 30 mm from required elevation.

3.7 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Bring subsoil to required levels, profiles and contours indicated on drawings. Make changes in grade natural. Blend slopes into level areas.
- .3 Slope rough grade away from building minimum 1.5:100, unless noted otherwise.
- .4 Grade ditches to depth as indicated.
- .5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .6 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:
 - .1 85% under landscaped areas.
 - .2 95% under paved and walk areas.
 - .3 As recommended by Geotechnical report
- .7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.8 FIELD QUALITY CONTROL

- .1 Section 01 43 00: Field inspection and testing.
- .2 Inspection and testing of soil compaction in accordance with ASTM D698, Section 31 23 33-01 - Excavating, Trenching and Backfilling and as required by The Departmental Representative.
- .3 If tests indicate Work does not meet specified requirements, remove Work, replace and retest.
- .4 Frequency of Tests: at the discretion of The Departmental Representative.

3.9 SURPLUS MATERIAL

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping off site as directed by The Departmental Representative.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 00.01 – Earthwork.
- .2 Ontario Provincial Standard Specifications (OPSS):
 - .1 OPSS 314, Construction Specification for Untreated Granular, Subbase, Base, Surface Shoulder, and Stockpiling (November 2004).
 - .2 OPSS 401, Construction Specifications for Excavating, Trenching and Backfilling (November 2009).
 - .3 OPSS 802, Construction Specification for Topsoil (November 2010).
 - .4 OPSS 902, Construction Specification for Excavating and Backfilling – Structures (November 2010).
 - .5 OPSS 1860, Material Specification for Geotextiles (April 2012).

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing (2004).
 - .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates (2006).
 - .3 ASTM D422-63, Standard Test Method for Particle-Size Analysis of Soils (2007).
 - .4 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³) (2012).
 - .5 ASTM D1557-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (2,700 kN-m/m³) (2012).
 - .6 ASTM D4318-10, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (2010).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series (March 01, 1988).
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric (April 01, 1988).
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005) (2011).
 - .2 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete (2009).
- .4 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices (September 1992).

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.

- .1 Rock: solid material in excess of 0.25 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material not classified as rock.
- .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318-10, and gradation within limits specified when tested to ASTM D422-63 and ASTM C136-06: Sieve sizes to CAN/CGSB-8.1-88, CAN/CGSB-8.2-M88.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Notify The Departmental Representative a minimum of 48 hours prior to excavation work.
- .3 Preconstruction Submittals:
 - .1 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.
- .4 Contractor to notify and coordinate with the The Departmental Representative for soil testing and compaction as required.

1.5 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where contractor is responsible for design of temporary structures, submit proof that Work is included in Contractor's insurance coverage.
- .3 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Ontario, Canada.

- .5 Keep design and supporting data on site.
- .6 Engage services of qualified professional Engineer who is registered or licensed in Ontario, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .7 Do not use soil material until written report of soil test results are reviewed and approved by The Departmental Representative.
- .8 Health and Safety Requirements:

1.6 EXISTING CONDITIONS

- .1 Examine Geotechnical Investigation Proposed Single/Two Storey Building on Lot 181 York Road, Niagara-on-the-Lake, Ontario completed by LVM dated September 29, 2011.
- .2 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs as directed by The Departmental Representative.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify The Departmental Representative and applicable authorities having jurisdiction establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful test excavations or soil hydrovac methods as required.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered and as indicated.
 - .8 Where utility lines or structures exist in area of excavation, obtain direction of The Departmental Representative before removing or re-routing.
 - .9 Record location of maintained, re-routed and abandoned underground lines.
 - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
 - .1 Conduct, with the The Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.

- .2 Gradations to be within limits specified when tested as specified in Geotechnical Report and as directed by the The Departmental Representative.
- .2 Type 3 fill: selected material from excavation or other sources, approved by The Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum cement content of 25 kg/m³ with 40% by volume fly ash replacement: to CSA-A3001-08, Type GU.
 - .3 Minimum strength of 0.07MPa at 24 h.
 - .4 Concrete aggregates: to CSA-A23.1-09/A23.2-09.
 - .5 Portland Cement: Type 10.
 - .6 Slump: 160 to 200 mm.
- .4 Voidform: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.
- .5 Geotextiles: to conform to OPSS 1860.

Part 3 EXECUTION

3.1 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.2 PREPARATION/ PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to The Departmental Representative's approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.3 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as indicated and as directed by The Departmental Representative after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Construction specifications for topsoil shall conform to OPSS 802.
- .3 Strip topsoil to depths as indicated and as directed by The Departmental Representative.
 - .1 Do not mix topsoil with subsoil.
- .4 Stockpile in locations as indicated and as directed by The Departmental Representative.
 - .1 Stockpile height not to exceed 2 m and should be protected from erosion.

