



SPECIFICATIONS

SOLICITATION #: 17-22089

BUILDING: U-66
655 Levy Private Road
Ottawa, Ontario

PROJECT: U66- New 115kW dead-end structure

PROJECT #: U66-5078

Date: October 2017

SPECIFICATION

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Directions to the Ottawa Research Facilities – Uplands

NRC Institute for Aerospace Research (NRC-IAR)

Research Road
Ottawa, Ontario, Canada

Tel: 613-991-5738

NRC Centre for Surface Transportation Technology (NRC-CSTT)

2320 Lester Road
Ottawa, Ontario, Canada

Tel: 613-998-9639

NRC Institutes/Branch/Program	Buildings
NRC Administrative Services and Property Management (NRC-ASPM)	U-62
NRC Institute For Aerospace Research (NRC-IAR)	U-61, U-66, U-67, U-69, U-70
NRC Centre for Surface Transportation Technology (NRC-CSTT)	U-84, U-86, U-87, U-88, U89, U-90, U-91

By Road, from the MONTREAL RD FACILITIES to NRC-CSTT, 2320 Lester Road

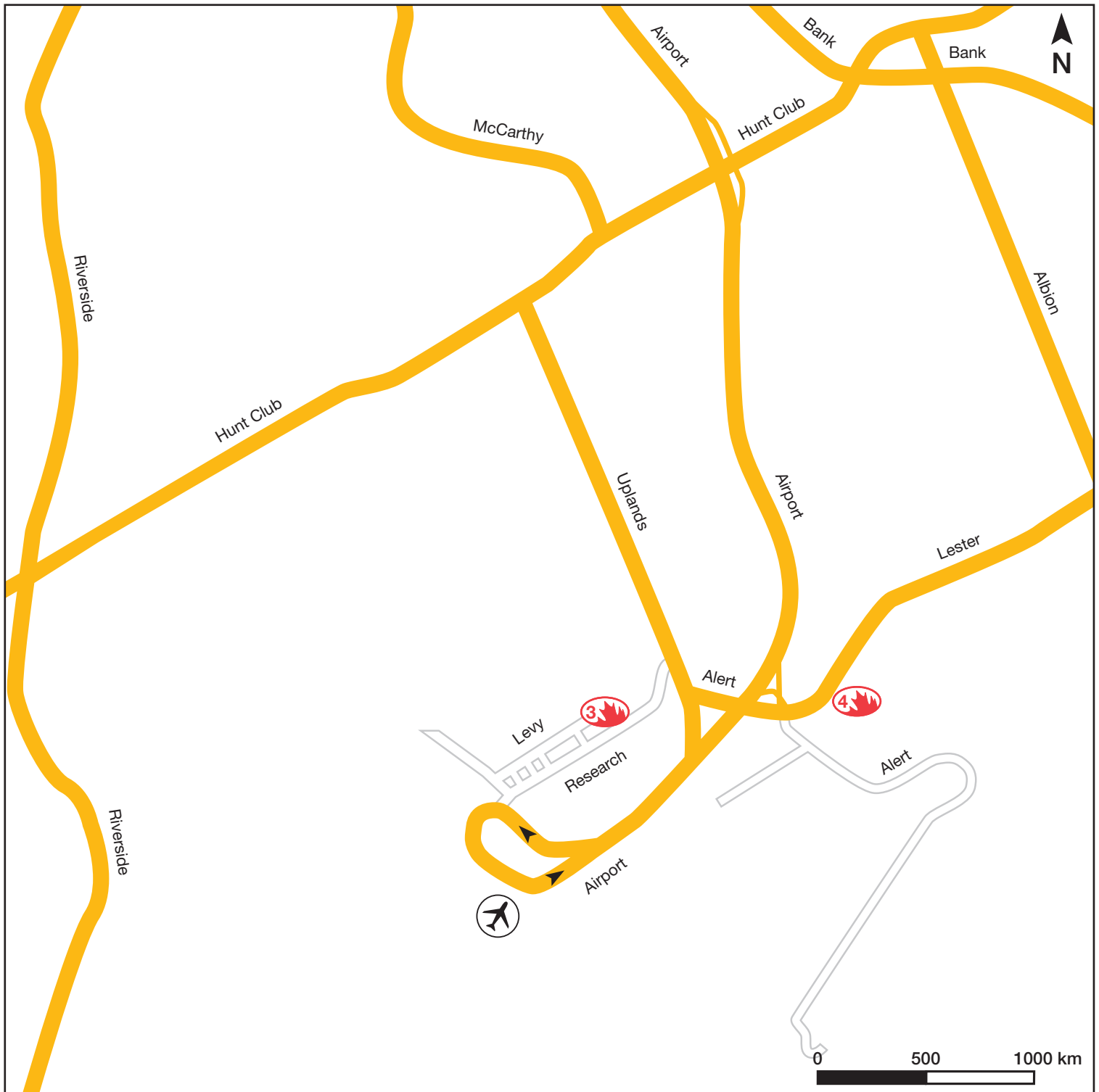
1. Drive EAST on MONTREAL RD
2. Turn RIGHT on BLAIR RD, cross OGILVIE RD
3. Take the ramp and follow Highway 174 WEST
4. Keep RIGHT and take first exit on ramp Highway 417 EAST towards Cornwall/Montreal
5. Exit at WALKLEY RD, merge RIGHT on WALKLEY
6. Turn LEFT at CONROY RD
7. Turn RIGHT at DAVIDSON RD, cross BANK ST – name changes to LESTER RD
8. Continue on LESTER RD and watch for NRC Research Facilities signs

By Road, from the MONTREAL RD FACILITIES to NRC-IAR, Research Road

1. Drive EAST on MONTREAL RD
2. Turn RIGHT on BLAIR RD, cross OGILVIE RD
3. Take the ramp and follow Highway 174 WEST
4. Keep RIGHT and take first exit on ramp Highway 417 EAST towards Cornwall/Montreal
5. Exit at WALKLEY RD, merge RIGHT on WALKLEY
6. Turn LEFT at HAWTHORNE RD
7. Turn RIGHT at HUNT CLUB RD, cross CONROY RD, ALBION RD, BANK ST
8. Turn LEFT at UPLANDS DR. Continue and watch for NRC Research Facilities signs



NRC Institute	Major HWY	Airport	Ferry	Metro
Trans Canada HWY	Secondary HWY	Train Station	Bus Station	

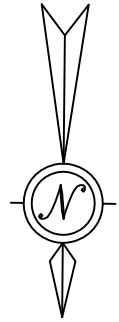


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|--|---|---|---|---|
|  NRC Institute |  Major HWY |  Airport |  Ferry |  Metro |
|  Trans Canada HWY |  Secondary HWY |  Train Station |  Bus Station | |



National Research
Council Canada

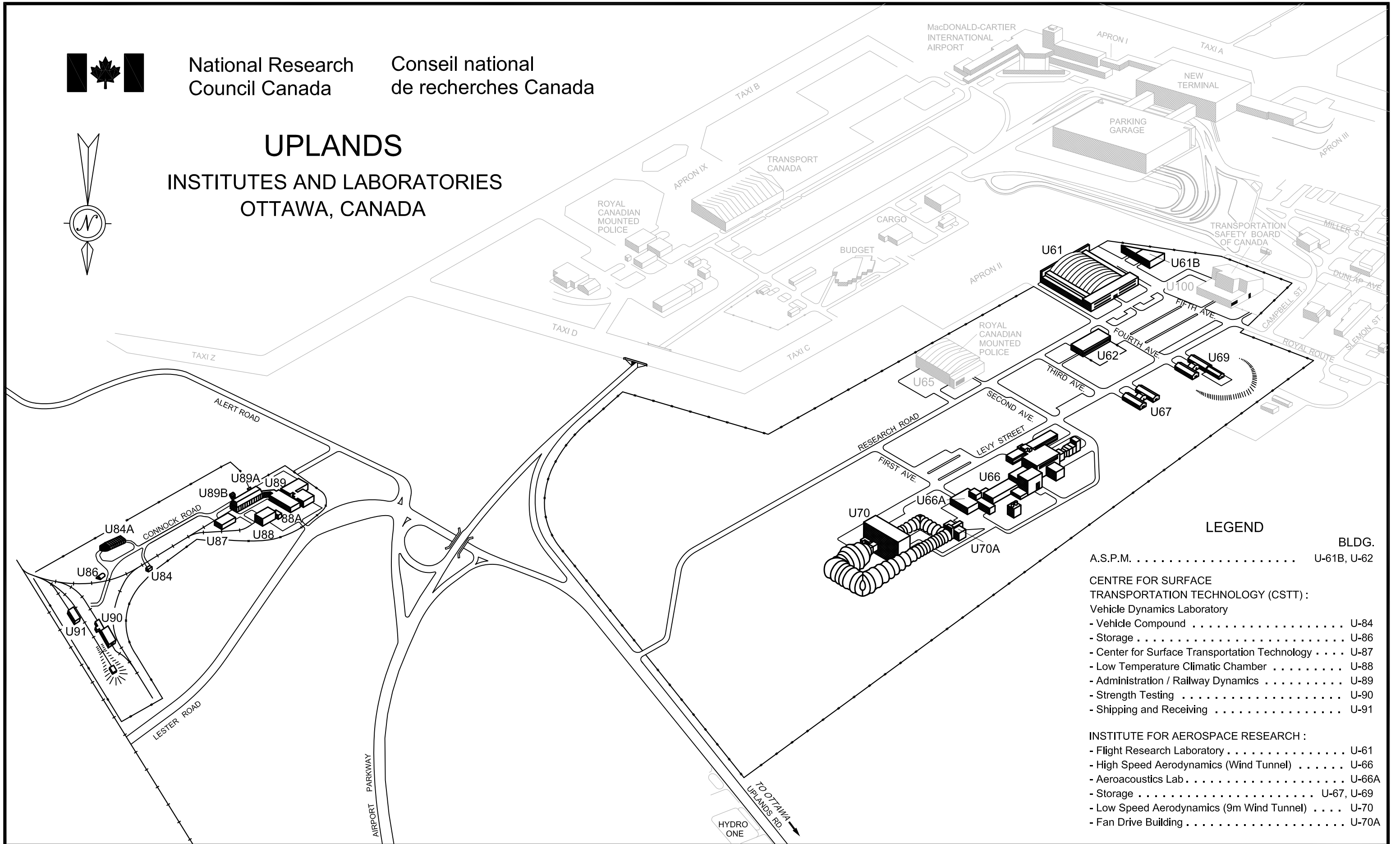
Conseil national
de recherches Canada



UPLANDS

INSTITUTES AND LABORATORIES

OTTAWA, CANADA



LEGEND

- | | |
|--|-------------------|
| A.S.P.M. | BLDG. U-61B, U-62 |
| CENTRE FOR SURFACE TRANSPORTATION TECHNOLOGY (CSTT) : | |
| Vehicle Dynamics Laboratory | |
| - Vehicle Compound | U-84 |
| - Storage | U-86 |
| - Center for Surface Transportation Technology | U-87 |
| - Low Temperature Climatic Chamber | U-88 |
| - Administration / Railway Dynamics | U-89 |
| - Strength Testing | U-90 |
| - Shipping and Receiving | U-91 |
| INSTITUTE FOR AEROSPACE RESEARCH : | |
| - Flight Research Laboratory | U-61 |
| - High Speed Aerodynamics (Wind Tunnel) | U-66 |
| - Aeroacoustics Lab. | U-66A |
| - Storage | U-67, U-69 |
| - Low Speed Aerodynamics (9m Wind Tunnel) | U-70 |
| - Fan Drive Building | U-70A |

National Research Council Conseil national de recherches
Canada Canada

Administrative Services Direction des services
& Property management administratif et gestion
Branch (ASPM) de l'immobilier (SAGI)

Construction Tender Form

Project Identification **U66- New 15kW Dead-End Structure**

Tender No.: **17-22089**

1.2 Business Name and Address of Tenderer

Name _____

Address _____

Contact Person(Print Name) _____

Telephone (_____) _____ **Fax:** (_____) _____

1.3 Offer

I/We the Tenderer, hereby offer to Her Majesty the Queen in Right of Canada (hereinafter referred to as "Her Majesty") represented by the National Research Council Canada to perform and complete the work for the above named project in accordance with the Plans and Specifications and other Tender Documents, at the place and in the manner set out therein for the Total Tender Amount (to be expressed in numbers only) of: \$_____. _____ **in lawful money of Canada (excluding GST/HST)**

The above amount is inclusive of all applicable (*) Federal, Provincial and Municipal taxes except that in the event of a change in any tax imposed under the Excise Act, the Excise Tax Act, the Old Age Security Act, the Customs Act, the Customs Tariff or any provincial sales tax legislation imposing a retail sales tax on the purchase of tangible personal property incorporated into Real Property, that occurs

- .1 after the date this tender was mailed or delivered, or
- .2 if this tender is revised, after the date of the last revision

the amount of this offer shall be decreased or decreased in the manner provided for in GC22 of the General Conditions of the Contract Documents.

National Research Council Canada	Conseil national de recherches Canada
Administrative Services & Property management Branch (ASPM)	Direction des services administratif et gestion de l'immobilier (SAGI)

1.3.1 Offer (continued)

(*) For the purpose of this tender, the Goods and Services Tax (GST) is not to be considered as an applicable tax.

In the province of Quebec, the Quebec Sales Tax is not to be included in the tender amount because the Federal Government is exempt from this tax. Tenderers shall make arrangements directly with the provincial Revenue Department to recover any tax they may pay on good and servives acquired in the performance of this contract. However, tenderers should include in their tender amount Quebec Sales Tax for which an Input Tax Refund is not available.

1.4 Acceptance and Entry into Contract

I/We undertake, within fourteen (14) days of notification of acceptance of my/our offer, to sign a contract for the performance of the work provided I/we are notified, by the Department, of the acceptance of my/our offer within 30 days of the tender closing date.

1.5 Construction Time

I/We Agree to complete the work within the time stipulated in the specification from the date of notification of acceptance of my/our offer.

1.6 Bid Security

I/We herewith enclose tender security in accordance with Article 5 of the General Instruction to Tenderers.

I/We understand that if a security deposit is furnished as tender security and if I/we refuse to enter into a contract when called upon to do so, my/our security deposit shall be forfeited but the Minister may, if it is in the public interest, waive the right of Her Majesty to forfeit the security deposit.

I/We understand that if the security furnished is not in the approved form as described in Article 5 of the General Instructions to Tenderers, my/our tender is subject to disqualification.

National Research Council Canada	Conseil national de recherches Canada
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Administrative Services & Property management Branch (ASPM)	Direction des services administratif et gestion de l'immobilier (SAGI)
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1.7 Contract Security

Within fourteen (14) days after receipt of written notification of the acceptance of my/our offer, I/we will furnish contract security in accordance with the Contract Conditions "F" of the Contract Documents.

I/We understand that the contract security referred to herein, if provided in the form of a bill of exchange, will be deposited into the Consolidated Revenue Fund of Canada.

1.8 Appendices

This Tender Form includes Appendix No. ____N/A_____.

1.9 Addenda

The Total Tender Amount provides for the Work described in the following Addenda:

NUMBER	DATE	NUMBER	DATE

(Tenderers shall enter numbers and dates of addenda)

National Research Council Canada	Conseil national de recherches Canada
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Administrative Services & Property management Branch (ASPM)	Direction des services administratif et gestion de l'immobilier (SAGI)
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1.10 Execution of Tender

The Tenderer shall refer to Article 2 of the General Instructions to Tenderers.

**SIGNED, ATTESTED TO AND DELIVERED on the _____ day of
_____ on behalf of**

(Type or print the business name of the Tenderer)

AUTHORIZED SIGNATORY (IES)

(Signature of Signatory)

(Print name & Title of Signatory)

(Signature of Signatory)

(Print name & Title of Signatory)

SEAL

BUY AND SELL NOTICE

U66- New 115kW dead-end structure

The National Research Council Canada, 655 Levy Private Road Ottawa, ON has a requirement for a project that includes:

This project is for a new 115kW dead-end located at building U-66, Uplands Campus.

1. GENERAL

Questions regarding any aspect of the project are to be addressed to and answered only by the Departmental Representative (or his designate) or the Contracting Authority.

Any information received other than from the Departmental Representative (or his designate) or the Contracting Authority will be disregarded when awarding the contract and during construction.

Firms intending to submit tenders on this project should obtain tender documents through the Buyandsell.gc.ca TMA services provider. Addenda, when issued, will be available from the Buyandsell.gc.ca TMA service provider. Firms that elect to base their bids on tender documents obtained from other sources do so at their own risk and will be solely responsible to inform the tender calling authority of their intention to bid. Tender packages are not available for distribution on the actual day of tender closing.

2. MANDATORY SITE VISIT

It is mandatory that the bidder attends one of the site visits at the designated date and time. At least one representative from proponents that intend to bid must attend.

The site visits will be held on October 31st and November 2nd, 2017 at **9:00**. Meet Maurice Richard at Building U66, Main Entrance, 655 Levy Private Road Ottawa, ON. Bidders who, for any reason, cannot attend at the specified date and time will not be given an alternative appointment to view the site and their tenders, therefore, will be considered as non-responsive. **NO EXCEPTIONS WILL BE MADE.**

As proof of attendance, at the site visit, the Contracting Authority will have an Attendance Form which **MUST** be signed by the bidder's representative. It is the responsibility of all bidders to ensure they have signed the Mandatory Site Visit Attendance form prior to leaving the site. Proposals submitted by bidders who have not attended the site visit or failed to sign the Attendance Form will be deemed non-responsive.

3. CLOSING DATE

Closing date is November 29th, 2017 at 14:00.

4. TENDER RESULTS

Following the Tender closing, the tender results will be sent by facsimile to all Contractors who submitted a tender

5. SECURITY REQUIREMENT FOR CANADIAN CONTRACTORS

5.1 MANDATORY SECURITY REQUIREMENT:

This procurement contains a mandatory security requirement as follows:

- 1 The Contractor must, at all times during the performance of the Contract, hold a valid Designated Organization Screening (DOS), issued by the Canadian Industrial Security Director (CISD), Public Works Government Services Canada.
- 2 The Contractor personnel requiring access to sensitive work site(s) must EACH hold a valid RELIABILITY STATUS, granted or approved by CISD/PWGSC.
- 3 The Contractor must comply with the provisions of the:
 - a. Security Requirements Checklist attached at Appendix "D"
 - b. Industrial Security Manual (Latest Edition) available at: <http://ssi-iss.tpsgc-pwgsc.gc.ca/ssi-iss-services/eso-oss-eng.html>

5.2 VERIFICATION OF SECURITY CLEARANCE AT BID CLOSING

- 1 The Bidder must hold a valid Designated Organization Screening (DOS) issued by the Canadian Industrial Security Directorate (CISD), Public Works and Government Services Canada (PWGSC), **TO BE INCLUDED WITH THEIR TENDER OR PROVIDED WITHIN 48 HOURS FROM THE DATE AND TIME OF TENDER CLOSING.** Verifications will be made through CISD to confirm the security clearance status of the Bidder. Failure to comply with this requirement will render the bid non-compliant and no further consideration will be given to the bid.
- 2 Within 72 hours of tender closing, the General Contractor must name all of his sub-contractors, each of whom **must hold a valid RELIABILITY STATUS**, granted or approved by CISD/PWGSC, or any other Federal Department or Agency along with the names and birthdates or security clearance certificate numbers of all personnel who will be assigned to the project.
- 3 It is to be noted that any subcontractor required to perform any part of the work during the performance of the subsequent contract must also adhere to the mandatory security requirement of the contract. As well, no personnel without the required level of security will be allowed on site. It will be the responsibility of the successful bidder to ensure that the security requirement is met throughout the performance of the contract. The Crown will not be held liable or accountable for any delays or additional costs associated with the contractor's non-compliance to the mandatory security requirement. Failure to comply with the mandatory security requirement will be grounds for being declared in default of contract.
- 4 For any enquiries concerning the project security requirement during the bidding period, the Bidder/Tenderer must contact the Security Officer @ 613-993-8956.

6.0 WSIB (WORKPLACE SAFETY AND INSURANCE BOARD)

- 1 All Bidders must provide a valid WSIB certificate with their Tender or prior to contract award.

7.0 OFFICE OF THE PROCUREMENT OMBUDSMAN

1 Dispute Resolution Services

The parties understand that the Procurement Ombudsman appointed pursuant to Subsection 22.1(1) of the *Department of Public Works and Government Services Act* will, on request or consent of the parties to participate in an alternative dispute resolution process to resolve any dispute between the parties respecting the interpretation or application of a term and condition of this contract and their consent to bear the cost of such process, provide to the parties a proposal for an alternative dispute resolution process to resolve their dispute. The Office of the Procurement Ombudsman may be contacted by telephone at 1-866-734-5169 or by e-mail at boa.opo@boa-opo.gc.ca.

2 Contract Administration

The parties understand that the Procurement Ombudsman appointed pursuant to Subsection 22.1(1) of the *Department of Public Works and Government Services Act* will review a complaint filed by [*the supplier or the contractor or the name of the entity awarded this contract*] respecting administration of this contract if the requirements of Subsection 22.2(1) of the *Department of Public Works and Government Services Act* and Sections 15 and 16 of the *Procurement Ombudsman Regulations* have been met, and the interpretation and application of the terms and conditions and the scope of the work of this contract are not in dispute. The Office of the Procurement Ombudsman may be contacted by telephone at 1-866-734-5169 or by e-mail at boa.opo@boa-opo.gc.ca.

- 3 The Office of the Procurement Ombudsman (OPO) was established by the Government of Canada to provide an independent avenue for suppliers to raise complaints regarding the award of contracts under \$25,000 for goods and under \$100,000 for services. You have the option of raising issues or concerns regarding the solicitation, or the award resulting from it, with the OPO by contacting them by telephone at 1-866-734-5169 or by e-mail at boa.opo@boa-opo.gc.ca. You can also obtain more information on the OPO services available to you at their website at www.opo-boa.gc.ca.

The Departmental Representative or his designate for this project is: **Maurice Richard**
Telephone: **613 993-9299**.

Contracting Authority for this project is: **Alain Leroux** alain.leroux@nrc-cnrc.gc.ca
Telephone: **613 991-9980**.

INSTRUCTIONS TO BIDDERS

Article 1 – Receipt of Tender

- 1a) Tenders must be received not later than the specified tender closing time. Tenders received after this time are invalid and shall not be considered, regardless of any reason for their late arrival.
- 1b) A letter of printed telecommunication from a bidder quoting a price shall not be considered as a valid tender unless a formal tender has been received on the prescribed Tender Form.
- 1c) Bidders may amend their tenders by letter or printed telecommunication provided that such amendments are received not later than the specified tender closing time.
- 1d) Any amendments to the tender which are transmitted by telefax must be signed and must clearly identify the tenderer.

All such amendments are to be addressed to:
National Research Council of Canada
Alain Leroux, Senior Contracting Officer
Building M-22
Montreal Road, Ottawa, Ontario
K1A 0R6

Fax: (613) 991-3297

Article 2 – Tender Form & Qualifications

- 1) All tenders must be submitted on the Construction Tender Form and the tender must be signed in compliance with the following requirements:
 - a) Limited Company: The full names of the Company and the name(s) and status of the authorized signing officer(s) must be printed in the space provided for that purpose. The signature(s) of the authorized officer(s) and the corporate seal must be affixed.
 - b) Partnership: The firm name and the name(s) of the person(s) signing must be printed in the space provided. One or more of the partners must sign in the presence of a witness who must also sign. An adhesive coloured seal must be affixed beside each signature.
 - c) Sole Proprietorship : The business name and the name of the sole proprietor must be printed in the space provided. The sole proprietor must sign in the presence of a witness who must also sign. An adhesive coloured seal must be affixed beside each signature.
- 2) Any alterations in the printed part of the Construction Tender Form or failure to provide the information requested therein, may render the tender invalid.
- 3) All space in the Construction Tender Form must be completed and any handwritten or typewritten corrections to the parts so completed must be initialed immediately to the side of the corrections by the person or persons executing the tender on behalf of the the tenderer.
- 4) Tenders must be based on the plans, specifications and tender documents provided.

Article 3 - Contract

- 1) The Contractor will be required to sign a contract similar to the Standard Contract Form for Fixed Price Construction Contracts, a blank specimen of which is enclosed in the package for reference purposes.

Article 4 – Tender Destination

- 1a) Tenders are to be submitted in sealed envelopes to:
National Research Council Canada
Administrative Services and Property Management Branch
1200 Montreal Road
Building M-22
Ottawa, ON
K1A 0R6

Endorsed "Tender for (insert title of work as it appears in the drawings and specifications)" and must bear the name and address of the tenderer.

- 1b) Unless otherwise specified, the only documents required to be submitted with the tender are the Tender form and the Bid Security.

Article 5 - Security

- 1a) Bid Security is required and must be submitted in one of the following forms:
 - i) a certified cheque payable to the Receiver General for Canada and drawn on a member of the Canadian Payments Association or a local cooperative credit society that is a member of a central cooperative credit society having membership in the Canadian Payments Association; **OR**
 - ii) bonds of the Government of Canada, or bonds unconditionally guaranteed as to principal and interest by the Government of Canada; **OR**
 - iii) a bid bond.
- 1b) Regardless of the Bid Security submitted, it should never be more than \$250,000 maximum, calculated at 10% of the first \$250,000 of the tendered price, plus 5% of any amount in excess of \$250,000.
- 2a) Bid Security shall accompany each tender or, if forwarded separately from the tender, shall be provided not later than the specified tender closing time. Bid Security must be in the **ORIGINAL** form. Fax or photocopies and **NOT** acceptable. **FAILURE TO PROVIDE THE REQUIRED BID SECURITY SHALL INVALIDATE THE TENDER.**
- 2b) If the tender is not accepted, the Bid Security submitted pursuant to Article 8 shall be returned to the tenderer.
- 3a) The successful tenderer is required to provide security within 14 days of receiving notice of tender acceptance. The tenderer must furnish **EITHER**:
 - i) a Security Deposit as described in 1(b) above together with a Labour and Material Payment Bond in the amount of at least 50% of the amount payable under the contract, **OR**

- ii) a Performance Bond and a Labour and Material Payment Bond – each in the amount of 50% of the amount payable under the contract.
- 3b) Should it not be possible to obtain a Labour Material Payment Bond as required under 3(a) above, on making application thereof to at least two acceptable Bonding Companies, an additional Security Deposit of a straight 10% of the amount payable under the contract must be furnished.
- 3c) Where a tender has been accompanied by a Security Deposit, as described in 1(b) above, the amount of the Security Deposit required under 3(a) above may be reduced by the amount of the Security Deposit which accompanied the tender.
- 3d) Bonds must be in an approved form and from the companies whose

bonds are acceptable to the Government of Canada. Samples of the approved form of Bid Bond, Performance Bond and Labour and Material Payment Bond and a list of acceptable Bonding Companies may be obtained from the Contracting Officer, National Research Council, Building M-22, Montreal Road, Ottawa, Ontario, K1A 0R6.

Article 6 – Interest On Security Deposits

- 1) Tenderers are notified that they must make their own arrangements with their bankers as to the interest, if any, on the amount of the certified cheque accompanying their tender. The Council will not pay interest on said cheque pending the awarding of the contract nor be responsible for the payments of interest under any arrangement made by the tenderers.

Article 7 – Sales Tax

- 1) The amount of the tender shall include all taxes as levied under the Excise Act, the Excise Tax Act, the Old Age Security Act, the Customs Act or the Customs Tariff, in force or applicable at the time.
- 2) In Quebec, the Provincial Sales Tax should not be included in the Tender Price as the Federal Government is exempt. Tenderers should contact the Provincial Revenue Minister to recover all taxes paid for goods and services rendered under this contract.

Tenderers must include in their Tender Price the amount of Provincial Sales Tax for which the exemption does not apply.

Article 8 – Examination of Site

- 1) All parties tendering shall examine the sites of the proposed work before sending in their tender and make themselves thoroughly acquainted with the same and obtain for themselves any and all information that may be necessary for the proper carrying out of the Contract. No after claim will be allowed or entertained for any work or material that may be requisite and necessary for the proper execution and completion of this Contract with the exception of that provided for under GC 35 in the General Conditions of the General Specification.

Article 9 – Discrepancies, Omissions, Etc.

- 1a) Bidders finding discrepancies in, or omissions from, drawings, specifications or other documents, or having any doubt as to the meaning or intent of any part thereof, should at once notify the Engineer who will send written instructions or explanation to all bidders.
- 1b) Neither the Engineer nor the Council will be responsible for oral instructions.
- 1c) Addenda or corrections issued during the time of the bidding shall be covered in the proposal. However, the contract supersedes all communications, negotiations and agreements, either written or oral, relating to the work and made prior to the date of the contract.

Article 10 – No additional Payments for Increased Costs

- 1) The only other adjustments in the contract price allowed are those specified in the General Conditions of the General Specification. The contract price will not be amended for change in freight rates, exchange rates, wage rates or cost of materials, plant or services.

Article 11 – Awards

- 1a) The Council reserves the power and right to reject tenders received from parties who cannot show a reasonable acquaintance with and preparation for the proper performance of the class of work herein specified and shown on plans. Evidence of such competence must be furnished by the tenderers if required to do so.
- 1b) A tenderer may be required to furnish to the Contracting Office, National Research Council of Canada, Building M-22, 1200 Montreal Road, Ottawa, Ontario, K1A 0R6, Canada, unsigned copies of the insurance requirements as covered by the Insurance Conditions of the General Specification.
- 1c) The Council does not bind itself to accept the lowest or any tender.

Article 12 – Harmonized Sales Tax

- 1) The Harmonized Sales Tax (HST) which is now in effect shall be considered an applicable tax for the purpose of this tender. However, the bidder shall NOT include any amount in the bid price for said HST. The successful contractor will indicate on each application for payment as a separate amount the appropriate HST the Owner is legally obliged to pay. This amount will be paid to the Contractor in addition to the amount certified for payment under the Contract in addition to the amount certified for payment under the Contract and will therefore not affect the Contract Price. The Contractor agrees to remit any HST collected or due to Revenue Canada.

Non-resident contractors

RST guide 804

Published August 2006

ISBN: 1-4249-2007-8 (Print), **1-4249-2009-4 (PDF)**, **1-4249-2008-6 (HTML)**

Publication Archived

Notice to the reader: For Retail Sales Tax (RST) – On July 1, 2010 the 13 per cent Harmonized Sales Tax (HST) took effect in Ontario replacing the existing provincial Retail Sales Tax (RST) and combining it with the federal Goods and Services Tax (GST). As a result, RST provisions described on this page and in other publications ended on June 30, 2010.

Effective July 1, 2010 this publication was archived for RST purposes **only**. Use caution when you refer to it, since it reflects the law in force for RST at the time it was released and may no longer apply.

- The information in this Guide explains the Retail Sales Tax (RST) responsibilities of a non-resident contractor who is awarded a construction contract to perform work in Ontario and their Ontario customers. Please note that this Guide replaces the previous version dated March 2001.

Non-Resident Contractor Defined

A non-resident contractor is a contractor located outside Ontario who has been awarded a construction contract to perform work in Ontario, and who has not maintained a permanent place of business in Ontario continuously for twelve months immediately prior to signing the contract, or which is not a company incorporated under the laws of Ontario. A construction contract is a contract for the erection, remodelling or repair of a building or other structure on land.

A contractor is a person who is in the business of constructing, altering, repairing or improving real property and includes, but is not limited to,

1. a general contractor and subcontractor,
2. a carpenter, bricklayer, stonemason, electrician, plasterer, plumber, painter, decorator, paver, and bridge builder,
3. a sheet metal, tile and terrazzo, heating, air conditioning, insulation, ventilating, papering, road, roofing and cement contractor, who installs or incorporates items into real property. (See RST [Guide 206 - Real Property and Fixtures](#)).

Registration and Guarantee Deposit

Non-resident contractors who are awarded a construction contract in Ontario are required to register with the Ministry of Finance (ministry), Centralized Programs Unit and post a guarantee equal to 4 per cent of the total of each Ontario contract. The guarantee can be paid in cash, by certified cheque (payable to the Minister of Finance), letter of credit or by a guarantee bond.

To register with the ministry and to obtain further information on posting a guarantee, contractors should contact the ministry's Centralized Programs Unit, 33 King Street West, PO Box 623, Oshawa, Ontario, L1H 8H7, toll-free 1 866 ONT-TAXS (1 866 668-8297) or fax to 905 435-3617.

Non-resident contractors who sell taxable goods on a supply only basis to Ontario customers, or provide taxable services in Ontario, may obtain a regular Vendor Permit to collect and remit RST on their sales. Non-resident contractors who have been issued a regular Vendor Permit must still register separately with the ministry and post a guarantee if they are awarded a construction contract in Ontario.

Letter of Compliance

After receiving the guarantee, the ministry mails out two copies of a "letter of compliance" to the contractor certifying the Retail Sales Tax (RST) requirements have been met. Contractors must give a copy of the letter to their customers.

If a copy of the compliance letter is not provided, the customer must withhold 4 per cent of all amounts payable to the non resident contractor and pay the withheld amounts to the Minister of Finance (minister). Details relating to the contract should be sent along with the payments to the Centralized Programs Unit. Customers may give the minister a guarantee bond equal to 4 per cent of the total contract price instead of making the 4 per cent payments.

Note: Customers who do not follow these requirements may be held liable for 4 per cent of all amounts payable to the non resident contractor or any other amount that the Ministry deems to be the RST payable resulting from the performance of the contract.

Calculation of RST

Fair Value

RST is payable on the "fair value" of materials, purchased or brought into Ontario, to be used for work performed in Ontario. "Fair value" includes:

- the purchase price in Canadian funds;
- all charges by the supplier for handling and delivery, and
- any federal customs duties and excise taxes paid (but not the federal Goods and Services Tax (GST)).

Contractors are also required to pay RST to Ontario suppliers on the purchase, rental or lease of taxable services, materials, machinery, or equipment.

Machinery and Equipment - Leased

If machinery or equipment is leased from a supplier outside Ontario and brought into the province, RST is payable on the lease payments for the period the machinery or equipment is in Ontario.

Machinery and Equipment - Owned by Contractor

If machinery or equipment is owned by the contractor, RST may be calculated in one of the following ways:

- a. If a contractor brings machinery and equipment into Ontario for less than 12 months' use, RST is to be calculated using the following formula:

$$1/36 \times \text{net book value at date of import} \times \text{number of months in Ontario} \times \text{tax rate}$$

For the purpose of this formula, RST is payable for each month or part of a month that the goods are in Ontario. A month is considered 31 consecutive days and a part month is considered more than 12 days. The RST payable is based on the number of days the machinery and equipment are located in Ontario and not the number of days the items are actually used.

Example: Equipment is brought into Ontario on March 28 and taken out on May 8. The items were in the province for 41 days. RST is payable on the first 31 days' temporary stay in Ontario vs. use of the equipment. Since the remainder (10 days) is not considered part of a month, no RST is payable on this portion.

- b. If, at the time the goods are brought into Ontario, it is expected that the machinery or equipment will be in Ontario for more than twelve months, contractors must pay Retail Sales Tax (RST) on the following basis:

net book value at date of import x tax rate

If, at the time of import, the length of time is not known, vendors may use the formula under (a). If they later find it necessary to keep the machinery and equipment in Ontario for more than 12 months, the RST paid under (a) may be deducted from the RST payable under (b).

Using formula (a) or (b) above, contractors will calculate and remit the RST payable on the return that is filed when the contract is finished.

(See Completion of Contract section)

M a n u f a c t u r i n g f o r O w n U s e

Contractors may need to manufacture items, such as doors and windows, for their construction contracts. Manufacturing is work done in a factory away from a construction site, or in a mobile unit or workshop that is on or near the construction site. Manufacturing occurs when raw materials are changed into manufactured goods for use in real property contracts.

Contractors are considered to be manufacturing contractors if they produce goods:

1. for their own use in real property contracts, and
2. the manufactured cost of the goods is more than \$50,000 a year.

(See RST Guide 401 - Manufacturing Contractors)

C o n t r a c t s w i t h t h e F e d e r a l G o v e r n m e n t

Where a non-resident contractor enters into a construction contract with the federal government, for the construction of a building and/or the installation of equipment, the nature of the equipment will determine whether the contract should be let on a tax-included or tax excluded basis.

Contracts for the construction of a building and the installation of equipment that directly services that building (i.e., elevators, escalators, light fixtures, central heating and air conditioning, etc.) should be tendered on a tax -included basis. Contractors are the consumers of the materials used in fulfilling these contracts and must pay or account for RST on the materials used to complete the contracts. There is NO exemption just because the contract is with the federal government.

Contracts for the installation of equipment that becomes a fixture and does not directly service a building (i.e., material handling equipment, production machinery, communication equipment, training equipment) may be tendered on a tax-excluded basis. Contractors engaged in contracts of this nature are permitted to make tax exempt purchases of such equipment by issuing a valid Purchase Exemption Certificate (PEC) to their supplier. Only non-resident contractors who have registered with the ministry and posted a guarantee may issue a PEC.

E x e m p t i o n s

Contractors may supply and install equipment or materials for certain customers that may be entitled to an exemption from RST (e.g., manufacturers, Indian band councils, farmers and diplomatic organizations). The equipment or materials, when installed, becomes real property if it is permanently attached to land, or a fixture if it is permanently attached to a building or real property structure. Since

contractors are liable for RST, they should contact the ministry to find out if the customer qualifies for exemption before tendering the contract on a tax-excluded basis.

Status Indians, Indian Bands and Band Councils

Non-resident contractors may purchase building materials exempt from Retail Sales Tax (RST) for certain buildings and structures situated on reserves. The cost of such projects must be paid by the band council, and the buildings must provide a community service for the reserve. Contracts for the construction of an exempt community building project should be made on an RST-excluded basis. Non-resident contractors may purchase the materials exempt from RST by providing suppliers with a valid Purchase Exemption Certificate (PEC). As noted previously, only non-resident contractors who have registered with the ministry and posted a guarantee may issue a PEC. (See RST Guide [204 - Purchase Exemption Certificates](#)).

Non-resident contractors must pay RST on items purchased for incorporation into a building or structure built for individual status Indians on a reserve. (See RST [Guide 808 - Status Indians, Indian Bands and Band Councils](#)).

Completion of Contract

When a contract is completed, non-resident contractors who were required to post a guarantee must complete a [Non-Resident Contractor Retail Sales Tax Return \[PDF - 92 KB\]](#) that is provided by the ministry.

If a contractor's guarantee was given in cash or by certified cheque, the amount of the deposit can be deducted from the RST liability owed by the contractor. If the liability is greater than the deposit, the amount remaining must be paid by the contractor. If the deposit is more than the liability, the contractor will receive a refund.

If a guarantee bond was posted instead of cash, the bond will be discharged once the RST liability is paid in full.

All returns are subject to audit.

Legislative References

- Retail Sales Tax Act, Subsections 19(2) and 39(3)(4) and (5)
- Regulation 1012 under the Act, Subsections 15.3(1)(2)(5)(6) and (7)
- Regulation 1013 under the Act, Sections 1 and 3

For More Information

The information contained in this publication is only a guideline. For more information, please contact the Ontario Ministry of Finance at 1 866 ONT-TAXS (1 866 668-8297) or visit our website at ontario.ca/finance.

Acceptable Bonding Companies

Published September 2010

The following is a list of insurance companies whose bonds may be accepted as security by the government.

1. Canadian Companies

- ACE INA Insurance
- Allstate Insurance Company of Canada
- Ascentus Insurance Ltd. (Surety only)
- Aviva Insurance Company of Canada
- AXA Insurance (Canada)
- AXA Pacific Insurance Company
- Canadian Northern Shield Insurance Company
- Certas Direct Insurance Company (Surety only)
- Chartis Insurance Company of Canada (formerly AIG Commercial Insurance Company of Canada)
- Chubb Insurance Company of Canada
- Commonwealth Insurance Company
- Co-operators General Insurance Company
- CUMIS General Insurance Company
- The Dominion of Canada General Insurance Company
- Echelon General Insurance Company (Surety only)
- Economical Mutual Insurance Company
- Elite Insurance Company
- Everest Insurance Company of Canada
- Federated Insurance Company of Canada
- Federation Insurance Company of Canada
- Gore Mutual Insurance Company
- Grain Insurance and Guarantee Company
- The Guarantee Company of North America
- Industrial Alliance Pacific General Insurance Corporation
- Intact Insurance Company
- Jevco Insurance Company (Surety only)
- Lombard General Insurance Company of Canada
- Lombard Insurance Company
- Markel Insurance Company of Canada
- The Missisquoi Insurance Company
- The Nordic Insurance Company of Canada
- The North Waterloo Farmers Mutual Insurance Company (Fidelity only)
- Novex Insurance Company (Fidelity only)
- The Personal Insurance Company
- Pilot Insurance Company
- Quebec Assurance Company
- Royal & Sun Alliance Insurance Company of Canada
- Saskatchewan Mutual Insurance Company
- Scottish & York Insurance Co. Limited
- The Sovereign General Insurance Company
- TD General Insurance Company
- Temple Insurance Company
- Traders General Insurance Company

- Travelers Guarantee Company of Canada
- Trisura Guarantee Insurance Company
- The Wawanesa Mutual Insurance Company
- Waterloo Insurance Company
- Western Assurance Company
- Western Surety Company

2. Provincial Companies

Surety bonds issued by the following companies may be accepted provided that the contract of suretyship was executed in a province in which the company is licensed to do business as indicated in brackets.

- AXA Boreal Insurance Company (P.E.I., N.B., Que., Ont., Man., B.C.)
- AXA Boreal Insurance Company (P.E.I., N.B., Que., Ont., Man., B.C.)
- ALPHA, Compagnie d'Assurances Inc. (Que.)
- Canada West Insurance Company (Ont., Man., Sask, Alta., B.C., N.W.T.) (Surety only)
- The Canadian Union Assurance Company (Que.)
- La Capitale General Insurance Inc. (Nfld. & Lab., N.S., P.E.I., Que.(Surety only), Man., Sask., Alta., B.C., Nun., N.W.T., Yuk.)
- Coachman Insurance Company (Ont.)
- Continental Casualty Company (Nfld. & Lab., N.S., P.E.I., N.B., Que., Ont., Man., Sask., Alta., B.C., Nun., N.W.T., Yuk.)
- GCAN Insurance Company (Nfld. & Lab., N.S., P.E.I., N.B., Que., Ont., Man., Sask., Alta., B.C., Nun., N.W.T., Yuk.)
- The Insurance Company of Prince Edward Island (N.S., P.E.I., N.B.)
- Kingsway General Insurance Company (N.S., N.B., Que., Ont., Man., Sask., Alta., and B.C.)
- Liberty Mutual Insurance Company (Nfld. & Lab., N.S., P.E.I., N.B., Que., Ont., Man., Sask., Alta., B.C., Nun., N.W.T., Yuk.)
- Manitoba Public Insurance Corporation (Man.)
- Norgroupe Assurance Générales Inc.
- Orleans General Insurance Company (N.B., Que., Ont.)
- Saskatchewan Government Insurance Office (Sask.)
- SGI CANADA Insurance Services Ltd. (Ont., Man., Sask., Alta.)
- L'Unique General Insurance Inc. (Nfld. & Lab., N.S., P.E.I., N.B., Que.(Surety only), Ont.(Surety only), Man., Sask., Alta., B.C.(Surety only), Nun., N.W.T., Yuk.)

3. Foreign Companies

- Aspen Insurance UK Limited
- Compagnie Française d'Assurance pour le Commerce Extérieur (Fidelity only)
- Eagle Star Insurance Company Limited
- Ecclesiastical Insurance Office Public Limited Company (Fidelity only)
- Lloyd's Underwriters
- Mitsui Sumitomo Insurance Company, Limited
- NIPPONKOA Insurance Company, Limited
- Sompo Japan Insurance Inc.
- Tokio Marine & Nichido Fire Insurance Co., Ltd.
- XL Insurance Company Limited (Surety only)
- Zurich Insurance Company Ltd

Articles of Agreement

Standard Construction Contract – Articles of Agreement
(23/01/2002)

- A1 Contract Documents
- A2 Date of Completion of Work and Description of Work
- A3 Contract Amount
- A4 Contractor's Address
- A5 Unit Price Table

Articles of Agreement

These Articles of Agreement made in duplicate this day of .

Between

Her Majesty the Queen, in right of Canada (referred to in the contract documents as “ Her Majesty”) represented by the National Research Council Canada (referred to in the contract documents as the “Council”)

and

(referred to in the contract documents as the “Contractor”)

Witness that in consideration for the mutual promises and obligations contained in the contract, Her Majesty and the Contractor covenant and agree as follows:

A1 Contract Documents

(23/01/2002)

1.1 Subject to A1.4 and A1.5, the documents forming the contract between Her Majesty and the Contractor, referred to herein as the contract documents, are

1.1.1 these Articles of Agreement,

1.1.2 the document attached hereto, marked “A” and entitled “Plans and Specifications”, referred to herein as the Plans and Specifications,

1.1.3 the document attached hereto, marked “B” and entitled “Terms of Payment”, referred to herein as the Terms of Payment,

1.1.4 the document attached hereto, marked “C” and entitled “General Conditions”, referred to herein as the General Conditions,

1.1.5 the document attached hereto, marked “D” and entitled “Labour Conditions”, referred to herein as the Labour Conditions,

1.1.6 the document attached hereto, marked “E” and entitled “Insurance Conditions”, referred to herein as the Insurance Conditions,

1.1.7 the document attached hereto, marked “F” and entitled “Contract Security Conditions”, referred to herein as the Contract Security Conditions, and

1.1.8 any amendment or variation of the contract documents that is made in accordance with the General Conditions.

1.1.9 the document entitled Fair Wage Schedules for Federal Construction Contracts referred to herein as Fair Wage Schedules

1.1.10

Articles of Agreement

The Council hereby designates _____ of _____ of the Government of Canada as the Engineer for the purposes of the contract, and for all purposes of or incidental to the contract, the Engineer's address shall be deemed to be:

1.2 In the contract

1.3.1 "Fixed Price Arrangement" means that part of the contract that prescribes a lump sum as payment for performance of the work to which it relates; and

1.3.2 "Unit Price Arrangement" means that part of the contract that prescribes the product of a price multiplied by a number of units of measurement of a class as payment for performance of the work to which it relates.

1.3 Any of the provisions of the contract that are expressly stipulated to be applicable only to a Unit Price Arrangement are not applicable to any part of the work to which a Fixed Price Arrangement is applicable.

1.4 Any of the provisions of the contract that are expressly stipulated to be applicable only to a Fixed Price Arrangement are not applicable to any part of the work to which a Unit Price Arrangement is applicable.

A2 Date of Completion of Work and Description of Work

(23/01/2002)

2.1 The contractor shall, between the date of these Articles of Agreement and the _____, _____, in the careful and workmanlike manner, diligently perform and complete the following work:

which work is more particularly described in the Plans and Specifications.

Articles of Agreement

A3 Contract Amount

(23/01/2002)

- 3.1 Subject to any increase, decrease, deduction, reduction or set-off that may be made under the Contract, Her Majesty shall pay the Contractor at the times and in the manner that is set out or referred to in the Terms of Payment
- 3.1.1 the sum of _____ (GST/HST extra), in consideration for the performance of the work or the part thereof that is subject to Fixed Price Arrangement, and
- 3.1.2 a sum that is equal to the aggregate of the products of the number of units of Measurement of each class of labour, plant and material that is set out in a Final Certificate of Measurement referred to in GC44.8 multiplied in each case by the appropriate unit price that is set out in the Unit Price Table in consideration for the performance of the work or the part thereof that is subject to a Unit Price Arrangement.
- 3.2 For the information and guidance of the Contractor and the persons administering the contract on behalf of Her Majesty, but not so as to constitute a warranty, representation or undertaking of any nature by either party, it is estimated that the total amount payable by Her Majesty to the Contractor for the part of the work to which a Unit Price Arrangement is applicable will be approximately \$N/A
- 3.3 A3.1.1 is applicable only to a Fixed Price Arrangement.
- 3.4 A3.1.2 and A3.2 applicable only to a Unit Price Arrangement.

A4 Contractor's Address

(23/01/2002)

- 4.1 For all purposes of or incidental to the contract, the Contractor's address shall be deemed to be:

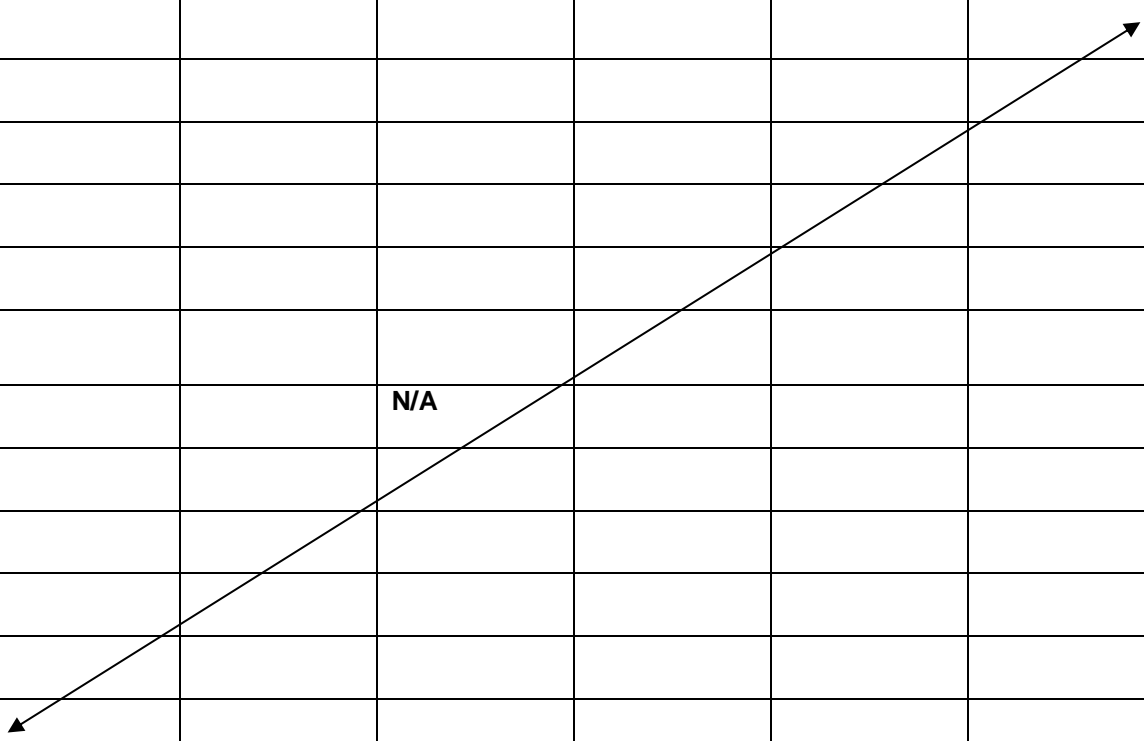
Articles of Agreement

A5 Unit Price Table

(23/01/2002)

5.1 Her Majesty and the Contractor agree that the following table is the Unit Price Table for the purposes of the contract.

Column 1 Item	Column 2 Class of Labour Plant Or Material	Column 3 Unit of Measurement	Column 4 Estimated Total Quantity	Column 5 Price per Unit	Column 6 Estimated Total Price
		N/A			



5.2 The Unit Price Table that is set out in A5.1 designates the part of the work to which a Unit Price Arrangement is applicable.

5.3 The part of the work that is not designated in the Unit Price Table referred to in A5.2 is the part of the work to which a Fixed Price Arrangement is applicable.

Articles of Agreement

Signed on behalf of Her Majesty by

as Senior Contracting Officer

and _____

as _____

of the **National Research Council Canada**

on the _____

day of _____

Signed, sealed and delivered by

as _____ and
Position

by _____

as _____ and
Position

of

on the _____

day of _____

Seal

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Appendices

- Geotechnical Investigation, Proposed Compressor Plant Addition and Substation Expansion, National Research Council Canada, Research Road, Ottawa, Ontario – dated July 9, 2015.

Part 1 General

1.1 SCOPE OF WORK

- .1 Work under this contract covers the construction of a new 115kV dead-end structure at the Uplands Campus, Building U66 of the National Research Council.

1.2 DRAWINGS

- .1 The following drawings illustrate the work and form part of the contract documents:
 - .1 Electrical Drawings
 - .1 G100 – General Project Area, Drawing list and General Notes
 - .2 E100 – Electrical Part. Single Line Diagram Phase 1 - Demolition
 - .3 E101 – Electrical Part. Single Line Diagram Phase 1 – New Construction
 - .4 E102 – Electrical 115kV Substation Layout – Demolition
 - .5 E103 – Electrical 115kV Substation Layout – New Construction
 - .6 E104 – Electrical 115kV Substation Layout – Grounding
 - .7 E105 – Electrical 115kV Substation Section – Demolition
 - .8 E106 – Electrical 115kV Substation Section – New Work
 - .9 E107 – Electrical Details

1.3 COMPLETION

- .1 Complete all work within 14 week(s) after receipt of notification of acceptance of tender.

1.4 GENERAL

- .1 The word "provide" in this Specification means to supply and install.
- .2 Provide items mentioned in either the drawings or the specification.

1.5 SPECIFIED ACCEPTABLE & ALTERNATIVE EQUIPMENT & MATERIALS

- .1 Materials and equipment scheduled and/or specified on the drawings or in the specifications have been selected to establish a performance and quality standard. In most cases, acceptable manufacturers are stated for any material or equipment specified by manufacturer's name and model number. Contractors may base their tender price on materials and equipment supplied by any of the manufacturers' names as acceptable for the particular material or equipment.
- .2 In addition to the manufacturers specified or named as acceptable, you may propose alternative manufacturers of materials or equipment to the Departmental Representative for acceptance. For a product to be considered as an alternative product substitute, make a written application to the Departmental Representative during the tender period, not later than ten (10) working days before tender closing.

- .3 Certify in writing that the alternative meets all requirements of the specified material or equipment. In addition, it shall be understood that all costs required by or as a result of acceptance or proposed alternatives, will be borne by the contractor.
- .4 Approval of alternatives will be signified by issue of an Addendum to the Tender Documents. Alternates are not considered acceptable unless confirmed by addendum.
- .5 Any alternative manufacturers or materials submitted which are incomplete and cannot be evaluated, or are later than ten (10) working days before tender closing date or after the tender period, will not be considered.

1.6 MINIMUM STANDARDS

- .1 Conform to or exceed minimum acceptable standards of the various applicable federal, provincial and municipal codes such as The National Building Code, The National Fire Code, Canadian Plumbing Code, Canadian Electrical Code, Canadian Code for Construction Safety and the Provincial Construction Safety Act.
- .2 Work to conform to referenced standards and codes as reaffirmed or revised to date of specification.

1.7 WORKPLACE HAZARDOUS MATERIAL INFORMATION SYSTEM (WHMIS)

- .1 The general contractor shall comply with Federal and Provincial legislation regarding the WHMIS. The contractor's responsibilities include, but are not limited to the following:
 - .1 To ensure that any controlled product brought on site by the contractor or sub-contractor is labeled;
 - .2 To make available to the workers and the Departmental Representative, Material Safety Data Sheets (MSDS) for these controlled products;
 - .3 To train own workers about WHMIS, and about the controlled products that they use on site;
 - .4 To inform other contractors, sub-contractors, the Departmental Representative, authorized visitors and outside inspection agency personnel about the presence and use of such products on the site.

The site foreman or superintendent must be able to demonstrate, to the satisfaction of the Departmental Representative, that he/she has had WHMIS training and is knowledgeable in its requirements. The Departmental Representative can require replacement of this person if this condition or implementation of WHMIS is not satisfactory.

1.8 REQUIREMENTS OF BILL 208, SECTION 18(A)

Under the requirements of Bill 208 of the Ontario Ministry of Labour Occupational Health & Safety Act, the following designated substances may be encountered while performing the work described in these contract documents:

- .1 Acrylonitrile, Isocyanates, Arsenic, Lead, Asbestos, Mercury, Benzene, Silica, Coke Oven Emissions, Vinyl Chloride, and Ethylene Oxide

- .1 It is the responsibility of the general contractor to ensure that each prospective subcontractor for this project has received a copy of the above list.

1.9 COST BREAKDOWN

- .1 Submit, for approval by the Departmental Representative, a cost breakdown of tender 72 hours after the contract is awarded.
- .2 Use the approved cost breakdown as the basis for submitting all claims.
- .3 Request Departmental Representative's verbal approval to amount of claim prior to preparing and submitting the claim in its final form.

1.10 SUB-TRADES

- .1 Submit no later than 72 hours after tender closing, a complete list of sub trades for the Departmental Representative's review.

1.11 PERSONNEL SECURITY AND IDENTIFICATION

- .1 All persons employed by the contractor, or by any subcontractor and present on the site must be security cleared in accordance with the requirements of the Section entitled Special Instructions to Tenderers.
- .2 All such persons must wear and keep visible identification badges as issued by the Security Office of NRC.

1.12 WORKING HOURS AND SECURITY

- .1 Normal working hours on the NRC property are from 8:00 a.m. until 4:30 p.m., Monday to Friday inclusive, except statutory holidays.
- .2 At all other times, special written passes are required for access to the building site.
- .3 Before scheduling any work outside normal working hours, obtain permission from the Departmental Representative to perform the specific tasks.
- .4 An escort may be required whenever working outside normal hours. Contractor to bear the associated costs.

1.13 SCHEDULE

- .1 The contractor shall prepare a detailed schedule, fixing the date for commencement and completion of the various parts of the work and update the said schedule. Such schedule shall be made available to the Departmental Representative not later than two weeks after the award of the contract and prior to commencement of any work on site.
- .2 Notify Departmental Representative in writing of any changes in the schedule.

- .3 20 day(s) before the scheduled completion date, arrange to do an interim inspection with the Departmental Representative.

1.14 PROJECT MEETINGS

- .1 Hold regular project meetings at times and locations approved by the Departmental Representative.
- .2 Notify all parties concerned of meetings to ensure proper coordination of work.
- .3 Departmental Representative will set times for project meetings and assume responsibility for recording and distributing minutes.

1.15 SHOP DRAWINGS

- .1 Submit to Departmental Representative for review, shop drawings, product data and samples specified as per section 013300. Submit to Departmental Representative for review a complete list of all shop drawings, product data and samples specified and written confirmation of corresponding delivery dates within one (1) week after shop drawings, product data and samples approval date. This list shall be updated on a 2 week basis and any changes to the list shall be immediately notified in writing to the Departmental Representative.
- .3 Review shop drawings, data sheets and samples prior to submission.
- .4 Submit electronic copy of all shop drawings and product data and samples for review, unless otherwise specified.
- .5 Review of shop drawings and product data by the Departmental Representative does not relieve the contractor of the responsibility for errors and omissions and for the conformity with contract documents.

1.16 SAMPLES AND MOCK-UPS

- .1 Submit samples in sizes and quantities as specified.
- .2 Where colour, pattern or texture is criterion, submit full range of samples.
- .3 Construct field samples and mock-ups at locations acceptable to Departmental Representative.
- .4 Reviewed samples or mock-ups will become standards of workmanship and material against which installed work will be checked on the project.

1.17 MATERIALS AND WORKMANSHIP

- .1 Install only new materials on this project unless specifically noted otherwise.
- .2 Only first class workmanship will be accepted, not only with regard to safety, efficiency, durability, but also with regard to neatness of detail and performance.

1.18 WORK & MATERIALS SUPPLIED BY OWNER

- .1 Work and materials not included in this contract are described on drawings and in this specification.
- .2 Deliver to a storage place, as directed by the Departmental Representative, all materials returned to the Owner.
- .3 Unless otherwise specified, accept owner-supplied materials at their storage location and provide all transportation as required.
- .4 General Contractor's duties:
 - .1 Unload at site.
 - .2 Promptly inspect products and report damaged or defective items.
 - .3 Give written notification to the Departmental Representative for items accepted in good order.
 - .4 Handle at site, including uncrating and storage.
 - .5 Repair or replace items damaged on site.
 - .6 Install, connect finished products as specified.

1.19 SITE ACCESS

- .1 Make prior arrangements with the Departmental Representative before starting work or moving materials and equipment on site.
- .2 Obtain approval of Departmental Representative for regular means of access during the construction period.
- .3 Obtain approval of Departmental Representative before temporarily suspending operations on site; before returning to the site and before leaving the site at the end of the job.
- .4 Provide and maintain access to site.
- .5 Build and maintain temporary roads and provide snow removal during period of work.
- .6 Make good any damage and clean up dirt, debris, etc., resulting from contractor's use of existing roads.

1.20 USE OF SITE

- .1 Restrict operations on the site to the areas approved by the Departmental Representative
- .2 Locate all temporary structures, equipment, storage, etc., to the designated areas.
- .3 Restrict parking to the designated areas.

1.21 ACCEPTANCE OF SITE

- .1 Inspect the site before commencing work, review any unexpected conditions with the Departmental Representative.

- .2 Commencement of work will imply acceptance of existing conditions.

1.22 SITE OFFICE & TELEPHONE

- .1 Contractor to erect a temporary site office at his own expense.
- .2 Install and maintain a telephone, if necessary.
- .3 Use of NRC phones is not permitted unless in the case of an emergency.

1.23 SANITARY FACILITIES

- .1 Provide sanitary facilities, and bear all associated costs.

1.24 TEMPORARY SERVICES

- .1 A source of temporary power will be made available in the area. Bear all costs to make connections to the power source and perform distribution on site.
- .2 Provide all load centres, breakers, conduit, wiring, disconnects, extension cords, transformers, as required from the source of power.
- .3 Power is to be used only for power tools, lighting, controls, motors, and not for space heating.
- .4 A source of temporary water will be made available if required.
- .5 Bear all costs associated with distributing the water to the required locations.
- .6 Comply with NRC requirements when connecting to existing systems in accordance with the articles entitled "Co-operation" and "Service Interruptions" of this section.

1.25 DOCUMENTS REQUIRED AT WORK SITE

- .1 The contractor shall keep on the site, one (1) up-to-date copy of all contract documents, including specifications, drawings, addenda, shop drawings, change notices, schedule and any reports or bulletins pertaining to the work, in good order, available to the Departmental Representative and to his / her representatives at all times.
- .2 At least one (1) copy of specifications and drawings shall be marked by the contractor to show all work "As Built" and shall be provided to the Departmental Representative with the Application for Payment and for the Final Certificate of Completion.

1.26 CO-OPERATION

- .1 Co-operate with NRC staff in order to keep disruption of normal research work to an absolute minimum.
- .2 Work out in advance, a schedule for all work which might disrupt normal work in the building.

- .3 Have schedule approved by the Departmental Representative.
- .4 Notify the Departmental Representative in writing, 72 hours prior to any intended interruption of facilities, areas, corridors, mechanical or electrical services and obtain requisite permission.

1.27 PROTECTION AND WARNING NOTICES

- .1 Provide all materials required to protect existing equipment.
- .2 Erect dust barriers to prevent dust and debris from spreading through the building.
- .3 Place dust protection in the form of cover sheets over equipment and furniture and tape these sheets to floors, to ensure no dust infiltration.
- .4 Repair or replace any and all damage to Owner's property caused during construction, at no cost to the Owner and to the satisfaction of the Departmental Representative.
- .5 Protect the buildings, roads, lawns, services, etc. from damage which might occur as a result of this work.
- .6 Plan and co-ordinate the work to protect the buildings from the leakage of water, dust, etc.
- .7 Ensure that all doors, windows, etc., that could allow transfer of dust, noise, fumes, etc., to other areas of the building are kept closed.
- .8 Be responsible for security of all areas affected by the work under the Contract until acceptance by NRC. Take all necessary precautions to prevent entry to the work area by unauthorized persons and guard against theft, fire and damage by any cause. Secure working area at the end of each day's work and be responsible for same.
- .9 Provide and maintain adequate safety barricades around the work sites to protect NRC personnel and the public from injury during the construction.
- .10 Post warnings, in all instances where possible injury could occur such as Work Overhead, Hard Hat Areas, etc. or as required by the Departmental Representative.
- .11 Provide temporary protective enclosures over building entrances and exits to protect pedestrians. All enclosures to be structurally sound against weather and falling debris.

1.28 BILINGUALISM

- .1 Ensure that all signs, notices, etc. are posted in both official languages.
- .2 Ensure that all identification of services called for by under this contract are bilingual.

1.29 LAYOUT OF WORK

- .1 Location of equipment, fixtures, outlets and openings indicated on drawings 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 the manufacturer's recommendations for safety, access and maintenance.
- .3 Employ competent person to lay out work in accordance with the contract documents.

1.30 DISCREPANCIES & INTERFERENCES

- .1 Prior to the start of the work, examine drawings and specifications. Report at once to the Departmental Representative, any defects, discrepancies, omissions or interferences affecting the work.
- .2 Contractor to immediately inform the Departmental Representative in writing, of any discrepancies between the plans and the physical conditions so the Departmental Representative may promptly verify same.
- .3 Any work done after such a discovery, until authorized, is at the contractor's risk.
- .4 Where minor interferences as determined by the Departmental Representative are encountered on the job and they have not been pointed out on the original tender or on the plans and specifications, provide offsets, bends or reroute the services to suit job conditions at no extra cost.
- .5 Arrange all work so as not to interfere in any way with other work being carried out.

1.31 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.
- .2 Notify the Departmental Representative in writing of any conflict between these specifications and manufacturer's instruction. Departmental Representative will designate which document is to be followed.

1.32 TEMPORARY HEATING AND VENTILATING

- .1 Bear the costs of temporary heat and ventilation during construction including costs of installation, fuel, operation, maintenance, and removal of equipment.
- .2 Use of direct-fired heaters discharging waste products into the work areas will not be permitted unless prior approval is given by the Departmental Representative.
- .3 Furnish and install temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of work.
 - .2 Protect work and products against dampness and cold.
 - .3 Reduce moisture condensation on surfaces to an acceptable level.
 - .4 Provide ambient temperature and humidity levels for storage, installation and curing of materials.

- .5 Provide adequate ventilation to meet health regulations for a safe working environment.
- .4 Maintain minimum temperature of 10 °C (50 °F) or higher where specified as soon as finishing work is commenced and maintain until acceptance by the Departmental Representative. Maintain ambient temperature and humidity levels as required for comfort of NRC personnel.
- .5 Prevent hazardous or unhealthy accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction including also, storage areas and sanitary facilities.
 - .1 Dispose of exhaust materials in a manner that will not result in a harmful or unhealthy exposure to persons.
- .6 Maintain strict supervision of operation of temporary heating and ventilating equipment.
 - .1 Enforce conformance with applicable codes and standards.
 - .2 Comply with instructions of the Departmental Representative including provision of full-time watchman services when directed.
 - .3 Enforce safe practices.
 - .4 Vent direct-fired combustion units to outside.
- .7 Submit tenders assuming existing or new equipment and systems will not be used for temporary heating and ventilating.
- .8 After award of contract, Departmental Representative may permit use of the permanent system providing agreement can be reached on:
 - .1 Conditions of use, special equipment, protection, maintenance, and replacement of filters.
 - .2 Methods of ensuring that heating medium will not be wasted and in the case of steam, agreement on what is to be done with the condensate.
 - .3 Saving on contract price.
 - .4 Provisions relating to guarantees on equipment.

1.33 CONNECTIONS TO AND INTERRUPTIONS TO EXISTING SERVICES

- .1 Where work involves breaking into or connecting to existing services, carry out work at times and in the manner agreed to by the Departmental Representative and by authorities having jurisdiction, with minimum disruption to NRC Personnel and vehicular traffic and minimum service interruption. Do not operate any NRC equipment or plant.
- .2 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.
- .3 Submit a schedule to and obtain approval from the Departmental Representative for any shut-down or closure of active service or facility; allow minimum 72 hours notice. Adhere to approved schedule and provide notice to the Departmental Representative.
- .4 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

- .5 Provide detours, bridges, alternate feeds, etc., as required to minimize disruptions.
- .6 Protect existing services as required and immediately make repairs if damage occurs.
- .7 Remove any abandoned service lines as indicated on the contract documents and as approved by the Departmental Representative; cap or otherwise seal lines at cut-off points. Record and provide a copy to the Departmental Representative of locations of maintained, re-routed and abandoned service lines.

1.34 CUTTING AND PATCHING

- .1 Cut existing surfaces as required to accommodate new work.
- .2 Remove all items as shown or specified.
- .3 Patch and make good with identical materials, the surfaces that have been disturbed, cut or damaged, to the satisfaction of the Departmental Representative.
- .4 Where new pipes pass through existing construction, core drill an opening. Size openings to leave 12mm (1/2") clearance around the pipes or pipe insulation. Do not drill or cut any surface without the approval of the Departmental Representative.
- .5 Obtain written approval of the Departmental Representative before cutting openings through existing or new structural members.
- .6 Seal all openings where cables, conduits or pipes pass through walls with an acoustic sealant conforming to CAN/CGSB-19.21-M87.
- .7 Where cables, conduits and pipes pass through fire rated walls and floors, pack space between with compressed glass fibres and seal with fire stop caulking in accordance with CAN/CGSB-19.13-M87 AND NBC 3.1.7.

1.35 FASTENING DEVICES

- .1 Do not use explosive actuated tools, without first obtaining permission from the Departmental Representative.
- .2 Comply with the requirements of CSA A-166 (Safety Code for Explosive Actuated Tools).
- .3 Do not use any kind of impact or percussion tool without first obtaining permission from the Departmental Representative.

1.36 OVERLOADING

- .1 Ensure that no part of the building or work is subjected to a load which will endanger safety or cause permanent deformation or structural damage.

1.37 DRAINAGE

- .1 Provide temporary drainage and pumping as required to keep excavations and site free of water.

1.38 ENCLOSURE OF STRUCTURES

- .1 Construct and maintain all temporary enclosures as required to protect foundations, sub-soil, concrete, masonry, etc., from frost penetration or damage.
- .2 Maintain in place until all chances of damage are over and proper curing has taken place.
- .3 Provide temporary weather tight enclosures for exterior openings until permanent sash and glazing and exterior doors are installed.
- .4 Provide lockable enclosures as required to maintain the security of NRC facilities and be responsible for the same.
- .5 Provide keys to NRC security personnel when required.
- .6 Lay out the work carefully and accurately and verify all dimensions and be responsible for them. Locate and preserve general reference points.
- .7 Throughout the course of construction, keep continuously acquainted with field conditions, and the work being developed by all trades involved in the project. Maintain an awareness of responsibility to avoid space conflict with other trades.
- .8 Conceal all services, piping, wiring, ductwork, etc., in floors, walls or ceilings except where indicated otherwise.

1.39 STORAGE

- .1 Provide storage as required to protect all tools, materials, etc., from damage or theft and be responsible for the same.
- .2 Do not store flammable or explosive materials on site without the authorization of the Departmental Representative.

1.40 GENERAL REVIEW

- .1 Periodic review of the contractor's work by the Departmental Representative does not relieve the contractor of the responsibility of making the work in accordance with contract documents. Contractor shall carry out his own quality control to ensure that the construction work is in accordance with contract documents.
- .2 Inform the Departmental Representative of any impediments to the installation and obtain his / her approval for actual location.

1.41 INSPECTION OF BURIED OR CONCEALED SERVICES

- .1 Prior to concealing any services that are installed, ensure that all inspection bodies concerned, including NRC, have inspected the work and have witnessed all tests. Failure to do so may result in exposing the services again at the contractor's expense.

1.42 TESTING

- .1 On completion, or as required by local authority inspectors and/or Departmental Representative during progress of work and before any services are covered up and flushing is complete, test all installations in the presence of the Departmental Representative.
- .2 Obtain and hand to the Departmental Representative all acceptance certificates or test reports from authority having jurisdiction. The project will be considered incomplete without the same.

1.43 PARTIAL OCCUPANCY

- .1 NRC may request partial occupancy of the facility if the contract extends beyond the expected completion date.
- .2 Do not restrict access to the building, routes, and services.
- .3 Do not encumber the site with materials or equipment.

1.44 DISPOSAL OF WASTES

- .1 Dispose of waste materials including volatiles, safely off NRC property. Refer to the section entitled "General and Fire Safety Requirements" included as part of this specification.

1.45 CLEAN-UP DURING CONSTRUCTION

- .1 On a daily basis, maintain project site and adjacent area of campus including roofs, free from debris and waste materials.
- .2 Provide on-site dump containers for collection of waste materials and rubbish.

1.46 FINAL CLEAN-UP

- .1 Upon completion do a final clean-up to the satisfaction of the Departmental Representative.
- .2 Clean all new surfaces, lights, existing surfaces affected by this work, replace filters, etc.
- .3 Clean all resilient flooring and prepare to receive protective finish. Protective finish applied by NRC

1.47 WARRANTY AND RECTIFICATION OF DEFECTS IN WORK

- .1 Refer to General Conditions "C", section GC32.
- .2 Ensure that all manufacturers' guarantees and warranties are issued in the name of the **General Contractor** and the National Research Council.

1.48 MAINTENANCE MANUALS

- .1 Provide three (3) bilingual copies of maintenance manuals or two English and two French maintenance manuals immediately upon completion of the work and prior to release of holdbacks.
- .2 Manuals to be neatly bound in hard cover loose leaf binders.
- .3 Manuals to include operating and maintenance instructions, all guarantees and warranties, shop drawings, technical data, etc., for the material and apparatus supplied under this contract.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 GENERAL CONSTRUCTION SAFETY REQUIREMENTS

- .1 The Contractor shall take all necessary steps to protect personnel (workers, visitors, general public, etc.) and property from any harm during the course of the contract.
- .2 The Contractor shall be solely responsible for the construction safety of both its employees and those of its sub-contractors at the work site, and for initiating, maintaining and supervising safety precautions, programs and procedures in connection with the performance of the work.
- .3 The Contractor shall comply with all Federal, Provincial and Municipal safety codes and regulations and the Occupational Health and Safety Act and the Workplace Safety and Insurance Board. In the event of any conflict between any provisions in legislation or codes, the most stringent provisions shall apply.
- .4 Periodic review of the contractor's work by the Departmental Representative, using the criteria of the contract documents, does not relieve the contractor of his safety responsibilities in carrying out the work in accordance with the contract documents. The contractor shall consult with the Departmental Representative to ensure that this responsibility is carried out.
- .5 The Contractor shall ensure that only competent personnel are permitted to work onsite. Throughout the term of the contract, any person will be removed from the site who is not observing or complying with the safety requirements.
- .6 All equipment shall be in safe operating condition and appropriate to the task.
- .7 Following a project and site hazard assessment, the Contractor shall develop a Site Specific Safety Plan based on the following minimum requirements:
 - .1 Provide a safety board mounted in a visible location on the project site, with the following information included thereon:
 - .1 Notice of Project
 - .2 Site specific Safety Policy
 - .3 Copy of Ontario Health and Safety Act
 - .4 Building Schematic showing emergency exits
 - .5 Building emergency procedures
 - .6 Contact list for NRC, Contractor and all involved sub-contractors
 - .7 Any related MSDS sheets
 - .8 NRC Emergency phone number
- .8 The Contractor shall provide competent personnel to implement its safety program and those of any Health and Safety Act legislation applicable at this project location, and to ensure they are being complied with.

- .9 The Contractor shall provide safety orientation to all its employees as well as those of any subcontractors under its jurisdiction.
- .10 The Departmental Representative will monitor to ensure that safety requirements are met and that safety records are properly kept and maintained. Continued disregard for safety standards can cause the contract to be cancelled and the Contractor or sub-contractors removed from the site.
- .11 The Contractor will report to the Departmental Representative and jurisdictional authorities, any accident or incident involving Contractor or NRC personnel or the public and/or property arising from the Contractor's execution of the work.
- .12 If entry to a laboratory is required as part of the work of the Contractor, a safety orientation shall be provided to all his employees as well as those of any subcontractors regarding lab safety requirements and procedures, as provided by the Researcher or the Departmental Representative.

1.2 FIRE SAFETY REQUIREMENTS

- .1 Authorities
 - .1 The Fire Commissioner of Canada (FC) is the authority for fire safety at NRC.
 - .2 For the purpose of this document, "Departmental Representative" will be deemed as the NRC person in charge of the project and who will enforce these Fire Safety Requirements.
 - .3 Comply with the following standards as published by the Office of the Fire Commissioner of Canada:
 - .1 Standard No. 301 - June 1982 "Standard for Construction Operations";
 - .2 Standard No. 302 - June 1982 "Standard for Welding and Cutting".
- .2 Smoking
 - .1 Smoking is prohibited inside all NRC buildings, as well as roof areas.
 - .2 Obey all "NO SMOKING" signs on NRC premises.
- .3 Hot Work
 - .1 Prior to commencement of any "Hot Work" involving welding, soldering, burning, heating, use of torches or salamanders or any open flame, obtain a Hot Work Permit from the Departmental Representative.
 - .2 Prior to commencement of "Hot Work", review the area of hot work with the Departmental Representative to determine the level of fire safety precautions to be taken.
- .4 Reporting Fires
 - .1 Know the exact location of the nearest Fire Alarm Pull Station and telephone, including the emergency phone number.
 - .2 REPORT immediately, all fire incidents as follows:
 - .1 Activate nearest fire alarm pull station and;

- .2 Telephone the following emergency phone number as appropriate:

FROM AN NRC PHONE	333
FROM ANY OTHER PHONE	(613) 993-2411
- .3 When reporting a fire by phone, give the location of fire, building number and be prepared to verify location.
- .4 The person activating fire alarm pull station must remain at a safe distance from the scene of the fire but readily available to provide information and direction to the Fire Department personnel.
- .5 Interior and Exterior Fire protection & Alarm Systems
 - .1 DO NOT OBSTRUCT OR SHUT OFF FIRE PROTECTION EQUIPMENT OR SYSTEMS, INCLUDING BUT NOT LIMITED TO FIRE ALARM SYSTEMS, SMOKE/HEAT DETECTORS, SPRINKLER SYSTEM, PULL STATIONS, EMERGENCY CALL BUTTONS AND PA SYSTEMS, WITHOUT AUTHORIZATION FROM THE DEPARTMENTAL REPRESENTATIVE.
 - .2 WHEN ANY FIRE PROTECTION EQUIPMENT IS TEMPORARILY SHUT DOWN, ALTERNATIVE MEASURES AS PRESCRIBED BY THE DEPARTMENTAL REPRESENTATIVE SHALL BE TAKEN TO ENSURE THAT FIRE PROTECTION IS MAINTAINED.
 - .3 DO NOT LEAVE FIRE PROTECTION OR ALARM SYSTEMS INACTIVE AT THE END OF A WORKING DAY WITHOUT NOTIFICATION AND AUTHORISATION FROM THE DEPARTMENTAL REPRESENTATIVE. THE DEPARTMENTAL REPRESENTATIVE WILL ADVISE THE (FPO) OF THE DETAILS OF ANY SUCH EVENT.
 - .4 DO NOT USE FIRE HYDRANTS, STANDPIPES AND HOSE SYSTEMS FOR OTHER THAN FIRE FIGHTING PURPOSES UNLESS AUTHORISED BY DEPARTMENTAL REPRESENTATIVE.
- .6 Fire Extinguishers
 - .1 Provide a minimum of 1-20 lb. ABC Dry Chemical Fire Extinguisher at each hot work or open flame location.
 - .2 Provide fire extinguishers for hot asphalt and roofing operations as follows:
 - .1 Kettle area - 1-20 lb. ABC Dry Chemical;
 - .2 Roof - 1-20 lb. ABC Dry Chemical at each open flame location.
 - .3 Provide fire extinguishers equipped as below:
 - .1 Pinned and sealed;
 - .2 With a pressure gauge;
 - .3 With an extinguisher tag signed by a fire extinguisher servicing company.
 - .4 Carbon Dioxide (CO₂) extinguishers will not be considered as substitutes for the above.

- .7 Roofing Operations
 - .1 Kettles:
 - .1 Arrange for the location of asphalt kettles and material storage with the Departmental Representative before moving on site. Do not locate kettles on any roof or structure and keep them at least 10m (30 feet) away from a building.
 - .2 Equip kettles with 2 thermometers or gauges in good working order; a hand held and a kettle-mounted model.
 - .3 Do not operate kettles at temperatures in excess of 232°C (450 °F).
 - .4 Maintain continuous supervision while kettles are in operation and provide metal covers for the kettles to smother any flames in case of fire. Provide fire extinguishers as required in article 2.6.
 - .5 Demonstrate container capacities to Departmental Representative prior to start of work.
 - .6 Store materials a minimum of 6m (20 feet) from the kettle.
 - .2 Mops:
 - .1 Use only glass fibre roofing mops.
 - .2 Remove used mops from the roof site at the end of each working day.
 - .3 Torch Applied Systems:
 - .1 DO NOT USE TORCHES NEXT TO WALLS.
 - .2 DO NOT TORCH MEMBRANES TO EXPOSED WOOD OR CAVITY
 - .3 Provide a Fire Watch as required by article 2.9 of this section.
 - .4 Store all combustible roofing materials at least 3m (10 feet) away from any structure.
 - .5 Keep compressed gas cylinders a minimum of 6m (20 feet) away from the kettle, protected from mechanical damage and secured in an upright position.
- .8 Welding / Grinding Operations
 - .1 Contractor to provide fire blankets, portable fume extraction devices, screens or similar equipment to prevent exposure to welding flash, or sparks from grinding.
- .9 Fire Watch
 - .1 Provide a fire watch for a minimum of one hour after the termination of any hot work operation.
 - .2 For temporary heating, refer to General Instructions Section 00 010 00.
 - .3 Equip fire watch personnel with fire extinguishers as required by article 2.6.
- .10 Obstruction of access/egress routes-roadways, halls, doors, or elevators
 - .1 Advise the Departmental Representative in advance of any work that would impede the response of Fire Department personnel and their apparatus. This includes violation of minimum overhead clearance, erection of barricades and the digging of trenches.

- .2 Building exit routes must not be obstructed in any way without special permission from the Departmental Representative, who will ensure that adequate alternative routes are maintained.
 - .3 The Departmental Representative will advise the FPO of any obstruction that may warrant advanced planning and communication to ensure the safety of building occupants and the effectiveness of the Fire Department.
- .11 Rubbish and Waste Materials
- .1 Keep rubbish and waste materials to a minimum and a minimum distance of 6m (20 feet) from any kettle or torches.
 - .2 Do not burn rubbish on site.
 - .3 Rubbish Containers
 - .1 Consult with the Departmental Representative to determine an acceptable safe location for any containers and the arrangement of chutes etc. prior to bringing the containers on site.
 - .2 Do not overfill the containers and keep area around the perimeter free and clear of any debris.
 - .4 Storage
 - .1 Exercise extreme care when storing combustible waste materials in work areas. Ensure maximum possible cleanliness, ventilation and that all safety standards are adhered to when storing any combustible materials.
 - .2 Deposit greasy or oily rags or materials subject to spontaneous combustion in CSA or ULC approved receptacles and remove at the end of the work day or shift, or as directed.
- .12 Flammable Liquids
- .1 The handling, storage and use of flammable liquids is governed by the current National Fire Code of Canada.
 - .2 Flammable Liquids such as gasoline, kerosene and naphtha may be kept for ready use in quantities not exceeding 45 litres (10 imp gal), provided they are stored in approved safety cans bearing the ULC seal of approval and kept away from buildings, stockpiled combustible materials etc. Storage of quantities of flammable liquids exceeding 45 litres (10 imp gal) for work purposes, require the permission of the Departmental Representative.
 - .3 Flammable liquids are not to be left on any roof areas after normal working hours.
 - .4 Transfer of flammable liquids is prohibited within buildings.
 - .5 .5 Do not transfer flammable liquids in the vicinity of open flames or any type of heat producing device.
 - .6 Do not use flammable liquids having a flash point below 38 °C (100 °F) such as naphtha or gasoline as solvents or cleaning agents.
 - .7 Store flammable waste liquids for disposal in approved container located in a safe, ventilated area. Waste flammable liquids are to be removed from the site on a regular basis.

- .8 Where flammable liquids, such as lacquers or urethane are used, ensure proper ventilation and eliminate all sources of ignition. Inform the Departmental Representative prior to, and at the cessation of such work.
- .13 Questions and/or clarifications
 - .1 Direct any questions or clarification on Fire or General Safety, in addition to the above requirements, to the Departmental Representative.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Shop drawings and product data.
- .2 Samples.
- .3 Certificates and transcripts.
- .4 Alternate Materials.

1.2 RELATED SECTIONS

- .1 Section 017800 - Closeout Submittals.

1.3 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.

1.4 ADMINISTRATIVE

- .1 Submit to Engineer submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit 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.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent works are coordinated.

- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer review.
- .10 Keep one reviewed copy of each submission on site.

1.1 PROJECT SCHEDULE

- .1 Submit project schedule within 4 weeks of contract award. Schedule must clearly indicate the following milestones:
 - .1 Mobilization of personnel on site
 - .2 Date of each construction meeting
 - .3 Date of when shop drawings will be issued.
 - .4 Date of all shutdowns
 - .5 Date of equipment delivery to site
 - .6 Date of de-mobilization from site
 - .7 Date operation and maintenance manuals will be issued
 - .8 Date as-built drawings will be issued
- .2 Schedule to be prepared using Microsoft Projects

1.5 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term 'shop drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .3 Submit 1 electronic copy in Adobe Acrobat .pdf format of the following items requested in specification sections or as requested by the Engineer:
 - .1 Shop drawings of all products required within the project
 - .2 Product data sheets or brochures where shop drawings will not be prepared due to standardized manufacture of product.
 - .1 If standardized product data sheets are being provided due to the standard nature or manufacture of a specific product, ensure that either information on other models or ratings not applicable to project is removed, or circle and/or highlight applicable model or rating information. If not all model or rating information is present on data sheet, supplement standard information to provide details applicable to project.

- .3 Test reports
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .4 Certificates
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .5 Manufacturers instructions
 - .1 This may consist of pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .6 Manufacturer's Field Reports
 - .1 This may include documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .7 Operation and Maintenance Data
- .8 Programming, settings, and annotation for any electronic or digital control devices
- .4 For the Adobe Acrobat .pdf electronic document, group all related documents into one consistent and logically arranged .pdf document, with the detailed title page indicating which specification sections or item the document covers. Adobe Acrobat will must be searchable.
- .5 Allow six (6) business days for Engineer's review of each submission.
- .6 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .7 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of any revisions other than those requested.
- .8 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.

- .9 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Specification Section Number
 - .4 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .5 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .6 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .10 After Engineer's review, distribute copies.
- .11 If upon review by Engineer, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .12 The review of shop drawings by the Engineer is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Engineer approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.6 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Engineer's business address.
- .3 Notify Engineer in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.
- .6 Make changes in samples which Engineer may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.7 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status and any other specification required documentation.
- .2 Submit transcription of insurance immediately after award of Contract.

1.8 SUBSTITUTIONS

- .1 In the event that, prior to the closing of tenders, the Tenderer wishes to offer a substitution that differs from that named, specified, or otherwise described in contract documents, he/she shall submit a request in writing with enough supporting drawings and technical information to thoroughly evaluate the acceptability of the substitution. This shall be submitted in writing at least ten (10) business days prior to the time for receiving tenders. The request shall include the following:
 - .1 A detailed description of the proposed substitutions;
 - .2 In case of materials, products or systems, a direct comparison between the properties and compliance of the specified materials, products or systems with the properties and compliance of the proposed substitution; and,
 - .3 In the case of materials or products, country of manufacture.
 - .4 If requested by the Client, a list of no less than five (5) projects of comparable size where the proposed substitution has been used in a similar application, subject to climatic conditions similar to those experienced in the location of the client's facility. The list shall include the name and current telephone number of the Consultant and Owner for each project to allow confirmation that the item can be used acceptably.

- .2 In the event that the Consultant deems the information provided with the request for approval of a substitution to be inadequate, the request may be rejected.
- .3 Approval of alternative proposals of work, materials or methods will be signified by the issue of an addendum.
- .4 Cost of additional work and/or modification to the design due to the use of alternative materials, products or systems shall be borne by the Contractor. The acceptance by the Client and the Engineer of said material or products does not relieve the Contractor of any additional costs for additional work and/or modification to the design due to the use of alternative materials, products or systems that may be discovered after the acceptance of said material or products.
- .5 Herein the terms “or equal”, “or equivalent” or terms of similar meaning are used in the specifications, this shall not be construed as acceptance of any alternative material, product or system to those specified. The use of these terms does not relieve the Contractor from his responsibility to follow procedures for approval of substitutions specified herein (during tender period) or in accordance with the General Conditions.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 013300 - Submittal procedures.

1.2 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, updated 2011.

1.3 GENERAL

- .1 The contractor shall register the project, as required by OHSA and regulations, with the Ministry of Labour before commencing any work on site. A copy of the registration must be provided to the Contract Administrator/Project Manager before starting work on the site and a copy must be posted in a visible location on the work site at all times.
- .2 The contractor shall appoint a competent person, as defined by the OHSA, as the project supervisor.
- .3 The supervisor shall supervise the work at all times either personally or by having an identified assistant do so personally.
- .4 The supervisor shall inspect the work site and equipment associated with the project at least once a week. A copy of the inspection report must be provided to the Contract Administrator/Project Manager.
- .5 The contractor, in consultation with Contract Administrator/Project Manager, shall provide a health and safety management plan which as a minimum will include:
 - .1 A Site Management Plan, which includes a general overview of the project and roles and responsibilities for:
 - .1 Site workers
 - .2 Site safety coordinator
 - .3 Project environmental health and safety coordinator
 - .4 Task managers

- .2 A Hazard Identification Plan, which includes primary environmental hazards, personal conduct and hygiene, potential site hazards, and others such as:
 - .1 Survey Work in Traffic
 - .2 Physical
 - .3 Fire and Explosion
 - .4 Confined Space Entry
 - .5 Cranes, Hoists, and Rigging
 - .6 Crane Suspended Personnel Platforms
 - .7 Biological
 - .8 Stress and Fatigue
 - .9 Noise
 - .10 Personal Security
 - .11 Adverse Weather Conditions
 - .12 Other Site Activities
- .3 A Personal Protective Equipment Inventory, which includes;
 - .1 Requirements for all site personnel
 - .2 Selection, maintenance and continual assessment
 - .3 A Emergency Preparedness and Response Plan, which addresses
 - .1 First aid
 - .2 Fire Protection
 - .3 Critical Injury
 - .4 Accident or Incident
- .4 The plan shall be posted in a visible location on the work site prior to the commencement of any work.
- .5 Engineer will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 business days after receipt of plan. Revise plan as appropriate and resubmit plan to Engineer within 10 business days after receipt of comments from Engineer.
- .6 Engineer'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.
- .6 The contractor shall post signage in prominent locations identifying the required protective clothing or devices required to be worn on the work site and the contractor shall ensure compliance with these requirements.
- .7 The contractor shall remove waste material and debris from the work site(s) to a disposal area at least once a day or more frequently if necessary to prevent the creation of a hazardous condition.
- .8 The contractor shall ensure that fire extinguishing equipment is provided to ensure compliance with Section 52 to 58, O. Reg. 213.
- .9 The contractor shall ensure all vehicles, machinery, tools and equipment used on the work site are operated and maintained in accordance with Section 93 to 116, O. Reg. 213.

- .10 The contractor shall ensure no worker other than an electrician or apprentice certified under the Trades Qualifications and Apprenticeship Act do electrical work on the work site, unless they meet the qualifications required by CSA Z462 'Workplace Electrical Safety'.
- .11 File Notice of Project with Provincial authorities prior to commencement of Work.

1.4 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise the Departmental Representative verbally and in writing.

1.5 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 the Province having jurisdiction, and in consultation with the Departmental Representative.

1.6 CORRECTION OF NON-COMPLIANCE

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

1.7 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.

1.8 CHEMICALS

- .1 The contractor must provide a list of all chemicals to be used on site and a copy of the Material Safety Data Sheet (MSDS) for each chemical to the Contract Administrator/Project Manager prior to being brought onto the job site.
- .2 The contractor must ensure each chemical container brought on site is clearly labelled with the identity of the chemical, information for the safe handling of the chemical and the location of the MSDS.

- .3 The contractor must ensure adequate measures are taken to control the distribution, within the application area or throughout the building, of fumes/vapours before applying flammable, noxious or volatile materials.
- .4 The contractor may be required to schedule the application of hazardous materials which might affect the well-being of any workers or disrupt work of other contractors and cannot be adequately controlled to prevent such occurrences to evening or weekend periods.
- .5 The contractor must ensure workers wear the required personal protective equipment (respiratory protection, protective clothing, hand protection, eye/face protection, etc.) when working with chemicals.
- .6 The contractor must ensure the safe use and disposal of all chemicals that they are using. No chemicals and/or chemical waste product shall be disposed of on site without prior approval of Contract Administrator/Project Manager.
- .7 The contractor may not store chemicals and compressed gas cylinders on site without approval of the Contract Administrator/Project Manager. If approved, the contractor must ensure incompatible chemicals are stored separately.

1.9 DESIGNATED SUBSTANCES / HAZARDOUS WASTE

- .1 The contractor shall provide a work plan for the removal of designated substances, in accordance with all applicable legislation, for review and approval to the Contract Administrator/Project Manager.
- .2 The contractor shall provide evidence of competency with regards to the Environmental Protection Act and its regulations, a copy of safe handling work plan prior to commencing with work in the area.
- .3 The contractor shall register the project as a waste generator site, if not already registered, for the waste that will be generated as a result of the work activities related to the project.
- .4 The contractor shall ensure and provide evidence that all hazardous wastes removed from the sites sent to a licensed waste disposal site by a licensed carrier and advise the responsible individual when necessary testing is to be carried out.
- .5 The contractor shall retain copies of all hazardous waste manifests on file.
- .6 The contractor shall inspect the project daily to monitor compliance with designated substances and hazardous waste regulations.
- .7 The contractor shall provide access to the responsible individual for review of all inspection reports.

1.10 FALL PROTECTION

- .1 The contractor shall comply with the requirements of Section 26, O. Reg. 213/91 and Sections 85 and 86, O. Reg. 851.
- .2 The contractor shall provide, upon request, proof of worker training in the use of their fall protection systems.
- .3 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.11 CONFINED SPACE ENTRY

- .1 Access confined spaces only after receipt of written permission from Engineer.
- .2 The contractor shall comply with the requirements of Section 60 to 63, O. Reg. 213/91 as amended by O. Reg. 628/05 and Sections 67 to 71, O. Reg. 851 as amended by O. Reg. 629/05.
- .3 The contractor shall provide, upon request, a copy of their Confined Space Entry Procedure and proof of worker training in confined space entry.
- .4 The contractor shall inform the Contract Administrator/Project Manager prior to entering a confined space to ensure all the isolation of all potential hazards.
- .5 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.12 LADDERS

- .1 The contractor shall comply with the requirements of Section 78 to 84, O. Reg. 213/91 and Sections 73, O. Reg. 851.
- .2 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.13 WELDING/CUTTING

- .1 Use welding and cutting devices only after receipt of written permission from Engineer.
- .2 The contractor shall comply with the requirements of Section 122 to 124, O. Reg. 213/91.
- .3 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.14 SCAFFOLDING

- .1 The contractor shall comply with the requirements of Section 125 to 142, O. Reg. 213/91.
- .2 The contractor shall design, erect, inspect, maintain and use scaffolding equipment, materials, and components in accordance with CAN/CSA-S269.2-M87 (Access Scaffolding for Construction Purposes).
- .3 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.15 ELEVATED WORK PLATFORMS

- .1 The contractor shall comply with the requirements of Section 143 to 149, O. Reg. 213/91 and Sections 51 to 54, O. Reg. 851.
- .2 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.16 CRANES, HOISTING, RIGGING AND ACCESSORIES

- .1 The contractor shall comply with the requirements of Section 150 to 156 and 168 to 180, O. Reg. 213/91.
- .2 The contractor shall comply with the requirements of Section 187, O. Reg. 213/91 if a crane or similar hoisting device is operated near an energized overhead electrical conductor and if it is possible for a part of the equipment or its load to encroach upon the minimum distance permitted under section 186, or when the hoisting device is positioned closer than the length of its boom to an energized overhead electrical conductor.
- .3 The contractor shall provide, upon request, proof of worker training in the safe operation of the crane or similar hoisting device.
- .4 The contractor shall make available all logbooks, inspection records and tests for cranes or similar hoisting devices, upon request.
- .5 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.17 EXPLOSIVE ACTUATED FASTENING TOOL

- .1 Use powder actuated devices only after receipt of written permission from Engineer.
- .2 The contractor shall comply with the requirements of Section 117 to 121, O. Reg. 213/91.
- .3 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.18 EXCAVATING AND TRENCHING

- .1 The contractor shall ensure no person enters an excavation unless another worker is working above ground close to the excavation or to the means of access to it.
- .2 The contractor shall arrange the locating and marking of gas, electrical and other services prior to commencing an excavation.
- .3 The contractor shall obtain approval from Contract Administrator/Project Manager before arranging the shut off and disconnection of a service that may pose a hazard.
- .4 The contractor shall comply with the requirements of Section 230 to 242, O. Reg. 213/91.
- .5 The contractor shall be responsible for supplying and maintaining all equipment needed to perform this role.

1.19 PUBLIC WAY PROTECTION

- .1 The contractor shall comply with the requirements of Section 64 to 66, O. Reg. 213/91.

1.20 TRAFFIC CONTROL

- .1 The contractor shall not block or restrict traffic flow on driveways, laneways or emergency vehicle routes without approval of the Contract Administrator/Project Manager. The contractor must ensure work areas are clearly identified with traffic control devices necessary to provide vehicular traffic with sufficient warning of the work being performed and to protect the workers performing the work.
- .2 The contractor shall not block or restrict pedestrian access to walkways without approval of Contract Administrator/Project Manager. The contractor must provide a safe and clearly identified route for pedestrians in these circumstances

Part 2 Products

2.1 NOT USED.

Part 3 Execution

3.1 NOT USED.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Construction Documents Committee (CCDC)
 - .1 CCDC 2-2008, Stipulated Price Contract.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: conduct 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 submit verification that corrections have been made.
 - .2 Request Departmental Representative inspection.
 - .2 Departmental Representative Inspection:
 - .1 Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English and French that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, adjusted and fully operational.
 - .4 Certificates required by Utility companies: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
 - .2 When Work incomplete according to Owner, complete outstanding items and request re-inspection.

1.3 FINAL CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 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 RELATED SECTIONS

- .1 Section 017700 - Closeout Procedures.
- .2 Section 019100 - Commissioning.
- .3 Section 017900 - Demonstration and Training.
- .4 Section 260500 – Electrical General Requirements
- .5 Section 260510 – Electrical Testing

1.3 SUBMISSION

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned with Engineer'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 Engineer, four final copies of operating and maintenance manuals 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 contractor's expense, including costs of removal, transportation, re-installation, and re-commissioning.

1.4 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. Minimum 3" thick binder.
- .3 Provide binders labeled on the front cover and on the binder edge with the following information: Building Name and address, project name, project number, completed date (ex. October 2015).
 - .1 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Text: Manufacturer's printed data, or typewritten data.
- .5 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .6 Provide any electronic or digital programming, settings, control, or annotation in both readable paper form in the binder and as original software files on the CD in the required and compatible file format necessary for working with the devices.
- .7 Provide 1:1 scaled AutoCAD files in .dwg format on CD.
- .8 Provide one complete Adobe Acrobat .pdf format file of the complete Operations and Maintenance Manual on CD.

1.5 CONTENTS - EACH VOLUME

- .1 Provide Title Page with the following info: Building name, address, date, general contractor's and consultant' information (name, address, and phone numbers).
- .2 Table of Contents: provide title of project;
 - .1 date of submission; names,
 - .2 addresses, and telephone numbers of Consultant and Contractor with name of responsible parties;
 - .3 schedule of products and systems, indexed to content of volume.
- .3 Signed 'Letter of warranty' with activation date, identifying project by name, project number, location as well as warranty period. Any extended warranty of equipment must be identified also.

- .4 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .5 As-built drawings for the project.
- .6 Testing reports for the project.
- .7 Arrange content by systems under sequence of Specification's Section numbers; and
 - .1 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
 - .2 For each product or system:
 - .1 List extended warranty of equipment, if applicable.
 - .2 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
 - .3 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions as specified.
 - .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.6 AS-BUILTS AND SAMPLES

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

1.7 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings provided by Engineer.
- .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 grade.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Field changes of dimension and detail.
 - .4 Changes made by change orders.
 - .5 Details not on original Contract Drawings.
 - .6 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 Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.

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 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .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 Include manufacturer's printed operation and maintenance instructions.
- .7 Additional requirements: As specified in individual specification sections.

1.9 MATERIALS AND FINISHES

- .1 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .2 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.
- .3 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 Engineer. 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 Engineer. 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 Engineer. 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 Engineer.

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 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.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Procedures for demonstration and instruction of equipment and systems to Owner's personnel.

1.2 PRECEDENCE

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 RELATED SECTIONS

- .1 Section 017800 - Closeout Submittals.
- .2 Section 019100 - Commissioning.

1.4 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner'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.

1.5 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.
- .2 Engineer will provide a description of each system and instruction on design philosophy, design criteria and design intents.
- .3 Factory-trained and certified manufacturer's personnel to provide instruction on start-up, operation, shut-down of equipment, components and systems. Instructions to include features of controls, such as reason for, results of, implications on associated systems of, adjustment of set-points of control and limit safety devices. Instructions to include information on servicing, maintenance, adjustment of system equipment and components.

1.6 SUBMITTALS

- .1 Submit a detailed training plan for review and approval by Engineer at least 20 business days before any training. The plan shall include a listing of components, systems, and integrated systems and other topics that will be covered in the training period. The plans shall also include tentative dates and times for each training session. Provide list of persons and their qualifications as instructors.
- .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.

1.7 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation in accordance with Section 019100 - Commissioning.
- .2 Testing, adjusting, and balancing have been performed in accordance with Section 019100 - Commissioning and equipment and systems are fully operational.
- .3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.8 PREPARATION

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated personnel are present.
- .3 Training materials to include at least the following:
 - .1 As-built Contract Document
 - .2 Operating Manual
 - .3 Maintenance Manual
- .4 Training materials to be in form permitting future training procedures to same degree of detail.
- .5 Supplement training materials as required with:
 - .1 Transparencies for overhead projectors or powerpoint presentations
 - .2 Manufacturers training video
 - .3 Equipment models

1.9 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 Deliver training during regular business hours, each training session to be a maximum of 4 hours in length (including break of 15 minutes minimum) between 08:00 – 12:00 and 13:00 – 16:00.
- .3 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .4 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .5 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Includes general requirements for commissioning facilities and facility systems.
- .2 The scope consists of:
 - .1 Testing of the ‘new’ components installed as defined in the tender document.
 - .2 Testing of system(s) including existing system(s) which have been modified or extended as part of the work as defined in the tender document.
 - .3 Integrated System Performance Testing and fine tuning as defined in the tender document.

1.2 PRECEDENCE

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 RELATED SECTIONS

- .1 Section 260510 – Electrical Testing.

1.4 COMMISSIONING SCHEDULE

- .1 Within 20 business days of contract award, the contractor will be responsible for providing an estimated schedule for showing all construction activities. The schedule to include the following milestones as a minimum; disconnection of existing 115kV overhead line, 115kV dead end structure installation, 115kV overhead line connection, testing, start-up, training, delivery of O&M Manual, sequencing of commissioning, acceptance, and occupancy.
- .2 At least 40 business days before estimated completion of new dead end structure, the contractor will be responsible for providing a detailed schedule for showing all construction and commissioning activities. The schedule to include the following milestones as a minimum; testing, start-up, training, delivery of O&M Manual, sequencing of commissioning, acceptance, and occupancy.
- .3 Contractor to provide schedule using Bar (Gantt) Charts.
- .4 Unless otherwise specified in writing by the Engineer, all testing and related requirements specified herein will be successfully performed prior to the issuance of the Substantial Completion Letter.

1.5 PROCEDURES - GENERAL

- .1 Provide testing organization services under provisions specified in Section 260510 – Electrical Testing.

1.6 FINAL REPORTS

- .1 Organization having managerial responsibility shall make reports, or assemble and compile reports completed by specialist subcontractors.
- .2 Ensure each form bears signature of recorder, and that of supervisor of reporting organization.

1.7 CONTRACTOR RESPONSIBILITIES

- .1 Prepare each system for testing and balancing.
- .2 Cooperate with testing organization and provide access to equipment and systems.
- .3 Provide personnel and operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.
- .4 Notify testing organization 10 business days prior to time project will be ready for testing, adjusting, and balancing.

1.8 MANUFACTURERS INVOLVEMENT

- .1 Arrange for Manufacturer to submit copies of all production test records for production test required by these specifications prior to shipping.
- .2 Prior to start-up of equipment or systems, obtain manufacturer's installation, start-up and operation instructions and review with Engineer.
- .3 Use manufacturer's trained start-up personnel to maintain integrity of warranty.
- .4 Verify with manufacturer that testing as specified will not void any warranties.
- .5 Manufacturer's personnel to be experienced in design, installation and operation of equipment and systems and be able to interpret test results in clear, concise, logical manner.
- .6 Report in writing to Engineer any deficiencies or defects noted during performance of services.

1.9 WITNESSING OF STARTING AND TESTING

- .1 Provide sufficient notice not less than ten (10) business days prior to commencement.
- .2 Engineer may witness all or any portion of start-up and testing at their discretion.
- .3 General Contractor to be present at all tests performed by sub-trades, suppliers, and equipment manufacturers.

1.10 AUTHORITIES HAVING JURISDICTION

- .1 The contractor will complete initial start-up successfully prior to performance verifications and certification by presiding authorities having jurisdiction.
- .2 To facilitate the turnover of the project, call and arrange for authorities to witness procedures in a manner that avoids unnecessary duplication of tests. It shall be the responsibility of the Contractor to confirm which tests the presiding authorities having jurisdiction are required to attend. Confirm that the presiding authorities will be present for each test, as required.
- .3 Any cost associated with presiding authorities attending testing during the daytime and during off-hours shall be the responsibility of the Contractor. Include all such cost in your tender.
- .4 Obtain Certificates of Approval, acceptance and compliance with the rules and regulations of authority having jurisdiction. Provide copies to the Engineer within five (5) days of tests with the commissioning report.
- .5 Submit reports generated by special testing agencies to the Engineer prior to the issuance of the Interim Certificate of Completion.
- .6 Special Testing agencies shall be approved by the Engineer with acceptable facilities and qualifications.

1.11 DEFICIENCIES, FAULTS, DEFECTS, REPETITION

- .1 Correct all deficiencies found during start-up and commissioning to satisfaction of the Engineer.
- .2 Report faults, defects affecting commissioning to Engineer in writing as they become apparent. Unless instructed otherwise, halt commissioning until same is rectified.
- .3 Where verification of reported results fail to receive Engineer approval, and where repetition of verification again fails to receive approval, and where Engineer deems Contractor's request for 2nd verification was premature, then all costs incurred by Engineer for 3rd and subsequent verifications to be borne by the contractor.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Perform all work to meet or exceed the requirements of the Canadian Electrical Code, CSA Standard C22.1 - (latest edition).
- .2 Consider CSA Electrical Bulletins in force at time of tender submission, while not identified and specified by number in this Division, to be forming part of related CSA Part II standard.
- .3 Do overhead and underground systems in accordance with CSA C22.3 except where specified otherwise.
- .4 Where requirements of this specification exceed those of above mentioned standards, this specification shall govern.
- .5 Notify the NRC Departmental Representative as soon as possible when requested to connect equipment supplied by NRC which is not CSA approved.
- .6 Refer to Sections 001000 & 001545.

1.2 PERMITS AND FEES

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay all fees required for the performance of the work.

1.3 START-UP

- .1 Instruct the NRC Departmental Representative and operating personnel in the operation, care and maintenance of equipment supplied under this contract.

1.4 INSPECTION AND FEES

- .1 Furnish a Certificate of Acceptance from the Authorized Electrical Inspection Department on completion of work.
- .2 Request and obtain Special Inspection approval from the Authorized Electrical Inspection Department for any non-CSA approved control panels or other equipment fabricated by the contractor as part of this contract.
- .3 Pay all fees required for inspections.

1.5 FINISHES

- .1 Shop finish metal enclosure surfaces by removal of rust and scale, cleaning, application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Outdoor electrical equipment "equipment green" finish to EEMAC Y1-1-1955.
 - .2 Indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1-1958.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

1.6 ACOUSTICAL PERFORMANCE

- .1 In general provide equipment producing minimal sound levels in accordance with the best and latest practices established by the electrical industry.
- .2 Do not install any device or equipment containing a magnetic flux path metallic core, such as gas discharge lamp ballasts, dimmers, solenoids, etc., which are found to produce a noise level exceeding that of comparable available equipment.

1.7 EQUIPMENT IDENTIFICATION

- .1 Identify with 3mm (1/8") Brother, P-Touch non-smearing tape, or an alternate approved by the NRC Departmental Representative, all electrical outlets shown on drawings and/or mentioned in the specifications. These are the lighting switches, recessed and surface mounted receptacles such as those in offices and service rooms and used to plug in office equipment, telecommunication equipment or small portable tools. Indicate only the source of power (Ex. for a receptacle fed from panel L32 circuit #1: "L32-1").
- .2 Light fixtures are the only exceptions for electrical equipment identification (except as noted in 7.13 below). They are not to be identified.
- .3 Identify with lamicoïd nameplates all electrical equipment shown on the drawings and/or mentioned in the specification such as motor control centers, switchgear, splitters, fused switches, isolation switches, motor starting switches, starters, panelboards, transformers, high voltage cables, industrial type receptacles, junction boxes, control panels, etc., regardless of whether or not the electrical equipment was furnished under this section of the specification.
- .4 Coordinate names of equipment and systems with other Divisions to ensure that names and numbers match.
- .5 Wording on lamicoïd nameplates to be approved by the NRC Departmental Representative prior to fabrication.
- .6 Provide two sets of lamicoïd nameplates for each piece of equipment; one in English and one in French.
- .7 Lamicoïd nameplates shall identify the equipment, the voltage characteristics and the power source for the equipment. Example: A new 120/240 volt single phase circuit breaker panelboard, L16, is fed from panelboard LD1 circuit 10.

"PANEL L16
120/240 V
FED FROM LD1-10"

PANNEAU L16
120/240 V
ALIMENTE PAR LD1-10

- .8 Provide warning labels for equipment fed from two or more sources - "DANGER MULTIPLE POWER FEED" black letters on a yellow background. These labels are available from NRC's Facilities Maintenance group in building M-19.
- .9 Lamicaid nameplates shall be rigid lamicaid, minimum 1.5 mm (1/16") thick with:
 - .1 Black letters engraved on a white background for normal power circuits.
 - .2 Black letters engraved on a yellow background for emergency power circuits.
 - .3 White letters engraved on a red background for fire alarm equipment.
- .10 For all interior lamicaid nameplates, mount nameplates using two-sided tape.
- .11 For all exterior lamicaid nameplates, mount nameplates using self-tapping 2.3 mm (3/32") dia. slot head screws - two per nameplate for nameplates under 75 mm (3") in height and a minimum of 4 for larger nameplates. Holes in lamicaid nameplates to be 3.7 mm (3/16") diameter to allow for expansion of lamicaid due to exterior conditions.
 - .1 No drilling is to be done on live equipment.
 - .2 Metal filings from drilling are to be vacuumed from the enclosure interiors.
- .12 All lamicaid nameplates shall have a minimum border of 3 mm (1/8"). Characters shall be 9 mm (3/8") in size unless otherwise specified.
- .13 Identify lighting fixtures which are connected to emergency power with a label "EMERGENCY LIGHTING/ÉCLAIRAGE D'URGENCE", black letters on a yellow background. These labels are available from NRC's Facilities Maintenance group in building M-19.
- .14 Provide neatly typed updated circuit directories in a plastic holder on the inside door of new panelboards.
- .15 Carefully update panelboard circuit directories whenever adding, deleting, or modifying existing circuitry.
- .16 Identify molded case breaker with lamicaid nameplate.

1.8 WIRING IDENTIFICATION

- .1 Unless otherwise specified, identify wiring with permanent indelible identifying markings, using either numbered or coloured plastic tapes on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.

1.9 CONDUIT AND CABLE IDENTIFICATION

- .1 All new conduits to be factory painted, colour-coded EMT, type as follows:
 - .1 Fire alarm – red conduit
 - .2 Emergency power circuits – yellow conduit
 - .3 Voice/data – blue conduit
 - .4 Gas detection system – purple conduit
 - .5 Building Automation system – orange conduit
 - .6 Security system – green conduit
 - .7 Control system – black conduit
- .2 Apply paint to the covers of junction boxes and condulets of existing conduits as follows:
 - .1 Fire alarm – red
 - .2 Emergency power circuits – yellow
 - .3 Voice/data – blue
 - .4 Gas detection system – purple
 - .5 Building Automation system – orange
 - .6 Security system – green
 - .7 Control system - black
- .3 For system running with cable, half-lap wrap with dedicated coloured PVC tape to 100 mm width, tape every 5 m and both sides where cable penetrates a wall.
- .4 All other systems need not be coloured.

1.10 MANUFACTURER'S & APPROVALS LABELS

- .1 Ensure that manufacturer's registration plates are properly affixed to all apparatus showing the size, name of equipment, serial number, and all information usually provided, including voltage, cycle, phase and the name and address of the manufacturer.
- .2 Do not paint over registration plates or approval labels. Leave openings through insulation for viewing the plates. Contractor's or sub-contractor's nameplate not acceptable.

1.11 WARNING SIGNS AND PROTECTION

- .1 Provide warning signs, as specified or to meet requirements of Authorized Electrical Inspection Department and NRC Departmental Representative.
- .2 Accept the responsibility to protect those working on the project from any physical danger due to exposed live equipment such as panel mains, outlet wiring, etc. Shield and mark all live parts with the appropriate voltage. Caution notices shall be worded in both English and French.

1.12 LOAD BALANCE

- .1 Measure phase current to new panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes, and revise panelboard schedules.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

1.13 MOTOR ROTATION

- .1 For new motors, ensure that motor rotation matches the requirements of the driven equipment.
- .2 For existing motors, check rotation before making wiring changes in order to ensure correct rotation upon completion of the job.

1.1 GROUNDING

- .1 Thoroughly ground all electrical equipment, cabinets, metal supporting frames, ventilating ducts and other apparatus where grounding is required in accordance with the requirements of the latest edition of the Canadian Electrical Code Part 1, C.S.A. C22.1 and corresponding Provincial and Municipal regulations. Do not depend upon conduits to provide the ground circuits.
- .2 Run separate green insulated stranded copper grounding conductors in all electrical conduits including those feeding toggle switches and receptacles.

1.2 TESTS

- .1 Provide any materials, equipment and labour required and make such tests deemed necessary to show proper execution of this work, in the presence of the NRC Departmental Representative.
- .2 Correct any defects or deficiencies discovered in the work in an approved manner at no additional expense to the Owner.
- .3 Megger all branch circuits and feeders using a 600V tester for 240V circuits and a 1000V tester for 600V circuits. If the resistance to ground is less than permitted by Table 24 of the Code, consider such circuits defective and do not energize.
- .4 The final approval of insulation between conductors and ground, and the efficiency of the grounding system is left to the discretion of the local Electrical Inspection Department.

1.3 COORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, fuses, are installed to values and settings as indicated on the Drawings.

1.4 WORK ON LIVE EQUIPMENT & PANELS

- .1 NRC requires that work be performed on non-energized equipment, installation, conductors and power panels. For purposes of quotation assume that all work is to be done after normal working hours and that equipment, installation, conductors and power panels are to be de-energized when worked upon.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SCOPE

- .1 The work listed in these specifications involves hazardous voltages, materials, operations, and equipment. These specifications do not claim to address all of the safety problems associated with their use. It is the responsibility of the user to review all applicable regulatory limitations prior to the use of these specifications.
- .2 The contractor shall provide qualified services, or shall engage the services of a specialized, qualified testing firm, for the purpose of performing inspections and tests as herein specified.
- .3 The contractor, or specialized testing firm, shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections.
- .4 The contractor will arrange and pay for all required ESA maintenance and inspection certificates for their scope of work.
- .5 The contractor will arrange and pay for all switching and isolation services required from Hydro-One.
- .6 The contractor will provide electrical switching and grounding orders as per EUSA and CSA Z462 guidelines to ensure adequate protection and safety for both contractor and the client during the shutdown. These switching orders to cover both de-energization and re-energization for both normal and emergency systems during the shutdown. These shall be provided to the engineer and client at least 20 business days before the shutdown for review.
- .7 The contractor will provide a comprehensive shutdown procedure. It will list all primary contacts with their telephone numbers, and will identify all timelines for the shutdown correlated to the starting and finishing of all tasks during the shutdown, such as generator starts, switching order implementations, safety meetings, re-energizations, and other similar tasks. This must be coordinated with the client, the maintenance contractor, the local supply authority, the specialist testing organization, and other related groups. These shall be provided to the engineer and client at least 20 business days before the shutdown for review.
- .8 The Client has the right to reschedule or cancel the shutdown as required with 24 hours written notice, without paying additional charges.
- .9 The Client has the right to reschedule or cancel the shutdown as required with between 0 and 24 hours of verbal or written notice, with the payment of fair and reasonable mobilization costs. These costs to be itemized with detailed documentation to be reviewed by the Client and Engineer.

1.2 REFERENCES

- .1 NETA, ATS-2013, Acceptance Testing Specification for Electrical Power Distribution Equipment and Systems.
- .2 IEEE – Standard Collection C57 – 1998.
- .3 IEEE – Standards Collection C37 – 1998.
- .4 CSA Z462 ‘Workplace Electrical Safety’
- .5 Infrastructure Health and Safety Association (comprising the former Electrical & Utilities Safety Association of Ontario)

1.3 QUALIFICATIONS OF TESTING FIRM

- .1 The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.
- .2 All employees of the testing firm shall be qualified as per CSA Z462 requirements.
- .3 The testing firm shall have at least one person on site with one of the following qualifications to provide technical supervision and/or guidance as required for the remainder of the testing personnel:
 - .1 An employee certified by the InterNational Electrical Testing Association (NETA)
 - .2 A Professional Engineer (P. Eng) licensed in the Province of Ontario with specialized training and experience in the testing and inspection of electrical power distribution equipment
 - .3 A member of the Ontario Association of Certified Engineering Technicians and Technologists (OACETT) with specialized training and experience in the testing and inspection of electrical power distribution equipment
 - .4 The contractor is to supply the Client, within 10 business days of awarding of contract, the name and qualifications of the proposed on-site supervisor. Approval, in writing from the Client, is required if the contractor needs to change the on-site supervisor for any reason. The Client will have the right to reject candidates not meeting the above qualifications.
- .4 All work designated ‘Specialist Testing’ shall be performed by employees of the specialist testing firm and all personnel must be qualified to operate, test, and commission high and low voltage electrical equipment.
- .5 All work designated ‘Generalist Testing’ may be completed by qualified electricians, technicians, technologists, or engineers employed or subcontracted by the specialist testing firm or electrical contractor.

- .6 The contractor to supply the Client with a list of people proposed for site work with their qualifications at least 10 business days before the shutdown, or as early as required to receive appropriate clearances. The Client will have the right to reject candidates not meeting the above qualifications.
- .7 The agency must have the necessary wiring, materials, equipment, tools, instruments, measuring devices and all other tools necessary to carry out the work.
- .8 The testing firm shall submit interim proof of all the above qualifications when responding to the Request for Proposals.
- .9 Various specialized testing firm have been pre-qualified to provide the client with the inspections and tests herein specified:
 - .1 Eaton Engineering Services
 - .2 Schneider Engineering Services

1.4 DIVISION OF RESPONSIBILITY

- .1 The testing firm shall supply a suitable and stable source of electrical power to each test site unless notified by the client in writing that sufficient local power will be available for operating test equipment. All portable alternating current (AC) power sources shall operate at 60 Hz +/- 0.1 Hz.
- .2 The testing firm shall supply adequate portable lighting for each test site unless notified by the client in writing that sufficient local lighting will be available for operating test equipment. Ensure adequate lighting is available both with and without normal and/or emergency power.
- .3 The owner, or owner's representative, will supply an up to date short circuit analysis and coordination study, a protective device setting sheet, a complete set of electrical plans, specifications, and any pertinent change orders to the testing firm prior to commencement of testing.
- .4 The owner, or owner's representative, shall notify the testing firm when equipment becomes available for maintenance tests. Work shall be coordinated to expedite project scheduling. Note: various pieces of equipment are required to maintain each buildings environmental condition. It is imperative that the communication between each building's operations personnel and the testing firm be established prior to the isolation of any equipment. Sufficient time shall be given for the shutdown and startup of equipment such as chillers, pumps, and other essential equipment.
- .5 The testing firm shall notify the owner, or owner's representative, prior to commencement of any testing.
- .6 Deviation from the planed schedule of work for each stage of the work must be approved by the owner or owner's representative prior to the isolation of any additional equipment.

- .7 Once the 'Station Guarantee' is received from the Utility, the testing firm shall be fully responsible for their own safety, including all switching procedures, equipment isolation, and grounding procedures. At the end of each stage of the work, the testing firm shall ensure that all temporary grounds are removed from the equipment and all equipment is placed into its normal operation position prior to releasing the 'Station Guarantee'. It is the testing firm's responsibility to record the position of all circuit breakers and switches under the scope of the contract and to ensure that the 'As found' position is maintained after the work is completed.

1.5 SAFETY AND PRECAUTIONS

- .1 Safety practices shall include, but are not limited to, the following requirements:
 - .1 The current Occupational Health and Safety Act
 - .2 CSA Z462 'Workplace Electrical Safety'
 - .3 Workplace Hazardous Materials Information System (WHMIS). Submit to owner, or owner's representative, pertinent MSDS information.
 - .4 Applicable Provincial, local, and client safety operating procedures
 - .5 National Fire Protection Association – NFPA, and the National Fire Code of Canada
 - .6 OSHA 29 CFR 1910.147. Control of Hazardous Energy Sources (Lockout/Tagout)
- .2 All tests shall be performed with apparatus de-energized except where otherwise specifically required. Lock out and tag procedures shall be in effect. All testing firm representatives shall lock and tag all equipment tested under the scope of work. The testing agency shall provide a 'lock box' for any equipment requiring more than 3 locks. All equipment to be tested under the scope of work shall be isolated from all sources of power, locked and tagged, tested for voltage potential with an approved potential tester rated for the voltage application, and grounded from all sources of power using approved temporary grounds.
- .3 As per CSA Z462, all testing firm representatives shall wear the appropriate Personal Protective Equipment (PPE) including approved safety boots, side impact hard hats, safety glasses and/or safety shields, arc flash coveralls, and rubber gloves with protectors during switching operations. All PPE shall be rated for the appropriate voltage class application.
- .4 The contractor shall review and supervise all operations with respect to safety, and notify any sub-contractors and/or the client of any known or found hazards or information about the client's installation that needs to be transmitted to sub-contractors.

1.6 TEST EQUIPMENT

- .1 All test equipment shall be in good mechanical and electrical condition.
- .2 Metering or monitoring equipment shall be true RMS sensing only. (Peak sensing equipment shall not be permitted).

- .3 Field test metering used to check power system meter calibration must have an accuracy higher than that of the instrument being checked. Field Test Equipment shall meet the following criteria;
 - .1 1000 volt DC Insulation Resistance test equipment shall have a meter scale of at least 500 Gig Ohms.
 - .2 5000 volt DC Insulation Resistance test equipment shall have a meter scale of at least 500 Meg Ohms
 - .3 Low Resistance test equipment shall have a minimum of 5 ampere DC output and the ability to measure down to a 5 micro Ohms.
 - .4 Transformer turns ratio test equipment shall have a minimum of 130 to 1 ratio and scaled operate to three (3) significant digits. Test equipment shall have excitation current measurement capability to at least 5 amperes.
 - .5 Winding Resistance test equipment shall have a minimum of 5 ampere DC output and the ability to measure to a 100 milli-Ohms scale.
 - .6 Relay test equipment shall have a minimum of 100 amperes AC output in order to test standard mechanical overcurrent relays.
 - .7 Accuracy of metering in test equipment shall be appropriate for the test being performed but not in excess of 2% of the scale used.
 - .8 Waveshape and frequency of test equipment output waveforms shall be appropriate for the test and tested equipment. Test equipment shall not exceed 2.0 percent Total Harmonic Distortion THD output on voltage waveforms and 2.0 percent THD output on current waveforms.
- .4 Test Instrument Calibration
 - .1 The testing firm shall have a calibration program, which assures that all applicable test instruments are maintained within rated accuracy.
 - .2 Calibration shall be done by a calibration agency compliant with International Standards Organization ISO 17025 and Standard Council of Canada CAN-P-4D.
 - .3 Dated calibration labels shall be visible on all test equipment.
 - .4 Records must be available and up to date for the owner, or owner's representative, to inspect calibration of each piece of equipment.

1.7 TEST REPORT

- .1 The testing firm shall maintain a written or typed record of all field tests, and then shall assemble and certify a final completely typed test report.
- .2 The test report shall include the following:
 - .1 Summary of project, complete with a detailed deficiency list, comments, results, analysis, and recommendations.
 - .2 Description of all equipment tested which shall include complete equipment nameplate values and/or installation information (e.g. Manufacturer, Date, Model Number, Serial Number, Voltage, Ampacity, Phases, kW, Power Factor, Horsepower, RPM, Torque, Type, Size, Insulation Type, Insulation Rating (100%, 133%, etc.), Shield if present, Number of conductors, Free air or Raceway rating, Configuration, etc.).

Please note, the above list is not a complete and comprehensive list. Each device test sheet should have enough data to clearly identify the device, its location within the distribution system, a unique identifier, and all parameters which define its ratings and application. As a minimum, each device test sheet should usually include all parameters defined by the device's ruling Industry Standard.

- .3 Include results from all tests above with starting conditions noted.
- .4 Include any items found out of specified tolerances.
- .5 Include any relevant comments about the condition of the switchgear.
- .3 A blank copy of all applicable test sheets on the project shall be submitted to the Client for approval within five (5) business days of the contract issuance. The Client has the right to reject test sheets that do not include all required information or test results.
- .4 Each item within the Specialist's testing listed under item 4.1.2 shall be detailed with all item information, ratings, and test results on one or more pages per unit (unless units are in sets like fuses).
- .5 Group all devices by substation, type, ID number, and area.
- .6 Furnish three (3) paper copies of the complete report to the owner, or owner's representative.
- .7 Furnish three (3) .pdf electronic copies, with high resolution printing allowed, of the complete report to the owner, or owner's representative on DVD.
- .8 Provide copies of report to owner, or owner's representative, with operation and maintenance manuals.
- .9 Any system, material, or workmanship, which is found defective on the basis of maintenance tests, shall be reported verbally during the shutdown, and in writing in the final report.

Part 2 Inspection and Test Procedures

2.1 WORK COMMON TO MOST ELECTRICAL ASSEMBLIES

- .1 Inspection
 - .1 Compare equipment nameplate information with latest single line diagram to ensure agreement.
 - .2 Inspect for evidence of corrosion, the presence of corona or insulation breakdown, and/or for environmental contamination, especially on insulators or insulating surfaces.
 - .3 Verify acceptable anchorage, required area clearances, and proper alignment.
 - .4 Verify presence of required warning signs.
 - .5 Verify that protective devices and settings, instrument transformers and ratios, and all other electrical elements correspond to single line drawings, coordination study, and/or relevant documentation.

- .6 Verify that ventilation filters are present and in good condition, and/or that ventilation openings or vents are clear.
- .7 Verify that there are no inadvertent connections of the ground bus to the neutral bus on any electrical systems containing a neutral. Ensure that a ground to neutral bond(s) is in the correct location.
- .2 Mechanical/Functional Verification
 - .1 For commissioning, verify tightness of accessible bolted electrical connections by calibrated torque-wrench in accordance with manufacture's published data or, if not available, use NETA Table 10.12. For maintenance, verify general tightness of accessible bolted electrical connections.
 - .2 Test operation, alignment, and penetration of instrument and control power transformer withdrawal disconnects, current-carrying and grounding.
 - .3 Exercise all active components, and verify the operation of all mechanical indicating devices.
 - .4 Test all electrical and mechanical interlock systems for proper operation and sequencing:
 - .5 Attempt to close locked-open devices. Attempt to open locked-closed devices.
 - .6 Make Kirk Key exchanges with devices operated in off-normal positions.
 - .7 Verify that Kirk Key numbers match with the single line diagram and record them on the approved test sheet.
- .3 Cleaning
 - .1 Thoroughly clean switchgear cells or electrical equipment prior to testing unless as-found and as-left tests are required. Clean equipment using cleaning agents that have high dielectric properties, repel moisture, prevent corona tracking, and are not harmful to the electrical equipment insulation, such as Banwet manufactured by Brodi.
 - .2 Vacuum all loose elements from electrical switchgear, junction boxes, and other areas within or without electrical equipment. Blowers shall not be used unless no other methods to remove contaminants are possible.
- .4 Lubrication
 - .1 Verify appropriate contact lubricant on moving current carrying parts. Refer to manufacturer's recommendations on lubrication of components.
 - .2 Verify appropriate lubrication on moving and sliding surfaces. Refer to manufacturer's recommendations on lubrication of components.

2.2 OVERHEAD ASSEMBLIES, GREATER THAN 750V

- .1 Visual and Mechanical Inspection, provide all typical inspections and cleaning.
 - .1 Clean and then visually inspect all insulators for the absence of any tracking or cracks.
 - .2 Use appropriate overhead lifting devices or manual work methods and protections as required by facility and local authority requirements.

.2 Electrical Tests

- .1 Disconnect all equipment and conductors that are not part of the equipment assembly prior to testing and ensure that all phases are properly identified (Phase A – Red, Phase B –Black, Phase C – Blue). After testing re-connect equipment and conductors in the original phasing order.

2.3 EXISTING 115,000V CIRCUIT SWITCHER

.1 Visual and Mechanical Inspection, provide all typical inspections and cleaning, plus:

- .1 Trip/Close – Verify circuit switcher and associated disconnect trips and removes potential kinetic energy for closing (spring charge type mechanism).
- .2 Position Indicator – verify charger, open and close indicator.
- .3 Secondary Contact Blocks - verify alignment, engagement, and correct contact
- .4 Padlock/Key Lock Operator – ensure circuit switcher’s interrupter and disconnect can be locked open.
- .5 Circuit Switcher
- .1 Operation Counter – record number of as found and as left operations
- .2 Auxiliary Switches – ensure that circuit switcher properly engages and toggles ‘a’, ‘b’, and position contacts
- .3 Cut Off Switch – ensure electrical motor cutoff operates consistently.
- .4 Electrical Interlocks – Ensure anti-pumping (Y) relay operates correctly. Ensure (52 X) relay operates correctly (electrical coil close only).

.2 Electrical Tests

- .1 Perform a contact resistance test with a low resistance ohmmeter. Test should be performed through the entire circuit switcher from line side of disconnect and load side of interrupter.
- .2 Perform insulation-resistance tests on each pole, phase-to-phase and phase-to-ground with switch closed and across each open pole for one minute. Test voltage shall be in accordance with manufacturer’s published data or Table 10.1.
- .3 Perform SF6 bottle integrity (overpotential) test across each SF6 bottle with the switch in the open position in strict accordance with manufacturer's published data. Do not exceed maximum voltage stipulated for this test. Do not perform this test unless the contact displacement of each interrupter is within manufacturer's tolerance. (Be aware that some dc high-potential test sets are half wave rectified and may produce peak voltages in excess of the switch manufacturer's recommended maximum.)
- .4 Perform resistance measurements through all bolted connections with a low resistance ohmmeter.
- .5 Perform insulation resistance test at 250 volts DC on all control wiring. Do not perform insulation resistance tests on solid state or electronic control devices.
- .6 Measure the following coil resistances with a DC ohmmeter;
- .1 Closing Coil
- .2 Tripping Coil
- .3 52 X Coil
- .7 With breaker in the test position, make the following tests:

- .1 Trip and close circuit switcher with the control switch.
 - .2 Trip circuit switcher by operating each of its protective relays.
 - .3 Verify trip free and antipump (Y relay) function.
 - .4 Perform minimum pickup voltage tests on trip coil and record value.
- .3 Test Values
- .1 Compare bolted connection resistances to values of similar connections.
 - .2 Bolt torque levels shall be in accordance with NETA Standard Table 10.12 unless otherwise specified by manufacturer.
 - .3 Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from adjacent poles or similar circuit switchers by more than 25 percent of the lowest value. Microhm value should not exceed the following:
 - .1
$$\frac{0.050 \text{volts}}{\text{Equipment Continuous Current Rating}} \times 1,000,000$$
 - .4 If circuit switcher contact resistance exceeds above formula, burnish main contacts and apply lubrication as per manufacturer specification until correct contact resistance is achieved.
 - .5 Control wiring insulation resistance shall be a minimum of two megohms.
 - .6 Critical distances of operating mechanism should be in accordance with manufacturer's published data.
 - .7 The SF6 bottles shall withstand the overpotential voltage applied.
 - .8 Coil resistances should be consistent with previous year's results.
 - .9 Minimum pickup for trip coil shall conform to manufacturers published data. If data is not available trip coil should operate at 25 percent below rated voltage.

2.4 A AND B PROTECTION RELAYS OF TRANSFORMER T1

- .1 All tests associate with the protection relay must be conducted in the presence of the engineer.
- .2 Visual and Mechanical Inspection, provide all typical inspections and cleaning, plus:
 - .1 Prior to cleaning the relay, record as-found settings.
 - .2 Tighten case connections. Inspect cover for correct gasket seal. Clean cover glass. Inspect shorting hardware, connection paddles, and/or knife switches. Remove any foreign material from the case. Verify target reset.
 - .3 Inspect relay for foreign material, particularly in disc slots of the damping and electromagnets. Verify disk clearance. Verify contact clearance and spring bias. Inspect spiral spring convolutions. Inspect disk and contacts for freedom of movement and correct travel. Verify tightness of mounting hardware and connections. Burnish contacts. Inspect bearings and/or pivots.
 - .4 Verify that all settings are in accordance with coordination study or setting sheet supplied by owner.
- .3 Electrical Tests

- .1 Ensure correct magnitude and polarity of power supply to relay including the verification of any external power supply voltage drop resistors inherent to the relay (solid state and microprocessor based relays only)
- .2 Verify operation of all light emitting diode indicators.
- .3 Set contrast for liquid crystal display readouts.
- .4 Functional Operation
 - .1 87T Transformer Differential Protection
 - .1 Record the relays setting and operating range.
 - .2 Determine pickup current.
 - .3 Determine time delay at rated current.
 - .2 46 Negative Sequence Current Protection
 - .1 Record the relays setting and operating range.
 - .2 Determine pickup current.
 - .3 Determine time delay at rated current.
 - .3 27 Under-Voltage Protection
 - .1 Record the relays setting and operating range.
 - .2 Determine pickup voltage.
 - .3 Determine time delay at rated voltage.
 - .4 81 Under/Over Frequency Protection
 - .1 Record the relays setting and operating range.
 - .2 Determine pickup frequency.
 - .3 Determine time delay at rated frequency.
 - .5 50/50G Instantaneous Overcurrent Relay
 - .1 Record the relays setting and operating range.
 - .2 Determine pickup current.
 - .3 Determine dropout current.
 - .4 Determine time delay at rated current.
 - .6 51/51N/51G Time Overcurrent Relay
 - .1 Record the relays tap setting, time dial setting, tap range, time dial range, seal in coil setting, seal in coil range, and time current curve type.
 - .2 Verify and/or calibrate timed contact zero adjustment.
 - .3 Perform secondary current injection test
 - .4 Determine minimum pickup current value.
 - .5 Determine time delays at two points on the manufacturers published time current curve or published formula. Time values shall be selected at 2 and 5 times the relay tap setting from the published time current curve with respect to the time dial setting.
 - .6 Verify the operation of the seal in target.
 - .7 Control Verification
 - .1 Perform primary injection test:
 - .1 Utilizing a high output relay test set, inject current from the secondary current transformers wires located at the primary bushings of transformer T1 to the protection relay.

- .2 Verify that each of the relay contacts performs its intended function in the control scheme including breaker trip tests, close inhibit tests, 86 lockout tests, and alarm functions.
- .3 Verify control wiring from the instrument transformers to each protective relay.
- .8 Test Values
 - .1 When not otherwise specified, use manufacturer's recommended tolerances.

2.5 EXISTING LIGHTNING ARRESTORS, GREATER THAN 750V

- .1 Visual and Mechanical Inspection, provide all typical inspections and cleaning, plus:
 - .1 Verify that the ground lead on each device is individually attached to a ground bus or ground electrode.
 - .2 Verify that stroke counter, if present, is correctly mounted and electrically connected.
- .2 Electrical Tests
 - .1 Disconnect all conductors prior to testing and ensure that all phases are properly identified (Phase A – Red, Phase B – Black, Phase C – Blue, Neutral – White). After testing, re-connect equipment and conductors in the original phasing order. For equipment rated over 750 volts AC ensure that the connections are covered with “air seal” and high voltage rubber tape correctly applied as per the system rated voltage levels. “Duct seal” shall not be permitted.
 - .2 Perform resistance measurements of ground connection with a low resistance ohmmeter.
 - .3 Perform an insulation resistance test at voltage levels in NETA Standard Table 10.1.
- .3 Test Values
 - .1 Compare bolted connection resistances to values of similar connections.
 - .2 Resistance between the arrester ground terminal and the ground system shall be less than 0.5 ohm.
 - .3 Insulation resistance values should be in accordance with NETA Standard Table 10. 1.

2.6 EXISTING GROUNDING RESISTORS, AIR COOLED

- .1 Visual and Mechanical Inspection, provide all typical inspections and cleaning
 - .1 Perform specific inspections and mechanical tests as recommended by manufacturer.
 - .2 Verify if current transformers, or other non-resistor devices are present within the resistor enclosure.
- .2 Electrical Tests
 - .1 Disconnect all equipment and conductors that are not part of the equipment assembly prior to testing and ensure that all phases are properly identified (Phase A – Red, Phase B – Black, Phase C – Blue, Neutral – White). After testing, re-

connect equipment and conductors in the original phasing order. Make field connections as per Section 3 if required.

- .2 Perform insulation resistance measurements per NETA
- .3 Perform resistance measurements through resistor or inductor and bolted connections with a low-resistance ohmmeter, either DC or AC as required.
- .3 Test Values
 - .1 Compare bolted connection resistances to values of similar connections.
 - .2 Bolt-torque levels should be in accordance with NETA Standard Table 10.12 unless otherwise specified by manufacturer.
 - .3 Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
 - .4 Insulation-resistance test values at one minute should be in accordance with NETA Standard Table 10.5.

2.7 GROUND ELECTRODE

- .1 Visual and Mechanical Inspection
 - .1 Inspect expose ground conductor and connections.
 - .2 Inspect ground rod viewport.
 - .3 Dig to expose to underground ground rods and connections, review condition
 - .4 Ensure proper connections are made to all exposed switchgear, structures, transformers, fences, gates, and other items per OESC section 36.
- .2 Electrical Tests
 - .1 Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.
- .3 Test Values
 - .1 Investigate point-to-point resistance values which exceed 0.5 ohm.

Part 3 Execution

3.1 GENERAL REQUIREMENTS

- .1 Keep working area clean and safe, all testing and maintenance areas are to be cleaned after usage.
- .2 The contractor is responsible for verifying all types of distribution equipment to be tested, and ensuring they have the proper equipment to test equipment, especially proprietary trip units, relays, controllers, and other similar items.

**3.2 EQUIPMENT TO BE TESTED UNDER THE SCOPE OF THE SPECIFICATION
SECTION**

- .1 A and B Relay Protection of Transformer T1
- .2 115000V Circuit Switcher for T1 only
- .3 115000V Lightning Arrestors for T1 Only
- .4 Grounding Resistor of T1 Only

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 337116.01 – Electrical Pole Lines and Hardware.
- .2 Section 260522 - Connectors and Terminations

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C61089-11 (R2015) – Round wire concentric lay overhead electrical stranded conductors
 - .2 CAN/CSA-G12-14 – Zinc-coated steel wire strand

Part 2 Products

2.1 PRIMARY OVERHEAD CONDUCTORS 115,000 V

- .1 ACSR Bare overhead conductor to Can/CSA C61089.
- .2 Size: Minimum diameter of 14.3mm, Penguin
- .3 Ultimate tensile strength (UTS): 37.4 kN.
- .4 Tension Requirements (Initial Conditions):
 - .1 Minus 20 degrees Celsius: 17.4 kN
- .5 Acceptable manufacturers: General Cable, Pirelli, or approved equivalent

2.2 GUARD WIRE 115,000 V OVERHEAD LINE

- .1 To CAN/CSA-G12
- .2 Minimum diameter of 11.35mm, Quail
- .3 Ultimate tensile strength (UTS): 22.5 kN.
- .4 Tension Requirements (Initial Conditions):
 - .1 Minus 20 degrees Celsius: 17.5 kN
- .5 Acceptable manufacturers: General Cable, Pirelli, or approved equivalent

Part 3 Execution

3.1 INSTALLATION

- .1 Install conductors on pole lines in accordance with Section 337116.01 – Electrical Pole Lines and Hardware.
- .2 Test conductors as per Section 260510 – Electrical Testing

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for connectors and terminations.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No. 41-13, Grounding and Bonding Equipment.
 - .2 CSA C22.2 No. 65-13, Wire Connectors
- .2 ANSI/IEEE 386-1985, Separable Insulated Connector Systems for Power Distribution Systems above 600V.
- .3 IEEE Std. 404, Cable Joints and Splices
- .4 ANSI C119.4, Standard for Copper and Aluminum Conductor Connectors

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 013300 – Submittal Procedures

1.4 CERTIFICATES

- .1 Obtain inspection certificate of compliance covering high voltage stress coning from inspection authority and include it with maintenance manuals.

Part 2 Products

2.1 CONNECTORS

- .1 Irreversible compression type wire connectors with current carrying parts of copper or copper alloy sized to fit copper conductors and aluminium alloy sized to fit aluminium conductors as required.
 - .1 Use 2 hole NEMA long barrel compression lugs for all cable connections.

Part 3 Execution

3.1 INSTALLATION

- .1 Install Irreversible Compression type connectors with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
- .2 Bond and ground as required to CSA C22.2No.41.

- .3 Compression lugs are to be provided for connections of #8 AWG or larger.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 260500 - Electrical General Requirements.
- .2 Section 323113 – Chain Link Fences and Gates

1.2 REFERENCES

- .1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE).
 - .1 ANSI/IEEE 837-1988, Qualifying Permanent Connections Used in Substation Grounding.
 - .2 Canadian Standards Association (CSA)
 - .1 CSA C22.2No.0.4-04 (R2013), Bonding and Grounding of Electrical Equipment

Part 2 Products

2.1 MATERIALS

- .1 Rod electrodes: copper clad steel, 19 mm dia by 3 m long.
- .2 Conductors: bare, stranded, soft annealed copper wire, size 2/0 AWG for ground bus, electrode interconnections, metal structures, gradient control mats, transformers, switchgear, motors, ground connections.
- .3 Conductors: pvc insulated coloured green, stranded soft annealed copper wire, size No. 4 AWG for grounding cable sheaths, raceways, pipe work, screen guards, switchboards, potential transformers.
- .4 Conductors: pvc insulated coloured green, stranded soft annealed copper wire No. 10 AWG for grounding meter and relay cases.
- .5 Conductors: No. 3/0 AWG extra flexible (425 strands) copper conductor for connection of switch mechanism operating rod to gradient control mat, fence gates, vault doors.
- .6 Bolted removable test links.
- .7 Accessories: non-corroding, necessary for complete grounding system, type, size material as indicated, including:
 - .1 Grounding and bonding bushings,
 - .2 Protective type clamps,
 - .3 Bolted type conductor connectors,

- .4 Thermit welded type conductor connectors,
- .5 Bonding jumpers, straps,
- .6 Pressure wire connectors.
- .8 Wire connectors and terminations: to Section 260522 - Connectors and Terminations.

Part 3 Execution

3.1 GROUNDING INSTALLATION

- .1 Install continuous grounding system including, electrodes, conductors, connectors and accessories in accordance with CSA C22.2No.0.4, design drawings and requirements of local authority having jurisdiction.
- .2 Ground fences to station ground grid.
- .3 Install connectors in accordance with manufacturer's instructions.
- .4 Protect exposed grounding conductors from mechanical injury.
- .5 Make buried connections, and connections to electrodes, structural steel work, using copper welding by thermit process, or permanent compression connectors to ANSI/IEEE 837.
- .6 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .7 Use No. 4/0 AWG bare copper cable for main ground bus of substation and No. 2/0 AWG bare copper cable for taps on risers from main ground bus to equipment.
- .8 Use tinned copper conductors for aluminum structures.
- .9 Do not use bare copper conductors near un-jacketed lead sheath cables.

3.2 ELECTRODE INSTALLATION

- .1 Install ground rod electrodes, driven vertically so the top of the rod is level with the grounding grid conductors at a depth of 0.15m. Make grounding connections to station equipment.
- .2 The ground electrode horizontal conductors are to be 4/0 AWG bare copper conductors and should be laid as per the substation electrode drawing. If a grid conductor's path is blocked by a concrete pad or another structure, minor adjustments in routing are acceptable; however, if the whole path is blocked, then circle the obstruction with a conductor, fasten the ends together and connect to rebar within the obstruction, and attach all obstructed grid conductors onto the circled conductor.
- .3 Install ground rod electrodes as indicated in drawings.
- .4 Install at least one Ground Electrode Inspection Box inside the high voltage substation to allow easy access to the actual grid.

- .5 The substation fence perimeter can be any size or shape but all segments, extensions, protrusions, etc. must be at least 1 m within the outside perimeter of the ground grid. The swinging gate should swing outward; therefore, the ground grid should be extended in a loop at least 1 m past the outer extremity of the gate during its travel.

3.3 HIGH VOLTAGE SUBSTATION EQUIPMENT GROUNDING

- .1 Install grounding connections as indicated to typical station equipment including:
 - .1 Sky wire (down wires), neutral, gradient control mats.
 - .2 Non current carrying parts of:
 - .1 Sub-station fences.

3.4 EQUIPMENT GROUNDING

- .1 Ground new 115kV Deadend structures/poles via down wires to ground grid as indicated on drawings.

3.5 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 260510 - Electrical Testing.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 013300 - Submittal Procedures.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D4791-99, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.3 SAMPLES

- .1 Submit samples in accordance with Section 013300 – Submittal Procedures.
- .2 Allow continual sampling by Engineer during production.
- .3 Provide Engineer with access to source and processed material for sampling.

Part 2 Products

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed five times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Natural sand.
 - .2 Manufactured sand.
 - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Engineer of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.
- .2 If, in opinion of Engineer, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise Engineer 4 weeks in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 PREPARATION

- .1 Topsoil stripping
 - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
 - .2 Begin topsoil stripping of areas as directed by Engineer after area has been cleared of weeds and grasses and removed from site.
 - .3 Strip topsoil to depths as directed by Engineer. Avoid mixing topsoil with subsoil.
 - .4 Stockpile in locations as directed by Engineer. Stockpile height not to exceed 2 m.
 - .5 Dispose of topsoil off site.
- .2 Aggregate source preparation
 - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by Engineer.
 - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
 - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
 - .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
 - .5 Trim off and dress slopes of waste material piles and leave site in neat condition.

- .3 Processing
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
 - .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Engineer.
 - .3 Wash aggregates, if required to meet specifications. Use only equipment approved by Engineer.
 - .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.
- .4 Handling
 - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .5 Stockpiling
 - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Engineer. Do not stockpile on completed pavement surfaces.
 - .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
 - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
 - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
 - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
 - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Engineer within 48 h of rejection.
 - .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Max 1.5 m for coarse aggregate and base course materials.
 - .2 Max 1.5 m for fine aggregate and sub-base materials.
 - .3 Max 1.5 m for other materials.
 - .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
 - .9 Do not cone piles or spill material over edges of piles.
 - .10 Do not use conveying stackers.
 - .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.2 CLEANING

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Engineer.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 310516 - Aggregates: General.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117-95, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-96a, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-98, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-00a, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557-00, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318-00, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 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.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A3000-98-A5-98, Portland Cement.
 - .2 CAN/CSA-A23.1-00, Concrete Materials and Methods of Concrete Construction.

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: any 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: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

- .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 Unsuitable materials:
 - .1 Weak and compressible materials under excavated areas.
 - .2 Frost susceptible materials under excavated areas.
 - .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1 CAN/CGSB-8.2.
 - .2 Table

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 – 100
0.02 mm	10 – 80
0.005 mm	0 – 45
 - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .7 Unshrinkable fill: very weak mixture of Portland cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.4 PROTECTION OF EXISTING FEATURES

- .1 Protect existing features in accordance with applicable local regulations.
- .2 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to commencing excavation Work, notify applicable Owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .3 Confirm locations of buried utilities by careful test excavations.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
 - .5 Where utility lines or structures exist in area of excavation, obtain direction of Engineer before removing, re-routing.
 - .6 Record location of maintained, re-routed and abandoned underground lines.
 - .7 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:

- .1 Conduct, with Engineer, 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 to approval of Engineer.
- .3 Where required for excavation, cut roots or branches as approved by Engineer in accordance with Section 02901 - Tree and Shrub Preservation.

1.5 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.
- .4 Keep design and supporting data on site.
- .5 Engage services of qualified professional Engineer who is registered or licensed in Province of Ontario, Canada in which Work is to be carried out to design and inspect shoring required for Work.

Part 2 Products

2.1 MATERIALS

- .1 Type 1 and Type 2 fill: properties to Section 310516 - Aggregates: General and the following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1, CAN/CGSB-8.2.
 - .3 Table

Sieve Designation	% Passing	
	Type 1	Type 2
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

- .2 Type 3 fill: selected material from excavation or other sources, approved by Engineer 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 Portland cement content of 25 kg/m³ with 40% fly ash replacement: to CAN/CSA-A3000-A5, Type 10.
 - .3 Minimum strength of 0.07 MPa at 24 h.
 - .4 Concrete aggregates: to CAN/CSA-A23.1.
 - .5 Portland cement: Type 10.
 - .6 Slump: 160 to 200 mm.
- .4 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

Part 3 Execution

3.1 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 All excavations around existing underground services are to be completed using hydro vac to prevent damage to existing services.

3.2 STRIPPING OF TOPSOIL

- .1 Commence topsoil stripping of areas as directed by Engineer after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as directed by Engineer. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by departmental representative. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil to location off site.

3.3 STOCKPILING

- .1 Stockpile fill materials in areas designated by Engineer. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

3.4 SHORING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Health and Safety Act for the Province of Ontario.
- .2 Construct temporary Works to depths, heights and locations as approved by Engineer.
- .3 During backfill operation:
 - .1 Unless otherwise indicated or directed, 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.
- .4 When sheeting is required to remain in place, cut off tops at elevations at least 1.2 meters below finished grade.
- .5 Upon completion of substructure construction:
 - .1 Remove shoring.
 - .2 Remove excess materials from site and restore as indicated.

3.5 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Submit for Engineer's review details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. 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 manner not detrimental to public and private property, or any portion of Work completed or under construction.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.

3.6 EXCAVATION

- .1 Advise Engineer at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as directed by Engineer.
- .3 Remove concrete and other obstructions encountered during excavation to appropriate waste disposal sites.

- .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. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Engineer 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 a safe distance away from edge of trench and excavation as directed by Engineer.
- .8 Restrict vehicle operations directly adjacent to open trenches and excavation.
- .9 Dispose of surplus and unsuitable excavated material off site.
- .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 Engineer when bottom of excavation is reached.
- .13 Obtain Engineer approval of completed excavation.
- .14 Remove unsuitable material from trench bottom to extent and depth as directed by Engineer.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings fill concrete.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected maximum dry density.
- .16 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Engineer.

3.7 FILL TYPES AND COMPACTION

- .1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698, ASTM.
 - .1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95 %.
 - .2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 98 %.
 - .3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill topped with shearmat filler as indicated to underside of slab. Compact base course to 100 %.

- .4 Place unshrinkable fill in areas as indicated.

3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated. Place bedding and surround material in unfrozen condition.

3.9 BACKFILLING

- .1 Do not proceed with backfilling operations until Engineer has inspected and approved installations.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 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. Difference not to exceed 1 m.
 - .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 Engineer or:
 - .2 If approved by Engineer, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Engineer.
- .6 Place unshrinkable fill in areas as indicated.
- .7 Consolidate and level unshrinkable fill with internal vibrators.
- .8 Install drainage system in backfill as indicated as directed by Engineer.

3.10 RESTORATION

- .1 Upon completion of Work, remove waste materials and, trim slopes, and correct defects as directed by Engineer.
- .2 Replace topsoil as directed by Engineer.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.

- .5 Clean and reinstate areas affected by Work as directed by Engineer.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 013300 – Submittal Procedures.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A53/A53M-01, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A90/A90M-01, Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - .3 ASTM A121-99, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
 - .4 A653/A653M-01, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM A585-97, Specification for Aluminum-Coated Steel Barbed Wire.
 - .6 ASTM C618-00, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.
 - .2 CAN/CGSB-138.2-96, Steel Framework for Chain Link Fence.
 - .3 CAN/CGSB-138.3-96, Installation of Chain Link Fence.
 - .4 CAN/CGSB-138.4-96, Gates for Chain Link Fence.
 - .5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA)
 - .1 CSA-A23.1/A23.2-00(June 2001), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .2 CAN/CSA-G164-M92(R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-A3000-98(April 2001), Cementitious Materials Compendium. Includes:
 - .1 CAN/CSA-A23.5-98, Supplementary Cementing Materials

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 013300 – Submittal Procedures.

Part 2 Products

2.1 MATERIALS

- .1 Concrete mixes and materials: in accordance with CSA-A23.1.
 - .1 Nominal coarse aggregate size: 20-5.
 - .2 Compressive strength: 20 MPa minimum at 28 days.
 - .3 Additives: fly ash to CAN/CSA-A23.5.
- .2 Chain-link fence fabric: to CAN/CGSB-138.1.
 - .1 Type 1, Class A, #9 gauge steel wire, 4.8 mm in diameter, woven in 50.8 mm mesh.
 - .2 Height of fabric: 1.8 m.
 - .3 Acceptable material: galvanized steel.
- .3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions as indicated.
- .4 Bottom tension wire: to CAN/CGSB-138.1, Table 2, single strand, galvanized steel wire, 5 mm diameter.
- .5 Tie wire fasteners: to CAN/CGSB-138.1, Table 2 (steel wire) 4, aluminum alloy wire single strand.
- .6 Tension bar: to ASTM A653/A653M, 5 x 25 mm minimum galvanized steel.
- .7 Gates: to CAN/CGSB-138.4.
- .8 Gate frames: to ASTM A53/A53M, galvanized steel pipe, standard weight 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing.
 - .1 Fabricate gates as indicated with electrically welded joints, and hot-dip galvanized painted with zinc pigmented paint after welding.
 - .2 Fasten fence fabric to gate with twisted selvage at top.
 - .3 Furnish gates with galvanized malleable iron hinges, latch and latch catch with provision for padlock which can be attached and operated from either side of installed gate.
 - .4 Furnish double gates with chain hook to hold gates open and centre rest with drop bolt for closed position.
- .9 Fittings and hardware: to CAN/CGSB-138.2, cast aluminum alloy, galvanized steel or malleable or ductile cast iron. Tension bar bands: 3 x 20 mm minimum galvanized steel or 5 x 20 mm minimum aluminum. Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail. Overhang tops to provide waterproof fit, to hold top rails and an outward projection to hold barbed wire overhang. Provide projection with clips or recesses to hold 3 strands of barbed wire spaced 100 mm apart. Projection of approximately 300 mm long to project from fence at 45 deg above horizontal. Turnbuckles to be drop forged.

- .10 Organic zinc rich coating: to CAN/CGSB-1.181.
- .11 Barbed wire: 2 mm diameter galvanized steel wire to ASTM A121 4 point barbs 125 mm spacing.
- .12 Grounding rod: 16 mm diameter copperwell rod, 3 m long to Section 16061 – Grounding Primary.

2.2 FINISHES

- .1 Galvanizing:
 - .1 For chain link fabric: to CAN/CGSB-138.1 Grade2.
 - .2 For pipe: 550 g/m² minimum to ASTM A90.
 - .3 For barbed wire: to ASTM A121, Class 2 CAN/CGSB-138.2.
 - .4 For other fittings: to CAN/CSA-G164.

Part 3 Execution

3.1 GRADING

- .1 Remove debris and correct ground undulations along fence line to obtain smooth uniform gradient between posts. Provide clearance between bottom of fence and ground surface of 30 mm to 50 mm.

3.2 ERECTION OF FENCE

- .1 Erect fence along lines as indicated as directed by Engineer and to CAN/CGSB-138.3.
- .2 Excavate post holes to 900 mm depth x 300 mm diameter.
- .3 Space line posts 3m apart, measured parallel to ground surface.
- .4 Space straining posts at equal intervals not exceeding 150m if distance between end or corner posts on straight continuous lengths of fence over reasonably smooth grade is greater than 150m.
- .5 Install additional straining posts at sharp changes in grade and where directed by Engineer.
- .6 Install corner post where change in alignment exceeds 10 deg .
- .7 Install end posts at end of fence and at buildings. Install gate posts on both sides of gate openings.
- .8 Place concrete in post holes then embed posts into concrete to 900 mm depth x 300 mm diameter. Extend concrete 50 mm above ground level and slope to drain away from posts. Brace to hold posts in plumb position and true to alignment and elevation until concrete has set.

- .9 Do not install fence fabric until concrete has cured minimum of 5 days.
- .10 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface at inclination as indicated. Install braces on both sides of corner and straining posts in similar manner.
- .11 Install overhang tops and caps.
- .12 Install top rail between posts and fasten securely to posts and secure waterproof caps and overhang tops.
- .13 Install bottom tension wire, stretch tightly and fasten securely to end, corner, gate and straining posts with turnbuckles and tension bar bands.
- .14 Lay out fence fabric. Stretch tightly to tension recommended by manufacturer and fasten to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals. Knuckled selvedge at bottom. Twisted selvedge at top.
- .15 Secure fabric to top rails, line posts and bottom tension wire with tie wires at 450 mm intervals. Give tie wires minimum two twists.
- .16 Install barbed wire strands and clip securely to lugs of each projection. Barb wire to extend as per distance indicated in drawings.
- .17 Install grounding rods as indicated.

3.3 INSTALLATION OF GATES

- .1 Install gates in locations as indicated.
- .2 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.
- .3 Determine position of centre gate rest for double gate. Cast gate rest in concrete as directed. Dome concrete above ground level to shed water.
- .4 Install gate stops where indicated.

3.4 TOUCH UP

- .1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas. Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.5 CLEANING

- .1 Clean and trim areas disturbed by operations. Dispose of surplus material and replace damaged turf with sod as directed by Engineer.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/National Electrical Manufacturers (NEMA)
 - .1 ANSI/NEMA C29.4-1989(R2002), Wet-Processed Porcelain Insulators (Strain Type).
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G12-92(R2007), Zinc-Coated Steel Wire Strand.
 - .2 CAN/CSA-C83-96(R2005), Communication and Power Line Hardware.
 - .3 CAN/CSA-O80 Series-08, Wood Preservation.
 - .4 CAN/CSA-O15-05, Wood Utility Poles and Reinforcing Stubs.
 - .5 CSA O116-1969(R2008), Power and Communication Sawn Wood Crossarms.
- .3 Local Utility Standards

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 013300 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada indicating:
 - .1 Materials.
 - .2 Method of anchorage.
 - .3 Number of anchors.
 - .4 Supports.
 - .5 Reinforcement.
 - .6 Assembly details.
 - .7 Accessories.

1.3 QUALITY ASSURANCE

- .1 Quality assurance submittals: submit following in accordance with Section 013300 – Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
- .2 Health and Safety Requirements: worker protection:

- .1 Workers must wear gloves, respirators, dust masks, long sleeved clothing, eye protection, protective clothing when applying preservative materials.
 - .2 Workers must not eat, drink or smoke while applying preservative material.
 - .3 Clean up spills of preservative materials immediately with absorbent material and safely discard to sanitary landfill.
 - .4 Workers must wear personal protective wear: hardhat and safety shoes.
- .3 Perform work to comply with applicable Provincial/Territorial regulations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding and packaging materials.

Part 2 Products

2.1 MATERIALS

- .1 Wood preservation: to CAN/CSA O80 Series.
- .2 Power line hardware: to CAN/CSA-C83.
- .3 Wood utility poles: to CAN/CSA-O15, wood species Western Red Cedar, Class H3, preservative treated.
 - .1 24.4 m long poles for primary circuits only.
 - .2 25.9 m long poles for support of Skywire.

2.2 CROSSARMS

- .1 Wood crossarms: to CSA O116, pressure or vacuum treated with Pentachlorophenol
 - .1 Crossarm at deadend structure to extend across the tree utility poles, without any joints. Crossarms to be Class 1 construction.
 - .2 Hardware used to mount crossarms to poles must be galvanized steel.
 - .3 Deadend construction to match existing dead-end structure; therefore a total of 9 deadend insulators must be mounted to deadend structure. 6 deadend insulators and 3 suspension insulators.
- .2 Galvanized bolt eye (1 per suspension/dead end insulator) for dead end:
 - .1 Strain insulator rod and link installed as required.

2.3 INSULATORS

- .1 Guy strain insulators:
 - .1 Strain type: to ANSI/NEMA C29.4, nominal rating 115 kV, one per guy wire.
- .2 Suspension/dead end insulators nominal rating 115kV.

2.4 GUYS AND ANCHORS

- .1 Guy wire: to CAN/CSA-G12, 9 mm nominal diameter, stranded, galvanized steel for dead ends and guys.
- .2 Guy clamps: three-bolt heavy duty or preform grip type.
- .3 Eye bolt: 19 mm thimble, length to suit, four hole guy straps and 16 mm machine bolt with square washer to attach guy wire to pole.
- .4 Anchor rod: 19 mm diameter x 2.7 m long, galvanized steel with thimble eye.
- .5 Anchor: manufacturer's standard, approved by Departmental Representative.
 - .1 Power installed screw anchor (PISA), double helix.
 - .2 Log anchor in earth or swamp.
 - .3 Rock anchor.
- .6 Guy guard: half-round, galvanized steel 2.7 m long.
- .7 Guy guard: plastic, colored yellow, 2.7 m long.

2.5 PRIMARY CONDUCTORS

- .1 In accordance with Section 26 05 14 - Power Cable and Overhead Conductors (1001 to 115,000V).

2.6 EQUIPMENT IDENTIFICATION

- .1 Rustproof number nails with 50 mm high designated number.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Install electrical pole lines and hardware in accordance with manufacturer's written recommendations and specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 PREPARATION OF POLES

- .1 Where poles require shortening, cut piece from top only.
- .2 Roof top of poles with single slope bevelled top.
- .3 Treat roof top, gains, bored holes with preservative before assembly.
- .4 Cut parallel plane crossarm gains in face of pole for single and double arming, spacing as indicated.
- .5 Bore hole in center of each gain for crossarm bolt.
- .6 Drill crossarms for pins, through bolts, double arm bolts and brace bolts.
 - .1 Pre-drill treated crossarms to standard spacing.
- .7 Install crossarms and braces.
- .8 Attach stand-off insulators and eye-bolts.

3.3 INSTALLATION

- .1 Locate and dig pole holes.
 - .1 Make holes large enough to allow space for tamping backfill.
- .2 Set poles.
- .3 Align poles with crossarms at right angles to pole line on straight runs.
- .4 At change in direction of line, set crossarms to bisect angle formed by change.
- .5 Set poles to maintain even grade.
 - .1 Allow for contour of terrain and do not exceed grading of 1.5 m per pole.
- .6 Replace backfill in 150 mm layers.
 - .1 Tamp each layer, and apply final layer to drain water away from pole.
- .7 Locate and install guy wires and anchors at dead-ends, at non-tangent poles, corner poles, and start of branch feeders.
- .8 Insert anchor at least 1.8 m into ground. Backfill and tamp in 150 mm layers.
- .9 Install insulators.
- .10 Install number nails on each pole.
- .11 Identify primary circuit on pole showing phasing of each conductor, every 1000 m and including origin of primary pole.

3.4 FIELD QUALITY CONTROL

- .1 Perform tests and field inspection for pole lines and hardware prior to energization.
- .2 Use qualified tradespersons for installation, termination and testing of high voltage power lines and hardware.
- .3 Engage an independent testing agent to perform test and inspection on high voltage power lines and equipment.
- .4 Submit test result and inspection certificate for review.

3.5 CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling.

END OF SECTION



Stantec Consulting Ltd.
400 - 1331 Clyde Avenue, Ottawa ON K2C 3G4

July 9, 2015
File: 163301694

Attention: Mr. Peter Dyck, P.Eng.
Stantec Consulting Ltd.
400 - 1331 Clyde Avenue
Ottawa, ON K2C 3G4

Dear Mr. Dyck,

**Reference: Geotechnical Investigation
Proposed Compressor Plant Addition and Substation Expansion, National Research
Council Canada, Research Road, Ottawa, ON**

This letter provides the geotechnical engineering results and recommendations from the geotechnical investigation completed for the proposed substation expansion and building expansion at the campus of the National Research Council Canada (NRC), located on Research Road in Ottawa, ON.

This report has been prepared specifically and solely for the project described herein. It presents the factual results of the investigation and provides geotechnical recommendations for the design and construction of the proposed development.

Limitations associated with this report and its contents are provided in the statement of conditions included in Appendix A.

1.0 PROPOSED DEVELOPMENT

The proposed development will include a new compressor plant adjacent to the existing building U-66, and an expansion of the existing 115kV outdoor substation. The development is located at the NRC Uplands Campus, the location of the site is shown on the Key Plan, Drawing No. 1 in Appendix B. The proposed development is understood to include the following:

Compressor Plant Addition

The proposed compressor plant addition will be located on the north side of the existing building U-66. Borehole BH14-2 was drilled within the proposed footprint.

Substation Expansion

The substation expansion will be located north of Building U-66 and east of the existing substation. Borehole BH14-1 was drilled within the proposed footprint. The proposed substation will be identical to the existing substation and will contain two switchgears and one transformer; it is assumed that these will be mounted on concrete pads.



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2.0 SCOPE OF WORK

The scope of work for this geotechnical investigation included the following:

- A borehole program consisting of two (2) sampled boreholes to characterize the subsurface soil conditions near the proposed substation expansion and building expansion.
- Laboratory testing program consisting of moisture content determination and grain size analysis on selected soil samples.
- A geotechnical engineering report that includes borehole location plan, borehole logs and provides a summary of the findings and geotechnical comments and recommendations regarding the proposed development.

3.0 METHOD OF INVESTIGATION

3.1 FIELD INVESTIGATION

The borehole drilling program consisted of two (2) boreholes (BH14-1 and BH14-2) advanced to 6.1 m below ground surface. The borehole locations are shown in Drawing No. 2 in Appendix B.

Prior to carrying out the investigation, Stantec Consulting Ltd. (Stantec) marked the proposed borehole locations. As a component of our standard procedures and due diligence, Stantec contacted the public utility authorities to clear the locations of both private and public underground utilities.

The field drilling program was carried out on May 13, 2014, and was carried out using a truck-mounted CME-75 drill rig equipped with soil sampling capabilities. Standard Penetration Tests (SPT) were completed at regular intervals while collecting soil samples. The subsurface stratigraphy encountered in each borehole was recorded in the field by experienced Stantec personnel. Upon completion of drilling, the boreholes were backfilled with the augered material.

All recovered soil samples were stored in moisture-proof bags and transported to the Stantec Ottawa laboratory for detailed geotechnical classification and testing.

3.2 SURVEY

The elevations of the boreholes were determined using a Trimble GPS Receiver with decimeter accuracy. The instrument's accuracy may be affected by satellite coverage at the time of the survey. Geodetic elevations are shown on the Borehole Records in Appendix C.



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3.3 LABORATORY TESTING

All soil samples returned to the laboratory were subjected to detailed visual examination and additional classification by a geotechnical engineer. Moisture content determination was undertaken on all recovered soil samples. Grain size analyses were conducted on selected soil samples.

The results of the laboratory tests are discussed in the text of this report and are provided on the Borehole Records in Appendix C and the figures included in Appendix D.

Soil samples will be stored for one (1) month after the issuance of the final report unless otherwise directed by the client.

4.0 SUBSURFACE CONDITIONS

In general, the subsurface profile at this site consisted of a fill material over a deposit of silty sand to silty sand with gravel.

4.1 TOPSOIL

Topsoil was encountered at ground surface in borehole BH14-1. The thickness of the topsoil was 150 mm.

4.2 FILL

Fill was encountered beneath the topsoil or at ground surface. The fill consisted of brown silty sand to silty sand with gravel. The fill ranged in thickness from 1.5 m to 2.3 m. The moisture content of this material ranged from 6% to 10%. One sample of this material was submitted for a gradation test and yielded the following results:

- Gravel: 5%
- Sand: 81%
- Fines: 15%

According to the Unified Soil Classification System (USCS), this material can be classified as a silty sand (SM). The gradation results are presented in Figure 1 in Appendix D.



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4.3 SILTY SAND

A deposit of silty sand to silty sand with gravel was encountered beneath the fill in both boreholes. A gravel seam was encountered in borehole BH14-2. The thickness of the silty sand encountered ranged from 3.7 m to 4.6 m; both boreholes were terminated within this material at a depth of 6.1 m below ground surface (elevation 100.5 m and 100.7 m in BH14-1 and BH14-2, respectively). The moisture content of this material ranged from 2% to 17%. Two samples of this material were submitted for gradation testing and yielded the following results:

- Gravel: 0 – 23 %
- Sand: 60 - 86%
- Fines: 14 - 17%

According to the Unified Soil Classification System (USCS), this material can be classified as a silty sand to silty sand with gravel (SM). The gradation results are presented in Figure 2 in Appendix D.

4.4 BEDROCK

Bedrock was not encountered within the limits of the investigation.

4.5 GROUNDWATER

Groundwater was inferred at a depth of 2.3 m in BH14-1 and 3.4 m in BH14-2.

Fluctuations in the groundwater level due to seasonal variations or in response to a particular precipitation event should be anticipated.

5.0 DISCUSSIONS AND RECOMMENDATIONS

5.1 GENERAL

The following geotechnical issues should be considered during design activities:

- Conventional spread footings founded on the native silty sand are appropriate to support the compressor plant addition and the proposed elements of the substation expansion.
- The site includes 1.5 to 2.5 m of fill material which will have to be removed and replaced with compacted Structural Fill. In addition, the underlying native soils are loose and should be



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subexcavated to 3.0 m below grade and replaced with Structural Fill; this subexcavation will address liquefaction potential and bearing resistance issues.

5.2 SITE PREPARATION

All fill material and the loose soil within 3 m of surface should be removed from beneath the footprint of the compressor plant addition and the footprint of the substation expansion. The lateral extent of the excavations should extend beyond the footprint of the footing or pad by a distance equal to the depth of excavation below the proposed concrete founding level. This excavation effort must not undermine the existing foundation and therefore should only be carried out under observation by a Stantec employee representing the project geotechnical engineers.

The excavated area should be backfilled with Structural Fill material such as OPSS Granular A, OPSS Granular B Type I or OPSS Granular B Type II, placed in lifts no thicker than 300 mm and compacted to 100% Standard Proctor Maximum Dry Density (SPMDD).

5.3 FOUNDATIONS – COMPRESSOR PLANT ADDITION AND SUBSTATION EXPANSION

5.3.1 Spread Footings

The proposed compressor plant building and substation expansion structures can be supported by footings designed to bear on the native silty sand or on Structural Fill placed on the native silty sand as specified in 5.2.

The spread footings will have to be founded on the structural fill to be placed after removal of the fill and loose upper portion of the native silty sand to a minimum depth of 3.0 m. Table 5.1 provides the geotechnical bearing resistances in limit states design.

Table 5.1: Geotechnical Bearing Resistances for Foundations on Structural Fill

Foundation Type	Footing Width (m)	Ultimate Limit State (ULS) (kPa)	Serviceability Limit State (SLS) (kPa)
Strip or Square Footing	1.0	300	150
Strip or Square Footing	2.0	325	150
Strip or Square Footing	3.0	350	150



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The factored geotechnical resistance at Ultimate Limit States (ULS) incorporates a resistance factor of 0.5. The geotechnical reaction at Serviceability Limit States (SLS) is the bearing pressure that corresponds to a 25 mm of total and 19 mm differential settlements.

The design frost penetration depth in the Ottawa area is 1.8 m. The proposed structures are considered to be unheated structures. Therefore, the required cover to protect footings of unheated structures from frost is 1.8 m or equivalent rigid insulation.

Assuming that the proposed compressor plant addition is unheated, the interior slab should be protected against frost heaving by the placement of a 75 mm thick layer of extruded polystyrene, such as Dow Chemical Styrofoam HI-30, beneath the floor slab as well as along the vertical faces of the outside facing or exterior foundation walls.

The base of all footing excavations should be inspected by a geotechnical engineer prior to placing concrete to confirm the design pressures and to ensure that there is no disturbance of the found soils.

Where construction is undertaken during winter conditions, all footing subgrades should be protected from freezing. Foundation walls and columns should be protected against heave due to soil adfreeze by backfilling with free draining granular material such as Ontario Provincial Standard Specification (OPSS) Granular A or Granular B Type II.

5.4 SEISMIC SITE CLASS AND LIQUEFACTION POTENTIAL

5.4.1 Seismic Site Classification

The subsurface soil and rock conditions were compared with Section 4.1.8.4.A of the 2010 National Building Code of Canada (NBCC). The soils consist of fill underlain by native silty sand.

Based on the borehole information, the seismic site response for the site is Class D – Stiff Soil. The site class is based on the Average Standard Penetration Resistance shown in Table 5.2.

Table 5.2: Parameters for Seismic Site Classification

Depth	Soil	N ₆₀ Value
3.0 m to 4.0 m	Silty Sand	7
4.0 m to 33.0 m ¹	Silty Sand	24
Design N ₆₀		21

¹The conditions between 6.0 m and 33.0 m were inferred

The 2010 National Building Code Seismic Hazard Calculation for the site is included in Appendix E.



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5.4.2 Liquefaction Potential

An assessment for seismic liquefaction has been carried out for this site. Seismic liquefaction is the sudden loss in stiffness and strength of soil due to the loading effects of an earthquake. Liquefaction can cause significant settlements and structural failure.

The analysis followed was the one set forth in the Canadian Foundation and Engineering Manual, 2006 (CFEM). For the analysis, a magnitude 6.2 design earthquake with a Peak Ground Acceleration of 0.323g, were assumed. Based on the SPT N values for the soil, our analysis indicates that the loose upper portion of the native silty sand is considered susceptible to liquefaction (between elevation 104.3 m and 102.9 m in BH14-1 and elevation 105.3 m and 103.9 m in BH14-2). It is recommended that all fill and loose native silty sand be removed to a depth of 3.0 m from the footprint of all footings.

5.5 SLAB ON GRADE CONSTRUCTION

For the substations, the individual slabs could be designed and constructed as a slabs-on-grade. The slabs should be cast on a 200 mm thick layer of OPSS Granular A compacted to 100 % SPMDD placed on the structural fill pad. The slabs may be designed using a soil modulus of subgrade reaction of 40MPa/m for structural fill and compact native sand subgrade.

For the case of a slab on grade construction, the supporting subsoils should be protected against freezing by insulating beneath the slab on ground. Given that 3.0 m of excavation and structural fill placement is anticipated, insulation protection could consist of 75 mm of HI-30 type insulation placed at 0.75 m below the bottom of the slab as the structural fill is being placed. The insulation would need to extend outwardly beyond the edge of the slab a distance of 1.5 m as well as being placed directly beneath the slab.

5.6 LATERAL EARTH PRESSURE ON SUBSURFACE WALLS

To prevent the buildup of hydrostatic pressure behind the subsurface walls of the oil containment structure, the backfill behind the subsurface wall should consist of free draining granular material such as OPSS Granular A or Granular B Type II. Also, a permanent perimeter drainage system should be installed. Alternatively, the wall can be designed to resist hydrostatic pressure.

Earth pressures will need to be considered in the design of shoring systems for temporary excavations during construction and subsurface walls. Table 5.3 gives the coefficients of lateral earth pressure, these values are based on the assumption that a horizontal back slope will be utilized.



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5.6.1 Static Lateral Earth Pressures

For subsurface walls that are designed to allow rotation, active earth pressure may be used for design. For rigidly tied and unyielding structures, the at-rest earth pressure should be used for design. The unfactored soil parameters provided in Table 5.3 may be used for design of walls with a horizontal backfill. The effects of compaction should be accounted for by applying a compaction surcharge.

The total active (P_A), passive (P_P) and at-rest (P_O) thrusts can be calculated using the following equations

$$P_A = \frac{1}{2} K_a \gamma H^2$$

$$P_P = \frac{1}{2} K_p \gamma H^2$$

$$P_O = \frac{1}{2} K_o \gamma H^2$$

where H is the height of the wall and γ is the unit weight of the backfill soil. Preliminary values for K_a , K_p , K_o and γ are provided below. The thrust acts at a point one third up the height of the wall.

Table 5.3: Static Lateral Earth Pressure Parameters

Material	K_o (at rest)	K_a (active)	K_p (passive)	ϕ (friction angle)	Unit Weight (kN/m ³)
OPSS Granular A	0.43	0.27	3.69	35°	22
OPSS Granular B Type II	0.47	0.31	3.25	32°	22
Silty Sand	0.47	0.31	3.25	32°	21

5.6.2 Seismic Lateral Earth Pressures

Seismic earth pressures may be calculated using the parameters detailed in Table 5.4 below.

The total active and passive thrusts under seismic loading conditions can be calculated using the following equations:

$$P_{AE} = \frac{1}{2} K_{AE} \gamma H^2 (1 - k_v)$$

$$P_{PE} = \frac{1}{2} K_{PE} \gamma H^2 (1 - k_v)$$



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where:

- K_{AE} = active earth pressure coefficient (combined static and seismic)
- K_{PE} = passive earth pressure coefficient (combined static and seismic)
- H = height of wall
- k_h = horizontal acceleration coefficient
- k_v = vertical acceleration coefficient
- γ = total unit weight of soil

For this site, the following design parameters were used to develop the recommended K_{AE} and K_{PE} values. A yielding wall was assumed.

Zonal Acceleration Ratio, A or PGA	0.32
Horizontal Acceleration Coefficient, k_h	0.16
Vertical Acceleration Coefficient, k_v	0.11
Horizontal Backslope to Wall	0°
Vertical Back of Wall	0°

The k_h value above corresponds to half of the A value for yielding walls. The k_v value corresponds to 0.67 of the k_h value. The angle of friction between the soil and the wall has been set at 0° to provide a conservative estimate.

Table 5.4: Seismic Lateral Earth Pressure Parameters (Yielding Wall)

Material	K_{AE}	Height of Application of P_{AE} from base as a ratio of wall height, (H)	K_{PE}	Height of Application of P_{AE} from base as a ratio of wall height, (H)	ϕ (friction angle)	Unit Weight (kN/m ³)
OPSS Granular A	0.38	0.39	3.33	0.27	35°	22
OPSS Granular B Type II	0.43	0.38	2.91	0.27	32°	22
Silty Sand	0.43	0.38	2.67	0.27	32°	21

If the wall is designed as a non-yielding wall it could be designed based on values obtained from the Wood (1973) method:

$$\Delta P_{eq} = \gamma H^2 \frac{a_h}{g} F_p$$



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Reference: **Geotechnical Investigation**
Proposed Compressor Plant Addition and Substation Expansion, National Research Council
Canada, Research Road, Ottawa, ON

- ΔP_{eq} : Steady state dynamic thrust
- γ : Bulk unit weight of soil
- H : Height of wall (m)
- g : Gravity (m/s^2)
- a_h : Amplitude of harmonic base acceleration = k_h
- F_p : Dimensionless thrust factor at $\nu=0.5$; $F = 1.1$

$$h_{eq} = \frac{\Delta M_{eq}}{\Delta P_{eq}} \approx 0.63H$$

5.7 UPLIFT RESISTANCE

The subsurface structures may be subjected to uplift forces due to the presence of groundwater. Resistance to uplift may be provided by increasing the weight of the structure by thickening the base or extending the base of the footing and resisting the uplift by the weight of the soil over the extended portion of the base. For design purposes, the groundwater level should be assumed at ground surface. Additional information can be provided, if required.

5.8 EXCAVATION AND DE-WATERING REQUIREMENTS

5.8.1 Excavations

Excavations for footings are anticipated to extend into the native silty sand, approximately 3.0 m below ground surface. Excavations can be undertaken by conventional excavating equipment capable of removing possible debris within the fill.

Open cut, unsupported excavations must be undertaken in accordance with the Occupational Health and Safety Act (OHSA). The soils are considered to be Type 3, in accordance with OHSA excavation sideslopes must be cut back at 1H:1V from the bottom of the excavation. Flatter sideslopes may be required in zones of concentrated seepage.

In areas of restricted space where open cut, unsupported excavations are not feasible, the excavations can be undertaken within the confines of an engineered, hydraulic or prefabricated (trench box) support system designed and installed in accordance with OHSA.



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**Reference: Geotechnical Investigation
Proposed Compressor Plant Addition and Substation Expansion, National Research Council
Canada, Research Road, Ottawa, ON**

Since the proposed structures will be located in close proximity to existing buildings and underground services, it is recommended that preconstruction surveys be undertaken of the nearby buildings and underground services prior to start of construction. In addition, caution should be exercised during construction so as not to undermine foundations of existing buildings.

5.8.2 De-Watering Requirements

It is anticipated that dewatering of excavations can be undertaken by conventional sump and pump methods.

5.9 FOUNDATION BACKFILL

Backfill for foundations should consist of non frost susceptible, compactible material such as OPSS Granular A or Granular B Type II materials. The foundation backfill can be placed in 300 mm thick lifts compacted using suitable equipment to 95% Standard Proctor Maximum Dry Density (SPMDD). Care should be taken immediately adjacent to the footings to avoid over-compaction of the soil which could result in damage to these foundation units.

5.10 REUSE OF SITE GENERATED MATERIAL

Portions of the silty sand and till may be re-used as backfill material in areas where non-free draining material is required, subject to further evaluation during construction. These soils contain silt and therefore are sensitive to moisture changes. These materials can be reused as noted above, provided they are free of organic material and debris and the moisture content is such that adequate compaction can be achieved.



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Reference: Geotechnical Investigation
Proposed Compressor Plant Addition and Substation Expansion, National Research Council
Canada, Research Road, Ottawa, ON

6.0 CLOSURE

Use of this report is subject to the Statement of General Conditions provided in Appendix A. It is the responsibility of National Research Council Canada, who is identified as "the Client" within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec Consulting Ltd. should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Use of the report
- Basis of the report
- Standard of care
- Interpretation of site conditions
- Varying of unexpected site conditions
- Planning, design or construction

This report has been prepared by Katurah Firdawsi and reviewed by Raymond Haché.

Regards,

STANTEC CONSULTING LTD.

Katurah Firdawsi, EIT, B.Sc.Eng.

Raymond Haché, M.Sc., P.Eng.
Senior Principal, Geotechnical Engineering
Phone: (613) 738-6055
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APPENDIX A

Statement of General Conditions

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

BASIS OF THE REPORT: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

STANDARD OF CARE: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or subsurface conditions are present upon becoming aware of such conditions.

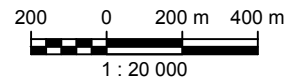
PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.

APPENDIX B

Key Plan

Borehole Location Plan

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2014/07/09 11:43 AM By: Britones, Gliceria



JULY 2014
Project No. 163301694



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Ottawa, ON, Canada K2C 3G4
www.stantec.com

NOTES

BASEPLAN FROM MAPART 2006.

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NATURAL RESOURCES CANADA
GEOTECHNICAL INVESTIGATION
RESEARCH ROAD, OTTAWA, ONTARIO

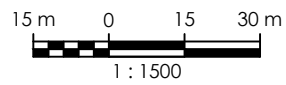
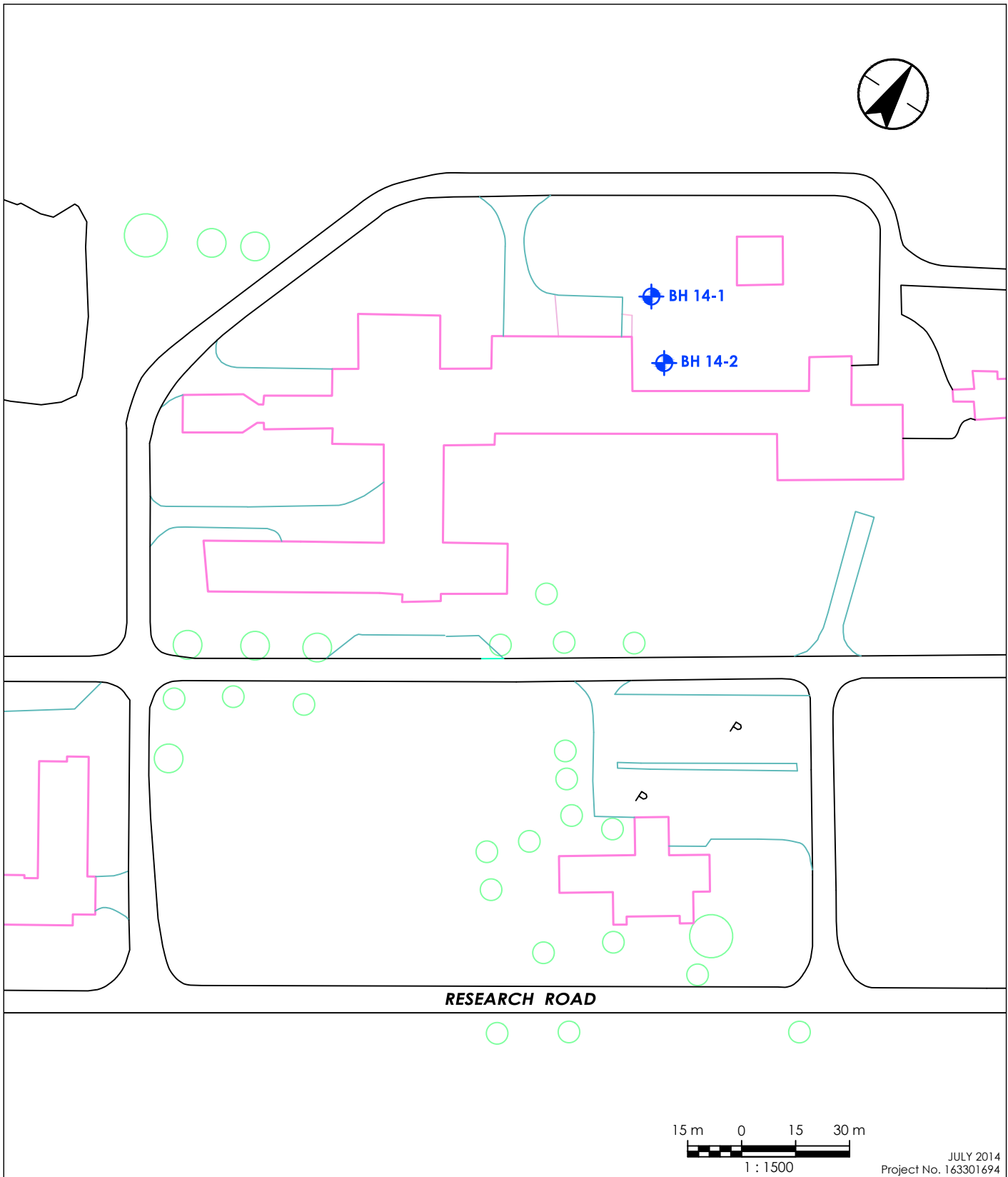
Drawing No.

1

Title

KEY PLAN

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2014/07/14 9:05 AM By: Briones, Gliceria



JULY 2014
Project No. 163301694



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Ottawa, ON, Canada K2C 3G4
www.stantec.com

LEGEND

 BOREHOLE

NOTES

- 1. COORDINATE SYSTEM: NAD 1983 MTM ZONE 9.
- 2. BASE FEATURES FROM CITY OF OTTAWA.

Client/Project
NATURAL RESOURCES CANADA
GEOTECHNICAL INVESTIGATION
RESEARCH ROAD, OTTAWA, ONTARIO

Drawing No.
2

Title
BOREHOLE LOCATION PLAN

APPENDIX C

Symbols and Terms Used on Borehole Records

Borehole Records

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

<i>Topsoil</i>	- mixture of soil and humus capable of supporting vegetative growth
<i>Peat</i>	- mixture of visible and invisible fragments of decayed organic matter
<i>Till</i>	- unstratified glacial deposit which may range from clay to boulders
<i>Fill</i>	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

<i>Desiccated</i>	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
<i>Fissured</i>	- having cracks, and hence a blocky structure
<i>Varved</i>	- composed of regular alternating layers of silt and clay
<i>Stratified</i>	- composed of alternating successions of different soil types, e.g. silt and sand
<i>Layer</i>	- > 75 mm in thickness
<i>Seam</i>	- 2 mm to 75 mm in thickness
<i>Parting</i>	- < 2 mm in thickness

Terminology describing soil types:

The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488). The classification excludes particles larger than 76 mm (3 inches). The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):

Terminology describing materials outside the USCS, (e.g. particles larger than 76 mm, visible organic matter, construction debris) is based upon the proportion of these materials present:

<i>Trace, or occasional</i>	Less than 10%
<i>Some</i>	10-20%
<i>Frequent</i>	> 20%

Terminology describing compactness of cohesionless soils:

The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test N-Value (also known as N-Index). A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
<i>Very Loose</i>	<4
<i>Loose</i>	4-10
<i>Compact</i>	10-30
<i>Dense</i>	30-50
<i>Very Dense</i>	>50

Terminology describing consistency of cohesive soils:

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests.

Consistency	Undrained Shear Strength	
	kips/sq.ft.	kPa
<i>Very Soft</i>	<0.25	<12.5
<i>Soft</i>	0.25 - 0.5	12.5 - 25
<i>Firm</i>	0.5 - 1.0	25 - 50
<i>Stiff</i>	1.0 - 2.0	50 - 100
<i>Very Stiff</i>	2.0 - 4.0	100 - 200
<i>Hard</i>	>4.0	>200

ROCK DESCRIPTION

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	<i>Very Poor</i>
25-50	<i>Poor</i>
50-75	<i>Fair</i>
75-90	<i>Good</i>
90-100	<i>Excellent</i>

Rock quality classification is based on a modified core recovery percentage (RQD) in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be due to close shearing, jointing, faulting, or weathering in the rock mass and are not counted. RQD was originally intended to be done on NW core; however, it can be used on different core sizes if the bulk of the fractures caused by drilling stresses are easily distinguishable from *in situ* fractures. The terminology describing rock mass quality based on RQD is subjective and is underlain by the presumption that sound strong rock is of higher engineering value than fractured weak rock.

Terminology describing rock mass:

Spacing (mm)	Joint Classification	Bedding, Laminations, Bands
> 6000	<i>Extremely Wide</i>	-
2000-6000	<i>Very Wide</i>	<i>Very Thick</i>
600-2000	<i>Wide</i>	<i>Thick</i>
200-600	<i>Moderate</i>	<i>Medium</i>
60-200	<i>Close</i>	<i>Thin</i>
20-60	<i>Very Close</i>	<i>Very Thin</i>
<20	<i>Extremely Close</i>	<i>Laminated</i>
<6	-	<i>Thinly Laminated</i>

Terminology describing rock strength:

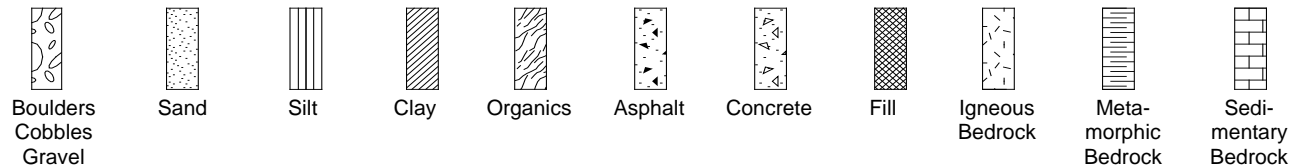
Strength Classification	Unconfined Compressive Strength (MPa)
<i>Extremely Weak</i>	< 1
<i>Very Weak</i>	1 – 5
<i>Weak</i>	5 – 25
<i>Medium Strong</i>	25 – 50
<i>Strong</i>	50 – 100
<i>Very Strong</i>	100 – 250
<i>Extremely Strong</i>	> 250

Terminology describing rock weathering:

Term	Description
<i>Fresh</i>	No visible signs of rock weathering. Slight discolouration along major discontinuities
<i>Slightly Weathered</i>	Discolouration indicates weathering of rock on discontinuity surfaces. All the rock material may be discoloured.
<i>Moderately Weathered</i>	Less than half the rock is decomposed and/or disintegrated into soil.
<i>Highly Weathered</i>	More than half the rock is decomposed and/or disintegrated into soil.
<i>Completely Weathered</i>	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.

STRATA PLOT

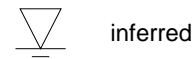
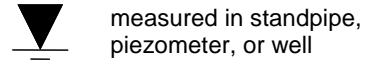
Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.



SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
WS	Wash sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT



RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil. For split spoon samples where insufficient penetration was achieved and N-values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N value corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to A size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (305 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

CLIENT National Research Council BOREHOLE No. BH14-1
 LOCATION NRC Uplands PROJECT No. 163301694
 DATES: BORING May 13, 2014 WATER LEVEL _____ DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				UNDRAINED SHEAR STRENGTH - kPa																
					TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR ROD	WATER CONTENT & ATTERBERG LIMITS W_p W W_L DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ STANDARD PENETRATION TEST, BLOWS/0.3m ●																
0	106.61	150 mm TOPSOIL FILL: brown silty sand with gravel (SM)																							
	106.5				SS	1	450	9	●																
1					SS	2	500	11	●																
2		Loose to compact brown silty SAND (SM)		▽	SS	3	400	11	○	●															
	104.2				SS	4	400	2	●	○															
3					SS	5	500	7	●	○															
4					SS	6	450	24		○	●														
5					SS	7	500	28		○	●														
6					SS	8	500	21		○	●														
6	100.5				End of Borehole																				
7																									
8																									
9																									
10																									

▽ Inferred Groundwater Level
 ▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa
 □ Remoulded Vane Test, kPa App'd _____
 ▲ Pocket Penetrometer Test, kPa Date _____

STN13-STAN-GEO 163301694 - NRC UPLANDS.GPJ SMART.GDT 7/15/14

CLIENT National Research Council BOREHOLE No. BH14-2
 LOCATION NRC Uplands PROJECT No. 163301694
 DATES: BORING May 13, 2014 WATER LEVEL _____ DATUM Geodetic

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	WATER LEVEL	SAMPLES				UNDRAINED SHEAR STRENGTH - kPa																	
					TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR ROD	WATER CONTENT & ATTERBERG LIMITS W_p W W_L DYNAMIC PENETRATION TEST, BLOWS/0.3m ★ STANDARD PENETRATION TEST, BLOWS/0.3m ●																	
0	106.79	FILL: brown silty sand (SM)		▽	SS	1	450	19	○	●																
1	105.3	Very loose to very dense brown silty SAND with gravel (SM)		▽	SS	2	350	14	○	●																
2				▽	SS	3	350	6	●	○																
3		- gravel seam at 3.3 m		▽	SS	4	350	5	●																	
4		- very dense below 5.2 m		▽	SS	5	300	13	○	●																
5				▽	SS	6	300	15	○	●																
6	100.7			▽	SS	7	300	15	○	●																
7				▽	SS	8	350	68	○	●																
8		End of Borehole																								
9																										
10																										

▽ Inferred Groundwater Level
 ▼ Groundwater Level Measured in Standpipe

■ Field Vane Test, kPa
 □ Remoulded Vane Test, kPa App'd _____
 ▲ Pocket Penetrometer Test, kPa Date _____

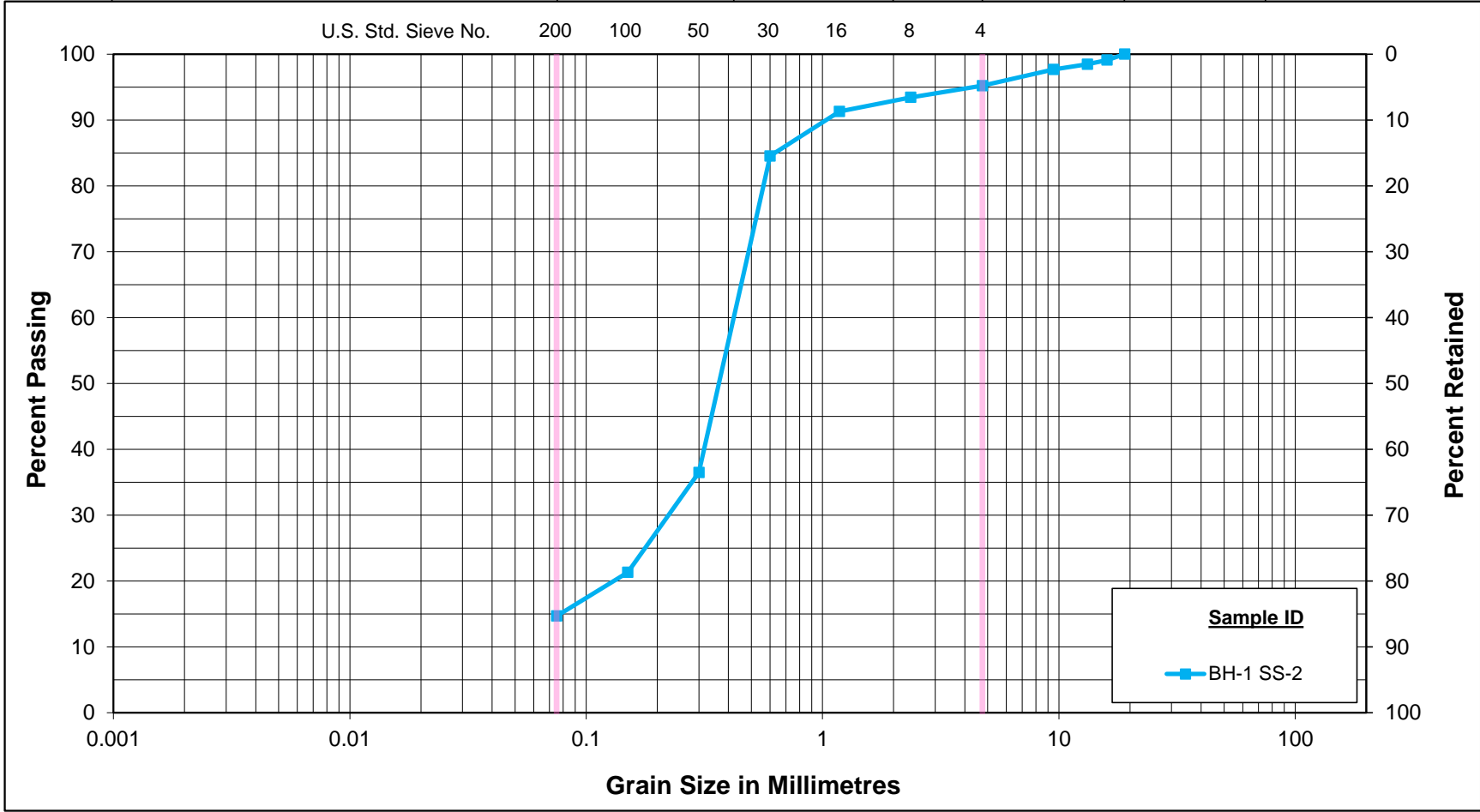
STN13-STAN-GEO 163301694 - NRC UPLANDS.GPJ SMART.GDT 7/15/14

APPENDIX D

Laboratory Test Results

Unified Soil Classification System

	SAND			Gravel	
CLAY & SILT	Fine	Medium	Coarse	Fine	Coarse



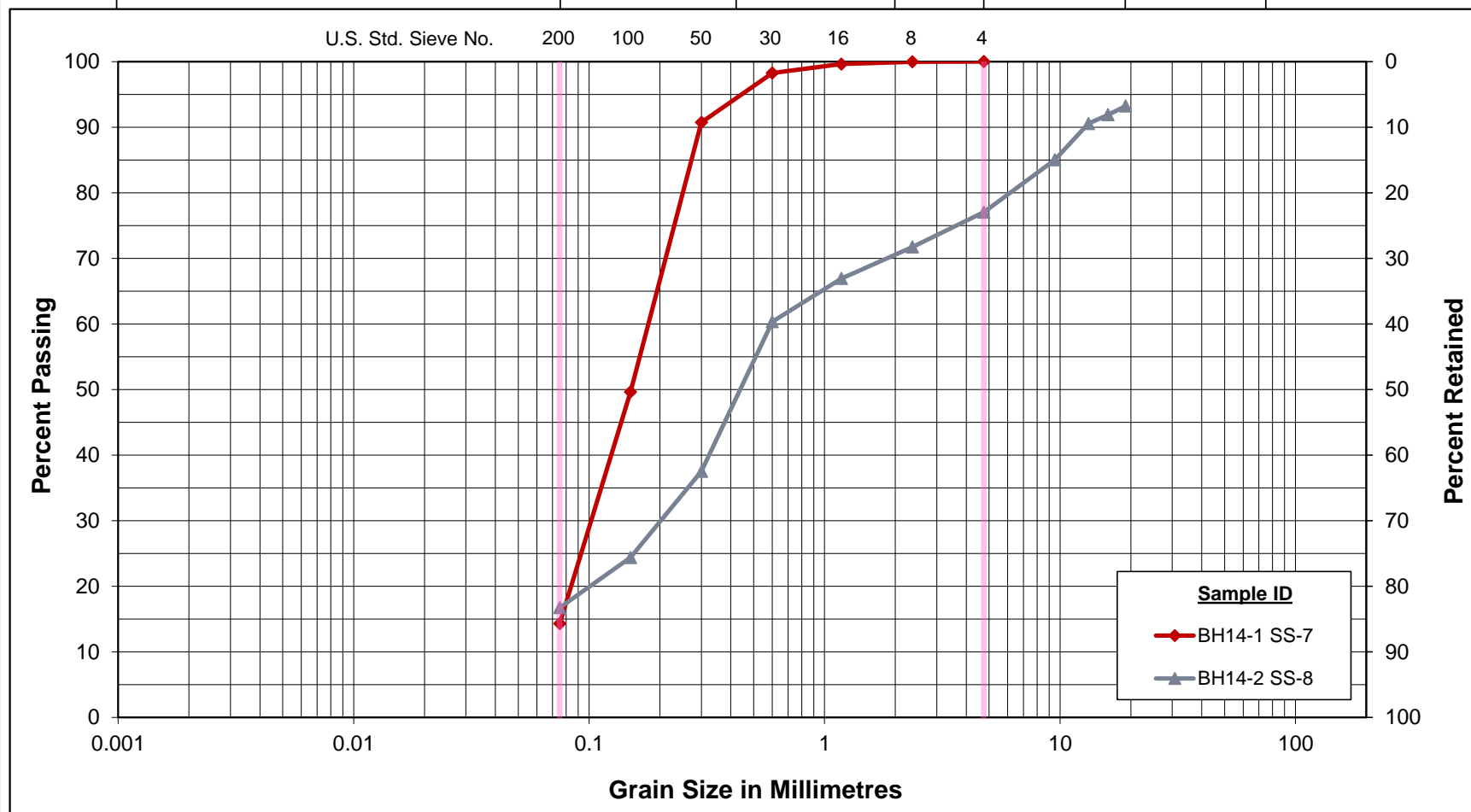
GRAIN SIZE DISTRIBUTION
FILL: Silty Sand with Gravel

Figure No. 1

Project No. 163301694

Unified Soil Classification System

	SAND			Gravel	
CLAY & SILT	Fine	Medium	Coarse	Fine	Coarse



GRAIN SIZE DISTRIBUTION
Silty SAND to Silty SAND with Gravel (SM)

Figure No. 2

Project No. 163301694

APPENDIX E

NBC Seismic Hazard Calculation

2010 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Requested by: ,

July 14, 2014

Site Coordinates: 45.3288 North 75.6641 West

User File Reference:

National Building Code ground motions:

2% probability of exceedance in 50 years (0.000404 per annum)

Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)	PGA (g)
0.633	0.306	0.137	0.046	0.323

Notes. Spectral and peak hazard values are determined for firm ground (NBCC 2010 soil class C - average shear wave velocity 360-750 m/s). Median (50th percentile) values are given in units of g. 5% damped spectral acceleration (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are tabulated. Only 2 significant figures are to be used. **These values have been interpolated from a 10 km spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the calculated values.**

Ground motions for other probabilities:

Probability of exceedance per annum	0.010	0.0021	0.001
Probability of exceedance in 50 years	40%	10%	5%
Sa(0.2)	0.088	0.247	0.384
Sa(0.5)	0.043	0.121	0.185
Sa(1.0)	0.017	0.055	0.087
Sa(2.0)	0.006	0.018	0.028
PGA	0.038	0.121	0.200

References

National Building Code of Canada 2010 NRCC no. 53301; sections 4.1.8, 9.20.1.2, 9.23.10.2, 9.31.6.2, and 6.2.1.3

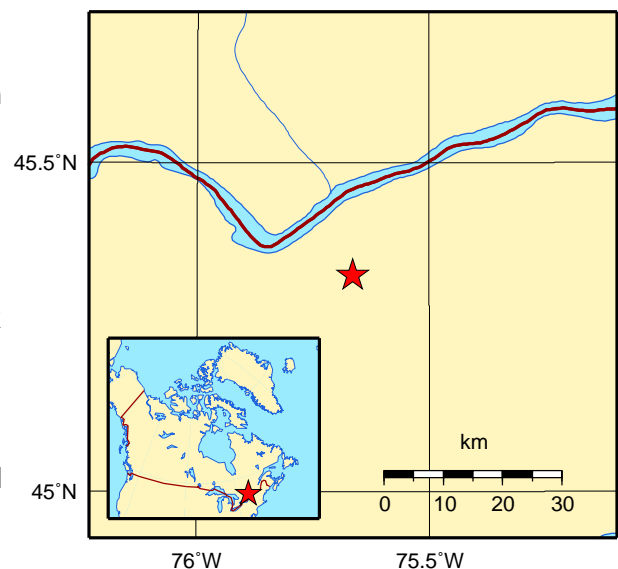
Appendix C: Climatic Information for Building Design in Canada - table in Appendix C starting on page C-11 of Division B, volume 2

User's Guide - NBC 2010, Structural Commentaries NRCC no. 53543 (in preparation)
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File xxxx
Fourth generation seismic hazard maps of Canada: Maps and grid values to be used with the 2010 National Building Code of Canada (in preparation)

See the websites www.EarthquakesCanada.ca and www.nationalcodes.ca for more information

Aussi disponible en français





TP1 Amount Payable – General

1.1 Subject to any other provisions of the contract, Her Majesty shall pay the Contractor, at the times and in the manner hereinafter set out, the amount by which

1.1.1 the aggregate of the amounts described in TP2 exceeds

1.1.2 the aggregate of the amounts described in TP3

and the Contractor shall accept that amount as payment in full satisfaction for everything furnished and done by him in respect of the work to which the payment relates.

TP2 Amounts Payable to the Contractor

2.1 The amounts referred to in TP1.1.1 are the aggregate of

2.1.1 the amounts referred to in the Articles of Agreement, and

2.1.2 the amounts, if any, that are payable to the Contractor pursuant to the General Conditions.

TP3 Amounts Payable to Her Majesty

3.1 The amounts referred to in TP1.1.2 are the aggregate of the amounts, in any, that the Contractor is liable to pay Her Majesty pursuant to the contract.

3.2 When making any payments to the Contractor, the failure of Her Majesty to deduct an amount referred to in TP3.1 from an amount referred to in TP2 shall not constitute a waiver of the right to do so, or an admission of lack of entitlement to do so in any subsequent payment to the Contractor.

TP4 Time of Payment

4.1 In these Terms of Payment

4.1.1 The “payment period” means a period of 30 consecutive days or such other longer period as is agreed between the Contractor and the Departmental Representative.

4.1.2 An amount is “due and payable” when it is due and payable by Her Majesty to the Contractor according to TP4.4, TP4.7 or TP4.10.

4.1.3 An amount is overdue when it is unpaid on the first day following the day upon which it is due and payable.

4.1.4 The “date of payment” means the date of the negotiable instrument of an amount due and payable by the Receiver General for Canada and given for payment.

4.1.5 The “Bank Rate” means the discount rate of interest set by the Bank of Canada in effect at the opening of business on the date of payment.



- 4.2 The Contractor shall, on the expiration of a payment period, deliver to the Departmental Representative in respect of that payment period a written progress claim that fully describes any part of the work that has been completed, and any material that was delivered to the work site but not incorporated into the work during that payment period.
- 4.3 The Departmental Representative shall, not later than ten days after receipt by him of a progress claim referred to in TP4.2,
- 4.3.1 inspect the part of the work and the material described in the progress claim; and
- 4.3.2 issue a progress report, a copy of which the Departmental Representative will give to the Contractor, that indicates the value of the part of the work and the material described in the progress claim that, in the opinion of the Departmental Representative,
- 4.3.2.1 is in accordance with the contract, and
- 4.3.2.2 was not included in any other progress report relating to the contract.
- 4.4 Subject to TP1 and TP4.5 Her Majesty shall, not later than 30 days after receipt by the Departmental Representative of a progress claim referred to in TP4.2, pay the Contractor
- 4.4.1 an amount that is equal to 95% of the value that is indicated in the progress report referred to in TP4.3.2 if a labour and material payment bond has been furnished by the Contractor, or
- 4.4.2 an amount that is equal to 90% of the value that is indicated in the progress report referred to in TP4.3.2 if a labour and material payment bond has not been furnished by the Contractor.
- 4.5 It is a condition precedent to Her Majesty's obligation under TP4.4 that the Contractor has made and delivered to the Departmental Representative,
- 4.5.1 a statutory declaration described in TP4.6 in respect of a progress claim referred to in TP4.2,
- 4.5.2 in the case of the Contractor's first progress claim, a construction schedule in accordance with the relevant sections of the Specifications, and
- 4.5.3 if the requirement for a schedule is specified, an update of the said schedule at the times identified in the relevant sections of the Specifications.
- 4.6 A statutory declaration referred to in TP4.5 shall contain a deposition by the Contractor that
- 4.6.1 up to the date of the Contractor's progress claim, the Contractor has complied with all his lawful obligations with respect to the Labour Conditions; and
- 4.6.2 up to the date of the Contractor's immediately preceding progress claim, all lawful obligations of the Contractor to subcontractors and suppliers of material in respect of the



work under the contract have been fully discharged.

- 4.7 Subject to TP1 and TP4.8, Her Majesty shall, not later than 30 days after the date of issue of an Interim Certificate of Completion referred to in GC44.2, pay the Contractor the amount referred to in TP1 less the aggregate of
- 4.7.1 the sum of all payments that were made pursuant to TP4.4;
 - 4.7.2 an amount that is equal to the Departmental Representative's estimate of the cost to Her Majesty or rectifying defects described in the Interim Certificate of Completion; and
 - 4.7.3 an amount that is equal to the Departmental Representative's estimate of the cost to Her Majesty of completing the parts of the work described in the Interim Certificate of Completion other than the defects referred to in TP4.7.2.
- 4.8 It is a condition precedent to Her Majesty's obligation under TP4.7 that the Contractor has made and delivered to the Departmental Representative,
- 4.8.1 a statutory declaration described in TP4.9 in respect of an Interim Certificate of Completion referred to in GC44.2, and
 - 4.8.2 if so specified in the relevant sections of the Specifications, and update of the construction schedule referred to in TP4.5.2 and the updated schedule shall, in addition to the specified requirements, clearly show a detailed timetable that is acceptable to the Departmental Representative for the completion of any unfinished work and the correction of all defects.
- 4.9 A statutory declaration referred to in TP4.8 shall contain a deposition by the contractor that up to the date of the Interim Certificate of Completion the Contractor has
- 4.9.1 complied with all of the Contractor's lawful obligations with respect to the Labour Conditions;
 - 4.9.2 discharged all of the Contractor's lawful obligations to the subcontractors and suppliers of material in respect of the work under the contract; and
 - 4.9.3 discharged the Contractor's lawful obligations referred to in GC14.6.
- 4.10 Subject to TP1 and TP4.11, Her Majesty shall, not later than 60 days after the date of issue of a Final Certificate of Completion referred to in GC44.1, pay the Contractor the amount referred to in TP1 less the aggregate of
- 4.10.1 the sum of all payments that were made pursuant to TP4.4; and
 - 4.10.2 the sum of all payments that were made pursuant to TP4.7.
- 4.11 It is a condition precedent to Her Majesty's obligation under TP4.10 that the Contractor has made and delivered a statutory declaration described in TP4.12 to the Departmental Representative.



- 4.12 A statutory declaration referred to in TP4.11 shall, in addition to the depositions described in TP4.9, contain a deposition by the Contractor that all of the Contractor's lawful obligations and any lawful claims against the Contractor that arose out of the performance of the contract have been discharged and satisfied.

TP5 Progress Report and Payment Thereunder Not Binding on Her Majesty

- 5.1 Neither a progress report referred to in TP4.3 nor any payment made by Her Majesty pursuant to these Terms of Payment shall be construed as an admission by Her Majesty that the work, material or any part thereof is complete, is satisfactory or is in accordance with the contract.

TP6 Delay in Making Payment

- 6.1 Notwithstanding GC7 any delay by Her Majesty in making any payment when it is due pursuant to these Terms of Payment shall not be a breach of the contract by Her Majesty.
- 6.2 Her Majesty shall pay, without demand from the Contractor, simple interest at the Bank Rate plus 1 -1/4 per centum on any amount which is overdue pursuant to TP4.1.3, and the interest shall apply from and include the day such amount became overdue until the day prior to the date of payment except that
- 6.2.1 interest shall not be payable or paid unless the amount referred to in TP6.2 has been overdue for more than 15 days following
- 6.2.1.1 the date the said amount became due and payable, or
- 6.2.1.2 the receipt by the Departmental Representative of the Statutory Declaration referred to in TP4.5, TP4.8 or TP4.11,
- whichever is the later, and
- 6.6.2 interest shall not be payable or paid on overdue advance payments if any.

TP7 Right of Set-off

- 7.1 Without limiting any right of set-off or deduction given or implied by law or elsewhere in the contract, Her Majesty may set off any amount payable to Her Majesty by the Contractor under this contract or under any current contract against any amount payable to the Contractor under this contract.
- 7.2 For the purposes of TP7.1, "current contract" means a contract between Her Majesty and the Contractor
- 7.2.1 under which the Contractor has an undischarged obligation to perform or supply work, labour or material, or
- 7.2.2 in respect of which Her Majesty has, since the date of which the Articles of Agreement were made, exercised any right to take the work that is the subject of the contract out of the Contractor's hands.



TP8 Payment in Event of Termination

- 8.1 If the contract is terminated pursuant to GC41, Her Majesty shall pay the Contractor any amount that is lawfully due and payable to the Contractor as soon as is practicable under the circumstances.

TP9 Interest on Settled Claims

- 9.1 Her Majesty shall pay to the Contractor simple interest on the amount of a settled claim at an average Bank Rate plus 1 ¼ per centum from the date the settled claim was outstanding until the day prior to the date of payment.
- 9.2 For the purposes of TP9.1,
- 9.2.1 a claim is deemed to have been settled when an agreement in writing is signed by the Departmental Representative and the Contractor setting out the amount of the claim to be paid by Her Majesty and the items or work for which the said amount is to be paid.
- 9.2.2 an "average Bank Rate" means the discount rate of interest set by the Bank of Canada in effect at the end of each calendar month averaged over the period the settled claim was outstanding.
- 9.2.3 a settled claim is deemed to be outstanding from the day immediately following the date the said claim would have been due and payable under the contract had it not been disputed.
- 9.3 For the purposes of TP9 a claim means a disputed amount subject to negotiation between Her Majesty and the Contractor under the contract.



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GC1 Interpretation

1.1 In the contract

- 1.1.1 where reference is made to a part of the contract by means of numbers preceded by letters, the reference shall be construed to be a reference to the particular part of the contract that is identified by that combination of letters and numbers and to any other part of the contract referred to therein;
- 1.1.2 “contract” means the contract document referred to in the Articles of Agreement;
- 1.1.3 “contract security” means any security given by the Contractor to Her Majesty in accordance with the contract;
- 1.1.4 “Departmental Representative” means the officer or employee of Her Majesty who is designated pursuant to the Articles of Agreement and includes a person specially authorized by him to perform, on his behalf, any of his functions under the contract and is so designated in writing to the Contractor;
- 1.1.5 “material” includes all commodities, articles and things required to be furnished by or for the Contractor under the contract for incorporation into the work;
- 1.1.6 “Minister” includes a person acting for, or if the office is vacant, in place of the Minister and his successors in the office, and his or their lawful deputy and any of his or their representatives appointed for the purposes of the contract;
- 1.1.7 “person” includes, unless the context otherwise requires, a partnership, proprietorship, firm, joint venture, consortium and a corporation;
- 1.1.8 “plant” includes all animals, tools, implements, machinery, vehicles, buildings, structures, equipment and commodities, articles and things other than material, that are necessary for the due performance of the contract;
- 1.1.9 “subcontractor” means a person to whom the Contractor has, subject to GC4, subcontracted the whole or any part of the work;
- 1.1.10 “superintendent” means the employee of the Contractor who is designated by the Contractor to act pursuant to GC19;
- 1.1.11 “work includes, subject only to any express stipulation in the contract to the contrary, everything that is necessary to be done, furnished or delivered by the Contractor to perform the contract.

1.2 The headings in the contract documents, other than in the Plans and Specifications, form no part of the contract but are inserted for convenience of reference only.

1.3 In interpreting the contract, in the event of discrepancies or conflicts between anything in the Plans and Specifications and the General Conditions, the General Conditions govern.



- 1.4 In interpreting the Plans and Specifications, in the event of discrepancies or conflicts between
- 1.4.1 the Plans and Specifications, the Specifications govern;
 - 1.4.2 the Plans, the Plans drawn with the largest scale govern; and
 - 1.4.3 figured dimensions and scaled dimensions, the figured dimensions govern.

GC2 Successors and Assigns

- 2.1 The contract shall inure to the benefit of and be binding upon the parties hereto and their lawful heirs, executors, administrators, successors and assigns.

GC3 Assignment of Contract

- 3.1 The contract may not be assigned by the Contractor, either in whole or in part, without the written consent of the Minister.

GC4 Subcontracting by Contractor

- 4.1 Subject to this General Condition, the Contractor may subcontract any part of the work.
- 4.2 The Contractor shall notify the Departmental Representative in writing of his intention to subcontract.
- 4.3 A notification referred to in GC4.2 shall identify the part of the work, and the subcontractor with whom it is intended to subcontract.
- 4.4 The Departmental Representative may object to the intended subcontracting by notifying the Contractor in writing within six days of receipt by the Departmental Representative of a notification referred to in GC4.2.
- 4.5 If the Departmental Representative objects to a subcontracting pursuant to GC4.4, the Contractor shall not enter into the intended subcontract.
- 4.6 The contractor shall not, without the written consent of the Departmental Representative, change a subcontractor who has been engaged by him in accordance with this General Condition.
- 4.7 Every subcontract entered into by the Contractor shall adopt all of the terms and conditions of this contract that are of general application.
- 4.8 Neither a subcontracting nor the Departmental Representative's consent to a subcontracting by the Contractor shall be construed to relieve the Contractor from any obligation under the contract or to impose any liability upon Her Majesty.

GC5 Amendments



- 5.1 No amendment or change in any of the provisions of the contract shall have any force or effect until it is reduced to writing.

GC6 No Implied Obligations

- 6.1 No implied terms or obligations of any kind by or on behalf of Her Majesty shall arise from anything in the contract and the express covenants and agreements therein contained and made by Her Majesty are the only covenants and agreements upon which any rights against Her Majesty are to be founded.
- 6.2 The contract supersedes all communications, negotiations and agreements, either written or oral, relating to the work that were made prior to the date of the contract.

GC7 Time of Essence

- 7.1 Time is of the essence of the contract.

GC8 Indemnification by Contractor

- 8.1 The Contractor shall indemnify and save Her Majesty harmless from and against all claims, demand, losses, costs, damages, actions, suits, or proceedings by whomever made, brought or prosecuted and in any manner based upon, arising out of, related to, occasioned by or attributable to the activities of the Contractor, his servants, agents, subcontractors and sub-subcontractors in performing the work including an infringement or an alleged infringement of a patent of invention or any other kind of intellectual property.
- 8.2 For the purpose of GC8.1, "activities" includes any act improperly carried out, any omission to carry out an act and any delay in carrying out an act.

GC9 Indemnification by Her Majesty

- 9.1 Her Majesty shall, subject to the Crown Liability Act, the Patent Act, and any other law that affects Her Majesty's rights, powers, privileges or obligations, indemnify and save the Contractor harmless from and against all claims, demands, losses, costs, damage, actions, suits or proceedings arising out of his activities under the contract that are directly attributable to
- 9.1.1 lack of or a defect in Her Majesty's title to the work site whether real or alleged; or
- 9.1.2 an infringement or an alleged infringement by the Contractor of any patent of invention or any other kind of intellectual property occurring while the Contractor was performing any act for the purposes of the contract employing a model, plan or design or any other thing related to the work that was supplied by Her Majesty to the Contractor.

GC10 Members of House of Commons Not to Benefit



- 10.1 As required by the Parliament of Canada Act, it is an express condition of the contract that no member of the House of Commons shall be admitted to any share of part of the contract or to any benefit arising therefrom.

GC11 Notices

- 11.1 Any notice, consent, order, decision, direction or other communication, other than a notice referred to in GC11.4, that may be given to the Contractor pursuant to the contract may be given in any manner.
- 11.2 Any notice, consent, order, decision, direction or other communication required to be given in writing, to any party pursuant to the contract shall, subject to GC11.4, be deemed to have been effectively given
- 11.2.1 to the Contractor, if delivered personally to the Contractor or the Contractor's superintendent, or forwarded by mail, telex or facsimile to the Contractor at the address set out in A4.1, or
- 11.2.2 to Her Majesty, if delivered personally to the Departmental Representative, or forwarded by mail, telex or facsimile to the Departmental Representative at the address set out in A1.2.1.
- 11.3 Any such notice, consent, order, decision, direction or other communication given in accordance with GC11.2 shall be deemed to have been received by either party
- 11.3.1 if delivered personally, on the day that it was delivered,
- 11.3.2 if forwarded by mail, on the earlier of the day it was received and the sixth day after it was mailed, and
- 11.3.3 if forwarded by telex or facsimile, 24 hours after it was transmitted.
- 11.4 A notice given under GC38.1.1, GC40 and GC41, if delivered personally, shall be delivered to the Contractor if the Contractor is doing business as sole proprietor or, if the Contractor is a partnership or corporation, to an officer thereof.

GC12 Material, Plant and Real Property Supplied by Her Majesty

- 12.1 Subject to GC12.2, the Contractor is liable to Her Majesty for any loss of or damage to material, plant or real property that is supplied or placed in the care, custody and control of the Contractor by Her Majesty for use in connection with the contract, whether or not that loss or damage is attributable to causes beyond the Contractor's control.
- 12.2 The Contractor is not liable to Her Majesty for any loss or damage to material, plant or real property referred to in GC12.1 if that loss or damage results from and is directly attributable to reasonable wear and tear.
- 12.3 The Contractor shall not use any material, plant or real property referred to in GC12.1 except for



the purpose of performing this contract.

- 12.4 When the Contractor fails to make good any loss or damage for which he is liable under GC12.1 within a reasonable time after being required to do so by the Departmental Representative, the Departmental Representative may cause the loss or damage to be made good at the Contractor's expense, and the Contractor shall thereupon be liable to Her Majesty for the cost thereof and shall, on demand, pay to Her Majesty an amount equal to that cost.
- 12.5 The Contractor shall keep such records of all material, plant and real property referred to in GC12.1 as the Departmental Representative from time to time requires and shall satisfy the Departmental Representative, when requested, that such material, plant and real property are at the place and in the condition which they ought to be.

GC13 Material, Plant and Real Property Become Property of Her Majesty

- 13.1 Subject to GC14.7 all material and plant and the interest of the Contractor in all real property, licenses, powers and privileges purchased, used or consumed by the Contractor for the contract shall, after the time of their purchase, use or consumption be the property of Her Majesty for the purposes of the work and they shall continue to be the property of Her Majesty.
- 13.1.1 in the case of material, until the Departmental Representative indicates that he is satisfied that it will not be required for the work, and
- 13.1.2 in the case of plant, real property, licenses, powers and privileges, until the Departmental Representative indicates that he is satisfied that the interest vested in Her Majesty therein is no longer required for the purposes of the work.
- 13.2 Material or plant that is the property of Her Majesty by virtue of GC13.1 shall not be taken away from the work site or used or disposed of except for the purposes of the work without the written consent of the Departmental Representative.
- 13.3 Her Majesty is not liable for loss of or damage from any cause to the material or plant referred to in GC13.1 and the Contractor is liable for such loss or damage notwithstanding that the material or plant is the property of Her Majesty.

GC14 Permits and Taxes Payable

- 14.1 The Contractor shall, within 30 days after the date of the contract, tender to a municipal authority an amount equal to all fees and charges that would be lawfully payable to that municipal authority in respect of building permits as if the work were being performed for a person other than Her Majesty.
- 14.2 Within 10 days of making a tender pursuant to GC14.1, the Contractor shall notify the Departmental Representative of his action and of the amount tendered and whether or not the municipal authority has accepted that amount.
- 14.3 If the municipal authority does not accept the amount tendered pursuant to GC14.1 the Contractor shall pay that amount to Her Majesty within 6 days after the time stipulated in GC14.2.



- 14.4 For the purposes of GC14.1 to GC14.3 “municipal authority” means any authority that would have jurisdiction respecting permission to perform the work if the owner were not Her Majesty.
- 14.5 Notwithstanding the residency of the Contractor, the Contractor shall pay any applicable tax arising from or related to the performance of the work under the contract.
- 14.6 In accordance with the Statutory Declaration referred to in TP4.9, a Contractor who has neither residence nor place of business in the province in which work under the contract is being performed shall provide Her Majesty with proof of registration with the provincial sales tax authorities in the said province.
- 14.7 For the purpose of the payment of any applicable tax or the furnishing of security for the payment of any applicable tax arising from or related to the performance of the work under the contract, the Contractor shall, notwithstanding the fact that all material, plant and interest of the Contractor in all real property, licenses, powers and privileges, have become the property of Her Majesty after the time of purchase, be liable, as a user or consumer, for the payment or for the furnishing of security for the payment of any applicable tax payable, at the time of the use or consumption of that material, plant or interest of the Contractor in accordance with the relevant legislation.

GC15 Performance of Work under Direction of Departmental Representative

- 15.1 The Contractor shall
- 15.1.1 permit the Departmental Representative to have access to the work and its site at all times during the performance of the contract;
 - 15.1.2 furnish the Departmental Representative with such information respecting the performance of the contract as he may require; and
 - 15.1.3 give the Departmental Representative every possible assistance to enable the Departmental Representative to carry out his duty to see that the work is performed in accordance with the contract and to carry out any other duties and exercise any powers specially imposed or conferred on the Departmental Representative under the contract.

CG16 Cooperation with Other Contractors

- 16.1 Where, in the opinion of the Departmental Representative, it is necessary that other contractors or workers with or without plant and material, be sent onto the work or its site, the Contractor shall, to the satisfaction of the Departmental Representative, allow them access and cooperate with them in the carrying out of their duties and obligation.
- 16.2 If
- 16.2.1 the sending onto the work or its site of other contractors or workers pursuant to GC16.1 could not have been reasonably foreseen or anticipated by the Contractor when entering into the contract, and



16.2.2 the Contractor incurs, in the opinion of the Departmental Representative, extra expense in complying with GC16.1, and

16.2.3 The Contractor has given the Departmental Representative written notice of his claim for the extra expense referred to in GC16.2.2 within 30 days of the date that the other contractors or workers were sent onto the work or its site,

Her Majesty shall pay the Contractor the cost, calculated in accordance with GC48 to GC50, of the extra labour, plant and material that was necessarily incurred.

GC17 Examination of Work

17.1 If, at any time after the commencement of the work but prior to the expiry of the warranty or guarantee period, the Departmental Representative has reason to believe that the work or any part thereof has not been performed in accordance with the contract, the Departmental Representative may have that work examined by an expert of his choice.

17.2 If, as a result of an examination of the work referred to in GC17.1, it is established that the work was not performed in accordance with the contract, then, in addition to and without limiting or otherwise affecting any of Her Majesty's rights and remedies under the contract either at law or in equity, the Contractor shall pay Her Majesty, on demand, all reasonable costs and expenses that were incurred by Her Majesty in having that examination performed.

GC18 Clearing of Site

18.1 The Contractor shall maintain the work and its site in a tidy condition and free from the accumulation of waste material and debris, in accordance with any directions of the Departmental Representative.

18.2 Before the issue of an interim certificate referred to in GC44.2, the Contractor shall remove all the plant and material not required for the performance of the remaining work, and all waste material and other debris, and shall cause the work and its site to be clean and suitable for occupancy by Her Majesty's servants, unless otherwise stipulated in the contract.

18.3 Before the issue of a final certificate referred to in GC44.1, the Contractor, shall remove from the work and its site all of the surplus plant and material and any waste material and other debris.

18.4 The Contractor's obligations described in GC18.1 to GC18.3 do not extend to waste material and other debris caused by Her Majesty's servants or contractors and workers referred to in GC16.1.

GC19 Contractor's Superintendent

19.1 The Contractor shall, forthwith upon the award of the contract, designate a superintendent.

19.2 The Contractor shall forthwith notify the Departmental Representative of the name, address and telephone number of a superintendent designate pursuant to GC19.1.



- 19.3 A superintendent designated pursuant to GC19.1 shall be in full charge of the operations of the Contractor in the performance of the work and is authorized to accept any notice, consent, order, direction, decision or other communication on behalf of the Contractor that may be given to the superintendent under the contract.
- 19.4 The Contractor shall, until the work has been completed, keep a competent superintendent at the work site during working hours.
- 19.5 The Contractor shall, upon the request of the Departmental Representative, remove any superintendent who, in the opinion of the Departmental Representative, is incompetent or has been conducting himself improperly and shall forthwith designate another superintendent who is acceptable to the Departmental Representative.
- 19.6 Subject to GC19.5, the Contractor shall not substitute a superintendent without the written consent of the Departmental Representative.
- 19.7 A breach by the Contractor of GC19.6 entitles the Departmental Representative to refuse to issue any certificate referred to in GC44 until the superintendent has returned to the work site or another superintendent who is acceptable to the Departmental Representative has been substituted.

GC20 National Security

- 20.1 If the Minister is of the opinion that the work is of a class or kind that involves the national security, he may order the Contractor
- 20.1.1 to provide him with any information concerning persons employed or to be employed by him for purposes of the contract; and
 - 20.1.2 to remove any person from the work and its site if, in the opinion of the Minister, that person may be a risk to the national security.
- 20.2 The Contractor shall, in all contracts with persons who are to be employed in the performance of the contract, make provision for his performance of any obligation that may be imposed upon him under GC19 to GC21.
- 20.3 The Contractor shall comply with an order of the Minister under GC20.1

GC21 Unsuitable Workers

- 21.1 The Contractor shall, upon the request of the Departmental Representative, remove any person employed by him for purposes of the contract who, in the opinion of the Departmental Representative, is incompetent or has conducted himself improperly, and the Contractor shall not permit a person who has been removed to return to the work site.

GC22 Increased or Decreased Costs



- 22.1 The amount set out in the Articles of Agreement shall not be increased or decreased by reason of any increase or decrease in the cost of the work that is brought about by an increase or decrease in the cost of labour, plant or material or any wage adjustment arising pursuant to the Labour Conditions.
- 22.2 Notwithstanding GC22.1 and GC35, an amount set out in the Articles of Agreement shall be adjusted in the manner provided in GC22.3, if any change in a tax imposed under the Excise Act, the Excise Tax Act, the Old Age Security Act, the Customs Act, the Customs Tariff or any provincial sales tax legislation imposing a retail sales tax on the purchase of tangible personal property incorporated into Real Property
- 22.2.1 occurs after the date of the submission by the Contractor of his tender for the contract,
- 22.2.2 applies to material, and
- 22.2.3 affects the cost to the Contractor of that material.
- 22.3 If a change referred to in GC22.2 occurs, the appropriate amount set out in the Articles of Agreement shall be increased or decreased by an amount equal to the amount that is established by an examination of the relevant records of the Contractor referred to in GC51 to be the increase or decrease in the cost incurred that is directly attributable to that change.
- 22.4 For the purpose of GC22.2, where a tax is changed after the date of submission of the tender but public notice of the change has been given by the Minister of Finance before that date, the change shall be deemed to have occurred before the date of submission of the tender.

GC23 Canadian Labour and Material

- 23.1 The Contractor shall use Canadian labour and material in the performance of the work to the full extent to which they are procurable, consistent with proper economy and expeditious carrying out of the work.
- 23.2 Subject to GC23.1, the Contractor shall, in the performance of the work, employ labour from the locality where the work is being performed to the extent to which it is available, and shall use the offices of the Canada Employment Centres for the recruitment of workers wherever practicable.
- 23.3 Subject to GC23.1 and GC23.2, the Contractor shall, in the performance of the work, employ a reasonable proportion of persons who have been on active service with the armed forces of Canada and have been honourably discharged therefrom.

GC24 Protection of Work and Documents

- 24.1 The Contractor shall guard or otherwise protect the work and its site, and protect the contract, specifications, plans, drawings, information, material, plant and real property, whether or not they are supplied by Her Majesty to the Contractor, against loss or damage from any cause, and he shall not use, issue, disclose or dispose of them without the written consent of the Minister, except as may be essential for the performance of the work.



- 24.2 If any document or information given or disclosed to the Contractor is assigned a security rating by the person who gave or disclosed it, the Contractor shall take all measures directed by the Departmental Representative to be taken to ensure the maintenance of the degree of security that is ascribed to that rating.
- 24.3 The Contractor shall provide all facilities necessary for the purpose of maintaining security, and shall assist any person authorized by the Minister to inspect or to take security measures in respect of the work and its site.
- 24.4 The Departmental Representative may direct the Contractor to do such things and to perform such additional work as the Departmental Representative considers reasonable and necessary to ensure compliance with or to remedy a breach of GC24.1 to GC24.3.

GC25 Public Ceremonies and Signs

- 25.1 The Contractor shall not permit any public ceremony in connection with the work without the prior consent of the Minister.
- 25.2 The Contractor shall not erect or permit the erection of any sign or advertising on the work or its site without the prior consent of the Departmental Representative.

GC26 Precautions against Damage, Infringement of Rights, Fire, and Other Hazards

- 26.1 The Contractor shall, at his own expense, do whatever is necessary to ensure that
- 26.1.1 no person, property, right, easement or privilege is injured, damaged or infringed by reasons of the Contractor's activities in performing the contract;
 - 26.1.2 pedestrian and other traffic on any public or private road or waterway is not unduly impeded, interrupted or endangered by the performance or existence of the work or plant;
 - 26.1.3 fire hazards in or about the work or its site are eliminated and, subject to any direction that may be given by the Departmental Representative, any fire is promptly extinguished;
 - 26.1.4 the health and safety of all persons employed in the performance of the work is not endangered by the method or means of its performance;
 - 26.1.5 adequate medical services are available to all persons employed on the work or its site at all times during the performance of the work;
 - 26.1.6 adequate sanitation measures are taken in respect of the work and its site; and
 - 26.1.7 all stakes, buoys and marks placed on the work or its site by or under the authority of the Departmental Representative are protected and are not removed, defaced, altered or destroyed.
- 26.2 The Departmental Representative may direct the Contractor to do such things and to perform such additional work as the Departmental Representative considers reasonable and necessary to ensure



compliance with or to remedy a breach of GC26.1.

- 26.3 The Contractor shall, at his own expense, comply with a direction of the Departmental Representative made under GC26.2.

GC27 Insurance

- 27.1 The Contractor shall, at his own expense, obtain and maintain insurance contracts in respect of the work and shall provide evidence thereof to the Departmental Representative in accordance with the requirements of the Insurance Conditions "E".

- 27.2 The insurance contracts referred to in GC27.1 shall

27.2.1 be in a form, of the nature, in the amounts, for the periods and containing the terms and conditions specified in Insurance Conditions "E", and

27.2.2 provide for the payment of claims under such insurance contracts in accordance with GC28.

GC28 Insurance Proceeds

- 28.1 In the case of a claim payable under a Builders Risk/Installation (All Risks) insurance contract maintained by the Contractor pursuant to GC27, the proceeds of the claim shall be paid directly to Her Majesty, and

28.1.1 the monies so paid shall be held by Her Majesty for the purposes of the contract, or

28.1.2 if Her Majesty elects, shall be retained by Her Majesty, in which event they vest in Her Majesty absolutely.

- 28.2 In the case of a claim payable under a General Liability insurance contract maintained by the Contractor pursuant to GC27, the proceeds of the claim shall be paid by the insurer directly to the claimant.

- 28.3 If an election is made pursuant to GC28.1, the Minister may cause an audit to be made of the accounts of the Contractor and of Her Majesty in respect of the part of the work that was lost, damaged or destroyed for the purpose of establishing the difference, if any, between

28.3.1 the aggregate of the amount of the loss or damage suffered or sustained by Her Majesty, including any cost incurred in respect of the clearing and cleaning of the work and its site and any other amount that is payable by the Contractor to Her Majesty under the contract, minus any monies retained pursuant to GC28.12, and

28.3.2 the aggregate of the amounts payable by Her Majesty to the Contractor pursuant to the contract up to the date of the loss or damage.

- 28.4 A difference that is established pursuant to GC28.3 shall be paid forthwith by the party who is determined by the audit to be the debtor to the party who is determined by the audit to be the



creditor.

- 28.5 When payment of a deficiency has been made pursuant to GC28.4, all rights and obligations of Her Majesty and the Contractor under the contract shall, with respect only to the part of the work that was the subject of the audit referred to in GC28.3, be deemed to have been expended and discharged.
- 28.6 If an election is not made pursuant to GC28.1.2 the Contractor shall, subject to GC28.7, clear and clean the work and its site and restore and replace the part of the work that was lost, damaged or destroyed at his own expense as if that part of the work had not yet been performed.
- 28.7 When the Contractor clears and cleans the work and its site and restores and replaces the work referred to in GC 28.6, Her Majesty shall pay him out of the monies referred to in GC28.1 so far as they will thereunto extend.
- 28.8 Subject to GC28.7, payment by Her Majesty pursuant to GC28.7 shall be made in accordance with the contract but the amount of each payment shall be 100% of the amount claimed notwithstanding TP4.4.1 and TP4.4.2.

GC29 Contract Security

- 29.1 The Contractor shall obtain and deliver contract security to the Departmental Representative in accordance with the provisions of the Contract Security Conditions.
- 29.2 If the whole or a part of the contract security referred to in GC29.1 is in the form of a security deposit, it shall be held and disposed of in accordance with GC43 and GC45.
- 29.3 If a part of the contract security referred to in GC29.1 is in the form of a labour and material payment bond, the Contractor shall post a copy of that bond on the work site.

GC30 Changes in the Work

- 30.1 Subject to GC5, the Departmental Representative may, at any time before he issues his Final Certificate of Completion,
- 30.1.1 order work or material in addition to that provided for in the Plans and Specifications;
and
- 30.1.2 delete or change the dimensions, character, quantity, quality, description, location or position of the whole or any part of the work or material provided for in the Plans and Specifications or in any order made pursuant to GC30.1.1,
- if that additional work or material, deletion, or change is, in his opinion, consistent with the general intent of the original contract.
- 30.2 The Contractor shall perform the work in accordance with such orders, deletions and changes that are made by the Departmental Representative pursuant to GC30.1 from time to time as if they had appeared in and been part of the Plans and Specifications.



- 30.3 The Departmental Representative shall determine whether or not anything done or omitted by the Contractor pursuant to an order, deletion or change referred to in GC30.1 increased or decreased the cost of the work to the Contractor.
- 30.4 If the Departmental Representative determines pursuant to GC30.3 that the cost of the work to the Contractor has been increased, Her Majesty shall pay the Contractor the increased cost that the Contractor necessarily incurred for the additional work calculated in accordance with GC49 or GC50.
- 30.5 If the Departmental Representative determines pursuant to GC30.3 that the cost of the work to the Contractor has been decreased, Her Majesty shall reduce the amount payable to the Contractor under the contract by an amount equal to the decrease in the cost caused by the deletion or change referred to in GC30.1.2 and calculated in accordance with GC49.
- 30.6 GC30.3 to GC30.5 are applicable only to a contract or a portion of a contract for which a Fixed Price Arrangement is stipulated in the contract.
- 30.7 An order, deletion or change referred to in GC30.1 shall be in writing, signed by the Departmental Representative and given to the Contractor in accordance with GC11.

GC31 Interpretation of Contract by Departmental Representative

- 31.1 If, at any time before the Departmental Representative has issued a Final Certificate of Completion referred to in GC44.1, any question arises between the parties about whether anything has been done as required by the contract or about what the Contractor is required by the contract to do, and, in particular but without limiting the generality of the foregoing, about
- 31.1.1 the meaning of anything in the Plans and Specification,
 - 31.1.2 the meaning to be given to the Plans and Specifications in case of any error therein, omission therefrom, or obscurity or discrepancy in their working or intention,
 - 31.1.3 whether or not the quality or quantity of any material or workmanship supplied or proposed to be supplied by the Contractor meets the requirements of the contract,
 - 31.1.4 whether or not the labour, plant or material provided by the Contractor for performing the work and carrying out the contract are adequate to ensure that the work will be performed in accordance with the contract and that the contract will be carried out in accordance with its terms,
 - 31.1.5 what quantity of any kind of work has been completed by the Contractor, or
 - 31.1.6 the timing and scheduling of the various phases of the performance of the work,
- the question shall be decided by the Departmental Representative whose decision shall be final and conclusive in respect of the work.
- 31.2 The Contractor shall perform the work in accordance with any decisions of the Departmental



Representative that are made under GC31.1 and in accordance with any consequential directions given by the Departmental Representative.

GC32 Warranty and Rectification of Defects in Work

32.1 Without restricting any warranty or guarantee implied or imposed by law or contained in the contract documents, the Contractor shall, at his own expense,

32.1.1 rectify and make good any defect or fault that appears in the work or comes to the attention of the Minister with respect to those parts of the work accepted in connection with the Interim Certificate of Completion referred to GC44.2 within 12 months from the date of the Interim Certificate of Completion;

32.1.2 rectify and make good any defect or fault that appears in or comes to the attention of the Minister in connection with those parts of the work described in the Interim Certificate of Completion referred to in GC44.2 within 12 months from the date of the Final Certificate of Completion referred to in GC44.1.

32.2 The Departmental Representative may direct the Contractor to rectify and make good any defect or fault referred to in GC32.1 or covered by any other expressed or implied warranty or guarantee.

32.3 A direction referred to in GC32.2 shall be in writing, may include a stipulation in respect of the time within which a defect or fault is required to be rectified and made good by the Contractor, and shall be given to the Contractor in accordance with GC11.

32.4 The Contractor shall rectify and make good any defect or fault described in a direction given pursuant to GC32.2 within the time stipulated therein.

GC33 Non-Compliance by Contractor

33.1 If the Contractor fails to comply with any decision or direction given by the Departmental Representative pursuant to GC18, GC24, GC26, GC31 or GC32, the Departmental Representative may employ such methods as he deems advisable to do that which the Contractor failed to do.

33.2 The Contractor shall, on demand, pay Her Majesty an amount that is equal to the aggregate of all cost, expenses and damage incurred or sustained by Her Majesty by reason of the Contractor's failure to comply with any decision or direction referred to in GC33.1, including the cost of any methods employed by the Departmental Representative pursuant to GC33.1.

GC34 Protesting Departmental Representative's Decisions

34.1 The Contractor may, within ten days after the communication to him of any decision or direction referred to in GC30.3 or GC33.1, protest that decision or direction.

34.2 A protest referred to in GC34.1 shall be in writing, contain full reasons for the protest, be signed



by the Contractor and be given to Her Majesty by delivery to the Departmental Representative.

- 34.3 If the Contractor gives a protest pursuant to GC34.2, any compliance by the Contractor with the decision or direction that was protested shall not be construed as an admission by the Contractor of the correctness of that decision or direction, or prevent the Contractor from taking whatever action he considers appropriate in the circumstances.
- 34.4 The giving of a protest by the Contractor pursuant to GC34.2 shall not relieve him from complying with the decision or direction that is the subject of the protest.
- 34.5 Subject to GC34.6, the Contractor shall take any action referred to in GC34.3 within three months after the date that a Final Certificate of Completion is issued under GC44.1 and not afterwards.
- 34.6 The Contractor shall take any action referred to in GC34.3 resulting from a direction under GC32 within three months after the expiry of a warranty or guarantee period and not afterwards.
- 34.7 Subject to GC34.8, if Her Majesty determines that the Contractor's protest is justified, Her Majesty shall pay the Contractor the cost of the additional labour, plant and material necessarily incurred by the Contractor in carrying out the protested decision or direction.
- 34.8 Costs referred to in GC34.7 shall be calculated in accordance with GC48 to GC50.

GC35 Changes in Soil Conditions and Neglect or Delay by Her Majesty

- 35.1 Subject to GC35.2 no payment, other than a payment that is expressly stipulated in the contract, shall be made by Her Majesty to the Contractor for any extra expense or any loss or damage incurred or sustained by the Contractor.
- 35.2 If the Contractor incurs or sustains any extra expense or any loss or damage that is directly attributable to
- 35.2.1 a substantial difference between the information relating to soil conditions at the work site that is contained in the Plans and Specifications or other documents supplied to the Contractor for his use in preparing his tender or a reasonable assumption of fact based thereon made by the Contractor, and the actual soil conditions encountered by the Contractor at the work site during the performance of the contract, or
- 35.2.2 any neglect or delay that occurs after the date of the contract on the part of Her Majesty in providing any information or in doing any act that the contract either expressly requires Her Majesty to do or that would ordinarily be done by an owner in accordance with the usage of the trade,

he shall, within ten days of the date the actual soil conditions described in GC35.2.1 were encountered or the neglect or delay described in GC35.2.2 occurred, give the Departmental Representative written notice of his intention to claim for that extra expense or that loss or damage.

- 35.3 When the Contractor has given a notice referred to in GC35.2, he shall give the Departmental Representative a written claim for extra expense or loss or damage within 30 days of the date that



a Final Certificate of Completion referred to in GC44.1 is issued and not afterwards.

- 35.4 A written claim referred to in GC35.3 shall contain a sufficient description of the facts and circumstances of the occurrence that is the subject of the claim to enable the Departmental Representative to determine whether or not the claim is justified and the Contractor shall supply such further and other information for that purpose as the Departmental Representative requires from time to time.
- 35.5 If the Departmental Representative determines that a claim referred to in GC35.3 is justified, Her Majesty shall make an extra payment to the Contractor in an amount that is calculated in accordance with GC47 to GC50.
- 35.6 If, in the opinion of the Departmental Representative, an occurrence described in GC35.2.1 results in a savings of expenditure by the Contractor in performing the contract, the amount set out in the Articles of Agreement shall, subject to GC35.7, be reduced by an amount that is equal to the saving.
- 35.7 The amount of the saving referred to in GC35.6 shall be determined in accordance with GC47 to GC49.
- 35.8 If the Contractor fails to give a notice referred to in GC35.2 and a claim referred to in GC35.3 within the times stipulated, an extra payment shall not be made to him in respect of the occurrence.

GC36 Extension of Time

- 36.1 Subject to GC36.2, the Departmental Representative may, on the application of the Contractor made before the day fixed by the Articles of Agreement for completion of the work or before any other date previously fixed under this General Condition, extend the time for its completion by fixing a new date if, in the opinion of the Departmental Representative, causes beyond the control of the Contractor have delayed its completion.
- 36.2 An application referred to in GC36.1 shall be accompanied by the written consent of the bonding company whose bond forms part of the contract security.

GC37 Assessments and Damages for Late Completion

- 37.1 For the purposes of this General Condition
- 37.1.1 the work shall be deemed to be completed on the date that an Interim Certificate of Completion referred to in GC44.2 is issued, and
- 37.1.2 "period of delay" means the number of days commencing on the day fixed by the Articles of Agreement for completion of the work and ending on the day immediately preceding the day on which the work is completed but does not include any day within a period of extension granted pursuant to GC36.1, and any other day on which, in the opinion of the Departmental Representative, completion of the work was delayed for reasons beyond the control of the Contractor.



- 37.2 If the Contractor does not complete the work by the day fixed for its completion by the Articles of Agreement but completes it thereafter, the Contractor shall pay Her Majesty an amount equal to the aggregate of
- 37.2.1 all salaries, wages and travelling expenses incurred by Her Majesty in respect of persons overseeing the performance of the work during the period of delay;
 - 37.2.2 the cost incurred by Her Majesty as a result of the inability to use the completed work for the period of delay; and
 - 37.2.3 all other expenses and damages incurred or sustained by Her Majesty during the period of delay as a result of the work not being completed by the day fixed for its completion.
- 37.3 The Minister may waive the right of Her Majesty to the whole or any part of the amount payable by the Contractor pursuant to GC37.2 I, in the opinion of the Minister, it is in the public interest to do so.

GC38 Taking the Work Out of the Contractor's Hands

- 38.1 The Minister may, at his sole discretion, by giving a notice in writing to the Contractor in accordance with GC11, take all or any part of the work out of the Contractor's hands, and may employ such means as he sees fit to have the work completed if the Contractor
- 38.1.1 Has not, within six days of the Minister or the Departmental Representative giving notice to the Contractor in writing in accordance with GC11, remedied any delay in the commencement or any default in the diligent performance of the work to the satisfaction of the Departmental Representative;
 - 38.1.2 has defaulted in the completion of any part of the work within the time fixed for its completion by the contract;
 - 38.1.3 has become insolvent;
 - 38.1.4 has committed an act of bankruptcy;
 - 38.1.5 has abandoned the work;
 - 38.1.6 has made an assignment of the contract without the consent required by GC3.1; or
 - 38.1.7 has otherwise failed to observe or perform any of the provisions of the contract.
- 38.2 If the whole or any part of the work is taken out of the Contractor's hands pursuant to GC38.1,
- 38.2.1 the Contractor's right to any further payment that is due or accruing due under the contract is, subject only to GC38.4, extinguished, and
 - 38.2.2 the Contractor is liable to pay Her Majesty, upon demand, an amount that is equal to the amount of all loss and damage incurred or sustained by Her Majesty in respect of the



Contractor's failure to complete the work.

- 38.3 If the whole or any part of the work that is taken out of the Contractor's hands pursuant to GC38.1 is completed by Her Majesty, the Departmental Representative shall determine the amount, if any, of the holdback or a progress claim that had accrued and was due prior to the date on which the work was taken out of the Contractor's hands and that is not required for the purposes of having the work performed or of compensating Her Majesty for any other loss or damage incurred or sustained by reason of the Contractor's default.
- 38.4 Her Majesty may pay the Contractor the amount determined not to be required pursuant to GC38.3.

GC39 Effect of Taking the Work Out of the Contractor's Hands

- 39.1 The taking of the work or any part thereof out of the Contractor's hands pursuant to GC38 does not operate so as to relieve or discharge him from any obligation under the contract or imposed upon him by law except the obligation to complete the performance of that part of the work that was taken out of his hands.
- 39.2 If the work or any part thereof is taken out of the Contractor's hands pursuant to GC38, all plant and material and the interest of the Contractor is all real property, licenses, powers and privileges acquired, used or provided by the Contractor under the contract shall continue to be the property of Her Majesty without compensation to the Contractor.
- 39.3 When the Departmental Representative certifies that any plant, material, or any interest of the Contractor referred to in GC39.2 is no longer required for the purposes of the work, or that it is not in the interest of Her Majesty to retain that plant, material or interest, it shall revert to the Contractor.

G40 Suspension of Work by Minister

- 40.1 The Minister may, when in his opinion it is in the public interest to do so, require the Contractor to suspend performance of the work either for a specified or an unspecified period by giving a notice of suspension in writing to the Contractor in accordance with GC11.
- 40.2 When a notice referred to in GC40.1 is received by the Contractor in accordance with GC11, he shall suspend all operations in respect of the work except those that, in the opinion of the Departmental Representative, are necessary for the care and preservation of the work, plant and material.
- 40.3 The Contractor shall not, during a period of suspension, remove any part of the work, plant or material from its site without the consent of the Departmental Representative.
- 40.4 If a period of suspension is 30 days or less, the Contractor shall, upon the expiration of that period, resume the performance of the work and he is entitled to be paid the extra cost, calculated in accordance with GC48 to GC50, of any labour, plant and material necessarily incurred by him as a result of the suspension.



- 40.5 If, upon the expiration of a period of suspension of more than 30 days, the Minister and the Contractor agree that the performance of the work will be continued by the Contractor, the Contractor shall resume performance of the work subject to any terms and conditions agreed upon by the Minister and the Contractor.
- 40.6 If, upon the expiration of a period of suspension of more than 30 days, the Minister and the Contractor do not agree that performance of the work will be continued by the Contractor or upon the terms and conditions under which the Contractor will continue the work, the notice of suspension shall be deemed to be a notice of termination pursuant to GC41.

GC41 Termination of Contract

- 41.1 The Minister may terminate the contract at any time by giving a notice of termination in writing to the Contractor in accordance with GC11.
- 41.2 When a notice referred to in GC41.1 is received by the Contractor in accordance with GC11, he shall, subject to any conditions stipulated in the notice, forthwith cease all operations in performance of the contract.
- 41.3 If the contract is terminated pursuant to GC41.1, Her Majesty shall pay the Contractor, subject to GC41.4, an amount equal to
- 41.3.1 the cost to the contractor of all labour, plant and material supplied by him under the contract up to the date of termination in respect of a contract or part thereof for which a Unit Price Arrangement is stipulated in the contract, or
 - 41.3.2 the lesser of
 - 41.3.2.1 an amount, calculated in accordance with the Terms and Payment, that would have been payable to the Contractor had he completed the work, and
 - 41.3.2.2 an amount that is determined to be due to the Contractor pursuant to GC49 in respect of a contract or part thereof for which a Fixed Price Arrangement is stipulated in the contract
- less the aggregate of all amounts that were paid to the Contractor by Her Majesty and all amounts that are due to Her Majesty from the Contractor pursuant to the contract.
- 41.4 If Her Majesty and the Contractor are unable to agree about an amount referred to in GC41.3 that amount shall be determined by the method referred to in GC50.

GC42 Claims Against and Obligations of the Contractor or Subcontractor

- 42.1 Her Majesty may, in order to discharge lawful obligations of and satisfy claims against the Contractor or a subcontractor arising out of the performance of the contract, pay any amount that is due and payable to the Contractor pursuant to the contract directly to the obligees of and the claimants against the Contractor or the subcontractor but such amount if any, as is paid by Her Majesty, shall not exceed that amount which the Contractor would have been obliged to pay to



such claimant had the provisions of the Provincial or Territorial lien legislation, or, in the Province of Quebec, the law relating to privileges, been applicable to the work. Any such claimant need not comply with the provisions of such legislation setting out the steps by way of notice, registration or otherwise as might have been necessary to preserve or perfect any claim for lien or privilege which claimant might have had;

42.2 Her Majesty will not make any payment as described in GC42.1 unless and until that claimant shall have delivered to Her Majesty:

42.2.1 a binding and enforceable Judgment or Order of a court of competent jurisdiction setting forth such amount as would have been payable by the Contractor to the claimant pursuant to the provisions of the applicable Provincial or Territorial lien legislation, or, in the Province of Quebec, the law relating to privileges, had such legislation been applicable to the work; or

42.2.2 a final and enforceable award of an arbitrator setting forth such amount as would have been payable by the Contractor to the claimant pursuant to the provisions of the applicable Provincial or Territorial lien legislation, or, in the Province of Quebec, the law relating to privileges, had such legislation been applicable to the work; or

42.2.3 the consent of the Contractor authorizing a payment.

For the purposes of determining the entitlement of a claimant pursuant to GC42.2.1 and GC42.2.2, the notice required by GC42.8 shall be deemed to replace the registration or provision of notice after the performance of work as required by any applicable legislation and no claim shall be deemed to have expired, become void or unenforceable by reason of the claimant not commencing any action within the time prescribed by any applicable legislation.

42.3 The Contractor shall, by the execution of his contract, be deemed to have consented to submit to binding arbitration at the request of any claimant those questions that need be answered to establish the entitlement of the claimant to payment pursuant to the provisions of GC42.1 and such arbitration shall have as parties to it any subcontractor to whom the claimant supplied material, performed work or rented equipment should such subcontractor wish to be adjoined and the Crown shall not be a party to such arbitration and, subject to any agreement between the Contractor and the claimant to the contrary, the arbitration shall be conducted in accordance with the Provincial or Territorial legislation governing arbitration applicable in the Province or Territory in which the work is located.

42.4 A payment made pursuant to GC42.1 is, to the extent of the payment, a discharge of Her Majesty's liability to the Contractor under the contract and may be deducted from any amount payable to the Contractor under the contract.

42.5 To the extent that the circumstances of the work being performed for Her Majesty permit, the Contractor shall comply with all laws in force in the Province or Territory where the work is being performed relating to payment period, mandatory holdbacks, and creation and enforcement of mechanics' liens, builders' liens or similar legislation or in the Province of Quebec, the law relating to privileges.

42.6 The Contractor shall discharge all his lawful obligations and shall satisfy all lawful claims against him arising out of the performance of the work at least as often as the contract requires Her



Majesty to pay the Contractor.

- 42.7 The Contractor shall, whenever requested to do so by the Departmental Representative, make a statutory declaration deposing to the existence and condition of any obligations and claims referred to in GC42.6.
- 42.8 GC42.1 shall only apply to claims and obligations
- 42.8.1 the notification of which has been received by the Departmental Representative in writing before payment is made to the Contractor pursuant to TP4.10 and within 120 days of the date on which the claimant
- 42.8.1.1 should have been paid in full under the claimant's contract with the Contractor or subcontractor where the claim is for money that was lawfully required to be held back from the claimant; or
- 42.8.1.2 performed the last of the services, work or labour, or furnished the last of the material pursuant to the claimant's contract with the Contractor or subcontractor where the claim is not for money referred to in GC42.8.1.1, and
- 42.8.2 the proceedings to determine the right to payment of which, pursuant to GC42.2. shall have commenced within one year from the date that the notice referred to in GC42.8.1 was received by the Departmental Representative, and
- the notification required by GC42.8.1 shall set forth the amount claimed to be owing and the person who by contract is primarily liable.
- 42.9 Her Majesty may, upon receipt of a notice of claim under GC42.8.1, withhold from any amount that is due and payable to the Contractor pursuant to the contract the full amount of the claim or any portion thereof.
- 42.10 The Departmental Representative shall notify the Contractor in writing of receipt of any claim referred to in GC42.8.1 and of the intention of Her Majesty to withhold funds pursuant to GC42.9 and the Contractor may, at any time thereafter and until payment is made to the claimant, be entitled to post, with Her Majesty, security in a form acceptable to Her Majesty in an amount equal to the value of the claim, the notice of which is received by the Departmental Representative and upon receipt of such security Her Majesty shall release to the Contractor any funds which would be otherwise payable to the Contractor, that were withheld pursuant to the provisions of GC42.9 in respect of the claim of any claimant for whom the security stands.

GC43 Security Deposit – Forfeiture or Return

- 43.1 If
- 43.1.1 the work is taken out of the Contractor's hands pursuant to GC38,
- 43.1.2 the contract is terminated pursuant to GC41, or
- 43.1.3 the Contractor is in breach of or in default under the contract,



Her Majesty may convert the security deposit, if any, to Her own use.

- 43.2 If Her Majesty converts the contract security pursuant to GC43.1, the amount realized shall be deemed to be an amount due from Her Majesty to the Contractor under the contract.
- 43.3 Any balance of an amount referred to in GC43.2 that remains after payment of all losses, damage and claims of Her Majesty and others shall be paid by Her Majesty to the Contractor if, in the opinion of the Departmental Representative, it is not required for the purposes of the contract.

GC44 Departmental Representative's Certificates

44.1 On the date that

44.1.1 the work has been completed, and

44.1.2 the Contractor has complied with the contract and all orders and directions made pursuant thereto,

both to the satisfaction of the Departmental Representative, the Departmental Representative shall issue a Final Certificate of Completion to the Contractor.

44.2 If the Departmental Representative is satisfied that the work is substantially complete he shall, at any time before he issues a certificate referred to in GC44.1, issue an Interim Certificate of Completion to the Contractor, and

44.2.1 for the purposes of GC44.2 the work will be considered to be substantially complete,

44.2.1.1 when the work under the contract or a substantial part thereof is, in the opinion of the Departmental Representative, ready for use by Her Majesty or is being used for the purpose intended; and

44.2.1.2 when the work remaining to be done under the contract is, in the opinion of the Departmental Representative, capable of completion or correction at accost of not more than

44.2.1.2.1 -3% of the first \$500,000, and

44.2.1.2.2 -2% of the next \$500,000, and

44.2.1.2.3 -1% of the balance

of the value of the contract at the time this cost is calculated.

44.3 For the sole purpose of GC44.2.1.2, where the work or a substantial part thereof is ready for use or is being used for the purposes intended and the remainder of the work or a part thereof cannot be completed by the time specified in A2.1, or as amended pursuant to GC36, for reasons beyond the control of the Contractor or where the Departmental Representative and the Contractor agree not to complete a part of the work within the specified time, the cost of that part of the work



which was either beyond the control of the Contractor to complete or the Departmental Representative and the Contractor have agreed not to complete by the time specified shall be deducted from the value of the contract referred to GC44.2.1.2 and the said cost shall not form part of the cost of the work remaining to be done in determining substantial completion.

44.4 An Interim Certificate of Completion referred to in GC44.2 shall describe the parts of the work not completed to the satisfaction of the Departmental Representative and all things that must be done by the Contractor

44.4.1 before a Final Certificate of Completion referred to in GC44.1 will be issued, and

44.4.2 before the 12-month period referred to in GC32.1.2 shall commence for the said parts and all the said things.

44.5 The Departmental Representative may, in addition to the parts of the work described in an Interim Certificate of Completion referred to in GC44.2, require the Contractor to rectify any other parts of the work not completed to his satisfaction and to do any other things that are necessary for the satisfactory completion of the work.

44.6 If the contract or a part thereof is subject to a Unit Price Arrangement, the Departmental Representative shall measure and record the quantities of labour, plant and material, performed, used and supplied by the Contractor in performing the work and shall, at the request of the Contractor, inform him of those measurements.

44.7 The Contractor shall assist and co-operate with the Departmental Representative in the performance of his duties referred to in GC44.6 and shall be entitled to inspect any record made by the Departmental Representative pursuant to GC44.6.

44.8 After the Departmental Representative has issued a Final Certificate of Completion referred to in GC44.1, he shall, if GC44.6 applies, issue a Final Certificate of Measurement.

44.9 A Final Certificate of Measurement referred to in GC44.8 shall

44.9.1 contain the aggregate of all measurements of quantities referred to in GC44.6, and

44.9.2 be binding upon and conclusive between Her Majesty and the Contractor as to the quantities referred to therein.

GC45 Return of Security Deposit

45.1 After an Interim Certificate of Completion referred to in GC44.2 has been issued, Her Majesty shall, if the Contractor is not in breach of or in default under the contract, return to the Contractor all or any part of the security deposit that, in the opinion of the Departmental Representative, is not required for the purposes of the contract.

45.2 After a Final Certificate of Completion referred to in GC44.1 has been issued, Her Majesty shall return to the Contractor the remainder of any security deposit unless the contract stipulates otherwise.



- 45.3 If the security deposit was paid into the Consolidated Revenue Fund of Canada, Her Majesty shall pay interest thereon to the Contractor at a rate established from time to time pursuant to section 21(2) of the Financial Administration Act.

GC46 Clarification of Terms in GC47 to GC50

- 46.1 For the purposes of GC47 to GC50,
- 46.1.1 "Unit Price Table" means the table set out in the Articles of Agreement, and
- 46.1.2 "plant" does not include tools customarily provided by a tradesman in practicing his trade.

GC47 Additions or Amendments to Unit Price Table

- 47.1 Where a Unit Price Arrangement applies to the contract or a part thereof the Departmental Representative and the Contractor may, by an agreement in writing,
- 47.1.1 add classes of labour or material, and units of measurement, prices per unit and estimated quantities to the Unit Price Table if any labour, plant or material that is to be included in the Final Certificate of Measurement referred to in GC44.8 is not included in any class of labour, plant or material set out in the Unit Price Table; or
- 47.1.2 subject to GC47.2 and GC47.3, amend a price set out in the Unit Price Table for any class of labour, plant or material included therein if the Final Certificate of Measurement referred to in GC44.8 shows or is expected to show that the total quantity of that class of labour, plant or material actually performed, used or supplied by the Contractor in performing the work is
- 47.1.2.1 less than 85% of that estimated total quantity, or
- 47.1.2.2 in excess of 115% of that estimated total quantity.
- 47.2 In no event shall the total cost of an item set out in the Unit Price Table that has been amended pursuant to GC47.1.2.1 exceed the amount that would have been payable to the Contractor had the estimated total quantity actually been performed, used or supplied.
- 47.3 An amendment that is made necessary by GC47.1.2.2 shall apply only to the quantities that are in excess of 115%.
- 47.4 If the Departmental Representative and the Contractor do not agree as contemplated in GC47.1, the Departmental Representative shall determine the class and the unit of measurement of the labour, plant or material and, subject to GC47.2 and GC47.3, the price per unit therefore shall be determined in accordance with GC50.

GC48 Determination of Cost – Unit Price Table



- 48.1 Whenever, for the purposes of the contract, it is necessary to determine the cost of labour, plant or material, it shall be determined by multiplying the quantity of that labour, plant or material expressed in the unit set out in column 3 of the Unit Price Table by the price of that unit set out in column 5 of the Unit Price Table.

GC49 Determination of Cost – Negotiation

- 49.1 If the method described in GC48 cannot be used because the labour, plant or material is of a kind or class that is not set out in the Unit Price Table, the cost of that labour, plant or material for the purposes of the contract shall be the amount agreed upon from time to time by the Contractor and the Departmental Representative.
- 49.2 For the purposes of GC49.1, the Contractor shall submit to the Departmental Representative any necessary cost information requested by the Departmental Representative in respect of the labour, plant and material referred to in GC49.1

GC50 Determination of Cost – Failing Negotiation

- 50.1 If the methods described in GC47, GC48 or GC49 fail for any reason to achieve a determination of the cost of labour, plant and material for the purposes referred to therein, that cost shall be equal to the aggregate of
- 50.1.1 all reasonable and proper amounts actually expended or legally payable by the Contractor in respect of the labour, plant and material that falls within one of the classes of expenditure described in GC50.2 that are directly attributable to the performance of the contract,
 - 50.1.2 an allowance for profit and all other expenditures or costs, including overhead, general administration cost, financing and interest charges, and every other cost, charge and expenses, but not including those referred to in GC50.1.1 or GC50.1.3 or a class referred to in GC50.2, in an amount that is equal to 10% of the sum of the expenses referred to in GC50.1.1, and
 - 50.1.3 interest on the cost determined under GC50.1.1 and GC50.1.2, which interest shall be calculated in accordance with TP9,

provide that the total cost of an item set out in the Unit Price Table that is subject to the provisions of GC47.1.2.1 does not exceed the amount that would have been payable to the Contractor had the estimated total quantity of the said item actually be performed, used or supplied.

- 50.2 For purposes of GC50.1.1 the classes of expenditure that may be taken into account in determining the cost of labour, plant and material are,
- 50.2.1 payments to subcontractors;
 - 50.2.2 wages, salaries and travelling expenses of employees of the Contractor while they are actually and properly engaged on the work, other than wages, salaries, bonuses, living



and travelling expenses of personnel of the Contractor generally employed at the head office or at a general office of the Contractor unless they are engaged at the work site with the approval of the Departmental Representative,

- 50.2.3 assessments payable under any statutory authority relating to workmen's compensation, unemployment insurance, pension plan or holidays with pay;
- 50.2.4 rent that is paid for plant or an amount equivalent of the said rent if the plant is owned by the Contractor that is necessary for and used in the performance of the work, if the rent of the equivalent amount is reasonable and use of that plant has been approved by the Departmental Representative;
- 50.2.5 payments for maintaining and operating plant necessary for and used in the performance of the work, and payments for effecting such repairs thereto as, in the opinion of the Departmental Representative, are necessary to the proper performance of the contract other than payments for any repairs to the plant arising out of defects existing before its allocation to the work;
- 50.2.6 payments for material that is necessary for and incorporated in the work, or that is necessary for and consumed in the performance of the contract;
- 50.2.7 payments for preparation, delivery, handling, erection, installation, inspection protection and removal of the plant and material necessary for and used in the performance of the contract; and
- 50.2.8 any other payments made by the Contractor with the approval of the Departmental Representative that are necessary for the performance of the contract.

GC51 Records to be kept by Contractor

51.1 The Contractor shall

- 51.1.1 maintain full records of his estimated and actual cost of the work together with all tender calls, quotations, contracts, correspondence, invoices, receipts and vouchers relating thereto.
- 51.1.2 make all records and material referred to in GC5.1.1 available to audit and inspection by the Minister and the Deputy Receiver General for Canada or by persons acting on behalf of either of both of them, when requested;
- 51.1.3 allow any of the person referred to in GC51.1.2 to make copies of and to take extracts from any of the records and material referred to in GC51.1.1; and
- 51.1.4 furnish any person referred to in GC51.1.2 with any information he may require from time to time in connection with such records and material.

- 51.2 The records maintained by the Contractor pursuant to GC51.1.1 shall be kept intact by the Contractor until the expiration of two years after the date that a Final Certificate of Completion referred to in GC44.1 was issued or until the expiration of such other period of time as the



Minister may direct.

- 51.3 The Contractor shall cause all subcontractors and all other persons directly or indirectly controlled by or affiliated with the Contractor and all persons directly or indirectly having control of the Contractor to comply with GC51.1 and GC51.2 as if they were the Contractor.

GC52 Conflict of Interest

- 52.1 It is a term of this contract that no former public office holder who is not in compliance with the Conflict of Interest and Post-Employment Code for Public Office Holders shall derive a direct benefit from this contract.

GC53 Contractor Status

- 53.1 The Contractor shall be engaged under the contract as an independent contractor.
- 53.2 The Contractor and any employee of the said Contractor is not engaged by the contract as an employee, servant or agent of Her Majesty.
- 53.3 For the purposes of GC53.1 and GC53.2 the Contractor shall be solely responsible for any and all payments and deductions required to be made by law including those required for Canada or Quebec Pension Plans, Unemployment Insurance, Worker's Compensation or Income Tax.



GENERAL CONDITONS

- IC 1 Proof of Insurance**
- IC 2 Risk Management**
- IC 3 Payment of Deductible**
- IC 4 Insurance Coverage**

GENERAL INSUANCE COVERAGES

- GCI 1 Insured**
- GIC 2 Period of Insurance**
- GIC 3 Proof of Insurance**
- GIC 4 Notification**

COMMERCIAL GENERAL LIABILITY

- CGL 1 Scope of Policy**
- CGL 2 Coverages/Provisions**
- CGL 3 Additional Exposures**
- CGL 4 Insurance Proceeds**
- CGL 5 Deductible**

BUILDER'S RISK – INSTALLATION FLOATER – ALL RISKS

- BR 1 Scope of Policy**
- BR 2 Property Insured**
- BR 3 Insurance Proceeds**
- BR 4 Amount of Insurance**
- BR 5 Deductible**
- BR 6 Subrogation**
- BR 7 Exclusion Qualifications**

INSURER'S CERTIFICATE OF INSURANCE



General Conditions

IC 1 Proof of Insurance (02/12/03)

Within thirty (30) days after acceptance of the Contractor's tender, the Contractor shall, unless otherwise directed in writing by the Contracting Officer, deposit with the Contracting Officer an Insurer's Certificate of Insurance in the form displayed in this document and, if requested by the Contracting Officer, the originals or certified true copies of all contracts of insurance maintained by the Contractor pursuant to the Insurance Coverage Requirements shown hereunder.

IC 2 Risk Management (01/10/94)

The provisions of the Insurance Coverage Requirements contained hereunder are not intended to cover all of the Contractor's obligations under GC8 of the General Conditions "C" of the contract. Any additional risk management measures or additional insurance coverages the Contractor may deem necessary to fulfill its obligations under GC8 shall be at its own discretion and expense.

IC 3 Payment of Deductible (01/10/94)

The payment of monies up to the deductible amount made in satisfaction of a claim shall be borne by the Contractor.

IC 4 Insurance Coverage (02/12/03)

The Contractor has represented that it has in place and effect the appropriate and usual liability insurance coverage as required by these Insurance Conditions and the Contractor has warranted that it shall obtain, in a timely manner and prior to commencement of the Work, the appropriate and usual property insurance coverage as required by these Insurance Conditions and, further, that it shall maintain all required insurance policies in place and effect as required by these Insurance Conditions.



INSURANCE COVERAGE REQUIREMENTS

PART I GENERAL INSURANCE COVERAGES (GIC)

GCI 1 Insured (02/12/03)

Each insurance policy shall insure the Contractor, and shall include, as an Additional Named Insured, Her Majesty the Queen in right of Canada, represented by the National Research Council Canada.

GIC 2 Period of Insurance (02/12/03)

Unless otherwise directed in writing by the Contracting Officer or otherwise stipulated elsewhere in these Insurance Conditions, the policies required hereunder shall be in force and be maintained from the date of the contract award until the day of issue of the Departmental Representative's Final Certificate of Completion.

GIC 3 Proof of Insurance (01/10/94)

Within twenty five (25) days after acceptance of the Contractor's tender, the Insurer shall, unless otherwise directed by the Contractor, deposit with the Contractor an Insurer's Certificate of Insurance in the form displayed in the document and, if requested, the originals or certified true copies of all contracts of insurance maintained by the Contractor pursuant to the requirements of these Insurance Coverages.

GIC 4 Notification (01/10/94)

Each Insurance policy shall contain a provision that (30) days prior written notice shall be given by the Insurer to Her Majesty in the event of any material change in or cancellation of coverage. Any such notice received by the Contractor shall be transmitted forthwith to Her Majesty.

PART II COMMERCIAL GENERAL LIABILITY

CGL 1 Scope of Policy (01/10/94)

The policy shall be written on a form similar to that known and referred to in the insurance industry as IBC 2100 – Commercial General Liability policy (Occurrence form) and shall provide for limit of liability of not less than \$2,000,000 inclusive for Bodily Injury and Property Damage for any one occurrence or series of occurrences arising out of one cause. Legal or defence cost incurred in respect of a claim or claims shall not operate to decrease the limit of liability.

CGL 2 Coverages/Provisions (01/10/94)



The policy shall include but not necessarily be limited to the following coverages/provisions.

- 2.1 Liability arising out of or resulting from the ownership, existence, maintenance or use of premises by the Contractor and operations necessary or incidental to the performance of this contract.
- 2.2 "Broad Form" Property Damage including the loss of use of property.
- 2.3 Removal or weakening of support of any building or land whether such support be natural or otherwise.
- 2.4 Elevator liability (including escalators, hoists and similar devices).
- 2.5 Contractor's Protective Liability
- 2.6 Contractual and Assumed Liabilities un this contact.
- 2.7 Completed Operations Liability – The insurance, including all aspects of this Part II of these Insurance Conditions shall continue for a period of at least one (1) year beyond the date of the Departmental Representative's Final Certificate of Completion for the Completed Operations.
- 2.8 Cross Liability – The Clause shall be written as follows:

Cross Liability – The insurance as is afforded by this policy shall apply in respect to any claim or action brought against any one Insured by any other Insured. The coverage shall apply in the same manner and to the same extent as though a separate policy had been issued to each Insured. The inclusion herein of more than one Insured shall not increase the limit of the Insurer's liability.

- 2.9 Severability of Interests – The Clause shall be written as follows:

Severability of Interests – This policy, subject to the limits of liability stated herein, shall apply separately to each Insured in the same manner and to the same extent as if a separate policy had been issued to each. The inclusion herein of more than one insured shall not increase the limit of the Insurer's liability.

CGL 3 Additional Exposures (02/12/03)

The policy shall either include or be endorsed to include the following exposures of hazards if the Work is subject thereto:

- 3.1 Blasting
- 3.2 Pile driving and calsson work
- 3.3 Underpinning
- 3.4 Risks associated with the activities of the Contractor on an active airport



- 3.5 Radioactive contamination resulting from the use of commercial isotopes
- 3.6 Damage to the portion of an existing building beyond that directly associated with an addition, renovation or installation contract.
- 3.7 Marine risks associated with the contraction of piers, wharves and docks.

**CGL 4 Insurance Proceeds
(01/10/94)**

Insurance Proceeds from this policy are usually payable directly to a Claimant/Third Party.

**CGL 5 Deductible
(02/12/03)**

This policy shall be issued with a deductible amount of not more than \$10,000 per occurrence applying to Property Damage claims only.

**PART III
BUILDER'S RISK – INSTALLATION FLOATER – ALL RISKS**

**BR 1 Scope of Policy
(01/10/94)**

The policy shall be written on an "All Risks" basis granting coverages similar to those provided by the forms known and referred to in the insurance industry as "Builder's Risk Comprehensive Form" or "Installation Floater – All Risks".

**BR 2 Property Insured
(01/10/94)**

The property insured shall include:

- 2.1 The Work and all property, equipment and materials intended to become part of the finished Work at the site of the project while awaiting, during and after installation, erection or construction including testing.
- 2.2 Expenses incurred in the removal from the construction site of debris of the property insured, including demolition of damaged property, de-icing and dewatering, occasioned by loss, destruction or damage to such property and in respect of which insurance is provided by this policy.

**BR 3 Insurance Proceeds
(01/10/94)**

- 3.1 Insurance proceeds from this policy are payable in accordance with GC28 of the General Conditions "C" of the contract.
- 3.2 This policy shall provide that the proceeds thereof are payable to Her Majesty or as the Minister may direct.



- 3.3 The Contractor shall do such things and execute such documents as are necessary to effect payment of the proceeds.

BR 4 Amount of Insurance
(01/10/94)

The amount of insurance shall not be less than the sum of the contract value plus the declared value (if any) set forth in the contract documents of all material and equipment supplied by Her Majesty at the site of the project to be incorporated into and form part of the finished Work.

BR 5 Deductible
(02/12/03)

The Policy shall be issued with a deductible amount of not more than \$10,000.

BR 6 Subrogation
(01/10/94)

The following Clause shall be included in the policy:

"All rights of subrogation or transfer of rights are hereby waived against any corporation, firm, individual or other interest, with respect to which, insurance is provided by this policy".

BR 7 Exclusion Qualifications
(01/10/94)

The policy may be subject to the standard exclusions but the following qualifications shall apply:

- 7.1 Faulty materials, workmanship or design may be excluded only to the extent of the cost of making good thereof and shall not apply to loss or damage resulting therefrom.
- 7.2 Loss or damage caused by contamination by radioactive material may be excluded except for loss or damage resulting from commercial isotopes used for industrial measurements, inspection, quality control radiographic or photographic use.
- 7.3 Use and occupancy of the project or any part of section thereof shall be permitted where such use and occupancy is for the purpose for which the project is intended upon completion.



INSURER'S CERTIFICATE OF INSURANCE

(TO BE COMPLETED BY INSURER (NOT BOKER) AND DELIVERD TO NATIONAL RESEARCH COUNCIL CANADA WITH 30 DAYS FOLLOWING ACCEPTANCE OF TENDER)

CONTRACT

DESCRIPTION OF WORK	CONTRACT NUMBER	AWARD DATE
LOCATION		

INSURER

NAME
ADDRESS

BROKER

NAME
ADDRESS

INSURED

NAME OF CONTRACTOR
ADDRESS

ADDITIONAL INSURED

HER MAJESTY THE QUEEN IN RIGHT OF CANADA AS REPRESENTED BY THE NATIONAL RESEARCH COUNCIL CANADA

THIS DOCUENT CERTIFIES THAT THE FOLLOWING POLICES OF INSURANCE ARE AT PRESENT IN FORCE COVERING ALL OPERATIONS OF THE INSURE IN CONNECTION WITH THE CONTRACT MADE BETWEEN THE NAMED INSURED AND THE NATIONAL RESEARCH COUNCIL CANADA AND IN ACCORDANCE WITH THE INSURANCE CONDITIONS "E"

POLICY					
TYPE	NUMBER	INCEPTION DATE	EXPIRY DATE	LIMITS OF LIABILITY	DEDUCTIBLE
COMMERCIAL GENERAL LIABILITY					
BUILDERS RISK "AL RISKS"					
INSTALLATION FLOATER "ALL RISKS"					

THE INSURER AGREES TO NOTIFY THE NATIONAL RESEARCH COUNCIL CANADA IN WRITING 30 DAYS PRIOR TO ANY MATERIAL CHANGE IN OR CANCELLATION OF ANY POLICY OR COVERAGE SPECIFICALLY RELATED TO THE CONTRACT

NAME OF INSURER'S OFFICER OR AUTHORIZED EMPLOYEE	SIGNATURE	DATE:
		TELEPHONE NUMBER:

ISSUANCE OF THIS CERTIFIATE SHALL NOT LIMIT OR RESTRICT THE RIGHT OF THE NATIONAL RESEARCH COUNCIL CANADA TO REQUEST AT ANY TIME DUPLICATE COPIES OF SAID INSURANCE POLICIES



CS1 Obligation to provide Contract Security

- 1.1 The Contractor shall, at the Contractor's own expense, provide one or more of the forms of contract security prescribed in CS2.
- 1.2 The Contractor shall deliver to the Departmental Representative the contract security referred to in CS1.1 within 14 days after the date that the Contractor receives notice that the Contractor's tender or offer was accepted by Her Majesty.

CS2 Prescribed Types and Amounts of Contract Security

- 2.1 The Contractor shall deliver to the Departmental Representative pursuant to CS1
 - 2.1.1 a performance bond and a labour and material payment bond each in an amount that is equal to not less than 50% of the contract amount referred to in the Articles of Agreement, or
 - 2.1.2 a labour and material payment bond in an amount that is equal to not less than 50% of the contract amount referred to in the Articles of Agreement, and a security deposit in an amount that is equal to
 - 2.1.2.1 not less than 10% of the contract amount referred to in the Articles of Agreement where that amount does not exceed \$250,000, or
 - 2.1.2.2 \$25,000 plus 5% of the part of the contract amount referred to in the Articles of Agreement that exceeds \$250,000, or
 - 2.1.3 a security deposit in an amount prescribed by CS2.12 plus an additional amount that is equal to 10% of the contract amount referred to in the Articles of Agreement.
- 2.2 A performance bond and a labour and material payment bond referred to in CS2.1 shall be in a form and be issued by a bonding or surety company that is approved by Her Majesty.
- 2.3 The amount of a security deposit referred to in CS2.1.2 shall not exceed \$250,000 regardless of the contract amount referred to in the Articles of Agreement.
- 2.4 A security deposit referred to in CS2.1.2 and CS2.1.3 shall be in the form of
 - 2.4.1 a bill of exchange made payable to the Receiver General of Canada and certified by an approved financial institution or drawn by an approved financial institution on itself, or
 - 2.4.2 bonds of or unconditionally guaranteed as to principal and interest by the Government of Canada.
- 2.5 For the purposes of CS2.4
 - 2.5.1 a bill of exchange is an unconditional order in writing signed by the Contractor and addressed to an approved financial institution, requiring the said institution to pay, on demand, at a fixed or determinable future time a sum certain of money to, or to the order



of, the Receiver General for Canada, and

- 2.5.2 If a bill of exchange is certified by a financial institution other than a chartered bank then it must be accompanied by a letter or stamped certification confirming that the financial institution is in at least one of the categories referred to in CS2.5.3
- 2.5.3 an approved financial institution is
 - 2.5.3.1 any corporation or institution that is a member of the Canadian Payments Association,
 - 2.5.3.2 a corporation that accepts deposits that are insured by the Canada Deposit Insurance Corporation or the Régie de l'assurance-dépôts du Québec to the maximum permitted by law,
 - 2.5.3.3 a credit union as defined in paragraph 137(6)(b) of the *Income Tax Act*,
 - 2.5.3.4 a corporation that accepts deposits from the public, if repayment of the deposit is guaranteed by Her Majesty in right of a province, or
 - 2.5.3.5 The Canada Post Corporation.
- 2.5.4 the bonds referred to in CS2.4.2 shall be
 - 2.5.4.1 made payable to bearer, or
 - 2.5.4.2 accompanied by a duly executed instrument of transfer of the bonds to the Receiver General for Canada in the form prescribed by the Domestic Bonds of Canada Regulations, or
 - 2.5.4.3 registered, as to principal or as to principal and interest in the name of the Receiver General for Canada pursuant to the Domestic Bonds of Canada Regulations, and
 - 2.5.4.4 provided on the basis of their market value current at the date of the contract.



Contract Number / Numéro du contrat 778489
Security Classification / Classification de sécurité UNCLASSIFIED

**SECURITY REQUIREMENTS CHECK LIST (SRCL)
LISTE DE VÉRIFICATION DES EXIGENCES RELATIVES À LA SÉCURITÉ (LVERS)**

PART A - CONTRACT INFORMATION / PARTIE A - INFORMATION CONTRACTUELLE

1. Originating Government Department or Organization / Ministère ou organisme gouvernemental d'origine	2. Branch or Directorate / Direction générale ou Direction ASPM/SAGI
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3. a) Subcontract Number / Numéro du contrat de sous-traitance	3. b) Name and Address of Subcontractor / Nom et adresse du sous-traitant
--	---

4. Brief Description of Work / Brève description du travail Construct new 115KV dead-end structure at U88 substation

5. a) Will the supplier require access to Controlled Goods? Le fournisseur aura-t-il accès à des marchandises contrôlées?	<input checked="" type="checkbox"/> No / Non	<input type="checkbox"/> Yes / Oui
--	--	------------------------------------

5. b) Will the supplier require access to unclassified military technical data subject to the provisions of the Technical Data Control Regulations? Le fournisseur aura-t-il accès à des données techniques militaires non classifiées qui sont assujetties aux dispositions du Règlement sur le contrôle des données techniques?	<input checked="" type="checkbox"/> No / Non	<input type="checkbox"/> Yes / Oui
--	--	------------------------------------

6. Indicate the type of access required / Indiquer le type d'accès requis

6. a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets? Le fournisseur ainsi que les employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS? (Specify the level of access using the chart in Question 7. c) (Préciser le niveau d'accès en utilisant le tableau qui se trouve à la question 7. c)	<input checked="" type="checkbox"/> No / Non	<input type="checkbox"/> Yes / Oui
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6. b) Will the supplier and its employees (e.g. cleaners, maintenance personnel) require access to restricted access areas? No access to PROTECTED and/or CLASSIFIED information or assets is permitted. Le fournisseur et ses employés (p. ex. nettoyeurs, personnel d'entretien) auront-ils accès à des zones d'accès restreintes? L'accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS n'est pas autorisé.	<input type="checkbox"/> No / Non	<input checked="" type="checkbox"/> Yes / Oui
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6. c) Is this a commercial courier or delivery requirement with no overnight storage? S'agit-il d'un contrat de messagerie ou de livraison commerciale sans entreposage de nuit?	<input checked="" type="checkbox"/> No / Non	<input type="checkbox"/> Yes / Oui
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7. a) Indicate the type of information that the supplier will be required to access / Indiquer le type d'information auquel le fournisseur devra avoir accès
Canada <input checked="" type="checkbox"/> NATO / OTAN <input type="checkbox"/> Foreign / Étranger <input type="checkbox"/>

7. b) Release restrictions / Restrictions relatives à la diffusion		
No release restrictions / Aucune restriction relative à la diffusion <input checked="" type="checkbox"/>	All NATO countries / Tous les pays de l'OTAN <input type="checkbox"/>	No release restrictions / Aucune restriction relative à la diffusion <input type="checkbox"/>
Not releasable / À ne pas diffuser <input type="checkbox"/>		
Restricted to: / Limité à: <input type="checkbox"/>	Restricted to: / Limité à: <input type="checkbox"/>	Restricted to: / Limité à: <input type="checkbox"/>
Specify country(ies): / Préciser le(s) pays:	Specify country(ies): / Préciser le(s) pays:	Specify country(ies): / Préciser le(s) pays:

7. c) Level of Information / Niveau d'information		
PROTECTED A / PROTÉGÉ A <input type="checkbox"/>	NATO UNCLASSIFIED / NATO NON CLASSIFIÉ <input type="checkbox"/>	PROTECTED A / PROTÉGÉ A <input type="checkbox"/>
PROTECTED B / PROTÉGÉ B <input type="checkbox"/>	NATO RESTRICTED / NATO DIFFUSION RESTREINTE <input type="checkbox"/>	PROTECTED B / PROTÉGÉ B <input type="checkbox"/>
PROTECTED C / PROTÉGÉ C <input type="checkbox"/>	NATO CONFIDENTIAL / NATO CONFIDENTIEL <input type="checkbox"/>	PROTECTED C / PROTÉGÉ C <input type="checkbox"/>
CONFIDENTIAL / CONFIDENTIEL <input type="checkbox"/>	NATO SECRET / NATO SECRET <input type="checkbox"/>	CONFIDENTIAL / CONFIDENTIEL <input type="checkbox"/>
SECRET / SECRET <input type="checkbox"/>	COSMIC TOP SECRET / COSMIC TRÈS SECRET <input type="checkbox"/>	SECRET / SECRET <input type="checkbox"/>
TOP SECRET / TRÈS SECRET <input type="checkbox"/>		TOP SECRET / TRÈS SECRET <input type="checkbox"/>
TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) <input type="checkbox"/>		TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) <input type="checkbox"/>



Contract Number / Numéro du contrat 778489
Security Classification / Classification de sécurité UNCLASSIFIED

PART A (continued) / PARTIE A (suite)

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets?
Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS?
If Yes, Indicate the level of sensitivity:
Dans l'affirmative, indiquer le niveau de sensibilité:

No / Non Yes / Oui

9. Will the supplier require access to extremely sensitive INFOSEC information or assets?
Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate?

No / Non Yes / Oui

Short Title(s) of material / Titre(s) abrégé(s) du matériel :
Document Number / Numéro du document :

PART B - PERSONNEL (SUPPLIER) / PARTIE B - PERSONNEL (FOURNISSEUR)

10. a) Personnel security screening level required / Niveau de contrôle de la sécurité du personnel requis

- | | | | |
|---|---|---|--|
| <input checked="" type="checkbox"/> RELIABILITY STATUS
COTE DE FIABILITÉ | <input type="checkbox"/> CONFIDENTIAL
CONFIDENTIEL | <input type="checkbox"/> SECRET
SECRET | <input type="checkbox"/> TOP SECRET
TRÈS SECRET |
| <input type="checkbox"/> TOP SECRET - SIGINT
TRÈS SECRET - SIGINT | <input type="checkbox"/> NATO CONFIDENTIAL
NATO CONFIDENTIEL | <input type="checkbox"/> NATO SECRET
NATO SECRET | <input type="checkbox"/> COSMIC TOP SECRET
COSMIC TRÈS SECRET |
| <input type="checkbox"/> SITE ACCESS
ACCÈS AUX EMPLACEMENTS | | | |

Special comments:
Commentaires spéciaux :

NOTE: If multiple levels of screening are identified, a Security Classification Guide must be provided.
REMARQUE: Si plusieurs niveaux de contrôle de sécurité sont requis, un guide de classification de la sécurité doit être fourni.

10. b) May unscreened personnel be used for portions of the work?
Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail?
If Yes, will unscreened personnel be escorted?
Dans l'affirmative, le personnel en question sera-t-il escorté?

No / Non Yes / Oui
 No / Non Yes / Oui

PART C - SAFEGUARDS (SUPPLIER) / PARTIE C - MESURES DE PROTECTION (FOURNISSEUR)

INFORMATION / ASSETS / RENSEIGNEMENTS / BIENS

11. a) Will the supplier be required to receive and store PROTECTED and/or CLASSIFIED information or assets on its site or premises?
Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS?

No / Non Yes / Oui

11. b) Will the supplier be required to safeguard COMSEC information or assets?
Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC?

No / Non Yes / Oui

PRODUCTION

11. c) Will the production (manufacture, and/or repair and/or modification) of PROTECTED and/or CLASSIFIED material or equipment occur at the supplier's site or premises?
Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ?

No / Non Yes / Oui

INFORMATION TECHNOLOGY (IT) MEDIA / SUPPORT RELATIF À LA TECHNOLOGIE DE L'INFORMATION (TI)

11. d) Will the supplier be required to use its IT systems to electronically process, produce or store PROTECTED and/or CLASSIFIED information or data?
Le fournisseur sera-t-il tenu d'utiliser ses propres systèmes informatiques pour traiter, produire ou stocker électroniquement des renseignements ou des données PROTÉGÉS et/ou CLASSIFIÉS?

No / Non Yes / Oui

11. e) Will there be an electronic link between the supplier's IT systems and the government department or agency?
Disposera-t-on d'un lien électronique entre le système informatique du fournisseur et celui du ministère ou de l'agence gouvernementale?

No / Non Yes / Oui



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PART C - (continued) / PARTIE C - (suite)

For users completing the form manually use the summary chart below to indicate the category(les) and level(s) of safeguarding required at the supplier's site(s) or premises.

Les utilisateurs qui remplissent le formulaire manuellement doivent utiliser le tableau récapitulatif ci-dessous pour indiquer, pour chaque catégorie, les niveaux de sauvegarde requis aux installations du fournisseur.

For users completing the form online (via the Internet), the summary chart is automatically populated by your responses to previous questions.

Dans le cas des utilisateurs qui remplissent le formulaire en ligne (par Internet), les réponses aux questions précédentes sont automatiquement saisies dans le tableau récapitulatif.

SUMMARY CHART / TABLEAU RÉCAPITULATIF

Category / Catégorie	PROTECTED / PROTÉGÉ			CLASSIFIED / CLASSIFIÉ			NATO				COMSEC					
	A	B	C	CONFIDENTIAL / CONFIDENTIEL	SECRET	TOP SECRET / TRÈS SECRET	NATO RESTRICTED / NATO DIFFUSION RESTREINTE	NATO CONFIDENTIAL / NATO CONFIDENTIEL	NATO SECRET	COSMIC TOP SECRET / COSMIC TRÈS SECRET	PROTECTED / PROTÉGÉ			CONFIDENTIAL / CONFIDENTIEL	SECRET	TOP SECRET / TRÈS SECRET
											A	B	C			
Information / Assets / Renseignements / Biens / Production																
IT Media / Support TI																
IT Link / Lien électronique																

12. a) Is the description of the work contained within this SRCL PROTECTED and/or CLASSIFIED? No Yes
 La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE? Non Oui

If Yes, classify this form by annotating the top and bottom in the area entitled "Security Classification".
 Dans l'affirmative, classifiez le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire.

12. b) Will the documentation attached to this SRCL be PROTECTED and/or CLASSIFIED? No Yes
 La documentation associée à la présente LVERS sera-t-elle PROTÉGÉE et/ou CLASSIFIÉE? Non Oui

If Yes, classify this form by annotating the top and bottom in the area entitled "Security Classification" and indicate with attachments (e.g. SECRET with Attachments).
 Dans l'affirmative, classifiez le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire et indiquez qu'il y a des pièces jointes (p. ex. SECRET avec des pièces jointes).



Government of Canada

Gouvernement du Canada

Contract Number / Numéro du contrat

778489

Security Classification / Classification de sécurité
UNCLASSIFIED

PART D - AUTHORIZATION / PARTIE D - AUTORISATION

13. Organization Project Authority / Chargé de projet de l'organisme

Name (print) - Nom (en lettres moulées) Denis Labelle		Title - Titre Construction Project Manager	Signature 	Date Oct. 20/17
Telephone No. - N° de téléphone 613-993-4923	Facsimile No. - N° de télécopieur 613-957-9828	E-mail address - Adresse courriel denis.labelle@nrc-cnrc.gc.ca		

14. Organization Security Authority / Responsable de la sécurité de l'organisme

Name (print) - Nom (en lettres moulées) Richard Bramucci		Title - Titre Analyst, Security in Contracting	Signature 	Date OCT 20 2017
Telephone No. - N° de téléphone (613) 991-1093	Facsimile No. - N° de télécopieur (613) 990-0946	E-mail address - Adresse courriel richard.bramucci@nrc-cnrc.gc.ca		

15. Are there additional instructions (e.g. Security Guide, Security Classification Guide) attached?
Des instructions supplémentaires (p. ex. Guide de sécurité, Guide de classification de la sécurité) sont-elles jointes?

OCT 20 2017

No / Yes
Non / Oui

16. Procurement Officer / Agent d'approvisionnement

Name (print) - Nom (en lettres moulées) Alain Levesque		Title - Titre Senior Proc. Officer	Signature 	Date 24-10-2017
Telephone No. - N° de téléphone 613 991-9520	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel alain.levsque@nrc-cnrc.gc.ca		

17. Contracting Security Authority / Autorité contractante en matière de sécurité

Name (print) - Nom (en lettres moulées)		Title - Titre	Signature	Date
Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date	