- .5 Dispose of unused topsoil as indicated and as directed by The Departmental Representative.

3.4 STOCKPILING

- .1 Stockpile in accordance with OPSS 314.
- .2 Stockpile fill materials in areas designated by The Departmental Representative.
 - .1 Stockpile granular materials in manner to prevent segregation.
- .3 Protect fill materials from contamination.
- .4 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Health and Safety Act for Ontario.
 - .1 Where conditions are unstable, The Departmental Representative to verify and advise methods.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
- .3 Construct temporary Works to depths, heights and locations as indicated or directed by The Departmental Representative.
- .4 During backfill operation:
 - .1 Unless otherwise indicated or directed by The Departmental Representative, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .5 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .6 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.
 - .2 Remove excess materials from site and restore watercourses as indicated and as directed by The Departmental Representative.

3.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for The Departmental Representative's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures to approved collection runoff areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.

- .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas as indicated on the Civil Engineering Drawings.

3.7 EXCAVATION

- .1 All Excavating activities shall conform to OPSS 401 and OPSS 902.
- .2 Excavate to lines, grades, elevations and dimensions as indicated and as directed by The Departmental Representative.
- .3 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation as directed.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by The Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by The Departmental Representative.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material as directed by The Departmental Representative.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify The Departmental Representative when bottom of excavation is reached.
- .13 Obtain The Departmental Representative's approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by The Departmental Representative.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete approved by The Departmental Representative Type 2 fill compacted to not less than 100% of corrected Standard Proctor maximum dry density.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected Standard Proctor maximum dry density.
- .16 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of The Departmental Representative.
- .17 Install geotextiles in accordance OPSS 1860.

3.8 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated on the Engineering Drawings, as indicated in the Geotechnical Report and as directed by The Departmental Representative.

3.9 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in Section 33 41 00 - Storm Utility Drainage Piping.
- .2 Place and compact granular material as specified on the engineering drawings. Compaction to be completed as per the Geotechnical report and to the satisfaction of the The Departmental Representative.
- .3 Place bedding and surround material in unfrozen condition.

3.10 BACKFILLING

- .1 Backfilling activities shall conform to OPSS 401 and OPSS 902.
- .2 Do not proceed with backfilling operations until completion of following:
 - .1 The Departmental Representative has inspected and approved installations.
 - .2 The Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .3 Place layers simultaneously on both sides of installed Work to equalize loading. Acceptable differences at The Departmental Representative's discretion.
 - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from The Departmental Representative or:
 - .2 If approved by The Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by The Departmental Representative.
- .7 Place unshrinkable fill in areas as indicated.
- .8 Consolidate and level unshrinkable fill with internal vibrators.
- .9 Install drainage or filter system in backfill as directed by The Departmental Representative.

3.11 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by The Departmental Representative.
- .2 Replace topsoil as indicated and as directed by The Departmental Representative.
- .3 Reinststate lawns to elevation which existed before excavation.
- .4 Reinststate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinststate areas affected by Work as directed by The Departmental Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

- 1 General
- 1.1 **RELATED REQUIREMENTS**
 - .1 Section 31 00 00.01 – Earthworks – Short Form
 - .2 Section 03 30 00 – Cast-In-Place Concrete
- 1.2 **MEASUREMENT AND PAYMENT**
 - .1 Measure excavation bedding and backfill for culverts in accordance with Section 31 00 00.01 – Earthworks – Short Form
 - .2 Measure supply of pipe culvert in metres for each size, type and class of pipe supplied.
 - .1 No separate measurement will be made for couplings and fittings for steel pipe and plastic pipe culverts.
 - .3 Measure supply and installation of pipe culvert including excavation and backfill in metres in place for each size, type and class of pipe.
 - .4 Measure granular material for culvert bedding and backfill in cubic metres, compacted in place, to excavation limits authorized by Departmental Representative in accordance with Section 31 00 00.01 – Earthworks – Short Form
 - .5 Cost of installation will include any necessary dewatering prior to placing of granular bedding.
- 1.3 **REFERENCES**
 - .1 ASTM International
 - .1 ASTM C 117-04, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM C 144 04, Standard Specification for Aggregate for Masonry Mortar.
 - .4 ASTM C 443M-10, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric).
 - .5 ASTM D 698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .6 ASTM A760 / A760M - 10 Standard Specification for Corrugated Steel Pipe, Metallic-Coated for Sewers and Drains
 - .7 ASTM D 1248-05, Standard Specification for Polyethylene Plastics Extrusion Materials For Wire and Cable.
 - .8 ASTM F 667-06, Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.

- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .4 CSA International
 - .1 CSA A3000-08, Cementitious Materials Compendium.
 - .2 CSA A257 Series-09, Standards for Concrete Pipe and Manhole Sections.
 - .3 CAN/CSA G401-07, Corrugated Steel Pipe Products.
- .5 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 **ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Certification: to be marked on pipe.
- .3 Test and Evaluation Reports:
 - .1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work.
- .4 Sustainable Design Submittals:
 - .1 LEED Canada-NC Version 1.0 Submittals: in accordance with Section 01 35 21 - LEED Requirements.
- .5 Construction Waste Management:
 - .1 Submit project Waste Management Plan Waste Reduction Workplan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50-75% of construction wastes were recycled or salvaged.
- .6 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - .2 Submit evidence, when Supplementary Cementing Materials (SCMs) are used, to certify reduction in cement from Base Mix to Actual SCMs Mix, as percentage.

- .7 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
- 1.5 **DELIVERY, STORAGE AND HANDLING**
- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect pipes from damage.
 - .3 Replace defective or damaged materials with new.
 - .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.
 - .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.
- 2 Products
- 2.1 **CORRUGATED STEEL PIPE**
- .1 Corrugated steel pipe: to CAN/CSA-G401.
 - .2 Water-tight cut-off collars: as indicated.
 - .3 Prefabricated end sections and wing walls: as indicated.
 - .4 Corrugated fluming: to CAN/CSA-G401.
- 2.2 **GRANULAR BEDDING AND BACKFILL**
- .1 Granular bedding and backfill material to Section 31 00 00.01 – Earthworks – Short Form and following requirements:
 - .1 Crushed pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.

.2 Concrete mixes and materials for bedding, cradles, encasement, supports: to Section 03 30 00 - Cast-in-Place Concrete.

.3 Recycled content: incorporate SCM's in concrete mix, minimum of 7.5 % post-industrial recycled content in accordance with Section 01 35 21 - LEED Requirements.

3 Execution

3.1 **EXAMINATION**

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe culvert installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 **PREPARATION**

.1 To be in accordance with Section 01 51 00 – Temporary Utilities.

3.3 **TRENCHING**

- .1 Do trenching Work in accordance with Section 31 00 00.01 – Earthworks – Short Form.
- .2 Obtain Departmental Representative's approval of trench line and depth prior to placing bedding material or pipe.

3.4 **BEDDING**

- .1 Dewater excavation, as necessary, to allow placement of culvert bedding in dry condition.
- .2 Place 200 mm minimum thickness of approved granular material on bottom of excavation and compact to 98% (SPMDD).
- .3 Shape bedding to fit lower segment of pipe exterior so that width of at least [50]% of pipe diameter is in close contact with bedding and to camber as indicated free from sags or high points.
- .4 Place bedding in unfrozen condition.

3.5 LAYING CORRUGATED STEEL PIPE CULVERTS

- .1 Begin pipe placing at downstream end.
- .2 Ensure bottom of pipe is in contact with shaped bed or compacted fill throughout its length.
- .3 Lay pipe with outside circumferential laps facing upstream and longitudinal laps or seams at side or quarter points.
- .4 Lay paved invert or partially lined pipe with longitudinal centre line of paved segment coinciding with flow line.
- .5 Do not allow water to flow through pipes during construction except as permitted by Departmental Representative.

3.6 JOINTS: CORRUGATED STEEL PIPE CULVERTS

- .1 Corrugated steel pipe:
 - .1 Match corrugations or indentations of coupler with pipe sections before tightening.
 - .2 Tap couplers firmly as they are being tightened, to take up slack and ensure snug fit.
 - .3 Insert and tighten bolts.
 - .4 Repair spots where damage has occurred to spelter coating by two coats of zinc rich paint approved by Departmental Representative.
- .2 Structural plate:
 - .1 Erect in final position by connecting plates with bolts at longitudinal and circumferential seams.
 - .2 Drift pins may be used to facilitate matching of holes.
- .3 Place plates in sequence recommended by manufacturer with joints staggered [so that not more than three plates come together at any one point.
- .4 Draw bolts up tight, without overstress, before beginning backfill.
- .5 Repair spots where damage has occurred to spelter coating by applying two coats of zinc rich paint approved by Departmental Representative.

3.7 BACKFILLING

- .1 Backfill around and over culverts as indicated.
- .2 Place backfill material in 150 mm layers to full width, alternately on each side of culvert, so as not to displace it laterally or vertically.
- .3 Compact each layer to 95% (SPMDD) taking special care to obtain required density under haunches.

- .4 Protect installed culvert with minimum 600mm cover of compacted fill before heavy equipment is permitted to cross.
 - .1 During construction, width of fill, at its top, to be at least twice diameter or span of pipe and with slopes not steeper than 1:2.
- .5 Place backfill in unfrozen condition.

3.8 **BACKFILLING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 General

1.1 **RELATED REQUIREMENTS**

- .1 Section 31 00 00.01 – Earthworks – Short Form.
- .2 Ontario Provincial Standard Specifications (OPSS): 405, 1860

1.2 **MEASUREMENT AND PAYMENT**

- .1 Excavation and backfill will be measured under Section 31 00 00.01 – Earthworks – Short Form.
- .2 Supply of sub-drain pipe will be measured in metres, of each type and size indicated and in authorized quantities delivered to designated storage area.
- .3 Geotextiles will be measured under Section 31 00 00.01 – Earthworks – Short Form.
- .4 Granular drainage material will be measured in tones of material incorporated into Work.
 - .1 No deduction to be made for volume occupied by drain pipe.
- .5 Supply and installation of pipe sub-drains will be measured in metres of each type and size installed.
 - .1 Horizontal measurement will be made from centre to centre of manholes or catch basins over surface after work has been completed.
 - .2 In cases where drain pipe is not connected to manholes or catch basins measurement will be actual length in place.
- .6 Supply and installation of sub-drainage including, trenching, backfill, bedding, clearstone and geotextile will be measured horizontally from manhole face to manhole face in metres of each pipe size and depth class installed.

1.3 **REFERENCES**

- .1 ASTM International
 - .1 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM D 698-10, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-2004, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum 2007).
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.

- .4 CSA International
 - .1 CAN/CSA-B1800-06, Thermoplastic Non-pressure Pipe Compendium.
 - .2 CAN/CSA-G401-07, Corrugated Steel Pipe Products.
- .5 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 **ADMINISTRATIVE REQUIREMENTS**

- .1 Inform Departmental Representative of proposed source of clearstone and provide access for sampling at least 4 weeks prior to commencing work.

1.5 **ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Certificates:
 - .1 Submit manufacturer's certification that drain pipe materials meet requirements of this Section.
 - .2 Certification to be marked on pipe.
- .3 Test and Evaluation Reports:
 - .1 Submit manufacturer's test data that drain pipe materials meet requirements of this Section.
- .4 Sustainable Design Submittals:
 - .1 LEED Canada-NC Version 1.0 Submittals: in accordance with Section 01 35 21 - LEED Requirements.
- .5 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.
- .6 Recycled Content:
 - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of [post-consumer] [and] [post-industrial] content, and total cost of materials for project.
- .7 Regional Materials: submit evidence that project incorporates required percentage 10% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.6 **DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect pipes and tiles from damage.
 - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 35 21 - LEED Requirements.
- .5 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and Section 01 35 21 - LEED Requirements.

2 Products

2.1 **MATERIALS**

- .1 Perforated plastic pipe and fittings: to CAN/CSA-B1800. Nominal pipe sizes 100mm.
- .2 Drainage granular material in accordance with Section 31 00 00.01– Earthworks – Short Form and following requirements:
 - .1 Screened stone.
 - .2 Gradations to be within limits specified when tested to ASTM C 136. Sieve sizes to CAN/CGSB-8.1, CAN/CGSB-8.2.
- .3 Geotextile filter fabric: In accordance with OPSS 1860

3 Execution

3.1 **EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sub-drainage piping installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately

- upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and approved by Departmental Representative.

3.2 TRENCHING

- .1 Do trenching and backfilling in accordance with Section 31 00 00.01 – Earthworks – Short Form.
- .2 Trench width and height to be 300x300mm.
- .3 Place granular drainage material after approval of trench by Departmental Representative.

3.3 BEDDING

- .1 Place 50mm layer of granular drainage material to full trench width.

3.4 INSTALLATION OF PIPE SUBDRAIN

- .1 Lay pipe drains on prepared bed, true to line and grade with inverts smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with bed throughout full length.
- .2 Begin laying at outlet and proceed in upstream direction.
- .3 Make joints tight in accordance with manufacturer's instructions.
- .4 Make watertight connections to existing drains, new or existing manholes and catch basins where indicated or as directed by Departmental Representative.
- .5 Plug open upstream ends of pipes with watertight concrete, steel or wood bulkheads.
- .6 Surround pipe with bedding gravel and compact as directed by Departmental Representative.
- .7 Surround and cover drain with filter material in uniform 150mm layers to an elevation of at least 150 mm above top of drain.
- .8 Wrap or sleeve perforated pipe with geotextile filter as indicated.
- .9 Backfill remainder of trench to Section 31 00 00.01 – Earthworks – Short Form as directed by Departmental Representative.
- .10 Do not place bedding surround and backfill materials in frozen condition.
- .11 Protect sub-drains against flotation during installation.
- .12 Install "Y" connections to surface as indicated, for flushing.

3.5 **CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION