NRC·CNRC Administrative Services and Property Management

SPECIFICATIONS

SOLICITATION #: 18-22090

BUILDING: HFX
1411 Oxford Street
Halifax, NS

PROJECT: HFX – MSS Freezer Room Relocation

PROJECT #: HFX-5605

Date: December 2018

National Research Council Canada | Conseil national de recherches Canada

Canada

SPECIFICATION

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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)

Construction Tender Form

Project Identification **HFX- MSS Freezer Room Relocation**

Tender No.: **18-22090**

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.

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 from as described in Article 5 of the General Instructions to Tenderers, my/our tender is subject to disqualification.

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)

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

BUYANDSELL NOTICE

HFX – MSS Freezer Room Relocation

The National Research Council Canada, 1411 Oxford Street, Halifax, NS, has a requirement for a project that includes:

This project is required to relocate the current CRMP packaging and freezer room area from the mechanical basement up to the second floor. This will create two new offices, a packaging area and an open freezer room for product storage. This will help maintain proper ambient temperatures in a facility that houses heat producing Ultra Low Freezers by providing the freezer room area with purpose built air conditioning systems. The project will involve the mechanical, electrical, building management and architectural trade work

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 December 17th and December 18th, 2018 at **10:00** . Meet Lee Petter at HFX Building,, 1411 Oxford Street, Halifax, NS. 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. **TENDER CLOSING DATE:**
Tender closing date is January 15th , 2019 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:

.1 All personnel that will be involved with the project must be security screened to **RELIABILITY** status level as defined in the security policy of Canada.

6.0 WCBNS (WORKERS COMPENSATION BOARD OF NOVA SCOTIA)

.1 All Bidders must provide a valid WCBNS 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: **Lee Petter**
Telephone: **902 401-9749**

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-58
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
HFX Building
1411 Oxford Street
Halifax, NS
B3H 3Z1

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 amout 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-58, 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-58, 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 in 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

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

A r t i c l e s o f A g r e e m e n t

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

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.

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:

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_____
Position

Seal

of

on the_____

day of_____

26 05 21	Wires and Cables (0-1000V)
26 05 28	Grounding – Secondary
26 05 29	Hangers and Supports for Electrical Systems
26 05 31	Splitters, Junction, Pull Boxes and Cabinet
26 05 32	Outlet Boxes, Conduit Boxes and Fittings
26 05 34	Conduits, Conduit Fastenings and Conduit Fittings
26 16 26.01	Dry Type Transformers Up to 600V Primary
26 24 16.01	Panelboards Breaker Type
26 27 26	Wiring Devices
26 28 16.02	Molded Case Circuit Breakers
26 28 23	Disconnect Switches – Fused and Non-Fused
26 29 10	Motor Starters to 600V
26 50 00	Lighting
27 05 14	Communication Cables – Inside Buildings
27 05 28	Pathways for Communications Systems
27 11 19	Terminals and Connectors for Building Communication Conductors

1. SCOPE OF WORK

.1 Work of this Contract comprises mechanical, electrical, structural/architectural, and controls system upgrades/modifications, per design documents/specifications and any issued addenda or supplemental instructions. For the new CRM Distribution Facility in the Council's Building in Halifax (1411 Oxford St, Halifax, NS B3H 3Z1) of the National Research Council.

2. DRAWINGS

.1 The following drawings illustrate the work and form part of the contract documents:

.1 M-101 Mechanical Plans.

.2 M-102 Mechanical Details and Schedules.

3. COMPLETION

.1 Complete all work by March 31, 2019 after receipt of notification of acceptance of tender.

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.

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 orequipment.

.2 In addition to the manufacturers specified or named as acceptable, you may propose alternative manufacturers of materials or equipment to the NRC Departmental Representative for acceptance. For a product to be considered as an alternative product substitute, make a written application to the NRC 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.

.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 beconsidered.

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.

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 NRC 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 NRC Departmental Representative, authorized visitors and outside inspection agency personnel about the presence and use of such products on the site.

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

8. COST BREAKDOWN

.1 Submit, for approval by the NRC Departmental Representative, a cost breakdown of tender 72 hours after the contract is awarded.

.2 Request NRC Departmental Representative's verbal approval to amount of claim prior to preparing and submitting the claim in its final form.

9. SUB-TRADES

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

10. 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.

11. WORKING HOURS AND ESCORTING REQUIREMENTS

.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 NRC Departmental Representative to perform the specific tasks.

.4 An escort may be required whenever working outside normal hours. Contractor to bear the associated costs.

12. 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 NRC Departmental Representative not later than two weeks after the award of the contract and prior to commencement of any work on site.

.2 Notify NRC Departmental Representative in writing of any changes in the schedule.

.3 10 day(s) before the scheduled completion date, arrange to do an interim inspection with the NRC Departmental Representative.

13. PROJECT MEETINGS

.1 Hold regular project meetings at times and locations approved by the NRC Departmental Representative.

.2 Notify all parties concerned of meetings to ensure proper coordination of work within 20 days.

.3 NRC Departmental Representative will set times for project meetings and assume responsibility for recording and distributing minutes.

14. SHOP DRAWINGS

.1 Submit to NRC Departmental Representative for review, shop drawings, product data and samples specified within 2 week(s) after contract award.

.2 Submit to NRC 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 weekly basis and any changes to the list shall be immediately notified in writing to the NRC 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 NRC Departmental Representative does not relieve the contractor of the responsibility for errors and omissions and for the conformity with contract documents.

15. SAMPLES AND MOCK-UPS

.1 Submit samples in sizes and quantities as specified within 1 week.

.2 Where color, pattern or texture is criterion, submit full range of samples within 1 week.

.3 Construct field samples and mock-ups at locations acceptable to NRC 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.

16. 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.

17. WORK & MATERIALS SUPPLIED BY NRC DEPARTMENTAL REPRESENTATIVE

.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 NRC Departmental Representative, all materials returned to the NRC Departmental Representative.

.3 Unless otherwise specified, accept NRC Departmental Representative-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 NRC 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.

18. SITE ACCESS

.1 Make prior arrangements with the NRC Departmental Representative before starting work or moving materials and equipment on site.

.2 Obtain approval of NRC Departmental Representative for regular means of access during the construction period.

.3 Obtain approval of NRC 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 Provide snow clearing and removal as required during the contract period

.7 Make good any damage and clean up dirt, debris, etc., resulting from contractor's use of existing roads.

19. USE OF SITE

.1 Restrict operations on the site to the areas approved by the NRC Departmental Representative

.2 Locate all temporary structures, equipment, storage, etc., to the designated areas.

.3 Restrict parking to the designated areas.

20. ACCEPTANCE OF SITE

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

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

21. 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.

22. SANITARY FACILITIES

.1 Obtain permission from the NRC Departmental Representative to use the existing washroom facilities in the building or provide its own facilities, and assume all costs

23. 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 centers, 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.

24. 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 NRC 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 NRC Departmental Representative with the Application for Payment and for the Final Certificate of Completion.

25. 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 NRC Departmental Representative.

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

26. 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 NRC Departmental Representative's property caused during construction, at no cost to the NRC Departmental Representative and to the satisfaction of the NRC 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 NRC 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.

27. 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.

28. 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, accessand maintenance.

.3 Employ competent person to lay out work in accordance with the contract documents.

29. DISCREPANCIES & INTERFERENCES

.1 Prior to the start of the work, examine drawings and specifications. Report at once to the NRC Departmental Representative, any defects, discrepancies, omissions or interferences affecting the work.

.2 Contractor to immediately inform the NRC Departmental Representative in writing, of any discrepancies between the plans and the physical conditions so the NRC 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 NRC 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.

30. MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods.

.2 Notify the NRC Departmental Representative in writing of any conflict between these specifications and manufacturer's instruction. NRC Departmental Representative will designate which document is to be followed.

31. 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 NRC 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 ^{o}C or higher where specified as soon as finishing work is commenced and maintain until acceptance by the NRC 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, vapor's 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 NRC 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, NRC 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.

32. 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 NRC 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 NRC Departmental Representative of findings.

.3 Submit a schedule to and obtain approval from the NRC 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 NRC Departmental Representative.

.4 Where unknown services are encountered, immediately advise NRC 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 NRC Departmental Representative; cap or otherwise seal lines at cut-off points. Record and provide a copy to the NRC Departmental Representative of locations of maintained, re-routed and abandoned service lines.

33. 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 NRC 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 NRC Departmental Representative.

.5 Obtain written approval of the NRC 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.

34. FASTENING DEVICES

.1 Do not use explosive actuated tools, without first obtaining permission from the NRC 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 NRC Departmental Representative.

35. 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.

36. DRAINAGE

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

37. 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.

38. 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 NRC Departmental Representative.

39. GENERAL REVIEW

.1 Periodic review of the contractor's work by the NRC 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 NRC Departmental Representative of any impediments to the installation and obtain his / her approval for actual location.

40. 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.

41. TESTING

.1 On completion, or as required by local authority inspectors and/or NRC 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 NRC Departmental Representative.

.2 Obtain and hand to the NRC Departmental Representative all acceptance certificates or test reports from authority having jurisdiction. The project will be considered incomplete without the same.

42. 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.

43. 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.

44. 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.

45. FINAL CLEAN-UP

.1 Upon completion do a final clean-up to the satisfaction of the NRC 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

46. 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.

47. MAINTENANCE MANUALS

.1 Provide two 2 hard copies of maintenance manuals and one electronic copy of same 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.

END OF SECTION

1. DESCRIPTION DES TRAVAUX

.1 Les travaux de ce contrat comprennent des travaux mécaniques, électriques, structurels / architecturaux et contrôle les mises à niveau / modifications du système, par document de conception / spécifications et tout publié des addenda ou des instructions supplémentaires. Pour la nouvelle installation de distribution CRM dans le bâtiment du Conseil à Halifax (1411, rue Oxford, Halifax, NS B3H 3Z1) du Conseil national de recherches.

2. DESSINS

.1 Terminer tous les travaux avant le 31 mars 2019 après réception de la notification d'acceptation de l'offre.

3. ACHÈVEMENT DES TRAVAUX

.1 Terminer tous les travaux avant le 31 mars 2019 après réception de la notification d'acceptation de l'offre.

4. GÉNÉRALITÉS

.1 Sans objet en Français.

.2 Fournir les items mentionnés dans les dessins ou dans les spécifications

5. MATÉRIEL ET PRODUITS SPÉCIFIÉS, DÉSIGNÉS ACCEPTABLES OU SUBSTITUTS

.1 Les produits et le matériel spécifiés dans les dessins ou les devis ont été sélectionnés dans le but d'établir des normes de rendement et de qualité. Dans la plupart des cas, lorsque l'on précise la marque de commerce et le numéro de modèle de tout produit ou matériel, on indique aussi les noms d'autres fabricants qui seraient acceptables. Les entrepreneurs peuvent calculer le montant de leur soumission en se fondant sur les prix des produits et du matériel fournis par n'importe quel des fabricants désignés comme étant des fournisseurs acceptables de produits ou de matériel particuliers.

.2 En plus des fabricants spécifiés ou désignés comme étant acceptables, vous pouvez demander au représentant ministériel d'approuver d'autres fabricants, produits ou matériel. Pour faire approuver un produit en tant que substitut, vous devez remettre une demande par écrit au représentant ministériel au cours de la période fixée pour soumissionner, au plus tard dix (10) jours ouvrables avant la clôture de l'appel d'offres.

.3 Vous devez attester par écrit que le substitut répond à toutes les exigences relatives aux dimensions, à la capacité, au rendement et à la qualité du matériel ou des produits spécifiés. En outre, il est entendu que l'entrepreneur assume tous les coûts qui sont reliés à l'acceptation des substituts proposés, ou qui en résultent.

.4 L'approbation des substituts sera communiquée sous forme d'un Addendum aux documents de soumission.

.5 Nous n'examinerons pas les demandes d'approbation d'autres fabricants, produits ou matériel qui sont incomplets et impossibles à évaluer ou qui sont soumises moins de dix (10) jours avant la clôture de l'appel d'offres.

6. NORMES MINIMALES

.1 Se conformer aux exigences des normes minimales acceptables des divers codes fédéraux, provinciaux et municipaux pertinents tels le Code national du bâtiment, le Code national de prévention des incendies, le Code canadien de la plomberie, le Code canadien de l'électricité, le Code canadien de la sécurité sur les chantiers de construction et la Loi provinciale sur la sécurité dans la construction, ou les dépasser.

.2 Effectuer les travaux conformément aux normes et codes dont il est fait mention, en vigueur ou révisés à la date de publication du présent devis.

7. SYSTÈME D'INFORMATION SUR LES MATIÈRES DANGEREUSES UTILISÉES AU TRAVAIL (SIMDUT)

.1 L'entrepreneur doit se conformer aux lois fédérales et provinciales portant sur le SIMDUT. Les responsabilités de l'entrepreneur comprennent les tâches suivantes, sans s'y limiter :

.1 S'assurer de l'étiquetage acceptable de tout produit contrôlé introduit sur les lieux des travaux par l'entrepreneur lui-même ou un sous-traitant, ou l'un de leurs fournisseurs;

.2 Mettre à la disposition des travailleurs et du représentant ministériel des fiches techniques « santé - sécurité » (FTSS) portant sur ces produits contrôlés;

.3 Former ses propres ouvriers pour le SIMDUT et les produits contrôlés présents au chantier;

.4 Informer les autres entrepreneurs, les sous-traitants, le représentant ministériel, les visiteurs autorisés, ainsi que les représentants des organismes externes d'inspection, de la présence et de l'utilisation de ces produits sur les lieux des travaux.

.5 Le contremaître ou le surveillant des travaux doit pouvoir démontrer au représentant ministériel qu'il a reçu une formation portant sur le SIMDUT et qu'il est au courant des exigences de ce système. Le représentant ministériel peut exiger le remplacement de cette personne, si celle-ci ne satisfait pas à l'exigence susmentionnée ou si le SIMDUT n'est pas mis en œuvre de façon acceptable.

8. VENTILATION DES COÛTS

.1 Avant de demander le premier paiement d'acompte, soumettre à l'approbation du représentant ministériel une ventilation des coûts.

.2 Avant de rédiger et de soumettre une demande sous sa forme définitive, obtenir le consentement verbal du représentant ministériel quant au montant de cette demande.

9. SOUS-TRAITANTS

.1 Dans les 72 heures qui suivent l'acceptation de la soumission, soumettre à l'étude du représentant ministériel une liste complète des sous-traitants.

10. INSIGNES D'IDENTIFICATION ET ENQUETES DE SÉCURITÉ DU PERSONNEL

.1 Toute personne employée par l'Entrepreneur ou par un de ses sous-traitants et présents sur le chantier doit rencontrer les exigences d'une enquête de sécurité en accord avec la section intitulée Instructions Spéciales aux Soumissionnaires.

.2 Toutes ces personnes doivent porter et garder visible une insigne d'identification émise par le Bureau de la sécurité du CNRC

11. HEURES DE TRAVAIL ET EXIGENCES D'ESCORTE

.1 Les heures normales de travail au CNRC sont de 8h00 à 16h30, du lundi au vendredi inclusivement, sauf les congés fériés.

.2 En tout autre temps, des laissez-passer spéciaux sont nécessaires pour avoir accès au chantier.

.3 Obtenir la permission du représentant ministériel d'exécuter des tâches particulières avant de planifier tout travail après les heures normales de travail.

.4 Après les heures normales de travail, il se peut qu'une escorte soit nécessaire. Défrayer les coûts de cette escorte si le représentant ministériel le demande.

12. CALENDRIER DES TRAVAUX

.1 L'Entrepreneur doit soumettre un calendrier détaillé des travaux, indiquant les dates du début et de la fin des diverses étapes des travaux et le mettre à jour. Il doit remettre ce calendrier au représentant ministériel au plus tard deux semaines après l'adjudication du contrat et avant d'entreprendre tout travail au chantier.

.2 Informer le représentant ministériel par écrit de toute modification apportée au calendrier,

.3 10 jour (s) avant la date d'achèvement prévue, planifier de faire une inspection provisoire avec le représentant ministériel.

13. RÉUNIONS

.1 Tenir régulièrement des réunions aux heures et aux endroits approuvés par le NRC représentant ministériel.

.2 notifier à toutes les parties concernées les réunions afin d'assurer une bonne coordination des travaux dans un délai de 20 jours.

.3 Le NRC représentant ministériel déterminera les heures de réunions et assume la responsabilité d'enregistrer et distribuer le procès verbal.

14. DESSINS D'ATELIER

.1 Soumettre au représentant ministériel, aux fins de vérification, les dessins d'atelier, la documentation et les échantillons prescrit 2 semaine(s) après l'adjudication du contrat.

.2 Soumettre au représentant ministériel aux fins de vérification, une liste complète de tous les dessins d'atelier, la documentation et les échantillons prescrits et une confirmation écrite des dates de livraison correspondantes dans l'intérieur d'une (1) semaine, suite à la date d'approbation des dessins d'atelier, de la documentation et des échantillons. Cette liste est mise à jour sur une base hebdomadaire et toute modification de la liste est immédiatement notifiée par écrit au représentant ministériel du CNRC

.3 Examiner les dessins d'atelier, la documentation et les échantillons avant de les soumettre.

.4 Sauf avis contraire, soumettre 5 copies de tous les dessins d'atelier, de la documentation, ainsi que des échantillons pour vérification.

.5 Demeurer responsable des erreurs et des omissions apparaissant dans les dessins d'atelier et la documentation et s'assurer qu'ils sont conformes aux documents contractuels même s'ils sont revus par le représentant ministériel.

15. ÉCHANTILLONS ET MAQUETTES

.1 Soumettez les échantillons dans les tailles et les quantités spécifiées dans un délai d'une semaine.

.2 Lorsque la couleur, le motif ou la texture sont des critères, soumettez une gamme complète d'échantillons dans la semaine.

.3 Monter des modèles et des maquettes au chantier, aux endroits qui conviennent le représentant ministériel.

.4 Tout travail terminé est vérifié sur place d'après les modèles ou maquettes approuvés qui servent de normes pour la façon et les matériaux.

16. MATÉRIAUX ET MISE EN ŒUVRE

.1 Pour le présent projet, n'utiliser que des matériaux neufs, sauf si noté autrement.

.2 Seuls les travaux de première classe seront acceptés, non seulement en ce qui a trait à la sécurité, l'efficacité et la durabilité, mais aussi à l'exactitude du détail et au bon rendement.

17. OUVRAGES ET MATÉRIAUX FOURNIS PAR LE PROPRIÉTAIRE

.1 Les ouvrages et matériaux non inclus dans ce contrat sont décrits sur les dessins et dans le devis.

.2 Tous les matériaux retournés au Propriétaire doivent être transportés à un lieu d'entreposage désigné par le représentant ministériel.

.3 Sauf indication contraire, prendre possession des matériaux fournis par le Propriétaire à leur lieu d'entreposage et assurer leur transport.

.4 Responsabilités de l'Entrepreneur :

.1 les décharger à pied d'œuvre;

.2 en faire aussitôt l'inspection et signaler tout article endommagé ou défectueux;

.3 par écrit, informer le représentant ministériel des articles qui sont reçus en bon état;

.4 les manutentionner à pied d'œuvre, ce qui comprend leur déballage et leur entreposage;

.5 Réparer ou remplacer les articles endommagés au chantier.

.6 Installer et raccorder les produits finis conformément aux prescriptions.

18. VOIES D'ACCÈS

.1 Prendre les dispositions nécessaires avec le représentant ministériel avant de commencer les travaux ou avant de transporter des matériaux et du matériel au chantier.

.2 Obtenir l'approbation du représentant ministériel quant aux moyens d'accès normaux au chantier pendant la période de construction.

.3 Obtenir l'approbation du représentant ministériel avant de suspendre temporairement les travaux sur le chantier; avant de retourner au chantier et avant de quitter le chantier à la fin des travaux.

.4 Obtenir l'approbation du représentant ministériel avant de suspendre temporairement les travaux sur le chantier; avant de retourner au chantier et avant de quitter le chantier à la fin des travaux.

.5 Aménager et entretenir des routes provisoires et assurer leur déneigement pendant les travaux.

.6 L'Entrepreneur doit réparer et nettoyer les routes qu'il a dû utiliser au cours des travaux.

19. UTILISATION DU CHANTIER

.1 Limiter les travaux sur le chantier aux secteurs approuvés par le représentant ministériel au moment de la soumission.

.2 Tous matériel, structures, abris, etc. provisoires doivent se trouver dans les secteurs désignés.

.3 Limiter le stationnement aux secteurs désignés.

20. ACCEPTATION DU CHANTIER

.1 Avant d'entreprendre les travaux, l'Entre- preneur doit visiter le chantier et, en compagnie du représentant ministériel, revoir toutes les conditions qui pourraient toucher ses travaux.

.2 Le début des travaux signifiera l'acceptation des conditions existantes.

21. BUREAU ET TÉLÉPHONE AU CHANTIER

.1 L'Entrepreneur devra ériger, à ses frais, un bureau temporaire au chantier.

.2 Au besoin, installer un téléphone et en assurer l'entretien.

.3 Il est interdit d'utiliser les téléphones du CNRC, sauf en cas d'urgence.

22. INSTALLATIONS SANITAIRES

.1 Obtenir la permission du représentant ministériel pour utiliser lesinstallations sanitaires existantes Fournir ses propres installations, et en assumer tous lesfrais

23. SERVICES PROVISOIRES

.1 L'Entrepreneur pourra bénéficier d'une source provisoire d'électricité à pied d'œuvre. Il devra fournir, sans frais, tous les raccords et matériaux nécessaires pour assurer ledit service au chantier.

.2 Fournir et installer tous les centres de distributions, disjoncteurs, conduits, câblage, commutateur de déconnexion, transformateurs nécessaires à partir de la source d'électricité.

.3 Il n'est permis d'utiliser le courant que pour les outils électriques, l'éclairage, les commandes, les moteurs, et non pas pour chauffer.

.4 Sur demande, il sera possible de se raccorder provisoirement au réseau de distribution d'eau.

.5 Assumer tous les frais pour amener l'eau aux endroits nécessaires.

.6 Se conformer aux exigences du CNRC lors du raccordement aux réseaux existants, conformément aux articles "Coopération" et "Interruptions des services" de cette section".

24. DEVIS DESCRIPTIF, BULLETINS, DESSINS D'ARCHIVES

.1 L'Entrepreneur doit conserver à pied d'œuvre une (1) copie à jour et en bon état de tous les devis, dessins et bulletins relatifs aux travaux; le représentant ministériel ou ses représentants doivent pouvoir les consulter en tout temps.

.2 L'Entrepreneur doit annoter au moins une (1) copie du devis et des dessins pour y indiquer tous les travaux tels qu'ils ont été exécutés. Il doit la remettre au représentant ministériel avec la Demande de paiement pour le Certificat définitif d'achèvement des travaux.

25. COOPÉRATION

.1 Coopérer avec le personnel du CNRC pour que les travaux de recherche courants soient interrompus le moins possible.

.2 Faire, à l'avance, un calendrier de tous les travaux qui pourraient interrompre le travail normal exécuté dans l'édifice.

.3 Faire approuver le calendrier par le représentant ministériel.

.4 Donner un préavis écrit de 72 heures au représentant ministériel avant toute interruption projetée des installations, des secteurs, des corridors, des services mécaniques ou électriques, et attendre son autorisation.

26. MESURES DE PROTECTION ET ÉCRITEAUX AVERTISSEMENT

.1 Fournir et installer tous les matériaux nécessaires pour protéger le matériel existant.

.2 Ériger des écrans anti-poussière pour éviter que la poussière et les débris ne se répandent en dehors des limites des travaux.

.3 Protéger contre la poussière le matériel et le mobilier avec des bâches et coller ces dernières au plancher, au moyen de ruban adhésif, pour que la poussière ne s'infiltre pas.

.4 Réparer ou remplacer, gratuitement et à la satisfaction du représentant ministériel, tout bien du Propriétaire endommagé pendant les travaux.

.5 Protéger les édifices, les routes, les pelouses, les services, etc. contre tout dommage qui pourrait survenir suite à l'exécution des présents travaux.

.6 Planifier et coordonner les travaux pour que l'eau, la poussière, etc. ne s'infiltre pas dans les édifices.

.7 Fermer toutes les portes, fenêtres, etc. qui pourraient permettre le passage de la poussière, de vapeurs, etc. dans les autres secteurs de l'édifice.

.8 Fermer le secteur des travaux à la fin de chaque journée de travail et être responsable des lieux.

.9 Fournir et installer en permanence des barrières de sécurité appropriées autour du chantier pour éviter que le public et le personnel du CNRC soient blessé pendant l'exécution des travaux.

.10 Poser des écriteaux d'avertissement pour toutes les situations où il pourrait se produire des blessures (ex : Casque protecteurs obligatoires, danger, travaux, etc.) ou lorsque le représentant ministériel le demande.

.11 Fournir et installer des abris provisoires au-dessus des entrées et des sorties de l'édifice pour assurer la protection des piétons. Tous ces abris doivent pouvoir résister aux intempéries et à la chute de débris

27. BILINGUISME

.1 Tous les écriteaux, avis, etc. doivent être bilingues.

.2 Toute identification de services exigée aux termes du présent contrat.

28. DISPOSITION DES OUVRAGES

.1 Les localisations des équipements, appareils, raccords et ouvertures tel que spécifiées ou indiquées aux dessins doivent être considérées comme approximatives.

.2 Situer les équipements, appareils et systèmes de distributions de façon à minimiser les interférences et maximiser l’espace utilisable et en accord avec les instructions du manufacturier pour un accès et entretien sécuritaire

.3 Engager une personne compétente pour agencer les travaux selon les documents contractuels

29. ÉCARTS ET INTERFÉRENCES

.1 Avant de débuter les travaux , examiner les dessins et le devis. Signaler aussitôt au représentant ministériel tout écart, défaut, omission ou interférence qui touchent les travaux.

.2 Si, au cours des travaux, l'Entrepreneur trouve que les plans ne reflètent pas la réalité, il lui incombe de le signaler immédiatement par écrit au représentant ministériel, lequel doit rapidement vérifier les allégations.

.3 Tout travail exécuté après cette découverte, jusqu'à ce qu'il soit autorisé, doit être fait aux risques de l'Entrepreneur.

.4 Si des obstacles ou interférences mineures sont décelés en cours d'exécution et qu'ils n'avaient pas été signalés sur la soumission originale ou sur les plans et le devis, fournir et installer des doubles coudes ou des coudes ou modifier le tracé des services pour qu'il soit appropriés aux conditions du chantier, et ce sans frais supplémentaire.

.5 Prendre les dispositions pour que tous les travaux ne gênent d'aucune façon l'exécution des autres travaux.

30. INSTRUCTIONS DU FABRICANT

.1 Sauf indications contraires, se conformer aux plus récentes instructions écrites du fabricant concernant les matériaux et le matériel à utiliser et les méthodes de mise en place.

.2 Aviser le représentant ministériel par écrit de toute divergence entre le présent devis et les instructions du fabricant; le représentant ministériel déterminera alors quel document a priorité.

31. CHAUFFAGE PROVISOIRE ET VENTILATION

.1 Assumer les frais de la ventilation et du chauffage provisoire utilisés pendant la construction, y compris les frais d'installation, de combustible, d'exploitation, d'entretien et d'enlèvement du matériel.

.2 Sauf si le représentant ministériel l'a autorisé, il est interdit d'utiliser des appareils de chauffage autonomes répandant des émanations dans les zones de travail.

.3 Fournir et installer le matériel provisoire de chauffage et de ventilation requis dans les endroits fermés afin de:

.1 faciliter l'exécution des travaux.

.2 protéger les ouvrages et les matériaux contre l'humidité et le froid.

.3 réduire la condensation de l'humidité sur les surfaces à un niveau acceptable.

.4 assurer les niveaux de température ambiante et d'humidité indispensables pour l'entreposage, l'installation et la période de séchage requis des matériaux.

.5 assurer une ventilation adéquate afin de répondre aux exigences de santé publique concernant la sécurité dans les zones de travail.

.4 Maintenir une température d'au moins 10o C (50oF) aux endroits spécifiés, partir du début des travaux de finition jusqu'au moment de l'acceptation du bâtiment par le représentant ministériel.

.1 Maintenir la température ambiante et l'humidité aux niveaux nécessaires pour assurer le bien être du personnel du CNRC.

.5 Prendre les mesures nécessaires pour empêcher les accumulations dangereuses de poussières, fumées, buées, vapeurs et émanations, dans les zones occupées pendant les travaux de construction, y compris aussi les aires d'entreposage et les installations sanitaires.

.1 Évacuer les substances dangereuses de sorte que la santé des occupants ne soit pas mise en danger.

.6 Assurer une surveillance constante et rigoureuse du fonctionnement du matériel de chauffage et de ventilation.

.1 Faire respecter les normes et les codes pertinents.

.2 Se conformer aux instructions de l'Agent de prévention des incendies du CNRC, ce qui comprend la désignation, sur demande, de gardiens de sécurité- incendie à temps complet.

.3 Faire respecter les normes de sécurité.

.4 Doter les appareils de combustion autonomes de mises à l'air libre vers l'extérieur.

.7 Rédiger les soumissions en supposant que les installations et le matériel neufs ou existants ne pourront être utilisés pour le chauffage et la ventilation provisoire.

.8 Une fois le contrat adjugé, le représentant ministériel peut autoriser l'utilisation de l'installation permanente s'il peut y avoir entente sur ce qui suit:

.1 conditions d'utilisation, matériel spécial, protection et entretien, remplacement des filtres, etc.;

.2 méthodes pour s'assurer que le caloporteur ne sera pas perdu et, dans le cas de la vapeur, entente sur ce qu'il adviendra du condensateur;

.3 réduction du prix du contrat (s'il doit être débit);

.4 prescriptions pertinentes aux garanties du matériel.

32. INTERRUPTIONS DES SERVICES

.1 Lorsque les travaux impliquent le raccord a des services existants, exécuter les travaux en temps et manière pré-agrées avec le représentant ministériel et autres autorités ayant juridiction avec le minimum de perturbations au personnel du CNRC, a la circulation véhiculaire et de temps d'interruption du service. L'entrepreneur ne doit en aucun cas opérer les équipements du CNRC.

.2 Avant de commencer les travaux, établir la localisation et l'étendue des lignes de services dans l'espace de travail et ou affectés par les travaux et aviser le représentant ministériel des constatations.

.3 Fournir une cédule et obtenir l'approbation du représentant ministériel pour toute interruption ou fermeture de services actif et allouer un préavis de 72 heures.

.4 Aviser le représentant ministériel immédiatement suivant la rencontre de services inconnus et confirmer la découverte par écrit

.5 Afin de minimiser les interruptions, prévoir des déviations, des ponts, des sources d'alimentation de rechange, etc., au besoin

.6 Protéger les services existants comme il se doit et effectuer aussitôt toutes les réparations nécessaires si des dommages surviennent.

.7 Enlever tous les lignes de services abandonnés tel qu'indiqués dans les documents contractuels et tel qu'approuvé par le représentant ministériel, boucher et ou autrement sceller aux points de coupure. Noter et fournir une copie au représentant ministériel de la localisation de toutes les lignes de services maintenues, déroutées et ou abandonnées

33. DÉCOUPAGE ET RAPIÉÇAGE

.1 Découper les surfaces existantes de façon à ce que les ouvrages s'agencent correctement entre eux.

.2 Supprimer tous les articles indiqués ou prescrits.

.3 Rapiécer et réparer, à la satisfaction du représentant ministériel, les surfaces qui ont été modifiées, découpées ou endommagées, avec des matériaux identiques.

.4 Là où des nouveaux tuyaux passent à travers des travaux existants, percer une ouverture. La dimension de l'ouverture doit laisser un jeu de 12mm (1/2") autour des tuyaux ou de l'isolation de la tuyauterie. Ne pas percer, ni couper aucune surface sans l'approbation de le représentant ministériel.

.5 Obtenir l'approbation écrite du représentant ministériel avant de percer des ouvertures dans les pièces de charpente neuves ou existantes.

.6 Calfeutrer toutes les ouvertes où des câbles, conduits ou tuyaux passent à travers les murs avec un calfeutrant acoustique conforme à CAN/CGSB 19.21-M87.

.7 Là où des câbles, conduits ou tuyaux passent à travers des murs ou des planchers coupe-feu, emplir l'espace avec des fibres de verre comprimées et calfeutrer avec un calfeutrant en accord avec CAN/CGSB-19.13 et NBC 3.1.7.

34. DISPOSITIFS DE FIXATION

.1 Sauf autorisation expresse du représentant ministériel, il est interdit d'utiliser des pistolets à charge explosive.

.2 Se conformer aux exigences de la norme ACNOR A-166, Pistolets d'ancrage à charge explosive.

.3 Obtenir la permission du représentant ministériel avant d'utiliser tout genre d'outils percussion.

35. SURCHARGE

.1 S'assurer qu'aucune partie de l'ouvrage ou de l'édifice ne supporte une charge susceptible de compromettre sa sécurité ou de causer une déformation permanente ou un dommage de structure.

36. DRAINAGE

.1 Assurer le drainage et le pompage temporaires, selon les besoins, afin de garder les excavations et le chantier propres.

37. ENCEINTES ET FERMETURES DE LA CHARPENTE

.1 Ériger et entretenir toutes les enceintes temporaires nécessaires pour protéger les fondations, le sous-sol, le béton, la maçonnerie, etc. contre le gel ou les dommages.

.2 Ne pas les enlever tant que tout danger de dommage n'est pas écarté et tant que la cure n'est pas terminée.

.3 Munir les ouvertures extérieures de fermetures protectrices provisoires à l'épreuve des intempéries, jusqu'à ce que les châssis, les vitres et les portes extérieures soient installés en permanence.

.4 Fournir et installer des fermetures avec verrou, afin d'assurer la sécurité des installations du CNRC, et en être responsable.

.5 Sur demande, remettre des clés au personnel de sécurité du CNRC.

.6 Disposer les ouvrages avec soin et avec précision. Vérifier toutes les dimensions et en être responsable. Situer les points de repère généraux et prendre les mesures nécessaires pour empêcher leur déplacement.

.7 Pendant toute la durée des travaux, voir à toujours être au courant des conditions du chantier et des travaux exécutés par tous les autres gens de métier, engagés dans le présent projet.

.8 Sauf indication contraire, dissimuler tous les services, tuyauterie, câblage, conduits, etc. dans les planchers, les murs ou les plafonds.

38. ENTREPOSAGE

.1 Pour ne pas que les outils, matériaux, etc. soient endommagés ou volés, prévoir un entrepôt et en être responsable.

.2 Il est interdit d'entreposer des produits inflammables ou explosifs sur le chantier à moins que l'Agent de prévention des incendies du CNRC l'autorise.

39. EXAMEN GÉNÉRAL

.1 Même si le représentant ministériel revoit périodiquement les travaux de l'Entrepreneur, ceci ne dégage pas l'Entrepreneur de sa responsabilité d'exécuter les travaux conformément aux documents contractuels. L'Entrepreneur doit effectuer son propre contrôle de la qualité pour vérifier si ses travaux sont conformes aux documents contractuels.

.2 Informer le représentant ministériel de tout obstacles à la bonne conduite des travaux et obtenir son approbation pour la relocalisation

40. INSPECTION DES SERVICES ENFOUIS OU DISSIMULÉS

.1 Avant de dissimuler tout service installé, s'assurer que tous les organismes d'inspection intéressés, y compris le CNRC, ont inspecté les ouvrages et ont assisté à tous les essais. Dans le cas contraire, l'Entrepreneur peut avoir à les découvrir à ses propres frais.

41. ESSAIS

.1 A l'achèvement des travaux, ou sur demande du représentant ministériel et (ou) des inspecteurs des organismes locaux en cours d'exécution, et avant que tout service soit couverts et que le rinçage soit terminé, faire l'essai de toutes les installations en présence du représentant ministériel.

.2 Obtenir tous les certificats d'acceptation ou tous les résultats d'essais des organismes compétents et les remettre le représentant ministériel. Dans le cas contraire, le projet ne sera pas complet.

42. OCCUPATION PARTIELLE

.1 Le CNRC peut demander une occupation partielle de l'installation si les travaux se poursuivent au-delà de la date d'achèvement prévue.

.2 Ne pas limiter l'accès à l'édifice, routes et services.

.3 Ne pas encombrer inutilement le chantier de matériaux ou de matériel.

43. ÉVACUATION DES DÉCHETS

.1 Évacuer, en toute sécurité hors des terrains du CNRC, tous les déchets, y compris les produits volatils; voir article "Sécurité-incendie et "Sécurité générale", section 01000.

44. NETTOYAGE PENDANT LA CONSTRUCTION

.1 Sur une base quotidienne, garder les lieux et le secteur adjacent au campus, y compris les toits, exempts de débris et de déchets.

.2 Apporter sur les lieux des conteneurs destinés à la cueillette des déchets et des débris.

45. NETTOYAGE FINAL

.1 A la fin des travaux, effectuer le nettoyage final à la satisfaction du représentant ministériel.

.2 Nettoyer toutes les nouvelles surfaces, les luminaires et les surfaces existantes touchés par les présents travaux, remplacer les filtres, etc.

.3 Nettoyer tous les couvre-planchers souples et les préparer à recevoir le fini protecteur qui sera appliqué par le personnel du CNRC.

46. GARANTIE

.1 Voir les conditions générales C, section GC32.

.2 Veiller à ce que toutes les garanties soient adressées au nom de l'entrepreneur et du Conseil national de recherches du Canada.

47. MANUELS D'ENTRETIEN

.1 À la fin des travaux et avant la décharge de garantie, soumettre trois (3) exemplaires bilingues des manuels d'entretien ou deux exemplaires de chacune des versions anglaises et françaises.

.2 Bien relier les données dans des cahiers à couverture rigide pour feuilles volantes.

.3 Les manuels doivent renfermer les instructions d'exploitation et d'entretien, les garanties, les dessins d'atelier, la documentation technique, etc. touchant les matériaux et les appareils fournis aux termes du présent contrat.

FIN DE SECTION

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 all provincial OSH regulation . 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 NRC 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 NRC Departmental Representative to ensure that this responsibility is carried out.

.5 The Contractor shall ensure that only competent personnel are permitted to work on site. 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 Provincial OSH regulation
- .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 Proper 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 NRC 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 NRC 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 NRC Departmental Representative.

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, "NRC 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:
    a. Standard No. 301 - June 1982 "Standard for Construction Operations";
    b. 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 NRC Departmental Representative.

.2 Prior to commencement of "Hot Work", review the area of hot work with the NRC 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 emergency phone numbers which will be provided at the project kick off meeting:

4. When reporting a fire by phone, give the location of fire, building number and be prepared to verify location.
5. 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 NRC DEPARTMENTAL REPRESENTATIVE.

.2 WHEN ANY FIRE PROTECTION EQUIPMENT IS TEMPORARILY SHUT DOWN, ALTERNATIVE MEASURES AS PRESCRIBED BY THE NRC 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 NRC DEPARTMENTAL REPRESENTATIVE. THE NRC 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 NRC 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:

a. Kettle area - 1-20 lb. ABC Dry Chemical;
b. Roof - 1-20 lb. ABC Dry Chemical at each open flame location.

.3 Provide fire extinguishers equipped as below:

c. Pinned and sealed;
d. With a pressure gauge;
e. With an extinguisher tag signed by a fire extinguisher servicing company.

.4 Carbon Dioxide (C02) 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 NRC 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 NRC 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 NRC 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 NRC Departmental Representative, who will ensure that adequate alternative routes are maintained.

.3 The NRC 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 NRC 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 NRC 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 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 ^{o}C (100 ^{o}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 NRC Departmental Representative prior to, and at the cessation of such work.

3. Questions and/or clarifications

.1 Direct any questions or clarification on Fire or General Safety, in addition to the above requirements, to the NRC Departmental Representative.

END OF SECTION

1. EXIGENCES GÉNÉRALES DE SÉCURITÉ EN CONSTRUCTION

.1 L'Entrepreneur doit prendre toutes les mesures nécessaires lors de l'exécution du contrat pour protéger le personnel (travailleurs, les visiteurs, le public général, etc…) et la propriété immobilière.

.2 L'Entrepreneur est le seul responsable pour la sécurité de ses employés, des employés de ses sous-traitants et pour l'initiation, le maintien et la supervision des précautions, programmes et procédures de sécurité en rapport avec l'exécution des travaux.

.3 L'Entrepreneur doit se conformer à la règlementation et les codes de sécurité Fédéraux , Provinciaux et municipaux et ainsi que toute règlementation provinciale sur la santé et la sécurité au travail. Advenant des conflits entre les dispositions de la législation ou des codes, les dispositions les plus sévères s'appliqueront.

.4 La révision périodique du travail de l'Entrepreneur par le représentant ministériel en utilisant les critères des documents contractuels ne relève pas l'Entrepreneur de ses responsabilités vis-à-vis la sécurité lors de l'accomplissement des travaux selon les documents contractuels. L'Entrepreneur doit consulter avec le représentant ministériel pour s'assurer que cette responsabilité est acquitte

.5 L'Entrepreneur doit s'assurer que seulement des personnes compétentes puissent avoir accès et travailler sur le chantier. Tout au cours du contrat toute personne qui n'observe pas ou n'applique pas les règlements de sécurité pourra être renvoyée du chantier.

.6 Tous les équipements doivent être sécuritaires en bon état de fonctionnement et appropriés pour la tâche.

.7 Suivant une évaluation du projet et des risques spécifiques au site des travaux, L'Entrepreneur doit développer un Plan de sécurité spécifique au Site

- .1 Fournir une affiche montée dans un endroit visible du site du projet contenant les informations suivantes :
  - .1 Avis de Projet
  - .2 Politique de Sécurité Spécifique au site
  - .3 Une copie de Loi provinciale sur la santé et la sécurité au travail
  - .4 Un schéma du bâtiment indiquant toutes les sorties d'urgence
  - .5 Les procédures en cas d'urgence spécifiques au bâtiment.
  - .6 Une liste de contacts pour le CNRC, l'Entrepreneur et tous les sous-traitants impliqués
  - .7 Toutes fiches signalétiques SIMDUT pertinentes
  - .8 Les numéros téléphoniques d'urgence du CNRC

.8 L'Entrepreneur doit fournir du personnel compétent pour appliquer son programme de sécurité ainsi que tout article applicable de la Loi sur la santé et la sécurité au travail et pour s'assurer que ces directives sont suivies

.9 L'Entrepreneur doit orienter tous ces employés ainsi que ceux des sous-traitants sous sa juridiction

.10 Le représentant ministériel exercera une surveillance pour s'assurer que les exigences de sécurité sont rencontrées, que les documents pertinents sont bien remplis et conservés. Le contrat pourra être cancellé et l'Entrepreneur ou ses sous-traitants pourront être renvoyés du chantier advenant le non-respect répétitif des standards de sécurités

.11 L'Entrepreneur devra rapporter tout accident ou incident qui résulte de l'exécution des travaux par l'Entrepreneur et impliquant l'Entrepreneur, le personnel du CNRC ou le public au représentant ministériel et aux autorités ayant juridiction.

.12 Si pour effectuer ses travaux, l'entrée dans une laboratoire est requise, l'Entrepreneur devra être fournir une session d'orientation concernant la sécurité et les procédures spécifiques a ce laboratoire a ses employés ainsi qu'à ceux de ses sous-traitants suivant les instructions fournies par le responsable du laboratoire ou le représentant ministériel.

2. EXIGENCES DE SÉCURITÉ INCENDIE

.1 Autorité

1. Le Commissaire des incendies du Canada (CIC) est l'autorité en matière de sécurité incendie au CNRC.
2. Aux fins du présent document, le représentant ministériel est le représentant de la CNRC en charge du projet.
3. Respectez les normes suivantes publiées par le Bureau du commissaire des incendies du Canada:
    a. Norme 301 'Norme Travaux de construction', juin 1982;
    b. Norme 302 'Norme Travaux de soudage et de coupage au chalumeau', juin 1982.

.2 Usage du Tabac

1. Il est interdit de fumer dans les immeubles du CNRC, ainsi que sur les toits.
2. Respectez les écriteaux "DÉFENSE DE FUMER".

.3 Travail à chaud

.1 Vous devez obtenir un permis de 'Travail à chaud' du représentant ministériel avant d'entreprendre des travaux de soudage, de brasage, de brûlage ou d'utilisation de chalumeaux et de salamandres ou d'une flamme nue.

.2 Avant le début du travail à chaud, réexaminez l'aire de travaux avec le représentant ministériel pour déterminer le niveau de sécurité incendie nécessaire.

.4 Signalisation des Incendies

.1 Soyez au courant de l'emplacement exact du téléphone et de l'alarme manuelle d'incendie les plus près, ainsi que le numéro de téléphone d'urgence.

.2 SIGNALER immédiatement tout incident comportant un feu en procédant comme suit :

.1 Déclenchez l'alarme manuelle d'incendie le plus près;

.2 Téléphonez au numéro de téléphone d'urgence qui vous serons fournis à la rencontre initiale de chantier:

.3 Lorsque vous signalez un incendie par téléphone, indiquez l'endroit exact du feu, le nom et le numéro du bâtiment, et soyez prêts à vérifier le lieu

.4 La personne qui déclenche l'alarme manuelle d'incendie doit demeurer sur la scène d'incendie pour fournir les renseignements et les indications nécessaires au personnel du service d'incendie.

.5 Réseaux Détecteurs et Alarmes d'Incendie à l'Intérieur et à l'Extérieur

.1 N'OBSTRUEZ PAS ET NE FERMEZ PAS LES RÉSEAUX DÉTECTEURS ET ALARMES D'INCENDIE SANS L'AUTORISATION DU REPRÉSENTANT MINISTÉRIEL..

.2 LORS D'UNE INTERRUPTION D'UN RÉSEAU AVERTISSEUR, DES MESURES SPÉCIALES DÉFINIES PAR LE REPRÉSENTANT MINISTÉRIEL DOIVENT ÊTRE PRISES POUR S'ASSURER QUE LA PROTECTION INCENDIE SOIT MAINTENUE.

.3 NE LAISSEZ PAS LES RÉSEAUX DÉTECTEURS ET AVERTISSEURS D'INCENDIE INACTIFS A LA FIN D'UNE JOURNÉE DE TRAVAIL SANS AVOIR AVISÉ LE REPRÉSENTANT MINISTÉRIEL ET OBTENU SON AUTORISATION. LE REPRÉSENTANT MINISTÉRIEL DOIT INFORMER L'API DES DÉTAILS À CHAQUE OCCASION.

.4 N'UTILISEZ PAS LES BORNES D'INCENDIE NI LES RÉSEAUX DE COLONNES MONTANTES ET ROBINETS ARMÉS À D'AUTRES FINS QUE LA LUTTE CONTRE L'INCENDIE SANS L'AUTORISATION DU REPRÉSENTANT MINISTÉRIEL.

.6 Extincteurs d'Incendies

.1 Fournissez au moins un extincteur à poudre ABC (20 lb) pour chaque site de travail à chaud.

.2 Fournissez les extincteurs suivants pour les travaux d'asphalte chaud et de toiture:

.1 Près du pot de goudron - 1 extincteur à poudre ABC (20 lb);

.2 Toiture - 2 extincteurs à poudre ABC (20 lb)..

.3 Prévoir des extincteurs munis:

.1 d'une goupille et d'un sceau;

.2 d'un manomètre;

.3 d'une étiquette portant la signature d'un préposé d'une compagnie d'entretien d'extincteurs d'incendie.

.4 d'une étiquette portant la signature d'un préposé d'une compagnie d'entretien d'extincteurs d'incendie.

.4 Les extincteurs à l'anhydride carbonique (CO) ne sont pas considérés comme des substituts des extincteurs ci-dessus.

.7 Travaux de Toiture

.1 Chaudières:

.1 Prévoyez l'emplacement des chaudières d'asphalte et le lieu d'entreposage avec le représentant ministériel avant la livraison au chantier. N'installez pas les chaudières sur une toiture ou sur un échafaudage et placez-les à une distance d'au moins 10 m (30 pi) de tout bâtiment..

.2 Les chaudières doivent être équipées de thermomètres ou de jauges en bon état de fonctionnement.

.3 N'utilisez pas les chaudières à des températures excédant 232C (450F).

.4 Assurez une surveillance permanente pendant l'usage des chaudières et fournissez des couvercles de métal pour étouffer les flammes en cas de feu dans les chaudières. Fournissez les extincteurs d'incendie exigés à l'article 2.6.

.5 Expliquez les capacités des récipients au représentant ministériel avant le début des travaux

.6 Ranger les bouteilles de gaz comprimé debout à une distance d'au moins 6M (20 pieds) de la chaudière.

.2 Balais à franges ('vadrouilles'):

.1 N'utilisez que des balais à franges en fibres de verre pour toitures.

.2 Enlevez les balais à franges usagés du lieu de travail à la fin de chaque journée de travail.

.3 Application au chalumeau::

.1 N'UTILISEZ PAS DE CHALUMEAUX À PROXIMITÉ DES MURS.

.2 N'UTILISEZ PAS DE CHALUMEAUX POUR APPLIQUER DES MEMBRANES SUR DU BOIS EXPOSÉS OU DANS DES CAVITÉS

.3 Assurez une surveillance incendie conformément à l'article 2.9 de la présente section.

.4 Rangez tous les matériaux combustibles utilisés pour les toitures à une distance d'au moins 3 m (10 pi) de toute structure.

.5 Les bouteilles de gaz doivent être protégées des dommages mécaniques et maintenues en position verticale et a au moins d'au moins 6m (20 pieds) de la chaudière.

.8 Operations de soudure et de meulage

.1 L'Entrepreneur doit fournir des couvertures ignifuges, des dispositifs d'extraction de fumée, de écrans et autre équipements similaires pour prévenir l'exposition aux éclairs d'arc de soudure ou étincelles de meulage

.9 Surveillance Incendie

.1 Assurez une surveillance incendie pendant au moins une heure après la fin d'une journée de travail à chaud.

.2 Chauffage provisoire : voir la Section 01000, Instructions générales.

.3 Dotez les équipes de repérage des incendies des extincteurs prévus à l'article 2.6.

.10 Obstruction des voies d'évacuation des chaussées, des couloirs, des portes et des ascenseurs

.1 Avisez le représentant ministériel avant d'entreprendre tout travail qui entraverait le libre passage du personnel du service d'incendie et de son équipement. Cela englobe toute dérogation à la hauteur libre minimale, à l'édification de barricades et au creusage de tranchées.

.2 Les parcours d'issue du bâtiment ne doivent nullement être obstrués sans la permission expresse du représentant ministériel, qui s'assurera que des parcours de remplacement seront maintenus.

.3 Le représentant ministériel avisera l'API de tout obstacle pouvant justifier une planification et des dispositifs de communication plus poussés pour assurer la sécurité des occupants et l'efficacité des interventions de lutte contre l'incendie.

.11 Débris et Déchets

.1 Limitez autant que possible les détritus et les déchets et les ranger à une distance d'au moins 20 pieds des chaudières ou des torches.

.2 Il est interdit de faire brûler des détritus sur le chantier.

.3 Bennes à déchets

.1 En consultation avec le représentant ministériel, déterminez un emplacement sûr et acceptable avant de livrer la benne au chantier ou installer des chutes.

.2 Ne pas excéder la capacité de remplissage des bennes et garder le périmètre libre de tous débris

.1 Soyez extrêmement prudents lorsque vous devez stocker des déchets combustibles sur les lieux de travail. Maintenez les lieux le plus propre possible et bien ventilés et respectez les normes de sécurité.

.2 Déposez les torchons et autres matériaux graisseux ou huileux sujets à la combustion spontanée dans des contenants approuvés et évacuez-les comme exigé au paragraphe 3.1.

.12 Liquides Inflammables

.1 La manutention, le stockage et l'utilisation de liquides inflammables sont régis par le Code national de prévention des incendies du Canada en vigueur.

.2 Les liquides inflammables comme l'essence, le kérosène et le naphta, peuvent être gardés sur les lieux pour fins d'usage à brève échéance en quantités ne dépassant pas 45 litres (10 Gal Imp.), à condition d'être stockés dans les bidons de sûreté portant le sceau d'approbation des LAC (ULC). Le stockage de plus grandes quantités de liquides inflammables aux fins de l'exécution des travaux qui nécessite l'autorisation du représentant ministériel.

.3 Il est interdit de laisser des liquides inflammables sur les toits après les heures normales de travail

.4 Il est interdit de transvaser des liquides inflammables à l'intérieur des bâtiments..

.5 Il est interdit de transvaser des liquides inflammables à proximité de dispositifs à flamme nue ou de tout autre type de dispositif dégageant de la chaleur.

.6 Il est interdit d'utiliser des liquides inflammables ayant un point d'éclair inférieur à 38C (100F, tels que le naphta ou l'essence, comme solvants ou agents de nettoyage.

.7 Stockez les liquides résiduels inflammables dans des récipients approuvés situés dans un endroit sûr bien ventilé. Les déchets constitués de liquides inflammables doivent être régulièrement évacués du chantier.

.8 Lorsque des liquides inflammables, tels que des laques ou des uréthanes, sont utilisés, veillez à ce que la ventilation soit adéquate et éliminer toute source d'inflammation. Prévenez le représentant ministériel avant le début de tels travaux et une fois les travaux achevés.

3. Questions et/ou demandes d'explications

.1 Adressez vos questions ou demandes d'explications concernant la sécurité incendie au représentant ministériel.

END OF SECTION

PART 1 - GENERAL

1.1 Related Work

.1 Finish Hardware: Section 08 71 00

.4 Glazing: Section 08 80 00

.5 Painting: Section 09 90 00

1.2 Shop Drawings

.1 Submit shop drawings for review.

.2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and finishes.

PART 2 - PRODUCTS

2.1 Material

.1 Sheet Steel: Commercial grade steel to ASTM A366, Class I finished to ASTM A526 (1991) W25 (wiped) zinc finish.

.1 Frames: 16 ga. (1.6 mm) base thickness steel.

.2 Floor Anchors, Channel Spreaders, and Wall Anchors: Minimum 16 ga. (1.6 mm) base thickness steel.

.3 Guard Boxes: Minimum 22 ga. (0.8 mm) base thickness steel.

.4 Glazing Stops: Minimum 1 mm base thickness steel, tamperproof.

.5 Steel frame sidelights where noted.

.2 Reinforcing Channel: to CSA G40.21-M1992, type 300W.

.3 Door Bumpers: Black Neoprene single stud.

.4 Primer: to CGSB I-GP-181M+Amdt-Mar-78.

2.2 Fabrication

.1 Fabricate frames as detailed to Canadian Steel Door and Frame Manufacturer's Association, "Canadian Manufacturing Specifications for Steel Doors and Frames", for hollow steel construction, except where specified otherwise.

.2 Cut mitres and joints accurately and weld continuously on inside of frame profile.

.3 Grind welded corners and joints to flat plane, fill with metallic paste filler, and sand to uniform smooth finish.

.4 Touch up frames with primer where galvanized finish damaged during fabrication.

.5 Provide jamb anchors for fixing at floor, walls, and adjacent surfaces to suit conditions and where required.

.6 Reinforce head of frames wider than 4'-0".

.7 Install 3 bumpers on strike jamb for each single door and 2 bumpers at head for pairs of doors.

.8 Install 16 ga. (1.6 mm) base thickness steel frames to openings and openings 4'-0" or less in unsupported width.

.9 Fabricate all exterior door frames as thermally broken frames.

PART 3 - EXECUTION

3.1 Installation

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction. Back up welded frames with mortar infill. Tool mortar to provide uniform finish with adjacent wall surface.

.3 Brace framing rigidly in position while building-in. Install temporary horizontal wood spreader at third points or door opening to maintain frame width. Provide vertical support at centre of head for openings over 4'-0" wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

SPEC NOTE: Edit the following paragraphs for this specific project.

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-12.1, Tempered or Laminated Safety Glass.
- .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
- .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
- .4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.
- .5 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.
- .6 CAN/CGSB-12.8-97, Insulating Glass Units.
- .7 CAN/CGSB-12.8-97 (Amendment), Insulating Glass Units.
- .8 CAN/CGSB-12.9-M91, Spandrel Glass.
- .9 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
- .10 CAN/CGSB-12.11-M90, Wired Safety Glass.
- .11 CAN/CGSB-12.12-M90, Plastic Safety Glazing Sheets.
- .12 CAN/CGSB-12.13-M91, Patterned Glass.

.2 Environmental Choice Program (ECP)
- .1 CCD-045-95(R2005), Sealants and Caulking Compounds.

1.2 APPROVED MANUFACTURERS

.1 Products of the following manufacturers meeting the specifications are approved for use on this project:

AFG Class Incorporated
PPG Canada Incorporated

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PART 2 - PRODUCTS

SPEC NOTE: Check with manufacturer for availability, size, colour and performance criteria before specifying.

2.1 MATERIALS

.1 All Glass shall be tempered safety glass unless noted elsewhere.

.2 Provide minimum thickness stated and as additionally required to meet performance requirements.

1. Provide minimum 6 mm (1/4 inch) thick glass units unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
- .1 Verify that openings for glazing are correctly sized and within tolerance.
- .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
- .3 Visually inspect substrate in presence of NRC Departmental Representative.

.4 Inform NRC Departmental Representative of unacceptable conditions immediately upon discovery.
.5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of approval to proceed from NRC Departmental Representative.

3.2 WORKMANSHIP

.1 Remove protective coatings and clean contact surfaces with solvent and wipe dry.

.2 Apply primer-sealer to contact surfaces.

.3 Place setting blocks as per manufacturer's instructions.

.4 Install glass, rest on setting blocks, ensure full contact and adhesion at perimeter.

.5 Install removable stops without displacing tape or sealant.

.6 Provide edge clearance of 1/8" minimum.

.7 Insert spacer shims to center glass in space. Place shims at 2'-0" o/c and keep ¼" below sight line.

.8 Apply cap bead of silicone sealant at exterior void. Apply heel bead of polysulphide to interior surface to provide wind seal.

.9 Apply sealant to uniform and level line, flush with sightline, and tooled or wiped with solvent to smooth appearance.

.10 Do not cut or abrade tempered, heat treated, or coated glass.

3.7 INSTALLATION: INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

.1 Perform work in accordance with GANA Glazing Manual for glazing installation methods.

.2 Cut glazing tape to length and install against permanent stops, projecting 1.6 mm above sight line.

.3 Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of light or unit.

.5 Install removable stops, with spacer shims inserted between glazing and applied stops at 600 mm intervals, 6 mm below sight line.

.6 Fill gaps between light and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

.7 Trim protruding tape edge.

3.11 CLEANING

.1 Leave Work area clean at end of each day.
.1 Remove traces of primer, caulking.
.2 Remove glazing materials from finish surfaces.
.3 Remove labels.
.4 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools

and equipment.

3.12 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 After installation, mark each light with an "X" by using removable plastic tape or paste.
.1 Do not mark heat absorbing or reflective glass units.

.3 Repair damage to adjacent materials caused by glazing installation.

END OF SECTION

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit Product Data, Samples, and Hardware
- .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit for review and acceptance of each unit.
- .3 After approval samples will be returned for incorporation in Work.
- .4 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

1.2 REFERENCES

.1 ANSI A117.1 - American National Standard for Accessible and Useable Buildings and Facilities.
.2 ANSI/BHMA A156.1, "Butts and Hinges"
.3 ANSI/BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches.
.4 ANSI/BHMA A156.4 - American National Standard for Door Controls - Closers.
.5 ANSI/BHMA A156.6, "Architectural Door Trim"
.6 ANSI/BHMA A156.7, "Template Hinge Dimensions"
.7 ANSI/BHMA A156.8, "Door Controls - Overhead Holders"
.8 ANSI/BHMA A156.13 - American National Standard for Mortise Locks and Latches Series 1000.
.9 ANSI/BHMA A156.15 - Life Safety Closer/Holder/Release Devices.
.10 ANSI/BHMA A156.16 - Auxiliary Hardware.
.11 ANSI/BHMA A156.18 - Materials and Finishes.
.12 ANSI A156.28 - American National Standard for Keying Systems
.17 NBC - National Building Codes or Canada

1.3 PERFORMANCE REQUIREMENTS

.1 Accessibility Requirements: Comply with requirements of the National Building Code Canada as well as any local building codes, and Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities.

1.4 SUBMITTALS

.1 Submit under provisions of Section 010000.
.2 Product Data: Manufacturer's catalog cuts on each product to be used.
.3 Schedule:
1. Submit schedule indicating each type of hardware for each door.
2. List manufacturer's name with each manufacturer's hardware number together with finishes in US standards.
3. Show door number/location, handing, door and frame material, manufacture and catalog numbers, all finishes and keying information. Explain fully all abbreviations.
4. Shop Drawings:
    1. Indicate locations and mounting heights of each type of hardware.
    2. Supply templates to door and frame manufacturer(s) to enable proper and accurate sizing and locations of cut-outs for hardware.
    3. Detail any conditions requiring custom extended lip strikes, or any other special or custom conditions.
    4. Wiring diagrams including point to point and riser diagrams, function

statements and system descriptions for all electrical hardware

.5 Closeout Submittals:
1. Project Record Documents: Schedule showing actual locations of installed cylinders and their master key code.
2. Parts lists and maintenance instructions including data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
3. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.5 QUALITY ASSURANCE

1. Manufacturer Qualifications:
A manufacturer with a minimum of ten years' experience manufacturing door hardware.
2. Supplier Qualifications:
A supplier with a minimum of two years demonstrated experience in the sale and distribution of builders' hardware for commercial projects.
3. Hardware Supplier Personnel:
Employ Architectural Hardware Consultant (AHC) or equally qualified person to supervise and prepare all schedules, details, and services required for the project.

1.6 DELIVERY STORAGE & HANDLING

1. Package hardware items individually with necessary fasteners and installation templates when necessary; label and identify each package with door opening code to match hardware schedule.
2. Store products in manufacturer's unopened packaging until ready for installation.
3. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.
4. Store materials in a dry, warm, ventilated weather tight location.

1.7 PROJECT CONDITIONS

1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

1. Provide a written contractors warranty for work on this section for one (1) year dated from substantial completion certificate.
2. Provide factory warranty against defects in material and workmanship as follows:
   1. Overhead Surface Closers, Grade 1, 25 Year Warranty.
   2. Floor Closers 25 Year Warranty.
   3. Mortise locks, Grade 1, 10 Year Warranty.
   4. Electrical components 5 Year Warranty.

1.9 MAINTENANCE MATERIALS

1. Provide special wrenches and tools applicable to each different or special hardware component
2. Provide all maintenance materials as listed in Sections for Closeout Submittals.

1. Coordinate work with other directly affected components involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
2. Coordinate work with other directly affected components involving electrical

wiring and components.

1.10 COORDINATION

1. Provide special wrenches and tools applicable to each different or special hardware component
2. Provide all maintenance materials as listed in Sections for Closeout Submittals.

1. Coordinate work with other directly affected components involving manufacture or fabrication of internal reinforcement for door hardware and recessed items.
2. Coordinate work with other directly affected components involving electrical wiring and components.

2.1 HARDWARE ITEMS

.1 Use one manufacturer's products only for similar items.

.2 All new and re-used doors to have new hardware to match the existing. All handles to be lever action.

2.2 MANUFACTURERS

.1 Acceptable Manufacturers:
- .1 Hinges –Stanley.
- .2 Locks and Cores –Best.
- .3 Closers –Sargent, LCN, Stanley.
- .4 Panic Hardware – VonDuprin, Sargent.
- .5 Fire Exit Devices - VonDuprin, Sargent.
- .6 Automatic Openers –Stanley.
- .7 Auxiliary Hardware – CBH, Draftseal, GSH, IVES.
- .8 Pocket Door Hardware - Hager

2.3 DOOR HARDWARE

.1 Locks and latches:
- .1 Bored and preassembled locks and latches: to ANSI/BHMA A156.2, series 4000 bored lock, grade 1, designed for function and keyed as directed by NRC Representative.
- .2 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for function and keyed as directed by NRC Departmental Representative.
- .4 Lever handles: plain (similar to Sargent LNL or LL) design.
- .5 Roses: round.
- .6 Normal strikes: box type, lip projection not beyond jamb.
- .7 Cylinders: interchangeable construction core similar to Sargent 64 prefix key into keying system as noted and as directed by NRC Departmental Representative.
- .8 Finished to 626.
- .9 Privacy set indicator similar to Schlage L9496 42B, Occupied Indicator, finished to 630.

.2 Butts and hinges:
- .1 Butts and hinges: ball-bearing type to ANSI/BHMA A156.1, Type 4, 1 ½ pair butts per door leaf, 114.3 mm x 114.3 mm, finished to 626.

.3 Door Closers and Accessories:
- .1 Door controls (closers): to ANSI/BHMA A156.4, grade 1, size adjustable, finished

to 689. Provide heavy-duty shock absorber on all exterior doors.

.2 Door controls - overhead holders: to ANSI/BHMA A156.8, heavy duty, finished to 626.

.4 Auxiliary locks and associated products: to ANSI/BHMA A156.5, finished to 626.
- .1 Dead bolt, type mortise, finished to 626. Key into keying system as noted and as directed by NRC Representative.
- .2 Cylinders: type mortise interchangeable construction core, finished to 626, doors as listed in Door, Frame and Hardware Schedule. Key into keying system as noted and as directed by NRC Departmental Representative.

.5 Architectural door trim: to ANSI/BHMA A156.6, finished to 630.
- .1 Door protection plates: kick plate type J01, 1.27 mm thick stainless steel finished to 630.
- .2 Push plates: type K11a, 1.27 mm thick stainless steel finished to 630.

2.3 KEYING

.1 Keying by NRC Departmental Representative.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Supply manufacturers' instructions for proper installation of each hardware component.

.3 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).

3.2 ADJUSTING

.1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

.2 Lubricate hardware, operating equipment and other moving parts.

.3 Adjust door hardware to ensure tight fit at contact points with frames.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by door hardware installation.

3.4 SCHEDULE

Hardware Group No. 1 (Existing Doors 216, 218, 224, 226): Function F07 with deadbolt
- .1 1 1/2 pair hinges A8111 114 x 150 mm 646. (or to suite existing frame)
- .2 1 lockset BEST core 1C7M1
- .3 1 wall stop L01D 619.
- .4 1 closure (re-use existing)
- .5 1 kick plate 302 mm high 1050mm wide 630.
- .6 1 existing door contact to be removed and re-installed

Hardware Group No. 2 (New Doors 224B and 226B): Function F04 Office
- .1 1 1/2 pair hinges A8111 114 x 101 mm 646.

.2 1 lockset BEST core 1C7M1
.3 1 kick plate 302 mm high 905.mm wide 630. F15

Hardware Group No. 3 (New Pocket Door 224A): Function F04 Office
.1 Track: Extruded aluminum with Box style twin V -shaped rails.
.2 Hanger: Jump-proof design with 4, 7/8 inch (22.2 mm) Heavy duty nylon wheels with steel ball bearings.
.3 By-Pass door Keyed Lock 9268
.4 Capacity: Door thickness 44 mm; door weight to 57 kg.
.5 Acceptable Materials: Hager Company.

Hardware Group No. 4 (Door 217): Function F07 with deadbolt, oversized door
.1 1 1/2 pair hinges A8111 114 x 150 mm 646.
.2 1 lockset Best core 1C7M1.
.3 1 deadbolt
.4 1 overhead stop/holder 4423 32D ABH
.5 1 kick plate 302 mm high 630.
6. 1 new door contact & associated services

Hardware Group No. 5 (Door 219): Function F15 no deadbolt, oversized door
.1 1 1/2 pair hinges A8111 114 x 150 mm 646.
.2 1 lockset Best core 1C7M1
.3 1 overhead stop/holder 4423 32D ABH
.4 1 kick plate 302 mm high 630.

Hardware Group No. 6 (Door 225): Function F01 Passage
.1 1 1/2 pair hinges A8111 114 x 101 mm 646.
.2 1 passage set.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS
.1 Section 08 11 10 Metal Frames
.2 Section 09 91 33 Painting

1.2 REFERENCES
.1 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DELIVERY, STORAGE AND HANDLING
.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

PART 2 - PRODUCTS

2.1 MATERIALS
.1 Performance / Design Criteria:
.1 Partition assembly to be non-combustible construction fire resistance rated.
.2 Minimum sound transmission class rating of installed panel partition to be STC 38, tested to ASTM E 90.

.2 Non-structural Metal Framing:
.1 Non-load bearing channel stud framing: to 89 mm stud size, roll formed from 0.53 mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centers.
.2 Floor and ceiling tracks: to ASTM C 645, in widths to suit stud sizes, 32 mm flange height.
.3 Metal channel stiffener: 19] x 1.4mm thick cold rolled steel, coated with rust inhibitive coating.

.3 Gypsum Board:
.1 Standard board: to ASTM C 1396/C 1396M regular, 15.9 mm thick and Type X, 15.9 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges tapered.
.2 Metal furring runners, hangers, tie wires, inserts, anchors
.3 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
.4 Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, PVC, one-piece length per location.

2.2 ACCESSORIES
.2 Sealants: in accordance to ASTM C 475.

PART 3 - EXECUTION

3.1 EXAMINATION
.1 Verification of Conditions: verify conditions of substrates previously

installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions prior to partition installation.

3.2 ERECTION OF FRAMING

.1 Install steel framing members to receive screw-attached gypsum board in accordance with ASTM C 754 except where specified otherwise.

.2 Align partition tracks at floor and ceiling and secure at 600 mm on center maximum.

.3 Place studs vertically at 400 mm on center and maximum of 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.4 Erect metal studding to tolerance of 1:1000.

.5 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.

.6 Include two studs extending from floor to ceiling at each side of openings wider than stud centers specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.7 Install heavy gauge single jamb studs at openings.

.8 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.9 Include 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.

.10 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.11 Extend partitions to ceiling height except where indicated.

.12 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use double track slip joint.

.13 Install continuous insulating strips to isolate studs from uninsulated surfaces.

3.3 ERECTION OF GYPSUM BOARD AND ACCESSORIES

.1 Do application and finishing of gypsum board in accordance with ASTM C 840 except where specified otherwise.

.2 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C 840 except where specified otherwise.

.3 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.4 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.5 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.6 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.7 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.8 Install wall furring for gypsum board wall finishes in accordance with ASTM C 840, except where specified otherwise.

.9 Install acoustical insulation and sealant in sound rated partitions to correspond with tested assembly.

.10 Install gypsum boards in direction that will minimize number of end-butt joints. Stagger end joints 250 mm minimum.

3.4 APPLICATION

.1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.

.2 Apply single layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.

3.5 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. [Seal joints with sealant].

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal

break.

.5 Install access doors to electrical and mechanical fixtures specified in respective sections.
.1 Rigidly secure frames to furring or framing systems.

.6 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.7 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.8 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

.9 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.6 CLEANING

.1 Leave Work area clean at end of each day.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by partition installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTION
.1 Section 09 21 99 Partitions for Minor Works
.2 Electrical Specifications

1.1 REFERENCES
.1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.
.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).
.3 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC-S102-[2007], Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS
.1 Shop Drawings:
.1 Submit reflected ceiling plans for special grid patterns as indicated.

1.4 DELIVERY, STORAGE AND HANDLING
.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging

PART 2 - PRODUCTS

2.1 COMPONENTS
.1 Reuse existing ceiling grid as indicated on drawings. Where new suspension system is called for, it is to match the existing.

.2 Acoustic tile units for suspended ceiling system: to CAN/CGSB-92.1, to match existing (ultima technical).
.1 Type smooth, washable, impact resistant, scratch resistant.
.2 Flame spread rating of 25 or less in accordance with CAN/ULC-S102.
.3 Noise Reduction Coefficient (NRC) designation of .7.
.4 Light Reflectance (LR).9 +/- 20% to ASTM E 1477.
.5 Edge type square lay in.
.6 Color white.
.7 Size 610 x 610 x 19mm thick.
.8 Shape flat.

.3 Acoustical Suspension to match existing:
.1 Fibreglass suspension system, high acoustical performance for open plan spaces tile to fit existing suspended ceiling assembly, Certified two directional exposed tee bar grids.

.2 Panels:
- .1 Smooth, moisture, sag and humidity resistant, NRC (Noise Reduction Coefficient) .9 Sound absorption, CAC 26 (Ceiling Attenuation Class) impact and soil resistant, Scrubable, washable.
- .2 NCR 95% 24 x24" x 1", drop in, white, regular edge

.3 Intermediate duty system to ASTM C 635.
- .1 Basic materials for suspension system: commercial quality cold rolled steel, zinc coated.
- .2 Suspension system: non-fire rated, two directional exposed tee bar grid.
- .3 Exposed tee bar grid components: shop painted satin sheen, white color. Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.
- .4 Hanger wire: galvanized soft annealed steel wire, 3.6 mm diameter for access tile ceilings.
- .5 Accessories: splices, clips, wire ties, retainers and wall molding, to complement suspension system components, as recommended by system manufacturer.
- .6 Suspended Acoustic Ceiling Panels – CT2 – Sound Transmission

.4 Performance/Design Criteria:
- .1 Maximum deflection: 1/360th of span to ASTM C 635 deflection test.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions prior to acoustical ceiling installation.

3.2 NSTALLATION

.1 Installation: in accordance with ASTM C 636 except where specified otherwise.

.2 Suspension System:
- .1 Erect ceiling suspension system after work above ceiling has been inspected by Departmental Representative.
- .2 Secure hangers to overhead structure using attachment methods acceptable to Departmental Representative.
- .3 Install hangers spaced at maximum 600 mm centers and within 150 mm from ends of main tees.
- .4 Lay out center line of ceiling both ways, to provide balanced borders at room perimeter with border units not less than 50% of standard unit

width, according to reflected ceiling plan.

.5 Install wall molding to provide correct ceiling height.

.6 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles and speakers.

.7 Support at light fixtures, diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600mm around perimeter of fixture.

.8 Interlock cross member to main runner to provide rigid assembly.

.9 Ensure finished ceiling system is square with adjoining walls and level within 1:1000.

.3 Acoustic Panels:

.1 Install acoustical panels and tiles in ceiling suspension system.

.2 Co-ordinate ceiling work with work of other sections such as interior lighting, fire protection communication, and intrusion and detection systems.

3.3 CLEANING

.1 Leave Work area clean at end of each day.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by acoustical ceiling installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International
- .1 ASTM C 501-Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by Taber Abraser.
- .2 ASTM D 2047- Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
- .3 ASTM F 1066- Standard Specification for Vinyl Composition Floor Tile.
- .4 ASTM F 1303- Standard Specification for Sheet Vinyl Floor Covering with Backing.
- .5 ASTM F 1344- Standard Specification for Rubber Floor Tile.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS.

.2 Samples & Shop Drawings:
- .1 Submit for review and acceptance of each unit.
- .2 Indicate sheet layout on shop drawings.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for flooring for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

1.6 SITE CONDITIONS

.1 Ensure high ventilation rate, with maximum outside air, during installation.
- .1 Vent directly to outside.
- .2 Do not let contaminated air recirculate through a district or whole building air distribution system.

.2 Contractor to inspect all existing sub-floor conditions prior to submitting bids and include repair or replacement of substrates to meet manufactures recommendations.

.3 Existing resilient floor in gym where sport floor is to be installed shall be cleaned, stripped and refinished with 3coats of seal prior to application of sport floor.

.4 Prior to install of sports flooring, all finishing work to be completed.

PART 2 - PRODUCTS

2.1 RESILIENT SHEET FLOORING

.1 Resilient Linoleum sheet flooring: heterogeneous sheet composed of natural materials consisting of linseed oil, wood flour and rosin binders which are mixed and calendared onto a jute backing:
.2 Pattern: marbleized.
.3 Thickness: 2.5mm, 25x50mm tiles
.4 Color: pattern and color shall extend throughout the entire thickness. Color: to match existing or as selected from manufactures full range
.5 Slip resistance: static coefficient of friction to ASTM D 2047.
.6 Wear resistance to ASTM C 501.
.7 Adhesive: water-based mastic specially formulated for use with floor, zero VOC, solvent free, non-toxic, moisture limiting.
.8 Seams: color match weld

2.3 ACCESSORIES

.1 Resilient base: continuous, top set, complete with pre-molded end stops and external corners:
  .1 Type: vinyl, 2.0 mm thick
  .2 Style: cove.
  .3 Height: 101.6 mm.
  .4 Lengths: cut lengths minimum 2400 mm.
  .5 Color: as selected by Departmental Representative from manufacturer's standard color range.

.2 Sub-floor filler and leveler: white premix latex requiring water only to produce cementitious paste 2-part latex-type filler requiring no water as recommended by flooring manufacturer for use with their product.

.3 Metal edge strips: extruded aluminum, smooth, stainless steel with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.

.4 Resilient Transition Strips: Resilient Transition Strips: vinyl mouldings, to terminate and transition flooring materials of different colour, thickness and type, nosing to include contrasting strip that meets visually impairment regulations; Profile and colour selected by Departmental Representative to coordinate with flooring. Provide one new strip at all doors where flooring materials change.

.5 Sealer and wax: coats and type as recommended by flooring material manufacturer for material type and location.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine conditions, substrates and work to receive work of this Section.

.2 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of NRC Departmental Representative.
- .2 Inform NRC Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from NRC Departmental Representative.

.3 Ensure floors are clean and dry by using test methods recommended by flooring manufacturer.

3.2 PREPARATION

.1 Prepare for installation in accordance with manufacturer's written recommendations.

.2 Remove sub-floor ridges and bumps and fill low spots, cracks, joints, holes and other defects with sub-floor filler. Infill concrete and level as needed to meet manufacturers' sub-floor condition requirements.
- .1 Anti-Fracture Membrane/ Floor Leveler
  - .1 Liquid Rubber Crack Filler: Mapelastic CI crack -isolation Membrane or equal to be applied on cracks up to 1/8”.
  - .2 Anti-Fracture Membrane: Mapelastic SM primer / Maequard 2, peel and stick membrane film, or equal for repair to cracks on concrete slabs, 1/8” to 3/8”
  - .3 Self Levelling Underlayment: floor lever required in all low areas where water pooling may occur and along edges where new tiles are to abut existing tile and a smooth level transition between material is required. Apply a self-levelling cement-based underlay and repair mix with quick curing time. Novaplan 2 plus or equal.

.3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface.
- .1 Prohibit traffic until filler is completely cured and dry.

.4 Ensure existing vinyl flooring is removed by trained personnel.

.5 Remove or treat existing adhesives to prevent residual bleeding through to new flooring or interfering with bonding of new adhesives.

.6 Seal as recommended by flooring manufacturer's written instructions.

3.3 APPLICATION: SHEET FLOORING

.1 Flooring to be provided based on manufactures suggested guideline for existing site conditions to ensure warranties remain applicable.

.2 Resilient Sheet flooring:
.1 Lay flooring with joints parallel to building lines to produce monolithic look or to suite existing conditions. Indicate layout on shop drawings.

.3 As installation progresses, roll flooring with 45 kg minimum roller to ensure full adhesion.

.4 Cut flooring neatly around fixed objects. Seal around opening

.5 Continue flooring over areas which will be under built-in furniture.

.6 Terminate resilient flooring at transition with adjoining flooring in openings where adjacent floor finish or color is dissimilar.

.7 Install metal edge strips at unprotected or exposed edges where flooring terminates and/or changes.

3.4 APPLICATION: EPOXY FLOORING

.1 Install as per manufacturers recommendations to ensure warranty and best quality solution.

3.5 APPLICATION: SPORTS FLOORING

.1 Install as per manufacturers recommendations to ensure warranty and best quality solution.

3.6 APPLICATION: VINYL BASE

.1 Lay out base to keep number of joints at minimum.

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use pre-molded end pieces at flush door frames.

.7 Cope internal corners using pre-molded corner units for right angle external corners and formed straight base material for external corners of other angles.

.8 Use toeless type base where floor finish will be carpet, coved type elsewhere. Install toeless type base before installation of carpet on floors.

3.7 CLEANING

.1 Progress Cleaning: Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.1 Remove excess adhesive from floor, base and wall surfaces without damage.

.2 Clean, seal and wax floor and base surface to flooring manufacturer's printed instructions.

3.8 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect new floors in accordance with manufacturer's printed instructions.

.3 Repair damage to adjacent materials caused by resilient flooring installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.2 The Master Painters Institute (MPI)
- .1 Architectural Painting Specification Manual - February 2004.
- .2 Standard GPS-1-05, MPI Green Performance Standard for Painting and Coatings.

.3 National Fire Code of Canada.

.4 Society for Protective Coatings (SSPC)
- .1 Systems and Specifications, SSPC Painting Manual Volume 2, 2008.

1.2 QUALITY ASSURANCE

.1 Qualifications:
- .1 Contractor: to have a minimum of five years proven satisfactory experience. When requested, provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
- .3 Other paint materials such as linseed oil, shellac, and turpentine to be highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and to be compatible with other coating materials as required.
- .4 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by NRC Departmental Representative.
- .5 Standard of Acceptance:
  - .1 Walls: No defects visible from a distance of 1000 mm at 90 degrees to surface.
  - .2 Ceilings: No defects visible from floor at 45 degrees to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, VOC rating, physical size, finish and limitations.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets.

1.4 QUALITY CONTROL

.1 When requested by NRC Departmental Representative, prepare and paint designated surface, area, room or item to requirements specified herein, with specified paint or coating showing selected colours, number of coats, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials as follows:
- .1 Deliver and store materials in original containers, sealed, with labels intact.
- .2 Labels: to indicate:
  - .1 Manufacturer's name and address.
  - .2 Type of paint or coating.
  - .3 Compliance with applicable standard.
  - .4 Color number in accordance with established color schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Provide and maintain dry, temperature controlled, secure storage.
- .5 Observe manufacturer's recommendations for storage and handling.
- .6 Store materials and supplies away from heat generating devices.
- .7 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.
- .8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of NRC Departmental Representative. After completion of operations, return areas to clean condition to approval of NRC Departmental Representative.
- .10 Remove paint materials from storage only in quantities required for same day use.
- .11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .12 Fire Safety Requirements:
  - .1 Provide one dry chemical fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

.2 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling, remove from site.
- .2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.) are regarded as hazardous products and are subject to regulations for disposal.
- .3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

1.6 AMBIENT CONDITIONS

.1 Heating, Ventilation and Lighting:
- .1 Ventilate enclosed spaces.
- .2 Do not perform painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .3 Where required, provide continuous ventilation for 7 days after completion of application of paint.
- .4 Co-ordinate use of existing ventilation system with General Contractor and ensure its operation during and after application of paint as required.
- .5 Perform no painting work unless a minimum lighting level of 323 Lux is

provided on surfaces to be painted. Adequate lighting facilities to be provided by General Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:
- .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:
  - .1 Ambient air and substrate temperatures are below 10 degrees C.
  - .2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
  - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
  - .4 Relative humidity is above 85 % or when dew point is less than 3 degrees C variance between air/surface temperatures.
  - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
- .2 Perform no painting work when maximum moisture content of substrate exceeds:
  - .1 12% for plaster, gypsum board, concrete and masonry (clay and concrete brick/block).
  - .2 15% for wood.
- .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
- .4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:
- .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
- .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
- .3 Apply paint when previous coat of paint is dry or adequately cured.
- .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations. Do not apply paint when:
  - .1 Temperature is expected to drop below [10] degrees C before paint has thoroughly cured.
  - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
  - .3 Surface to be painted is wet, damp or frosted.
- .5 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
- .6 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
- .7 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.
- .8 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of Owner such that painted surfaces will have dried and cured sufficiently before occupants are affected.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Only paint materials listed in latest edition of MPI Approved Products List (APL), Green Promise, are acceptable for use on this project. All products shall be fast drying, No VOC paints, washable and scrub able.

.2 Paint materials for paint systems: Preferred Series: Benjamin Moore, Aura or Natura or approved equal.

.3 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, to be as follows:

- .1 Water-based, water soluble water clean-up.
- .2 Non-flammable biodegradable.
- .3 Manufactured without compounds which contribute to ozone depletion in upper atmosphere.
- .4 Manufactured without compounds which contribute to smog in the lower atmosphere.
- .5 Shall not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

.4 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

.5 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

.6 Water-borne surface coatings and recycled water-borne surface coatings must have flash point of 61.0 degrees C or greater.

.7 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:

- .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.8 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

.9 Low/No odor products: wherever possible, select products exhibiting low odor characteristics. If two products are otherwise equivalent, select the product with the lowest odor.

2.2 COLOURS

.1 NRC Departmental Representative will provide Color Schedule after Contract award.

.2 Selection of colors' will be from manufacturer’s full range of colors'.

.3 All new paint to be applied to match existing unless noted otherwise.

2.3 MIXING AND TINTING

.1 Perform color tinting operations prior to delivery of paint to site. Paint shall have a VOC of less than 48 g per litre after tinting and be use low VOC tint base whenever possible. On-site tinting of painting materials is allowed only with NRC Departmental Representative's written permission.

.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Add thinner to paint manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based paints.

.4 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with MPI gloss/sheen standard levels:

Gloss Level Category/	Units @ 60 Degrees/	Units @ 85 Degrees/
G1 - matte finish	0 to 5	max. 10
G2 – velvet finish	0 to 10	10 to 35
G3 – eggshell finish	10 to 25	10 to 35
G4 - satin finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

2.5 PAINTING SYSTEMS

.1 New Surfaces: Paint interior surfaces in accordance with the following MPI Architectural Painting Specifications manual requirements. Wall finishes to be eggshell, ceilings to be flat finish and all trims to be satin finish. Walls and trim to receive:

.1 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts, etc.

.1 INT 5.3H - Waterborne dry wall finish for overhead decking, ducts, structural steel and low contact/low traffic areas only.

.2 INT 5.3M - High performance architectural latex G3 Egg shell finish.

.2 Plaster and gypsum board: gypsum wallboard, drywall:

.1 INT 9.2M - Institutional low odour/no VOC Latex G3 Egg shell finish.

.3 Interior wet and unheated locations – all exposed surfaces low luster satin G4 latex - K634. For kitchen and washrooms use kitchen & bath paint.

.2 Previously Painted Surfaces: Paint previously painted interior surfaces in accordance with the following MPI Maintenance Repainting Specification Manual requirements. The following paint formulas require a two-coat finish as indicated in the MPI Repainting Maintenance Manual:

.1 Plaster and gypsum board, gypsum wallboard, existing drywall:
  .1 INT 9.2a - Institutional low odor/low VOC Latex G3 Egg shell finish
  .2 For kitchen and baths use kitchen & bath paint.
  .3 Fresh start by Benjamin Moore (or approved equal) as primer. Number of coats as per manufacturer's recommendation.
.2 Exposed Concrete and Concrete masonry units, where noted RIN 4.2:
  .1 RIN 4.2A - Latex G5 finish. .
  .2 Concrete block - k634 latex exterior high build G4 low lustre finish
.3 Structural steel and metal fabrications where noted RIN 5.1:
  .1 RIN 5.1 K-2 component epoxy finish.
.4 Galvanized metal: doors, frames, railings, pipes, handrails and high contact/high traffic areas and low contact/low traffic areas such as overhead decking, pipes, and ducts RIN 5.3: RIN 5.3C – alkyd G5 finish.

2.6 PAINTING REQUIRMENTS

.1 All wall mounted accessories, switch plates, outlet covers and other fixtures to be removed in preparation for wall paper removal and re-painting.

.2 After first primer coat, inspect walls for damage, dents, cracks or remaining wall paper debris, sand off or fill blemishes, reapply primer. Department Representative to review primed wall prior to painting.

.3 All surface preparation and application as per manufacturer's technical data sheets. Primer, # of coats and clean up as per data sheets. Two-year replacement warranty shall be provided to cover peeling, delamination, blistering, cracking or any other paint failure.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

.1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Repainting Manual except where specified otherwise.
.2 Caulk all joints between different materials before painting.
.3 Apply paint materials in accordance with paint manufacturer's written application instructions, to sound surface areas (DSD-0), Slight Deteriorations (DSD-1).
.4 Clean and prepare exterior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements, severely deteriorated (DSD-3) with cracking, checking, scratches small holes and gouges. It is recognized that the existing building areas to be painted contain chips, gouges and other surface defects. No repainting work shall commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable.

.5 Do not apply paint until prepared surfaces have been accepted by NRC Departmental Representative.
.6 Damaged Substrates
  .1 Surfaces determined to be damaged and in need of repair or replacement

(DSD-4), shall be repaired prior to beginning work.

.2 Damage detected during prep: where assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered are to be corrected, as mutually agreed, before repainting is started.

.7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.3 SURFACE CONDITIONS

.1 Prior to commencement of repainting work, thoroughly examine all interior conditions and surfaces scheduled to be repainted, investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to NRC Departmental Representative damages, defects, unsatisfactory or unfavorable conditions before proceeding with work.

.2 It is recognized that some of the existing building areas to be painted contain chips, gouges and other surface defects. No repainting work shall commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the NRC Departmental Representative.

.3 Contractor may wish to replace existing trim with new hardwood trim in lieu of repair at his discretion.

.4 New work is to exactly match existing.

.5 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to NRC Departmental Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.4 PROTECTION

.1 Protect existing building surfaces, floor surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by NRC Departmental Representative.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect building occupants and general public in and about building.

.5 Remove light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Store items and re-install after painting is completed.

.6 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of NRC Departmental Representative.

3.5 APPLICATION

.1 Method of application to be as approved by NRC Departmental Representative. Apply paint by brush, roller or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise. All paint materials for each coating to be products of single manufacturer.

.2 Brush and Roller Application:

.1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by NRC Departmental Representative.
.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray Application:
.1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
.3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
.4 Brush out immediately runs and sags.
.5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by NRC Departmental Representative.

.5 Apply coats of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashing's on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of NRC Departmental Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by NRC Departmental Representative.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 The Contractor is responsible for all removals, demolition, painting (including preparation of surfaces, of all supplementary steel supports), testing, permits, ventilation, and fire protection (if required/if deemed necessary).

.2 The General Contractor to arrange to have the NRC Departmental Representative do an onsite review of work before it is closed in. Review to include but not limited to above ceiling and in wall work i.e Ventilation, Plumbing, Sprinkler, Electrical and Controls.

.3 Workmanship shall be of paramount importance on this project. The Contractors are expected to demonstrate the highest quality of workmanship, coordinating all aspects of the scope of work, providing adequate clearance for access, maintenance and inspection. The Client and the NRC Departmental Representative team expect that the Contractors will respond accordingly to meet this high level.

.4 The Contractor shall directly engage the services of the TAB Contractor. The Contractor shall coordinate their scope of work with this TAB Contractor during construction.

1.2 TENDER PACKAGES.

.1 Refer to front end specifications for tender package break down.

1.3 PROTECTION OF OPENINGS

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

1.4 SPECIAL TOOLS

.1 Provide one set of special tools required to service equipment as recommended by manufacturer.

1.5 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during

regular work hours, prior to acceptance.

.2 Where specified elsewhere in Divisions 21 and 23, manufacturers to provide demonstrations and instructions.

.3 Use operation and maintenance manual, as-built/record drawings, audio visual aids, etc. as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Where deemed necessary, the NRC Departmental Representative and/or NRC Departmental Representative may record these demonstrations on video tape for future reference.

1.6 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for incorporation into O&M manual.

.2 Operation and maintenance manual to be approved by, and final copies deposited with, NRC Departmental Representative before final inspection.

.3 Operation data to include:
.1 Control schematics for each system including environmental controls.
.2 Description of each system and its controls.
.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
.4 Operation instruction for each system and each component.
.5 Description of actions to be taken in event of equipment failure.
.6 Valves schedule and flow diagram.
.7 Colour coding chart.
.8 Legend of above ceiling identifiers.

.4 Maintenance data shall include:
.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:
.1 Equipment manufacturer's performance data sheets with point of operation.
.2 Equipment performance verification test results.
.3 Special performance data as specified elsewhere.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing (TAB) of Mechanical Systems.

.6 Approvals:
- .1 Submit one electronic PDF copy of Operation and Maintenance Manual to NRC Departmental Representative for approval. NRC shall also review manuals. Submission of individual data will not be accepted unless so directed by NRC Departmental Representative.
- .2 Make changes as required and re-submit as directed by NRC Departmental Representative.

.7 Additional data:
- .1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.
- .2 MSDS for all hazardous material installed and left stored on site or with the NRC Departmental Representative.

1.7 SHOP DRAWINGS AND PRODUCT DATA

.1 Shop drawings and product data shall show:
- .1 Mounting arrangements.
- .2 Operating and maintenance clearances. eg. access door swing spaces.
- .3 Wiring diagrams showing field wiring connections and field wiring between related components.

.2 Shop drawings and product data shall be accompanied by:
- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify as to current model production.
- .5 Certification of compliance to applicable codes.

.3 Use the "Shop Drawing Submittal Form" included within this specification section. Identify section and paragraph number.

.4 Provide one electronic copy of shop drawings for all equipment specified and/or indicated including but not limited to the following items:
- .1 General:
  - .1 Firestopping Materials.
  - .2 Access Doors (walls/ceilings/floors).
  - .3 Vibration Isolation (bases, pads, mounts, hangers, springs).

.2 Ventilation and Air Conditioning:
- .1 Duct Sealant.
- .2 Duct Tape.
- .3 Duct Proprietary Joints.
- .4 Flexible Ductwork.
- .5 Flexible Duct Connections.
- .6 Duct Access Doors.
- .7 Instrument Test Ports (for ductwork).
- .8 Balancing Dampers (single and multi-bladed).
- .9 Splitter Dampers.
- .10 Fire Dampers.
- .11 Grilles, Registers, and Diffusers (all types).
- .12 Controls and Instrumentation.

1.8 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of fans, air handling units, plenums, etc. Ductwork shall be shipped to the construction site with open ends of ducts covered with plastic. Ductwork not capped or covered over with plastic during construction shall be vacuumed also. The interior of all air handling units shall be wiped clean as well.

.2 Clean the job site daily. If the site is not cleaned to the NRC Departmental Representative=s satisfaction, then the NRC Departmental Representative shall make arrangements for cleaning and charge the cost against the Contract.

1.9 AS-BUILT DRAWINGS

.1 Site records:
- .1 Provide one set of white prints as required for each phase of the work. The contractor shall mark thereon all changes as work progresses and as changes occur.
- .2 On a (weekly) basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.
- .3 Use different colour waterproof ink for each service.
- .4 Make available for reference purposes and inspection at all times.

.2 As-built drawings:
- .1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.
- .2 Identify each drawing in lower right hand corner in letters at least 12mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
- .3 Submit to the NRC Departmental Representative for approval and make

corrections as directed.

.4 TAB to be performed using as-built drawings.

.5 Submit completed reproducible as-built drawings with the Operating and Maintenance Manual.

.3 Submit copies of As-Built Drawings for inclusion in final TAB report.

1.10 DEFINITIONS

.1 The word "provide" shall mean "supply and install" unless otherwise indicated.

1.11 DRAWINGS AND SPECIFICATIONS

.1 Not intended to show structural details or architectural features.

.2 Except where dimensioned, indicates general mechanical layouts only. Do not scale.

.3 The Mechanical Trade Contractor shall check the content of the drawings, specifications and dimensions, and before proceeding, report to the NRC Departmental Representative any error or omission between Mechanical or Electrical and Architectural plans.

.4 These specifications are to be considered as an integral part of the drawings which accompany them, neither the drawings nor the specifications shall be used alone. Any item which is omitted in one but which is reasonably implied in the other, shall be considered properly and sufficiently specified and must, therefore, be provided under the Contract. The decision of the NRC Departmental Representative shall be final, if interpretation is required.

.5 Misinterpretation of drawings and specifications shall not relieve the Mechanical Trade Contractor of responsibility.

.6 All Mechanical Trade Contractors shall make themselves familiar with the overall intended operation of the mechanical systems prior to installation so that all necessary accessories such as dampers, vents, valves, controls, etc., can be installed during the normal progress of the work. Failure to do so will result in the Mechanical Trade Contractor's responsibility in providing such devices, at his expense when the need of such devices becomes apparent during start-up.

1.12 SITE VISITS

.1 Before commencing work, visit site and verify that requirements of Plans and Specifications are consistent with site conditions.

.2 Advise NRC Departmental Representative in writing, of any discrepancies or conflicts.

.3 No allowance shall be made for failure to include items which a thorough investigation would have shown to be required.

1.13 GUARANTEES

.1 This Mechanical Trade Contractor shall guarantee all his work free from defects for a period of one year, unless specifically noted otherwise, after final acceptance of such work by the NRC Departmental Representative and shall make good all defects other than normal wear and tear during the life of the guarantee. This Mechanical Trade Contractor shall guarantee all work and equipment supplied by him to work quietly and satisfactorily and to accomplish the work for which it was installed during the life of the above guarantee. At any time during this period, he shall make any necessary changes and adjustments or replacements, to accomplish this at his own expense.

.2 Submit manufacturers' written guarantees to the NRC Departmental Representative for review.

.3 Each guarantee shall include:
- .1 Project name and address.
- .2 Guarantee time period (commencement date shall be as date shown on Project Final Certificate of Completion unless otherwise indicated).
- .3 Clear and concise definition of what is guaranteed and remedial action provided.
- .4 Signatures of Mechanical Trade Contractor and a company officer of the manufacturing firm.
- .5 Include all extended guarantees (and service contracts) as specified in individual sections.

1.14 PERMITS AND REGULATIONS

.1 All Mechanical Trade Contractors shall comply with all regulations of authorities having jurisdiction, where applicable, including but not limited to the following:
- Provincial Department of Labour
- Provincial Fire Marshal
- Municipal Plumbing Inspector
- Provincial Board of Insurance Underwriters
- Provincial Department of Health

.2 The Mechanical Trade Contractor shall obtain and pay for any permits required by Local Codes and Regulations and arrange for inspections.

.3 Any additional materials or labour required to conform to any of these rules and regulations will be furnished under the Contract with no additional cost to the NRC Departmental Representative.

1.15 REFERENCE STANDARDS

.1 Use following latest editions and amendments in effect on date of Tender call:

AABC Associated Air Balance Council
ADC Air Diffusion Council
AMCA Air Moving and Conditioning Association
API American Petroleum Institute
ARI Air Conditioning and Refrigeration Institute
ASHRAE American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME American Society of Mechanical Engineers
ASSE American Society of Sanitary Engineers
ASTM American Society for Testing and Materials
AWS American Welding Society
AWWA American Water Works Association
CEMA Canadian Electrical Manufacturers Association
CFUA Canadian Fire Underwriters' Association
CGSB Canadian Government Specification Board
CGA Canadian Gas Association
CHVAC Canadian Heating, Ventilation and Air Conditioning Code (NRC)
CSA Canadian Standards Association
CUA Canadian Underwriters' Association
HRA Heating, Refrigeration and Air Conditioning Institute of Canada
NACE National Association of Corrosion Engineers
NBC National Building Code of Canada
NBFU National Board of Fire Underwriters'
NBS National Bureau of Standards
NFPA National Fire Protection Association
NSC National Standards of Canada
SMACNA Sheet Metal and Air Conditioning Contractors National Association Inc.
TIMA Thermal Insulation Manufacturers Association
UL Underwriters' Laboratories
ULC Underwriters' Laboratories of Canada

1.16 CO-ORDINATION

.1 Co-ordinate work with other trades to avoid conflict.

.2 Locate distribution systems, equipment and materials to provide minimum

interference and maximum useable space.

.3 Co-ordinate location of duct drops, pipe drops and risers with trades erecting walls and ceilings.

.4 The Mechanical Contractor shall meet regularly with the relevant trades during the production of coordination drawings to obtain physical dimension, access requirements and preferred location for the services.

.5 In the event that conflicts arise, the Mechanical Contractor shall work with all other relevant Contractor(s) to ensure that the necessary adjustments are made so that all components fit in the space available with adequate clearance for servicing and removal. If after a through effort to fit equipment in a space and provide adequate space for servicing and removal, the Contractor determines that additional space is required, he may request assistance to resolve the issue through the Construction Manager.

.6 All adjustments or re-routing of the mechanical, electrical and sprinkler systems required to avoid conflict and provide adequate space for servicing and removal of equipment shall be made at the expense of the relevant trade contractor.

.7 Submit the completed co-ordination drawings to the Engineer for review, prior to fabrication and on site construction.

1.17 ALTERNATES

.1 Wherever an item or class of material is specified exclusively by trade name of maker or by catalogue reference or under "Acceptable Materials", only such item shall be used unless the NRC Departmental Representative's approval for an alternative is secured in writing.

.2 Should the Mechanical Trade Contractor desire to substitute another material for one or more specified by name, he shall apply in writing for such permission at least ten (10) calendar days before closing date of the Tender package. He shall also provide data and/or samples for the NRC Departmental Representatives consideration. The Contractor shall be fully responsible for any additional costs that might result due to equipment substitution.

.3 Equipment submitted as alternate to that specified on the drawings or in the specifications by model number or catalogue reference must be capable of meeting the full range of operating parameters as the specified equipment. It must also be configured and set to meet the specific design point parameters as called for on the plans or in the specifications.

.4 The Mechanical Trade Contractor shall note that all layouts on the mechanical drawings are based on the specified equipment and any changes necessitated in service connections, etc., will be done at the Mechanical Trade Contractor's expense. Furthermore, if it is found that the provisions made regarding space conditions are not met, the right is reserved by the NRC Departmental Representatives to require installation of the equipment used preparing the layout.

.5 Definitions:

.1 Acceptable Materials - Any product mentioned may be used provided it meets or exceeds the quality, performance capability, and space requirements of the equipment shown and called for on the plans and in the specifications. Alternates, other than those specified, must be submitted for approval prior to Tender closing.

.2 Standard of Acceptance - Only the product mentioned may be used unless alternate products are approved in the Addenda.

1.18 CUTTING AND PATCHING

.1 Cutting and patching to be performed by each trade Contractor for penetrations less than or equal to 200mm dia. or 200mm x 200mm. For larger penetrations, co-ordinate with the Construction Manager.

.2 Make every effort to minimize cutting and patching.

1.19 TESTS

.1 Notice of Tests: Give written notice for a minimum of four (4) working days prior to date when tests will be made.

.2 Prior Tests: Concealed or insulated work shall remain uncovered until completely tested and approved, but if construction schedule requires, arrange for prior tests on parts of system as approved.

.3 Acceptance Tests: Conduct in presence of the NRC Departmental Representative's representative or representative of the Authorities Having Jurisdiction.

.4 Costs: Bear all costs in connection with tests conducted.

.5 Certificates: Obtain acceptance certificates from the authorities having jurisdiction. Work is not considered complete until certificates have been delivered to the NRC Departmental Representative.

1.20 SLEEVES AND ESCUTCHEONS

.1 Sleeves:

.1 Unless otherwise specified, supply pipe sleeves for all points where pipe passes through masonry or concrete walls or floors.

.2 Where concrete walls or floors are core drilled to accommodate pipe, sleeves are not required except where indicated in paragraph 1.22.1.5 below

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.3 Unless otherwise specified, construct sleeve of galvanized sheet steel with lock seam joints of minimum 22 gauge.

.4 Use cast iron or galvanized steel pipe sleeves with perimeter fin continuously welded at mid point.

.1 Where sleeve extends above finished floor.

.2 Pipe penetrations through concrete foundation walls shall be sealed using proprietary pre-manufactured, water-tight seals such as ALink-Seal≅ or AMetraflex≅.

.2 Sizes:

.1 Provide approximately 12mm clearance, all around, between sleeve and pipes or between sleeve and insulation.

.2 Through footings, use sleeves large enough to accommodate hub of cast iron soil pipe (where applicable).

.3 Unless otherwise specified, terminate sleeves flush with walls and ceilings.

.4 Sleeves shall be sized to accommodate the insulated pipe diameter.

.3 Unless otherwise indicated for pipes passing through roofs, use galvanized or cast iron sleeves with caulking recess and flashing clamp device. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make watertight durable joint.

.4 Caulking:

.1 Seal space at each end of sleeve with non-hardening mastic.

.2 Ensure no contact between copper tube or pipe and ferrous sleeve.

.5 Escutcheons and Plates:

.1 Provide on pipes passing through finished walls, partition floors and ceilings.

.2 Use chrome or nickel plated brass, either split or solid type, with set screws for ceiling or wall-mounted. For equipment room, use cast iron type.

.3 Inside diameter shall fit around finished pipe insulation or uninsulated pipe. Outside diameter shall cover sleeve.

.4 Where sleeve extends above finished floor, escutcheons or plates shall be bell shaped to cover the sleeve extension.

.5 Secure to pipe or sleeve but not to insulation.

.6 Penetrations of Fire Separations:

.1 Where pipes or ducts pass through walls or floors which provide fire separations, seal around openings with ULC or cUL classified fire stop system. Material shall be installed to manufacturers' recommendations by factory trained installers and shall provide a fire rating equal to that of the separation which has been penetrated.

.2 The NRC Departmental Representative reserves the opportunity for destructive testing of a sample of the installation in order to examine the thickness of sealant and installation of the backing material.

.3 Provide shop drawings in accordance with specification Section 01 33 00 - Submittals. Each trade Contractor shall be responsible for his/her own firestopping.

.4 Acceptable Materials:

.1 Dow Corning Fire Stop System.

.2 3M Fire Barrier Penetration Sealing System.

.3 Hilti Fire Stop System.

.4 Royal Quickstop.

1.21 COMPLETION

.1 Nothing herein contained can be constructed to relieve the Trade from making good and perfect work in all usual details of construction and in accordance with best standard practice and in strict compliance with provisions of any and all laws and ordinances, and the rules and regulations of any duly constituted public body having jurisdiction over this work.

.2 The Contractor shall be held responsible to provide and furnish all necessary labour and to bear all expenses incidental to the satisfactory completion of the work.

1.22 MANUFACTURERS REVIEW

.1 It shall be the responsibility of the Contractor to have the equipment supplier or his representative review all proposed connections, clearances, sizes, valves, breakers, etc. including wire and pipe sizes to his equipment before installation commences. At that time, he shall inform the NRC Departmental Representative of any changes required to make the equipment function satisfactorily.

.2 Provide the Contractor with a letter accepting all connections as proposed and where required, recommend necessary changes.

.3 If any changes or additional material and labour are required to make the equipment function properly to capacity and the manufacturer has not pointed out

this work prior to commencement of work, the additional and/or corrective work shall then be done at the expense of the equipment supplier.

1.23 WARRANTIES

.1 Make good all defects other than normal wear and tear during the life of the warranty period specified in the General Conditions of the contract. Warrant all work and installed equipment to work quietly and satisfactorily and to accomplish the work for which it was installed during the life of the warranty. At any time during this period, make any necessary changes and adjustments, or replacements, to accomplish this at no additional cost to the NRC Departmental Representative.

1.24 APPENDIX A **18-289**

SHOP DRAWINGS

MECHANICAL CONTRACTOR'S REVIEW CONFIRMATION

The Shop Drawings Have Been Reviewed by the Mechanical Contractor and All

Items Are In Conformance with the Plans and Specifications? ☐ **Yes** ☐ **No**

Are Specified Model Numbers and/or Options Indicated? ☐ **Yes** ☐ **No**

If No, Explain: _____

_____

Confirmed by Contractor: _____
Print Name

Contractor's Signature: _____

Date: _____

Item: _____

Specification Section and Item Number: _____

Drawing Reference: _____

General Contractor: _____

Mechanical Contractor: _____

Mechanical Contractor's Project Representative: _____

Phone Number:_____ Fax Number:_____ E-mail: _____

Part 1 General

1.1 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
- .1 ASHRAE Standard 90.1 (latest edition).

.2 American Society for Testing and Materials (ASTM):
- .1 ASTM B 209M-95, Specification for Aluminum and Aluminum Alloy Sheet and Plate.
- .2 ASTM C 335-95, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .3 ASTM C 411-82(1992), Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .4 ASTM C 449M-88, Standard Specification for Mineral Fibre-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .5 ASTM C 795-92, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.
- .6 ASTM C 921-89, Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB):
- .1 CAN/CGSB-51.2-95, Thermal Insulation, Calcium Silicate, for Piping, Machinery and Boilers.
- .2 CAN/CGSB-51.9-92, Mineral Fibre Thermal Insulation for Piping and Round Ducting.
- .3 CAN/CGSB-51.11-92, Mineral Fibre Thermal Insulation Blanket.
- .4 CAN/CGSB-51.12-95, Cement, Thermal Insulating and Finishing.
- .5 CAN/CGSB-51.40-95, Thermal Insulation, Flexible, Elastomeric, Unicellular, Sheet and Pipe Covering.
- .6 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .7 CGSB 51-GP-53M-95, Jacketing, Polyvinyl, Chloride Sheet, for Insulating Pipes, Vessels and Round Ducts.

.4 Manufacturer's Trade Associations:
- .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.5 Underwriters' Laboratories of Canada (ULC):
- .1 CAN/ULC-S102-M88, Surface Burning Characteristics of Building Materials and Assemblies.

.6 National Building Code of Canada - 2010.

.7 National Plumbing Code of Canada - 2010.

.8 National Energy Code of Canada for Buildings - 2011.

1.2 DEFINITIONS

.1 For purposes of this section:
- .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible, chases and furred-in spaces.
- .2 "EXPOSED" - will mean "not concealed" as defined herein.

.2 TIAC:
- .1 CRF: Code Rectangular Finish.
- .2 CPF: Code Piping Finish.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 21 05 01

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves and jointing recommendations.

.3 Submit shop drawings for pipe insulation, covering.

1.4 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's installation instructions in Maintenance Manuals.

1.5 QUALIFICATIONS

.1 Installer to be specialist in performing work of this section, and have at least three years successful experience in this size and type of project.

.2 Approved Contractor: Guildfords Inc., Scotia Insulators Ltd., Twin City Insulation, Pro-Insul Ltd., Zinks Mechanical Insulation, Parker Kaefer Inc., Insul-Energy Ltd..

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather, construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions required by manufacturer.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:
- .1 Maximum flame spread rating: 25.
- .2 Maximum smoke developed rating: 50.

2.2 FIBREGLASS INSULATION

.1 Pipe insulation will be preformed glass fibre having a nominal density of 56.0 kg/m^3.

2.3 MINERAL FIBRE INSULATION

.1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.

2.4 ELASTOMERIC INSULATION

.1 Thermal conductivity ("k" factor) not to exceed specified values at 24EC mean temperature when tested in accordance with ASTM C 335.

2.5 TIAC CODES

.1 TIAC Code A-3: Rigid moulded mineral fibre with factory applied vapour retarder jacket.
- .1 Mineral fibre: to CAN/ULC-S702.
- .2 Jacket: to CGSB 51-GP-52MA.
- .3 Maximum "k" factor: to CAN/ULC-S702.

.2 TIAC Code C-2: Mineral fibre blanket faced with factory applied vapour retarder jacket.
- .1 Mineral fibre: to CAN/ULC-S702.
- .2 Jacket: to CGSB 51-GP-52MA.
- .3 Maximum "k" factor: to CAN/ULC-S702.

2.6 INSULATION SECUREMENT

.1 Tape: Self-adhesive, aluminum, reinforced, 50mm wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: Stainless steel, 20mm wide, 0.50 mm thick.

2.7 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.8 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.9 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated .031 kg.

2.10 JACKETS

.1 Polyvinyl Chloride (PVC):
- .1 One-piece moulded type to CGSB 51-GP-53M with pre-formed shapes as required.
- .2 Colours: White.
- .3 Minimum service temperatures: -20EC.
- .4 Maximum service temperature: 65.5EC.
- .5 Moisture vapour transmission: 0.02 perm.
- .6 Thickness: 0.50 mm
- .7 Fastenings:
  - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
  - .2 Tacks.

.2 Canvas:
- .1 0.22 kg. cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.
- .2 Lagging adhesive: Compatible with insulation.

.3 Aluminum:
- .1 To ASTM B 209.
- .2 Thickness: 0.50 mm sheet.
- .3 Finish: Stucco embossed, corrugated.

.4 Joining: Longitudinal and circumferential slip joints with 50mm laps.
.5 Fittings: 0.50 mm thick die-shaped fitting covers with factory-attached protective liner.
.6 Metal jacket banding and mechanical seals: stainless steel, 75mm wide, 0.50 mm thick at 300mm spacing.

2.11 ACCEPTABLE PRODUCTS

.1 Acceptable Manufacturers: Bakor, Fibreglass Canada, Knauf, Fibre Glass, Manson, Johns Manville, Roxul and Certainteed.

Part 3 Execution

3.1 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces to be clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 50mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, Hangers:
.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.3 REMOVABLE, PRE-FABRICATED INSULATION AND ENCLOSURES

.1 Application: At expansion joints, balancing valves, flanges and unions at equipment, pump bodies.

.2 Design: To permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:
.1 Insulation, fastenings and finishes: same as system.
.2 Jacket: Canvas.

3.4 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-3.
.1 Securements: Tape at 300mm oc.
.2 Seals: VR lap seal adhesive, VR lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.3 TIAC Code: C-2 with vapour retarder jacket.
.1 Insulation securements: 75mm wide pressure sensitive.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.4 Thickness of insulation to be as listed in following table.
.1 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temperature EC	Type	Pipe Sizes and Insulation Thickness				
			to 25	32 to 50	65 to 100	150	200 & Over
Hot Water Heating	Up to 60	Fibreglass	25	40	40	40	40
Hot Water Heating	60 to 96	Fibreglass	25	25	25	40	40
Heat Pump Loop	16 – 38	Fibreglass w/ Vapour Barrier	25	25	40	40	40
Chilled Water Supply and Return	Below 18	Fibreglass	25	25	25	25	40
Domestic Hot Water Supply and Recirculation		Fibreglass	25	25	40	40	40
Condensate Drainage		Elastomeri	25	25	25	25	25

Application	Temperature EC	Type	Pipe Sizes and Insulation Thickness				
			to 25	32 to 50	65 to 100	150	200 & Over
		c					
Domestic Cold Water with Vapour Retarder		Fibreglass w/ Vapour Barrier	25	25	25	25	25

.5 Finishes:

.1 Exposed in mechanical rooms: Canvas or PVC jacket where the temperature is less than 66EC.

.2 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.

.3 Finish attachments: SS bands, at 150mm oc.

.4 Installation: To appropriate TIAC code CRF/1 through CPF/5.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 National Fire Prevention Association (NFPA)
- .1 NFPA 13, Standard for the Installation of Sprinkler Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets, and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop Drawings:
- .1 Indicate:
  - .1 Pipe and Fittings
  - .2 Sprinkler Heads
  - .3 Pipe Hangers.

1.3 CLOSEOUT SUBMITTALS

.1 Manufacturer's Catalog Data, including specific model, type, and size for:
- .1 Pipe and fittings.
- .2 Sprinkler heads.
- .3 Pipe hangers.

.2 Drawings:
- .1 Sprinkler heads and piping system layout.
  - .1 Prepare 600 mm by 900 mm detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)".
  - .2 Show data essential for proper installation.
  - .3 Show details, plan view, piping lay-out.
  - .4 Indicate new heads.
  - .5 Indicate new piping.

.3 Records:
- .1 As-built drawing.
  - .1 After completion, but before final acceptance, submit an as-built drawing record purposes.
  - .2 Submit 600 mm by 900 mm drawing with title block similar to full size contract drawings.

1.4 QUALITY ASSURANCE

.1 Qualifications:
.1 Installer: company or person specializing in wet sprinkler systems with documented experience.

.2 Supply fittings, from a single manufacturer, supply piping from a single manufacturer, supply sprinkler heads from a single manufacturer. Sprinkler heads to match manufacturer used thru out the building.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:
1. Provide spare sprinklers and tools in accordance with NFPA 13.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:
.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:
.1 Store materials indoors in dry location.
.2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Add and or relocate sprinkler heads as per provisions of NFPA 13.

.2 Include all materials & accessories to provide the system complete and ready for use.

.3 Give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment.

.4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.

.5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.

.6 Location of Sprinkler Heads:
- .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13.
- .2 Uniformly space sprinklers on branch.

2.2 ABOVE GROUND PIPING SYSTEMS

.1 Provide fittings for changes in direction of piping and for connections.
- .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.

.2 Perform welding in shop; field welding will not be permitted.

.3 Conceal piping in areas with suspended ceiling

2.3 PIPE, FITTINGS AND VALVES

.1 Pipe:
- .1 Ferrous: to NFPA 13.

.2 Fittings and joints to NFPA 13:
- .1 Ferrous: screwed.
- .2 Provided threaded fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
- .3 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
- .5 Fittings: ULC approved for use in wet pipe sprinkler systems.
- .6 Ensure fittings are supplied by same manufacturer.
- .7 Side outlet tees using rubber gasketted fittings are not permitted.

.1 Pipe hangers:
- .1 ULC listed for fire protection services in accordance with NFPA.

2.4 SPRINKLER HEADS

.1 General: to NFPA 13 and ULC listed for fire services.

.2 Sprinkler Head Type:
- .1 Type A: upright bronze.
- .2 Type B: pendent chrome, glass bulb type with adjustable ring and cup.

.3 Provide nominal 12mm orifice sprinkler heads.

.1 Provide chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings.

2.5 ESCUTCHEON PLATES

.1 Provide split ring type metal plates for piping passing through walls, in exposed spaces.

.2 Provide polished chromium-plated finish on copper alloy plates in finished spaces.

2.6 SPARE PARTS CABINET

.1 Provide extra sprinkler heads and sprinkler head wrench. Number and types of extra sprinkler heads as specified in NFPA 13.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install, in accordance with NFPA 13.

3.3 PIPE INSTALLATION

.1 Install piping straight and true to bear evenly on hangers and supports.

.2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.

.3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.

.4 Inspect piping before placing into position.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 Mechanical General Requirements.

.2 Section 23 05 29 Bases, Hangers, and Supports.

.3 Section 23 05 53 Mechanical Identification.

.4 Section 23 08 02 Cleaning and Start-up of Mechanical Piping Systems.

.5 Section 21 07 19 Thermal Insulation of Piping.

.6 Section 23 05 05 Installation of Pipework.

.7 Section 22 42 01 Plumbing Specialties and Accessories.

.8 Section 23 05 93 Testing, Adjusting and Balancing (TAB) of Mechanical Systems.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME):
- .1 ANSI/ASME B16.15-06, Cast Bronze Threaded Fittings, Classes 125 and 250.
- .2 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
- .4 ANSI/ASME B16.24-01, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150 and 300.

.2 American Society for Testing and Materials (ASTM):
- .1 ASTM A 307-07b, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- .2 ASTM B 42-02, Specification for Seamless Copper Pipe, Standard Sizes
- .3 ASTM B 88M-05, Specification for Seamless Copper Water Tube.

.3 Canadian Standards Association (CSA):
- .1 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings and General Instructions No.1.

.4 Manufacturer's Standardization of the Valve and Fittings Industry (MSS):
- .1 MSS-SP-67-02a, Butterfly Valves.
- .2 MSS-SP-70-06, Cast Iron Gate Valves, Flanged and Threaded Ends.
- .3 MSS-SP-71-05, Cast Iron Swing Check Valves Flanged and Threaded.

.4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.

.5 National Plumbing Code of Canada - 2010.

1.3 SHOP DRAWINGS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit data for following: valves, roll grooved couplings and fittings.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into O&M Manual

Part 2 Products

2.1 PIPING

.1 Domestic cold systems within building.
- .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

.2 Trap primer piping:
- .1 Below slab (buried): Type K Copper Tube to ASTM B88, soft annealed, in long lengths with no buried joints.
  - .1 Assemble piping using fittings manufactured to ANSI standards. Lay in well compacted washed sand in accordance with AWWA Class B bedding. Bend tubing without crimping or constriction.
- .2 Above slab: Type L Copper Tube to ASTM B88.
- .3 To be installed in accordance with the remainder of Section 21 05 01 as well as Section 22 11 18, the 2010 National Plumbing Code of Canada and the Authority Having Jurisdiction.

2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18 (lead free).

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

2.3 JOINTS

.1 Rubber gaskets, 1.6 mm thick: to ANSI/AWWA C111/A21.11.

.2 Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.

.3 Solder: tin-antimony to ASTM B32 (lead free). Silfos for piping greater than 40mm diameter.

.4 Teflon tape: for threaded joints.

.5 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F 492, complete with thermoplastic liner.

2.4 VALVES

.1 All valves shall be one manufacturer and shall have the manufacturer's name and pressure rating clearly marked on the outside of the body.

.2 The metal bodies, bonnets, yokes and discs of all bronze valves shall conform to ASTM-B-62.

.3 Acceptable Products:

.1 Up to 50mm:

Manufacturer	Figure Nos.			
	Gate*	Ball	Globe	Check
Crane	1324	9322	1310	1342
Newman Hattersley	A41	1979	A51	A61
* Use only where specifically asked for.				

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Section 21 05 01, National Plumbing Code of Canada, and the authority having jurisdiction.

.2 Assemble piping using fittings manufactured to ANSI standards.

.3 Install cold water piping below and away from hot water and hot water recirculation and other hot piping so as to maintain temperature of cold water as low as possible. Insulate all piping. Install close to building structure to minimize furring and maximize headroom and space. Group exposed pipes and run parallel to building grid lines.

.4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.2 VALVES

.1 Isolate equipment, fixtures and branches with ball valves (up to 50mm diameter) and butterfly valves (64mm and greater).

.2 Balance recirculation system using balancing valves. Mark settings and record on as-built drawings on completion.

3.3 PRESSURE TESTS

.1 Test at the greater of 12 times maximum system operating pressure or 862kpa for four (4) hours without loss of pressure.

3.4 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.
- .1 Ensure that pressure booster systems are operating properly.
- .2 Ensure that air chambers, expansion compensators are installed properly and are functioning.

3.5 START-UP

.1 Timing: Start up after:
- .1 Pressure tests have been completed.
- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:
- .1 Establish circulation and ensure that air is eliminated.
- .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
- .3 Monitor piping domestic water piping systems for freedom of movement, pipe expansion as designed.
- .4 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

.5 Exposed plumbing water piping shall be triple chromium plated.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM):
- .1 ASTM B 32, Specification for Solder Metal.
- .2 ASTM B 306, Specification for Copper Drainage Tube (DWV).
- .3 ASTM C 564, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA).

.3 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.

.4 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.

.5 CAN/CSA-B125, Plumbing Fittings.

1.2 RELATED SECTIONS

.1 Section 21 05 01 Mechanical General Requirements.

.2 Section 23 05 05 Installation of Pipework.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary (including sanitary condensate drainage) and vent (50mm and smaller) Type DWV to: ASTM B 306.
- .1 Fittings.
  - .1 Cast brass: to CAN/CSA-B125.
  - .2 Wrought copper: to CAN/CSA-B125.
- .2 Solder: lead free, tin- Antimony 95:5 to ASTM B32, Type 50A.

2.2 CAST IRON PIPING AND FITTINGS

.1 Above ground sanitary, storm and vent (75mm and larger) to CAN/CSA-B70.

.2 Joints:
- .1 Mechanical joints.
  - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

Part 3 Execution

3.1 MANUFACTURER'S RECOMMENDATIONS

.1 Installation to be to manufacturer's recommendations. Provide printed copies of recommendations with shop drawings or product data.

3.2 INSTALLATION

.1 In accordance with Section 23 05 05 - Installation of Pipework.

.2 Install in accordance with National Plumbing Code of Canada and local authority having jurisdiction.

.3 Arrange and pay for all inspections required by municipal Authorities. Provide copy of reports resulting from these visits to the NRC Departmental Representative.

.4 Install piping parallel and close to walls to conserve headroom and ceiling space; grade as indicated.

3.3 TESTING

.1 Hydraulically test to verify grades and freedom from obstructions.

.2 Pressure test systems in accordance with National Plumbing Code and local Authority Having Jurisdiction.

.3 Provide copies of test reports to the NRC Departmental Representative.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:
- .1 Ensure accessible and that access doors are correctly located.
- .2 Open, cover with linseed oil and re-seal.
- .3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure that fixtures are properly anchored, connected to system, and effectively vented.

.4 Affix applicable label complete with directional arrows every floor or 4.5m whichever is less.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM):
- .1 ASTM A 126-95(2001), Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM B 62-02, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA):
- .1 AWWA C700-02, Cold Water Meters-Displacement Type, Bronze Main Case.
- .2 AWWA C701-02, Cold Water Meters-Turbine Type for Customer Service.
- .3 AWWA C702-01, Cold Water Meters-Compound Type.

.3 Canadian Standards Association (CSA):
- .1 CSA-B64 Series-01, Backflow Preventers and Vacuum Breakers.
- .2 CSA-B79-94 (R2000), Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
- .3 CSA-B356-00, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Plumbing and Drainage Institute (PDI):
- .1 PDI-G101-96, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
- .2 PDI-WH201-92, Water Hammer Arresters Standard.

1.2 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 21 05 01 Mechanical General Requirements.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into O&M Manual specified in Section 21 05 01 Mechanical General Requirements.

.2 Data to include:
- .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
- .2 Details of operation, servicing and maintenance.
- .3 Recommended spare parts list.

Part 2 Products

2.1 FLOOR DRAINS

.1 Floor Drains and Trench Drains: to CSA B79.

.2 Strainers shall be nickel Bronze in 'Finished' areas.

.3 Drains shall have a cast iron clamping collar and trap primer connections.

.4 General Floor Drain (FD): cast iron body, adjustable head, sediment basket nickel bronze strainer, integral seepage pan, and clamping collar.
- .1 Standard of Acceptance : Zurn Z-415 BPY

.5 Funnel Floor Drain (FFD); cast iron body with integral seepage pan, clamping collar, nickel bronze adjustable head strainer with integral oval funnel.
- .1 Standard of Acceptance : Zurn Z-415 BOFPY

2.2 CLEANOUTS

.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing caulked lead seat or neoprene gasket.
- .1 Standard of Acceptance : Zurn ZN1602-SP
- .2 Acceptable Materials: Zurn ZN1602-SP, Ancon, J.R. Smith, Mifab, Watts Drainage.

.2 Access Covers:
- .1 Floor Access: cast iron body and frame with adjustable secured nickel bronze top and:
  - .1 Plugs: bolted bronze with neoprene gasket.
  - .2 Cover for Unfinished Concrete Floors: cast iron, nickel bronze, round or square, gasket, vandal proof screws.
  - .3 Cover for Terrazzo Finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal proof locking screws.
  - .4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal proof locking screws.
  - .5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal proof locking screws.
  - .6 Standard of Acceptance : Zurn ZANB-1460-13
  - .7 Acceptable Materials: Zurn ZANB-1460-13, Ancon, Enpoco, Josam, Rototech-Smith Inc., Wade, Jay R. Smith, William Bros,

Mifab, Watts Drainage.

2.3 BALANCING VALVES

.1 All Balancing Valves to be sized using manufacturers published data.

.2 Valves 50mm and smaller to use sweat, solder, or threaded connections.

.3 Valves larger than 50mm to use flanged or grooved connections.

.4 Valves to be lead-free brass construction, wye pattern design, with globe valve body, rated for service to 2068 kpa and temperatures up to 1501C and c/w soft seals for positive shut off.

.5 Valves to incorporate memory stop, use 5 full turns minimum between fully open and fully closed.

.6 Provide valves c/w insulated pre-moulded cover or insulation kit.

.7 Acceptable Materials: Armstrong ,Bell & Gossett, Taco, Tour and Anderson, Victaulic.

2.4 TRAP SEAL PRIMER

.1 Electronic trap seal primer complete with anti-siphon atmospheric vacuum breaker, pre-set 24 hour adjustable timer, manual over-ride switch / test button, 120 volt solenoid valve, 3 wire single point connection, 75mm connection, calibrated manifold for equal water distribution. Number of outlets to be as specified within the mechanical design drawings

.2 Electrical requirements: 120 volts, Single Phase and 60 Hertz with a hold current of 0.13 Amps and an in-rush current of 0.28 Amps.

.3 Electrical components include a circuit breaker, manual over-ride switch / test-switch, timer and UL-Listed solenoid valve.

.4 Capable of providing a minimum of 59ml of water at 138kpa per drain served.

.5 Acceptable Material: Precision Plumbing Products PTS or Equivalent.

2.5 STRAINERS

.1 862kpa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.

.2 NPS 2 and under, bronze body, screwed ends, with brass cap.

.1 Acceptable Materials: Spirax/Sarco BT, Armstrong F4SC, Crane 988-2, Braukmann FY32, Leitch BE with 530 strainer, Watts 777, Wilkins Mod. S.

.3 NPS 2 1/2 and over, cast iron body, flanged ends, with bolted cap.

.1 Acceptable Materials: Spirax/Sarco F-250, Armstrong F4FL, Crane 989-2 , Braukmann FH33, Leitch 528 pipeline basket type, Watts 77F-250.

2.6 DI-ELECTRIC UNIONS

.1 All connections between steel and copper or brass for pipe 50 mm and smaller shall be made of di-electric unions, except on all closed systems. On pipe 65 mm and larger use flanged connections with non-metallic gasket and plastic sleeves for bolts.

.2 Standard of Acceptance: EPCO or approved equal.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Install in accordance with the National Plumbing Code of Canada, provincial codes, and local authority having jurisdiction.

3.3 FLOOR DRAINS

.1 Floor drains to be installed flush with finished floor and level.

.2 Protect grates, funnels, etc from damage.

.3 Install body of floor drains directly connected to buried pipe separately from grates, hubs, funnels, etc. and protect openings with blank cleanout plate. Set aside grates, hubs, funnels etc for installation after floor is finished.

.4 Install body of funnel floor drains and hub drains not directly connected to buried pipe separately from hubs and funnels and protect openings with blank cleanout

plate. Set aside hubs and funnels for installation after floor is finished.

3.4 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks, rainwater leaders, at locations required code, at every cumulative horizontal change in direction exceeding 135 degrees, at all ground floor slab penetrations by drainage pipe (except from Lavatories), and as indicated.

.2 Bring cleanouts of drainage pipe serving all Mechanical Rooms, Food Preparation Areas, and Laboratories to finished floor. Other cleanouts to be brought to the wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum 100 mm.

3.5 TRAP SEAL PRIMERS

.1 Install for floor drains and elsewhere, as indicated.

.2 Provide water hammer arrestor on inlet piping to trap primer.

.3 Do not feed traps on different floors from a common trap primer unit.

.4 Trap primers installed in 'finished' areas to be concealed in walls behind a labeled access door unless noted otherwise.

3.6 BALANCING VALVES

.1 Install balancing valve for Domestic Hot Water Recirculation piping and where shown on drawings.

.2 Locate balancing valves a minimum of two (2) pipe diameters upstream of pipe fittings and five (5) pipe diameters after pipe elbows, pipe tees.

.3 Install eccentric reducers where valve is sized differently than pipe.

.4 Record hand wheel position after TAB has been completed.

.5 Turn insulation covers over to insulator for installation.

.6 Where valves are concealed, identify location as per section 23 05 53.01.

3.7 TESTING AND ADJUSTING

.1 Timing:
- .1 After start-up deficiencies rectified.
- .2 After certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:
- .1 Pressure at fixtures: +/- 68.9 kpa
- .2 Flow rate at fixtures: +/- 20%.

.3 Adjustments:
- .1 Verify that flow rate and pressure meet design criteria.
- .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 Mechanical General Requirements.

.2 Section 23 08 02 Cleaning and Start-up of Mechanical Piping Systems.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB):
- .1 CAN/CGSB-1.181-(99), Ready-Mixed Organic Zinc-Rich Coating.

.2 National Plumbing Code of Canada - 2010.

.3 National Building Code of Canada - 2010.

1.3 SCOPE OF WORK

.1 This section applies to installation of piping for each of the following systems:
- .1 Sanitary Drainage (including Sanitary Condensate Drainage).
- .2 Domestic Water.
- .3 Condenser Water Supply and Return.

Part 2 Execution

2.1 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions, flanges, or mechanical couplings for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

2.2 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

2.3 DRAINS

.1 Install drain valve at low points in piping systems, at equipment and so that each section of piping can be drained.

.2 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.

.3 Drain valves: 75mm gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

2.3 AIR VENTS

.1 Install automatic air vents at high points in piping systems. Locations shall be indicated on the AAs-built≅ drawings.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

2.4 DI-ELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 50mm and under: Isolating unions or bronze valves.

.4 Over 50mm: Isolating flanges.

2.5 PIPEWORK INSTALLATION

.1 Screwed fittings to be jointed with Teflon tape.

.2 Protect openings against entry of foreign material.

.3 Install so that equipment can be isolated and removed without interruption to operation of any other equipment or systems.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of the main. Hole saw (or drill) and ream main so as to maintain full inside diameter of branch line prior to welding saddle.

.6 Install piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.8 Except where indicated otherwise, slope piping in direction of flow for positive drainage and venting.

.9 Except where indicated, install so as to permit separate thermal insulation of each pipe.

.10 Group piping wherever possible (and as indicated).

.11 Ream pipes, remove scale and other foreign material before assembly.

.12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.13 Provide for thermal expansion as indicated and specified.

.14 Install copper pipe/tube so that it is not in contact with dissimilar metal and will not be kinked or collapsed.

.15 Clean all excess flux and solder from joints.

2.6 VALVES

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above the horizontal position unless otherwise indicated.

.4 Valves to be accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use ball or butterfly valves at branch take-offs for isolating purposes except where otherwise specified. Provide isolation valves at all branch take-offs from mains, and at each take-off from risers on each floor.

.7 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.8 Install ball valves for glycol service.

.9 Use chain operators on valves 65mm and larger where installed more than 2438mm above floor in Mechanical Rooms.

2.7 SLEEVES

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Where sleeves extend above finished floors - to have annular fins continuously welded on at mid-point.

.4 Sizes: 6mm minimum clearance all round between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.

.2 Other floors: Terminate 25mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application

of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:
- .1 Provide space for firestopping. Maintain fire rating integrity.
- .2 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.
- .3 Ensure no contact between copper pipe or tube and sleeve.

2.8 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

2.9 PREPARATION FOR FIRESTOPPING

.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 21 05 01 Mechanical General Requirements.

.2 Uninsulated unheated pipes not subject to movement: No special preparation.

.3 Uninsulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.

.4 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

2.10 FLUSHING OUT OF PIPING SYSTEMS

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

2.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise NRC Departmental Representative 72 hours minimum prior to performance of pressure tests.

.2 Pipework: Test as specified in relevant sections of Division 21 and 23.

.3 Maintain specified test pressure without loss for four (4) hours minimum unless specified for longer period of time in relevant sections of Division 21 and 23.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of NRC Departmental Representative.

.6 Bear costs for repairs or replacement, retesting, and making good. NRC Departmental Representative to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by NRC Departmental Representative.

2.12 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by the NRC Departmental Representative-s representative.

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 Mechanical General Requirements

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE 90.1 01, Energy Standard for Buildings Except Low Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).

.2 Electrical Equipment Manufacturers' Association Council (EEMAC)

1.3 SUBMITTALS

.1 Shop drawing and maintenance manual submittals for each motor to be included with the equipment the motor is serving.

Part 2 Products

2.1 GENERAL

.1 Motors: premium efficiency, in accordance with local Electrical Utility standards and to ASHRAE 90.1. If premium efficient motor is not readily available for the fractional HP motor sizes, then high efficiency motors will be acceptable.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 Motors under 373 W, 1/2 HP: speed as indicated, continuous duty, built in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.3 Motors 373 W, 1/2 HP and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 105º C, 3 phase, 208 V, unless otherwise indicated.

.4 Motors controlled by VFD's shall be equipped with shaft grounding rings/bearing protection rings to minimize bearing raceway deterioration and failures and ball

bearing deterioration and failures.

2.3 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

.3 For motors under 10 HP: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid position of range for specified r/min.

.4 For motors 10 HP and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave determined during commissioning.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

.8 Supply one set of spare belts for each set installed.

Part 3 Execution

3.1 MANUFACTURER-S INSTRUCTIONS

.1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

.1 Make removable for servicing, easily returned into, and positively in position.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 13 13 Wet Pipe Sprinkler System.

.2 Section 23 05 05 Installation of Pipework.

.3 Section 23 31 13 Ductwork - Low Pressure Metallic to 50mm.

1.2 REFERENCES

.1 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME):
- .1 ANSI/ASME B31.1-07, Power Piping.

.2 American Society for Testing and Materials (ASTM):
- .1 ASTM A 125-1996 (2007), Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A 307-07b, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A 563-07a, Specification for Carbon and Alloy Steel Nuts.

.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS):
- .1 MSS SP-58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
- .2 MSS SP-69-2003, Pipe Hangers and Supports - Erection and Application.
- .3 MSS SP-89-2003, Pipe Hangers and Supports - Fabrication and Installation.

.4 Underwriter’s Laboratories of Canada (ULC).

1.3 DESIGN REQUIREMENTS

.1 Construct pipe hanger and support utilizing manufacturer's regular production components, parts and assemblies.

.2 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.3 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 21 05 01 - Mechanical General Requirements.

.2 Submit shop drawings and product data for following items:
- .1 All bases, hangers and supports.
- .2 Connections to equipment and structure.
- .3 Structural assemblies.

1.5 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into the O&M Manual

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 General Requirements:
- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning.

2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 PIPE HANGERS

.1 Where pipe is hung provide Pipe Attachments as per the following table:

Service	Type	Standard of Acceptance
Plumbing		
Domestic Cold Water	Clevis Hanger c/w insulation shield	Myatt Fig 124
DHW, DHW Recirc	Clevis Hanger	Myatt Fig 124L
Drainage – CI (NPS 6 and less)	Steel Support Hanger	Bibby 66000 series
Drainage – CI (NPS 8 and larger)	CI Support Hanger	Bibby 66000 series
Drainage – AHU Condensate	Clevis Hanger c/w insulation shield	Myatt Fig 124
Drainage – Other	Clevis Hanger	Myatt Fig 124
Fire Protection	See Relevant Specification Sections	

.2 Where pipe is resting its support provide Pipe Attachments as per the following table:

Service	Type	Standard of Acceptance
Plumbing		
Domestic Hot, Cold, and Recirculation	Trapeze support c/w insulation shield	-
Drainage – above grade - CI	Threaded Rod and Riser Clamp	-
Drainage – AHU Condensate	Trapeze support c/w insulation shield	-
Drainage – above grade - Other	Trapeze support	-
Fire Protection	See Relevant Specification Sections	

.3 Finishes:

.1 Pipe hangers and supports: galvanized or painted with zinc rich paint after

manufacture but before installation.

.2 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.4 Upper Attachment:

Structure	Attachment	Standard of Acceptance
Concrete	Concrete insert	Readhead RL Drop-In Anchor
		Anvil Fig 284

.5 Hanger rods: threaded rod material to MSS SP58:

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.6 Pipe insulation.

.1 Use 300mm long insulation shields and rigid insulation/buck-a-roos where insulation is between piping and support.

.2 Install pipe supports on outside pipe insulation / jacket of all piping below room temperature and all insulated piping installed outdoors.

.7 Wall brackets: carbon steel prime coated.

.1 Acceptable Materials: Myatt Fig. 321.

.8 Acceptable Manufacturers: Anvil, Bibby, Caddy, Grinnell, Hunt, Myatt, Taylor

2.4 Riser Clamps

.1 Steel or cast iron pipe: galvanized carbon steel to MSS SP58, type 42.

.1 Standard of Acceptance Myatt Fig 182

.2 Copper pipe: carbon steel copper or epoxy plated to MSS SP58, type 42.

.1 Standard of Acceptance Myatt Fig 150CT

.3 Cold Water pipe: For pipes with liquids below 20º C use pre-insulated riser clamps.

.1 Acceptable Materials: Bergen, Pipe Shields Piping Technology and

Products, Tolco Fig 6F.

PART 3 EXECUTION

3.1 MANUFACTURER'S RECOMMENDATIONS

.1 Installation to be to manufacturer's recommendations. Provide printed copies of recommendations with shop drawings or product data.

3.2 INSTALLATION

.1 Install in accordance with Manufacturer's instructions and recommendations.

.2 All pipes shall be hung securely from structure.

.3 Vibration Control Devices:
- .1 Install on piping systems as indicated.

.4 Clamps on riser piping:
- .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
- .2 Bolt-tightening torques to be to industry standards.
- .3 Steel pipes: Install below coupling or shear lugs welded to pipe.
- .4 Cast iron pipes: Install below joint.

.5 Clevis plates:
- .1 Attach to concrete with four minimum concrete inserts, one at each corner.

.6 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.3 HANGER SPACING

.1 Hangers shall be spaced as far apart as economically possible. Maximum spacing shall be as follows:

Material/Service	Pipe Size	Maximum Spacing

Material/Service	Pipe Size	Maximum Spacing
P.V.C.	All Sizes	1220mm and at the ends of branches and at changes in direction or elevation, and as close to the trap if the fixture drain is 1015mm or longer.
Hard Temper Copper	Less than 32mm	2134mm
	32mm and Larger	3000mm
Soft Temper Copper	All Sizes	2438mm
Copper Water Pipe	Up to 12mm	1524mm
Steel Water Pipe	25mm	2134mm
	32mm and over	3048mm

.2 Fire protection: to applicable fire code.

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 100mm from vertical.

.2 Where horizontal pipe movement is less than 12mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:
.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:
- .1 Tighten hanger load nut securely to ensure proper hanger performance.
- .2 Tighten upper nut after adjustment.

.3 C-clamps:
- .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:
- .1 Hammer jaw firmly against underside of beam.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 25 05 54 - EMCS Identification.

.2 Section 21 05 01 - Mechanical General Requirements.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
CAN/CGSB-24.3-(92), Identification of Piping Systems.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal nameplate with raised or recessed letters mechanically fastened to each piece of equipment by manufacturer.

.2 Information to include, as appropriate:
.1 Equipment: Manufacturer's name, model, size, serial number, capacity, registration plates where specified or required (eg pressure vessel, ULC, CSA).
.2 Motor: voltage, Hz, phase, power, power factor, duty, frame size, rpm.

2.2 SYSTEM NAMEPLATES

.1 Colours:
.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
.1 3.17mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Locations:
.1 Terminal cabinets, control panels.
.2 Equipment in Mechanical Rooms.

2.3 IDENTIFICATION DUCTWORK SYSTEMS

.1 50mm high stencilled letters and directional arrows 150mm long x 50mm high.

.2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.

2.4 CONTROLS COMPONENTS IDENTIFICATION

.1 See Section 25 05 54 - EMCS Identification.

2.5 EQUIPMENT

.1 Identify Air Handling Units with black lamicoid plates with white letters attached to equipment. Letters to be a minimum of 20mm high.

.2 Identification to be visible by an individual standing on the floor.

2.6 ABOVE CEILING EQUIPMENT IDENTIFICATION

.1 Pull and junction boxes for control wiring to be coloured inside and out (red and white).

.2 Where valves, and balancing dampers and are installed above accessible ceilings, adhesive discs coloured in accordance with the table below shall be installed on the ceiling spline directly below the valves and boxes. Discs shall be 19 mm diameter, white or black disc to be 6 mm diameter. In no case shall a valve or box be installed in a ceiling space that is not considered accessible unless a proper access hatch is provided by the Mechanical Trade Contractor. Discs shall be similarly applied to access hatches.

.3 Provide framed legend of colour coding used and mount in the main mechanical room or other location as directed by the NRC Departmental Representative. Include a copy of legend in Maintenance Manuals.

.4 Boxes, valves and dampers shall be colour coded as follows:

Service	Colour of Disc
Fire Dampers	Dark Blue
Balancing Dampers	Dark Blue
Control Panels/Junction Boxes	Red/White

.5 Use white lamicoid plates with black letters to identify balancing dampers.

.6 Use red lamicoid plates with white lettering to identify fire damper locations.

.7 Lamicoid plates referred to in above two sentences to be attached to T-bar splines with two rivets each.

2.7 LANGUAGE

.1 Identification to be in English and French

Part 3 Execution

3.1 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC (and) (or) CSA registration plates as required by respective agency.

.3 Identify all equipment, piping and duct systems.

3.2 NAMEPLATES

.1 Locate nameplates in conspicuous location to facilitate easy reading and identification from the floor.

.2 Do not paint, insulate or cover in any way.

3.3 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK

.1 On long straight runs in open areas in equipment rooms: At not more than 7m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 At beginning and end points of each run and at each piece of equipment in run.

.7 Identification to be easily and accurately readable from usual operating areas and from access points. Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do all other work as specified in this section.

.2 Submit three copies of air and water balancing report to NRC Departmental Representative for review. Make changes and re-submit if necessary.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Names of all personnel it is proposed to perform TAB to be submitted to and approved by NRC Departmental Representative within thirty (30) days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB Contractor shall submit list of projects completed within the last five years.

.4 TAB Contractor shall be familiar with the procedures outlined in AABC, NEBB, SMACNA and ASHRAE.

.5 Quality assurance: Perform TAB under direction of supervisor qualified by AABC or NEBB.

.6 Acceptable Contractors: Scan Air, Scotia Air Balance 1996 Ltd., Griffin Air Balance, Systems Balance 2006 Ltd., Barrington Air Balance, Source Management Ltd..

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with all other related systems under all normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction and the NRC Departmental Representative.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

.1 Review contract documents before project construction is started. Confirm in writing to NRC Departmental Representative adequacy or inadequacy of provisions for TAB and all other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to the NRC Departmental Representative in writing all proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by the NRC Departmental Representative for verification of TAB reports.

1.9 START OF TAB

.1 Notify the NRC Departmental Representative seven (7) days prior to start of TAB.
.2 Start TAB only when building is essentially completed, including:
  .1 Installation of ceilings, doors, windows, other construction affecting TAB.

.2 Application of weather stripping, sealing, caulking.
.3 All pressure, leakage, other tests specified elsewhere Division 23.
.4 All provisions for TAB installed and operational.

.3 Start-up, verification for proper, normal and safe operation of all mechanical and associated electrical and control systems affecting TAB including but not limited to:
.1 Proper thermal overload protection in place for electrical equipment.
.2 Air systems:
(a) Filters in place, clean.
(b) Duct systems clean.
(c) Ducts, are air tight to within specified tolerances.
(d) Correct fan rotation.
(e) Fire, volume control dampers installed and open.
(f) Coil fins combed, clean.
(g) Access doors, installed, closed.
(h) All outlets installed, volume control dampers open.

1.10 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 All HVAC systems: +5%, -5%.

1.11 ACCURACY TOLERANCES

.1 Measured values to be accurate to within plus or minus 2% of actual values.

1.12 INSTRUMENTS

.1 Prior to TAB, submit to the NRC Departmental Representative list of instruments to be used together with make, model and serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within three (3) months of TAB. Provide certificate of calibration to the NRC Departmental Representative.

.4 The balancing contractor is responsible for providing all tools necessary to obtain result.

1.13 SUBMITTALS

.1 Submit, prior to commencement of TAB:
- .1 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of the NRC Departmental Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
- .1 Details of instruments used.
- .2 Details of TAB procedures employed.
- .3 Calculations procedures.
- .4 Summaries.

1.15 TAB REPORT

.1 Format to be in accordance with AABC and/or NEBB.

.2 TAB report to show all results in SI units and to include:
- .1 Project record drawings.
- .2 System schematics.

.3 Submit one electronic copy of TAB Report to the NRC Departmental Representative for verification and approval.

1.16 VERIFICATION

.1 All reported results subject to verification by the NRC Departmental Representative.

.2 Provide manpower and instrumentation to verify up to 10% of all reported results.

.3 Number and location of verified results to be at discretion of the NRC Departmental Representative.

.4 Bear costs to repeat TAB as required to satisfaction of the NRC Departmental Representative.

1.17 SETTINGS

.1 After TAB is completed to satisfaction of the NRC Departmental Representative, replace drive guards, close all access doors, lock all devices in set positions, ensure

sensors are at required settings.

.2 Permanently mark all settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 COMPLETION OF TAB

.1 TAB to be considered complete only when final TAB Report received and approved by the NRC Departmental Representative.

1.19 AIR SYSTEMS

.1 Standard: TAB to be to most stringent of TAB standards of AABC, NEBB, SMACNA or ASHRAE.

.2 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, amps, voltage, and noise. Full octave band acoustical monitoring/testing shall be completed by this Contractor prior to building turnover. A minimum of four separate rooms shall be tested (at the discretion of the NRC Departmental Representative) for each air handling unit (AHU) system. Determine room NC valves and submit report to the NRC Departmental Representative for review.

.3 Locations of systems measurements to include, but not be limited to, following as appropriate: each main duct, main branch, sub-branch, run-out including grilles, registers or diffusers.

.6 Include room identification for grilles, registers and diffusers in report.

.7 Voltage and current measurements for motors to be reported for each phase for three (3) phase motor systems.

.8 Permanently mark the final position of the numerous balancing dampers with a permanent ink marker.

1.20 POST-OCCUPANCY TAB

.1 Emergency evacuation: Participate in full scale emergency evacuation exercises.

.2 Participate in systems checks twice during the one year standard Warranty

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 23 08 02 Cleaning and Start-up of Mechanical Piping Systems.

.2 Section 23 05 05 Installation of Pipework.

.3 Section 23 05 93 Testing, Adjusting and Balancing (TAB) of Mechanical Systems.

1.2 REFERENCES

.1 American National Standards Institute (ANSI):
- .1 ANSI/AWS A5.8/A5.8M-04, Specification for Filler Metals for Brazing and Braze Welding.
- .2 ANSI/ASME B16.4-2011, Gray Iron Threaded Fittings: Classes 125 and 250.
- .3 ANSI/ASME B16.15-2011, Cast Copper Alloy Threaded Fittings: Classes 125 and 250.
- .4 ANSI B16.18-2001 (R2005), Cast Copper Alloy Solder Joint Pressure Fittings.
- .5 ANSI/ASME B16.22-2001 (R2010), Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.2 American Society for Testing and Materials (ASTM):
- .1 ASTM B 32-08, Specification for Solder Metal.
- .2 ASTM B 62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 ASTM B 88M-09, Standard Specification for Seamless Copper Water Tube.
- .4 ASTM E 202-10, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS):
- .1 MSS-SP-70-2011, Gray Iron Gate Valves, Flanged and Threaded Ends.
- .2 MSS-SP-71-2011, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
- .3 MSS-SP-80-2008, Bronze Gate, Globe, Angle and Check Valves.
- .4 MSS-SP-85-2011, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.
- .5 MSS-SP-67-2011, Butterfly Valves.

1.3 SHOP DRAWINGS

.1 Indicate on manufacturers catalogue literature the following: VALVES.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into the O&M Manual

Part 2 Products

2.1 PIPING (SIZES LESS THAN 50mm)

.1 Type AL≅ hard drawn copper tubing: to ASTM B88M.

2.2 FITTINGS

.1 Cast bronze threaded fittings: to ANSI/ASME B16.15.

.2 Wrought copper and copper alloy solder joint pressure fittings: to ANSI/ASME B16.22.

.3 Cast iron threaded fittings: to ANSI/ASME B16.4.

.4 Cast copper alloy solder joint pressure fittings: to ANSI B16.18.

2.3 JOINTS

.1 Solder, tin-antimony, 95:5: to ASTM B32.

.2 Silver solder BCUP: to ANSI/AWS A5.8.

.3 Brazing: as indicated.

2.4 VALVE CONNECTIONS

.1 NPS 50mm and smaller: solder.

.2 NPS 65mm and larger: flanged or grooved.

2.5 GATE VALVES

.1 Application: isolating equipment, control valves, pipelines:

.2 NPS 50mm and under:
- .1 Mechanical Rooms: Class 125, rising stem split wedge disc Bronze.
- .2 Elsewhere: Class 125, non- rising stem, solid wedge disc Bronze.
- .3 Acceptable Materials: Crane 428, Jenkins 810, Kitz 24, Hattersley T607M, Toyo 293, Milwaukee Valve Company, Parker Kaefer Inc.
- .4 Rising stem: to ANSI/MSS SP-80-1987, Class 125, bronze body, solid wedge disc.
  - .1 Acceptable Materials: Crane 4652, Jenkins 454J, Mueller A-2483-6, Hattersley T504, Toyo 421JA, Watts 408, Milwaukee Valve Company, Kitz #72, Parker Kaefer Inc.

.3 NPS 2 1/2 and over:
- .1 Mechanical Rooms: rising stem, split wedge disc, bronze trim.
- .2 Elsewhere: Non rising stem, solid wedge disc, bronze trim, - Cast Iron.
- .3 Acceptable Materials: Crane 4652, Jenkins 454J, Mueller A-2483-6, Hattersley T504, Toyo 421JA, Watts 408, Milwaukee Valve Company, Kitz #72. Crane 461, Jenkins 452, Kitz 75, Mueller A-2380-6, Hattersley T501, Toyo 415JA, Watts 400, Milwaukee Valve Company.

2.6 BALL VALVES

.1 NPS 50mm and under: Bronze.

.2 Acceptable Materials: Jenkins 901FJ and 902FJ, Crane, Toyo, Kitz, Hattersley, Milwaukee Valve Company.

2.7 GLOBE VALVES

.1 Application: throttling, flow control, emergency bypass.

.2 NPS 50mm and under:
- .1 Mechanical Rooms: to ANSI/MSS SP-80-1987, Class 125, with PFTE disc, bronze body, screwed over bonnet and suitable for service.
- .2 Elsewhere: to ANSI/MSS SP-80-1987, Class 125, with composition disc, , bronze body, screwed over bonnet and suitable for service.
- .3 Acceptable Materials: Crane 5, Jenkins 106BP, Nibco S-211-Y, Toyo, Kitz, Milwaukee Valve Company, Hattersley A50M; Parker Kaefer Inc.

.3 NPS 65mm and over:
- .1 With composition disc, bronze trim, Cast Iron.
- .2 Acceptable Materials: Crane 351, Jenkins 2342, Kitz 76, Hattersley 731, Toyo 400 JA, Milwaukee Valve Company, Parker Kaefer Inc.

2.8 SWING CHECK VALVES

.1 NPS 50mm and under:
.1 Class 125, swing, with composition disc, Bronze.

.2 NPS 65mm and over: Flanged or Grooved ends, Cast Iron.

2.9 SILENT CHECK VALVES

.1 Less than NPS 50mm:
.1 To ASTM B62, Class 125, cast steel, wafer style, brass seat rings, brass inner valve, stainless steel spring.
.2 Acceptable Materials: Durabla GLC, Toyo, Kitz, Crane, Jenkins, Milwaukee Valve Company, Hattersley.

.2 NPS 65mm and over:
.1 Flanged or Grooved ends: Cast Iron.
.2 Acceptable Materials: Durabla GLC, Moyes & Groves 500 series, Toyo, Kitz, Crane, Jenkins, Milwaukee Valve Company, Hattersley, Parker Kaefer Inc.

.3 NPS 100mm and over, for roll grooved end pipe:
.1 To ANSI/MSS SP-71-1990, Class 125, ductile iron body, bronze discs, EPDM seat.
.2 Acceptable Materials: Victaulic 711, 715, 716.

2.10 CIRCUIT BALANCING VALVES

.1 General:
.1 Y style globe valve, designed to provide precise flow measurement and control, with valved ports for connecting to differential pressure meter.

.2 Accuracy:
.1 Readout to be within plus or minus 2% of actual flow at design flow rate.

.3 NPS 50mm and under:
.1 Pressure die-cast zinc dezincification resistant copper alloy (Ametal) construction; maximum working pressure of 862kpa, maximum temperature of 120º C, screwed ends, Teflon disc, screwed in bonnet.
.2 Flow control: at least four full turns of handwheel with digital hand wheel and tamperproof concealed mechanical memory.
.3 Acceptable Materials: ITT Bell & Gossett, Armstrong, Tour & Anderson, Taco, Danfoss, Oventrop.

.4 NPS 65mm and over:

.1 Body: epoxy resin coated cast iron: bonnet and trim: zinc-dezincification resistant copper alloy (Ametal), bonnet bolts of stainless steel maximum working pressure of 860kpa, maximum temperature of 120ºC, ANSI Class 125 flanged ends or grooved ends.

.2 Flow control: at least 8 full turns of handwheel with vernier type or digital type ring settings and tamperproof concealed mechanical memory.

.3 Acceptable Materials: ITT Bell & Gossett, Armstrong, Taco, Tour & Anderson, Danfoss.

.5 Insulation: use prefabricated shipping packaging of R-5.4 polyurethane as insulation for installation.

.6 Drain connection:

.1 20mm valved and capped drain connection suitable for hose socket to be incorporated into the valve body or provided as separate item.

2.11 DRAIN VALVES

.1 On radiation: Solid forged brass construction, solid brass body, forged brass cap, brass chain and hook, composition disc suitable for 250EC, working pressure 1378kpa at 250EC.

.1 Acceptable Material: Dahl #21.616.

.2 On Mains: Forged brass body, brass cap, steel handle, brass stem and ball, Teflon seat, hose end, 1690kpa at 250EC.

.1 Acceptable Material: Dahl #50.430.

2.12 LIFT CHECK VALVES

.1 Less than NPS 2:

.1 Class 125, swing check, Y-pattern, threaded ends, bronze disc with bronze hinge and stainless steel hinge pin, screw cap.

.2 Acceptable Materials: Crane Fig 37, Jenkins Fig. 4092J, Kitz Fig 22.

2.13 GROOVED END VALVES

.1 Where grooved piping concept is used in place of welded or threaded systems, the Mechanical Contractor shall incorporate grooved end valves of comparable construction.

Part 3 - Execution

3.1 MANUFACTURER=S INSTRUCTIONS

.1 Comply with manufacturer=s written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 PIPING INSTALLATION

.1 In accordance with Section 23 05 05 - Installation of Pipe Work.

.2 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.

.3 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping wherever practical.

.4 Slope piping in direction of drainage and for positive venting.

.5 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.

.6 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.

.7 Assemble piping using fittings manufactured to ANSI standards.

.8 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main. Hole saw or drill and ream main to maintain full inside diameter of branch line prior to welding saddle.

3.3 VALVE INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Install ball valves at branch take-offs and to isolate each piece of equipment and as indicated.

.3 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.

.4 Install swing check valves in horizontal lines and as indicated.

.5 Install ball valves for glycol service.

.6 Install globe valves on by-passes where indicated.

3.4 CIRCUIT BALANCING VALVES

.1 Install flow measuring stations and flow balancing valves as indicated.

.2 Remove hand wheel after installation and TAB is complete.

.3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.5 TESTING

.1 Test system in accordance with Section 21 05 01 - Mechanical General Requirements.

.2 For glycol systems, retest with propylene glycol to ASTM E 202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

3.6 FILLING OF SYSTEM

.1 Refill system with clean water, or glycol-water mixture as indicated, adding water treatment as specified.

3.7 GLYCOL CHARGING

.1 Re-test for concentration to ASTM E202 after cleaning.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM):
- .1 ASTM A 480/A480M-01, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- .2 ASTM A 635/A635M-00, Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
- .3 ASTM A 653/A653M-00, Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.2 National Fire Protection Agency (NFPA):
- .1 NFPA 90A-99, Installation of Air Conditioning and Ventilating Systems.
- .2 NFPA 90B-99, Installation of Warm Air Heating and Air Conditioning Systems.
- .3 NFPA 91-1995, Standard for Exhaust System for Air Conveying of Vapours, Gases, Mists, and Non-combustible Particle Solids.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
- .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.
- .2 SMACNA HVAC Duct Leakage Test Manual, 1985, Technical Research Update-92.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Indicate following:
- .1 Sealants.
- .2 Tape.
- .3 Proprietary Joints.

1.3 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 Sealant

.1 Sealant: oil resistant, polymer type, water based, high pressure, non-toxic, flame resistant duct sealant. Temperature range of minus 30^0C to plus 80^0C.
.1 Acceptable Materials: Bakor Duct-Seal, Duro Dyne DSW, Ductmate PROseal, Foster.

2.2 Tape

.1 Tape: polyvinyl treated, open weave fibreglass tape, 50mm wide.
.1 Acceptable Materials: Bakor 990-06, Duro Dyne FT-2.

2.3 Duct Leakage

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

2.4 Fittings

.1 Fabrication: to SMACNA.

.2 Radiused elbows:
.1 Rectangular: standard radius. Centreline radius: 1.5 times width of duct.
.2 Round: smooth radius. Centreline radius: 1.5 times diameter.
.3 Mitred elbows, rectangular:
.1 To 400mm: with single thickness turning vanes.
.2 Over 400mm: with double thickness turning vanes.

.3 Branches:
.1 Rectangular main and branch: with 45^0 entry on branch.
.2 Round main and branch: enter main duct at 45^0 with conical connection.
.3 Provide volume control damper in branch duct near connection to main duct.
.4 Main duct branches: with balancing dampers.

.4 Transitions:
.1 Diverging: 20^0 maximum included angle, unless indicated.
.2 Converging: 30^0 maximum included angle, unless indicated.

.5 Offsets:
.1 Full radiused elbows or as indicated.

.6 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles: as for transitions.

2.5 Firestopping

.1 Retaining angles around duct, on both sides of fire separation.

.2 Firestopping material and installation must not distort duct.

.3 Breakaway duct joints at fire damper locations.

.4 See also Section 21 05 01 Mechanical General Requirments.

2.6 Galvanized Steel

.1 Lock forming quality: to ASTM A 653, Z90 zinc coating. In general, all supply and perimeter/office exhaust ducts Sealed to SMACNA Class C. All general lab exhaust ducts are Galvanized steel Sealed to SMACNA Class A.

.2 Thickness, fabrication and reinforcement: to SMACNA HVAC duct construction standards.

.3 Joints: to SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered a Class A seal.
.1 Acceptable Materials: Ductmate Canada Ltd., Exanno Nexus.

2.7 Hangers and Supports

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500mm wide.

.2 Hanger configuration: to SMACNA.

.3 Hangers: galvanized steel angle with galvanized steel rods to the following table:

Duct Size	Angle Size	Rod Size
Up to 760mm	25mm x 25mm x 3.17mm	6.35mm

.4 Upper hanger attachments:
.1 For concrete: manufactured concrete inserts.
.1 Acceptable Materials: Myatt 492/494, Grinnell.

.5 Utilize galvanized threaded rods on stainless steel ductwork. Utilize galvanized support angle iron (or channel) with neoprene isolation pads to prevent dissimilar metal contact on stainless steel ductwork.

2.8 Duct Joints

.1 Ductwork is to be prefabricated using drive slip joints sized 460mm or greater. Joints 380mm or larger are to be reinforced.

.2 Ductmate 25 and 35 and Nexus G and J shall be approved as an acceptable equal to the above requirements, with neoprene gaskets and HM572 sealant for bolted assembly.

2.9 Round Ducts

.1 Concealed round branch ducts up to 400mm diameter may be constructed with longitudinal seams.

.2 Concealed round branch ducts over 400mm and all exposed round ducts shall be factory fabricated conduit consisting of helically wound galvanized iron strips with spiral lock seams. Fittings for these conduits shall be fabricated of 20 gauge galvanized sheet steel with butt welded seams.

Part 3 Execution

3.1 General

.1 Do work in accordance with CSA B228.1 and SMACNA and as indicated.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.3 Support risers in accordance with SMACNA and as indicated.

.4 Install breakaway joints in ductwork on both sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Clean all ductwork, plenums, AHU=s, fans, etc. prior to system start-up. Submit report to NRC Departmental Representative for review. The AHU=s, exhaust and heat recovery banks shall be vacuumed and wiped clean.

3.2 Hangers

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with ASHRAE and SMACNA.

3.3 Sealing and Taping

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and re-coat with minimum of one additional coat of sealant to manufacturers recommendations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA):
.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible- 1985.

1.2 PRODUCT DATA

.1 Indicate the following: the construction and sizes.

Part 2 Products

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

.1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Inside and outside nylon end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

Part 3 Execution

3.1 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 For supply, return and exhaust systems, locate balancing dampers in each branch duct.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 All dampers to be vibration free.

.6 Ensure damper operators are observable and accessible.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 National Fire Protection Association (NFPA):
- .1 NFPA 90A-99, Installation of Air Conditioning and Ventilating Systems.
- .2 NFPA 90B-99, Installation of Warm Air Heating and Air Conditioning Systems.

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
- .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 95 and Addendum No.1 1997.

.3 Underwriter's Laboratories of Canada (ULC):
- .1 CAN/ULC-S110-M86(R2001), Fire Tests for Air Ducts.
- .2 UL 181-96, Factory Made Air Ducts and Connectors.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 00 10 00 – General Instructions.

.2 Indicate the following:
- .1 Thermal properties.
- .2 Friction loss.
- .3 Acoustical loss.
- .4 Leakage.
- .5 Fire rating.

1.3 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 GENERAL

.1 Factory fabricated to CAN/ULC S110.

.2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.

.3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.2 NON-METALLIC - UNINSULATED

.1 Non-collapsible, coated aluminum foil Mylar type, mechanically bonded to, and helically supported by, external steel wire with factory applied 32mm thick flexible glass fibre thermal insulation with vapour barrier and reinforced Mylar/neoprene laminate jacket.

.2 Performance:
- .1 Factory tested to 2488pa without leakage.
- .2 Maximum relative pressure drop coefficient: 2.

.3 Acceptable material: Thermaflex M-KE, Duro-Dyne, Atlas, Flexmaster FAB3Tm Flexible Technologies MKE.

Part 3 Execution

3.1 DUCT INSTALLATION

.1 Install in accordance with: CAN/ULC-S110, UL-181, NFPA 90A, NFPA 90B, and SMACNA.

.2 Maximum length of flexible duct: ".

.3 Support properly at maximum 1220mm intervals with wide strips to prevent kinks in duct.

.4 Use rigid sheet metal elbow at diffuser inlet neck. Maximum 15E offset with flexible duct.

.5 Flexible ducts shall not rest on the finished T-bar or GWB ceilings.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 Mechanical General Requirements.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI/NFPA 90A 2002, Standard for the Installation of Air Conditioning and Ventilating Systems.

.2 International Organization of Standardization (ISO)
- .1 ISO 3741 2001, Acoustics Determination of Sound Power Levels of Noise Sources Using Sound Pressure Precision Methods for Reverberation Rooms.

.3 Underwriter's Laboratories (UL)
- .1 UL 181 2003, Factory Made Air Ducts and Air Connectors.

1.3 SUBMITTALS

.1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 21 05 01 Mechanical General Requirements.

Part 2 Products

2.1 GENERAL

.1 Grilles, registers and diffusers of same generic type, products of one manufacturer except where specifically noted otherwise.

.2 To meet capacity, pressure drop, terminal velocity, throw, noise level, and neck velocity as indicated.

.3 Frames:
- .1 Full perimeter gaskets.
- .2 Plaster frames where set into plaster or gypsum board and as specified.
- .3 Concealed fasteners.
- .4 Mitred corners.

.4 Provide accessories noted in schedule.

.5 Finish: off white baked enamel unless noted otherwise.

.6 Supply Door Grilles for installation by others. Door grilles to be c/w auxiliary frame.

.7 Acceptable Materials: Construction Specialties, E.H. Price, Krueger, Nailor, Titus, Tuttle & Bailey.

Part 3 Execution

3.1 MANUFACTURER=S INSTRUCTIONS

.1 Comply with manufacturer=s written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.

3.2 INSTALLATION

.1 All diffusers, registers, and grilles shall be free of fluttering, chattering, and vibration. Provide a felt or sponge rubber gasket behind outlet / inlet and adequate fastening to prevent air leakage and dirt streaks between the unit and the wall / ceiling.

.2 Install with flat head cadmium plated screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

.4 Provide concealed safety chain on each grille, register and diffuser in gymnasium and similar game rooms and elsewhere as indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 Mechanical General Requirements.

1.2 REFERENCES

.1 Air Conditioning and Refrigeration Institute (ARI)
- .1 ARI 210/240, Standard for Unitary Air Conditioning and Air Source Heat Pump Equipment.
- .2 ARI 325 98, Standard for Ground Water Source Heat Pumps.

.2 American National Standards Institute/Air Conditioning and Refrigeration Institute (ANSI/ARI)
- .1 ANSI/ARI 320, Standard for Water Source Heat Pumps.
- .2 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

.3 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .1 ASHRAE Standard 15, Safety Standard for Refrigeration Systems.

.4 Canadian Standards Association (CSA International)
- .1 CAN/CSA C273.3 M91 Performance Standard for Split System Central Air Conditioners and Heat Pumps.
- .2 CAN/CSA C446 M90, Performance of Ground and Water Source Heat Pumps.
- .3 CAN/CSA C655 M91, Performance Standard for Internal Water Loop Heat Pumps.
- .4 CAN/CSA C656, Performance Standard for Single Package Central Air Conditioners and Heat Pumps.

.5 Natural Resources Canada
- .1 Energy Efficiency Act - Canadian Energy Efficiency Regulations

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Provide Shop Drawing and Maintenance Manual submittals in accordance with Section 21 05 01 Mechanical General Requirements.

.2 Manufacturer shall also provide test data with the shop drawings for review to verify that the cabinet construction satisfies airflow leakage requirement below.

Part 2 Products

2.1 WATER SOURCE HEAT PUMP UNITS (VERTICAL WATER-TO-AIR A/C UNITS)

.1 General:
- .1 Vertical type, consisting of factory-assembled package containing fan, air-to-refrigerant coil, compressor, 4-way reversing valve, water-to-refrigerant heat exchanger.
- .2 Performance: as indicated, Certified in accordance with CAN/CSA-C655.

.2 Basic unit:
- .1 Compressor: welded hermetic type with internal vibration isolation. Controls to prevent compressor short cycling.
- .2 Air-to-refrigerant coil: aluminum plate fins mechanically bonded to copper tubing with joints brazed and with controls factory installed.
- .3 Water-to-refrigerant heat exchanger: circular tube-in-tube type with steel outer tube, stainless steel integral finned inner tube tested for maximum w.p. of 2 MPa.
- .4 Refrigerant piping: factory assembled, tested, charged, sealed, with capillary metering device, thermal expansion valve, pilot operated refrigerant reversing valve, high pressure and low temperature safety cut-outs.
- .5 Water piping within unit: factory assembled and tested to 1.4 MPa.
- .6 FPT connections: gate valve tested to 1.4 MPa WOG (on supply line) and ball valve tested to 2.8 MPa WOG (on return line), flexible hose with threaded swivel connections on supply and return lines to heat exchanger.
- .7 Piping connections: arranged so that only one supply and return connections to hydronic system is required on site.
- .8 Fan: centrifugal forward curved with double inlet, statically and dynamically balanced belt driven from multi-speed, factory lubricated motor.
- .9 Filters: 25 mm thick throw away type. Provide spare filter for each unit.
- .10 Unit cabinet: constructed of heavy gauge die-formed galvanized steel with welded corner bracing, complete with provision for connection to return ductwork.
- .11 Console cabinet acoustically insulated.

.13 Finish: oven baked enamel.
.14 Provide for field connection of water and electrical services.
.15 Condensate drain: pan and piping designed to ensure complete removal of water.
.16 Drain connections: minimum NPS 75mm
.17 Controls: unit mounted with OFF-COOL and fan speed selectors, manually adjustable thermostat with remote bulb in return air.
.20 Sound ratings: measured from unit casing at unit inlet while in cooling mode.
.21 Where manufacturer cannot meet specified Sound Power Levels, provide downstream or upstream silencer. Where radiated noise level exceeds specified PWL, provide special enclosure around entire unit, designed to fit in allotted space and still allow full access to unit for O&M.
.22 Acceptable Manufacturers: Engineered Air, Daikin, Trane.

Part 3 Execution

3.1 INSTALLATION

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

.2 Install floor-mounted units at on a equipment housekeeping pad.

.3 Install floor-mounted water-to-water heat pump units complete with spring vibration isolation providing 95% isolation efficiency.
.4 Installed concealed, ceiling-mounted, horizontal water-to-air Heat pump units complete with spring vibration isolation hangers providing 95% isolation efficiency.

.5 Secure with hold down bolts.

.6 Make duct connections through flexible connections.

.7 Level unit with fans running. Align ductwork. flexible connections. Misalignment with fan stopped not to strain or damage flexible connection.

.8 Make piping connections.

.9 Nothing to obstruct ready access to components or to prevent removal of components for servicing.

3.2 DRAIN PANS

.1 Install so that no water can accumulate and arrange for easy access for cleaning.

3.3 START-UP AND COMMISSIONING

.1 Manufacturer to certify installation.

.2 Manufacturer trained personal to test and start up units and certify performance.

.3 Manufacturer to provide verbal, video, and written instructions to operating personnel.

.4 Submit written report to the NRC Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 - Mechanical General Requirements
.2 Section 23 05 53.01 – Mechanical Identification
.3 Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.
.4 Section 25 90 01 - EMCS: Site Requirements Applications and Systems Sequences of Operation.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA).
  .1 ANSI/ISA 5.5-1985, Graphic Symbols for Process Displays.

.2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).
  .1 ANSI/IEEE 260.1-1993, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
  .1 ASHRAE STD 135-R2001, BACNET - Data Communication Protocol for Building Automation and Control Network.

.4 Consumer Electronics Association (CEA).
  .1 CEA-709.1-B-2002, Control Network Protocol Specification.

.5 Nova Scotia Department of Labour and Workforce Development
.1 Electrical Bulletin 2012-02

1.3 SUBMITTALS

.1 Make submittals in accordance with 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

1.4 ACRONYMS AND ABBREVIATIONS

.1 Acronyms used in EMCS:
  .1 AEL - Average Effectiveness Level.
  .2 AI - Analog Input.
  .3 AIT - Agreement on International Trade.
  .4 AO - Analog Output.
  .5 BACnet - Building Automation and Control Network.
  .6 BC(s) - Building Controller(s).
  .7 BECC - Building Environmental Control Center.
  .8 CAD - Computer Aided Design.
  .9 CDL - Control Description Logic.
  .10 CDS - Control Design Schematic.
  .11 COSV - Change of State or Value.

.12 CPU - Central Processing Unit.
.13 DI - Digital Input.
.14 DO - Digital Output.
.15 DP - Differential Pressure.
.16 ECU - Equipment Control Unit.
.17 EMCS - Energy Management and Control System.
.18 HVAC - Heating, Ventilation, Air Conditioning.
.19 IDE - Interface Device Equipment.
.20 I/O - Input/Output.
.21 ISA - Industry Standard Architecture.
.22 LAN - Local Area Network.
.23 LCU - Local Control Unit.
.24 MCU - Master Control Unit.
.25 NC - Normally Closed.
.26 NO - Normally Open.
.27 OS - Operating System.
.28 O&M - Operation and Maintenance.
.29 OWS - Operator Work Station.
.30 PC - Personal Computer.
.31 PCI - Peripheral Control Interface.
.32 PCMCIA - Personal Computer Micro-Card Interface Adapter.
.33 PID - Proportional, Integral and Derivative.
.34 RAM - Random Access Memory.
.35 SP - Static Pressure.
.36 ROM - Read Only Memory.
.37 TCU - Terminal Control Unit.
.38 USB - Universal Serial Bus.
.39 UPS - Uninterruptible Power Supply.
.40 VAV - Variable Air Volume.

1.5 DEFINITIONS

.1 AEL: ratio between total test period less any system downtime accumulated within that period and test period.

.2 Downtime: results whenever EMCS is unable to fulfill required functions due to malfunction of equipment defined under responsibility of EMCS contractor. Downtime is measured by duration, in time, between time that Contractor is notified of failure and time system is restored to proper operating condition. Downtime not to include following:

.1 Outage of main power supply in excess of back-up power sources, provided that:
.1 Automatic initiation of back-up was accomplished.
.2 Automatic shut-down and re-start of components was as specified.

.2 Failure of communications link, provided that:
.1 Controller automatically and correctly operated in stand-alone mode.
.2 Failure was not due to failure of any specified EMCS equipment.

.3 Functional failure resulting from individual sensor inputs or output devices, provided that:
.1 System recorded said fault.
.2 Equipment defaulted to fail-safe mode.

.3 AEL of total of all input sensors and output devices is at least 99 % during test period.

.3 Point: may be logical or physical.
- .1 Logical points: values calculated by system such as setpoints, totals, counts, derived corrections and may include, but not limited to result of and statements in CDL's.
- .2 Physical points: inputs or outputs which have hardware wired to controllers which are measuring physical properties, or providing status conditions of contacts or relays which provide interaction with related equipment (stop, start) and valve or damper actuators.

.4 Point Name: composed of two parts, point identifier and point expansion.
- .1 Point identifier: comprised of three descriptors, "area" descriptor, "system" descriptor and "point" descriptor, for which database to provide 25 character field for each point identifier. "System" is system that point is located on.
  - .1 Area descriptor: building or part of building where point is located.
  - .2 System descriptor: system that point is located on.
  - .3 Point descriptor: physical or logical point description. For point identifier "area", "system" and "point" will be shortforms or acronyms. Database must provide 25 character field for each point identifier.
- .2 Point expansion : comprised of three fields, one for each descriptor. Expanded form of shortform or acronym used in "area", "system" and "point" descriptors is placed into appropriate point expansion field. Database must provide 32 character field for each point expansion.
- .3 Bilingual systems to include additional point identifier expansion fields of equal capacity for each point name for second language.
  - .1 System to support use of numbers and readable characters including blanks, periods or underscores to enhance user readability for each of the above strings.

.5 Point Object Type: points fall into following object types:
- .1 AI (analog input).
- .2 AO (analog output).
- .3 DI (digital input).
- .4 DO (digital output).
- .5 Pulse inputs.

.6 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.
- .1 Printouts: to ANSI/IEEE 260.1.

1.6 QUALITY CONTROL
- .1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.
- .2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.

.3 Submit proof of compliance to specified standards with shop drawings and product data in accordance with Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process. Label or listing of specified organization is acceptable evidence.
.4 In lieu of such evidence, submit certificate from testing organization, approved by NRC Departmental Representative, certifying that item was tested in accordance with their test methods and that item conforms to their standard/code.
.5 For materials whose compliance with organizational standards/codes/specifications is not regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.
.6 Permits and fees: in accordance with general conditions of contract.
.7 Submit certificate of acceptance from authority having jurisdiction.
.8 Existing devices intended for re-use: submit test report.

1.7 SYSTEM DESCRIPTION

.1 Refer to control schematics and for system architecture.

.2 Work covered by sections referred to above consists of fully operational EMCS, including, but not limited to, following:
.1 Building Controllers.
.2 Control devices as listed in I/O point summary tables.
.3 OWS(s).
.4 Data communications equipment necessary to effect EMCS data transmission system.
.5 Field control devices.
.6 Software/Hardware complete with full documentation.
.7 Complete operating and maintenance manuals.
.8 Training of personnel.
.9 Acceptance tests, technical support during commissioning, full documentation.
.10 Wiring interface co-ordination of equipment supplied by others.
.11 Miscellaneous work as specified in these sections and as indicated.

.3 Design Requirements:
.1 Design and provide conduit and wiring linking elements of system.
.2 Supply sufficient programmable controllers of types to meet project requirements. Quantity and points contents as reviewed NRC Departmental Representative prior to installation.
.3 Location of controllers as reviewed by NRC Departmental Representative and NRC Departmental Representative prior to installation.
.4 Provide utility power to EMCS and emergency power to EMCS as indicated.

.4 Language Operating Requirements:
.1 Provide English and French operator selectable access codes.
.2 Use non-linguistic symbols for displays on graphic terminals wherever possible. Other information to be in English and French.

.3 Operating system executive: provide primary hardware-to-software interface specified as part of hardware purchase with associated documentation to be in English and French.

.4 System manager software: include in English and French system definition point database, additions, deletions or modifications, control loop statements, use of high level programming languages, report generator utility and other OS utilities used for maintaining optimal operating efficiency.

.5 Include, in English and French:

.1 Input and output commands and messages from operator-initiated functions and field related changes and alarms as defined in CDL's or assigned limits (i.e. commands relating to day-to-day operating functions and not related to system modifications, additions, or logic re-definements).

.2 Graphic "display" functions, point commands to turn systems on or off, manually override automatic control of specified hardware points. To be in English and French at specified OWS and to be able to operate one terminal in English and second in French. Point name expansions in both languages.

.3 Reporting function such as trend log, trend graphics, alarm report logs, energy report logs, maintenance generated logs.

.5 Acceptable Supplier/Manufacturer Siemens Building Technologies

1.8 QUALITY ASSURANCE

.1 Have local office within 50 km of project staffed by trained personnel capable of providing instruction, routine maintenance and emergency service on systems,

.2 Provide record of successful previous installations submitting tender showing experience with similar installations utilizing computer-based systems.

.3 Have access to local supplies of essential parts and provide 7 year guarantee of availability of spare parts after obsolescence.

.4 Ensure qualified supervisory personnel continuously direct and monitor Work and attend site meetings.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Provide Material Delivery Schedule to NRC Departmental Representative within 2 weeks after award of Contract.

1.10 EXISTING CONDITIONS - CONTROL COMPONENTS

.1 Utilize existing control wiring and piping as indicated.

.2 Re-use field control devices that are usable in their original configuration provided that they conform to applicable codes, standards specifications.

.1 Do not modify original design of existing devices without written permission from NRC Departmental Representative.

.2 Provide for new, properly designed device where re-usability of components is uncertain.

.3 Inspect and test existing devices intended for re-use within 30 days of award of contract, and prior to installation of new devices.

.1 Furnish test report within 40 days of award of contract listing each component to be re-used and indicating whether it is in good order or requires repair by NRC Departmental Representative.

.2 Failure to produce test report will constitute acceptance of existing devices by contractor.

.4 Non-functioning items:

.1 Provide with report specification sheets or written functional requirements to support findings.

.2 NRC Departmental Representative will repair or replace existing items judged defective yet deemed necessary for EMCS.

.5 Submit written request for permission to disconnect controls and to obtain equipment downtime before proceeding with Work.

.6 Assume responsibility for controls to be incorporated into EMCS after written receipt of approval from NRC Departmental Representative.

.1 Be responsible for items repaired or replaced by NRC Departmental Representative.

.2 Be responsible for repair costs due to negligence or abuse of equipment.

.3 Responsibility for existing devices terminates upon final acceptance of EMCS by NRC Departmental Representative.

.7 Remove existing controls not re-used or not required. Place in approved storage for disposition as directed.

Part 2 Products

2.1 EQUIPMENT

.1 Control Network Protocol and Data Communication Protocol: to CEA 709.1

.2 Complete list of equipment and materials to be used on project and forming part of tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.

Part 3 Execution

3.1 MANUFACTURER'S RECOMMENDATIONS

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

END OF SECTION

Part 1 General

1.1 REFERENCED SECTIONS

.1 Section 21 05 01 - Mechanical General Requirements.
.2 Section 25 05 01 - EMCS: General Requirements
.3 Section 25 01 11 - EMCS: Start-up, Verification and Commissioning

1.2 SUBMITTALS

.1 Submit preliminary design document within 5 working days after tender closing and before contract award, for review by NRC Departmental Representative.

.2 Shop Drawings to consist of 1 soft copy of design documents, shop drawings, product data and software.

.3 Soft copy to be in Autocad - latest version and *.pdf format, structured using menu format for easy loading and retrieval on OWS.

1.3 DESIGN REQUIREMENTS

.1 Preliminary Design Review: to contain following contractor and systems information.
- .1 Location of local office.
- .2 Description and location of installing and servicing technical staff.
- .3 Location and qualifications of programming design and programming support staff.
- .4 List of spare parts.
- .5 Location of spare parts stock.
- .6 Names of sub-contractors and site-specific key personnel.
- .7 Sketch of site-specific system architecture.
- .8 Specification sheets for each item including memory provided, programming language, speed, type of data transmission.
- .9 Descriptive brochures.
- .10 Sample CDL and graphics (systems schematics).
- .11 Response time for each type of command and report.
- .12 Item-by-item statement of compliance.
- .13 Proof of demonstrated ability of system to communicate utilizing BACnet.

1.4 PRELIMINARY SHOP DRAWING REVIEW

.1 Submit preliminary shop drawings within 30 working days of award of contract and include following:
- .1 Specification sheets for each item. To include manufacturer's descriptive literature, manufacturer's installation recommendations, specifications, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, other data to establish compliance.

.2 Detailed system architecture showing all points associated with each controller including signal levels, pressures where new EMCS ties into existing control equipment.
.3 Spare point capacity of each controller by number and type.
.4 Controller locations.
.5 Auxiliary control cabinet locations.
.6 Single line diagrams showing cable routings, conduit sizes, spare conduit capacity between control centre, field controllers and systems being controlled.
.7 Valves: complete schedule listing including following information: designation, service, manufacturer, model, point ID, design flow rate, design pressure drop, required Cv, Valve size, actual Cv, spring range, pilot range, required torque, actual torque and close off pressure (required and actual).
.8 Dampers: sketches showing module assembly, interconnecting hardware, operator locations, operator spring range, pilot range, required torque, actual torque.
.9 Flow measuring stations: complete schedule listing designation, service, point ID, manufacturer, model, size, velocity at design flow rate, manufacturer, model and range of velocity transmitter.
.10 Compressor schematic and sizing data.

1.5 DETAIL SHOP DRAWING REVIEW

.1 Submit detailed shop drawings within 60 working days after award of contract and before start of installation and include following:
.1 Corrected and updated versions of submissions made during preliminary review.
.2 Wiring diagrams.
.3 Piping diagrams and hook-ups.
.4 Interface wiring diagrams showing termination connections and signal levels for equipment to be supplied by others.
.5 Shop drawings for each input/output point, sensors, transmitters, showing information associated with each particular point including:
.1 Sensing element type and location.
.2 Transmitter type and range.
.3 Associated field wiring schematics, schedules and terminations.
.4 Pneumatic schematics and schedules.
.5 Complete Point Name Lists.
.6 Setpoints, curves or graphs and alarm limits (high and low, 3 types critical, cautionary and maintenance), signal range.
.7 Software and programming details associated with each point.
.8 Manufacturer's recommended installation instructions and procedures.
.9 Input and output signal levels or pressures where new system ties into existing control equipment.
.6 Control schematics, narrative description, CDL's fully showing and describing automatic and manual procedure required to achieve proper operation of project, including under complete failure of EMCS.
.7 Graphic system schematic displays of air and water systems with point identifiers and textual description of system, and typical floor plans as specified.

.8 Complete system CDL's including companion English language explanations on same sheet but with different font and italics. CDL's to contain specified energy optimization programs.
.9 Listing and example of specified reports.
.10 Listing of time of day schedules.
.11 Mark up to-scale construction drawing to detail control room showing location of equipment and operator work space.
.12 Type and size of memory with statement of spare memory capacity.
.13 Full description of software programs provided.
.14 Sample of "Operating Instructions Manual" to be used for training purposes.
.15 Outline of proposed start-up and verification procedures. Refer to Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

1.6 CONTRACT CLOSEOUT DOCUMENTS

.1 Prior to final site review by NRC Departmental Representative provide a draft copy of Maintenance Manual complete except for final checklists and setting.

.2 Prior to NRC Departmental Representative training provide final copy of Maintenance Manual. Manuals to be in format described in Section 21 05 01 – Common Work Results – Mechanical.

.3 Maintenance Manual shall include the following:
.1 Have a title sheet, or sheets, preceding data on which shall be recorded Project name, date, list of contents, Trade Contractor's name, and contact information.
.2 Be separated / organized into applicable sections of work with each section clearly labeled.
.3 Contain a list of local or nearest representative of each piece of equipment including mail address, e-mail address, web site, and phone number including sources of supply for all proprietary products used in the work.
.4 One (1) copy of each final approved shop drawing on which have been recorded changes made during fabrication and installation.
.5 Equipment Maintenance and Operating Data
.6 General and specific instructions for the maintenance and operation of automatic and adjustable controls.
.7 Lists of recommended spare parts.
.8 A Preventative Maintenance Schedule.
.9 Provide separate tab for MSDS or SDS for all hazardous material installed and left stored on site or with the NRC Departmental Representative. First page of tab to be an index of MSDS or SDS included.
.10 Provide separate tab for the Warrantee
.11 Points Verification List
.12 Control Sequences, schematic drawings of sequences, and Set Points
.13 Provide separate tab for all equipment startup reports including. First page of tab to be an index of reports include.

.2 As-Built Drawings

.1 Provide drawings of floor plans showing locations of control panels, transformers, temperature and pressure sensors, and all control devices concealed above finished ceiling, in walls behind access doors, or accessed on roof.

1.7 QUALITY ASSURANCE

.1 Preliminary Design Review Meeting: Convene meeting within 45 working days of award of contract to:

.1 Undertake functional review of preliminary design documents, resolve inconsistencies.

.2 Resolve conflicts between contract document requirements and actual items (e.g.: points list inconsistencies).

.3 Review interface requirements of materials supplied by others.

.4 Review "Sequence of Operations".

.2 Contractor's programmer to attend meeting.

.3 NRC Departmental Representative retains right to revise sequence or subsequent CDL prior to software finalization without cost to NRC Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 - Mechanical General Requirements
.2 Section 25 05 01 - EMCS: General Requirements.
.3 Section 25 05 02 - EMCS: Submittals and Review Process.
.4 Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

1.2 SUBMITTALS

.1 Make submittals in accordance with 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

.2 Record Documents to be in in English.

.3 Provide soft copies and hard copies in hard-back, 50 mm 3 ring, D-ring binders.
- .1 Binders to be 2/3 maximum full.
- .2 Provide index to full volume in each binder.
- .3 Identify contents of each manual on cover and spine.
- .4 Provide Table of Contents in each manual.
- .5 Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

1.3 AS-BUILTS

.1 Provide 1 copy of detailed shop drawings generated in Section 25 05 02 - EMCS: Submittals and Review Process and include:
- .1 Changes to contract documents as well as addenda and contract extras.
- .2 Changes to interface wiring.
- .3 Routing of conduit, wiring and control air lines associated with EMCS installation.
- .4 Locations of obscure devices to be indicated on drawings.
- .5 Listing of alarm messages.
- .6 Panel/circuit breaker number for sources of normal/emergency power.
- .7 Names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.
- .8 Test procedures and reports: provide records of start-up procedures, test procedures, checkout tests and final commissioning reports as specified in Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.
- .9 Basic system design and full documentation on system configuration.

.2 Submit for final review by NRC Departmental Representative.

.3 Provide before acceptance 3 Hard and 1 soft copy incorporating changes made during final review.

1.4 O&M MANUALS

.1 Custom design O&M Manuals (both hard and soft copy) to contain material pertinent to this project only and to provide full and complete coverage of subjects referred to in this Section.

.2 Provide 3 complete sets of hard and 1 soft copy prior to system or equipment tests

.3 Include complete coverage in concise language, readily understood by operating personnel using common terminology of functional and operational requirements of system. Do not presume knowledge of computers, electronics or in-depth control theory.

.4 Functional description to include:
- .1 Functional description of theory of operation.
- .2 Design philosophy.
- .3 Specific functions of design philosophy and system.
- .4 Full details of data communications, including data types and formats, data processing and disposition data link components, interfaces and operator tests or self-test of data link integrity.
- .5 Explicit description of hardware and software functions, interfaces and requirements for components in functions and operating modes.
- .6 Description of person-machine interactions required to supplement system description, known or established constraints on system operation, operating procedures currently implemented or planned for implementation in automatic mode.

.5 System operation to include:
- .1 Complete step-by-step procedures for operation of system including required actions at each OWS.
- .2 Operation of computer peripherals, input and output formats.
- .3 Emergency, alarm and failure recovery.
- .4 Step-by-step instructions for start-up, back-up equipment operation, execution of systems functions and operating modes, including key strokes for each command so that operator need only refer to these pages for keystroke entries required to call up display or to input command.
- .5 General and specific instructions for the maintenance and operation of automatic and adjustable controls.
- .6 Seasonal settings and changeovers.
- .7 Document the limits of adjustment of manual controls.

.6 Software to include:
- .1 Documentation of theory, design, interface requirements, functions, including test and verification procedures.

.2 Detailed descriptions of program requirements and capabilities.
.3 Data necessary to permit modification, relocation, reprogramming and to permit new and existing software modules to respond to changing system functional requirements without disrupting normal operation.
.4 Software modules, fully annotated source code listings, error free object code files ready for loading via peripheral device
.5 Complete program cross reference plus linking requirements, data exchange requirements, necessary subroutine lists, data file requirements, other information necessary for proper loading, integration, interfacing, program execution.
.6 Software for each Controller and single section referencing Controller common parameters and functions.

.7 Maintenance: document maintenance procedures including inspection, periodic preventive maintenance, fault diagnosis, repair or replacement of defective components, including calibration, maintenance, repair of sensors, transmitters, transducers, controller and interface firmware's, plus diagnostics and repair/replacement of system hardware.

.8 System configuration document:
.1 Provisions and procedures for planning, implementing and recording hardware and software modifications required during operating lifetime of system.
.2 Information to ensure co-ordination of hardware and software changes, data link or message format/content changes, sensor or control changes in event that system modifications are required.

.9 Programmer control panel documentation: provide where panels are independently interfaced with building network, including interfacing schematics, signal identification, timing diagrams, and fully commented source listing of applicable driver/handler.

.10 Preventative Maintenance (PM) Schedule.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 - Mechanical General Requirements
.2 Section 25 05 01 - EMCS: General Requirements.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
  .1 CSA Z204-94(R1999), Guidelines for Managing Indoor Air Quality in Office Buildings.

1.3 SUBMITTALS

.1 Make submittals in accordance with 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

.2 Submit detailed preventative maintenance schedule for system components to NRC Departmental Representative.

.3 Submit detailed inspection reports to NRC Departmental Representative.

.4 Submit dated, maintenance task lists to NRC Departmental Representative and include the following sensor and output point detail, as proof of system verification:
  .1 Point name and location.
  .2 Device type and range.
  .3 Measured value.
  .4 System displayed value.
  .5 Calibration detail
  .6 Indication if adjustment required and made
  .7 Other action taken or recommended.

.5 Submit network analysis report showing results with detailed recommendations to correct problems found.

.6 Records and logs: in accordance with Section 00 10 00 – General Instruction.
  .1 Maintain records and logs of each maintenance task on site.
  .2 Organize cumulative records for each major component and for entire EMCS chronologically.
  .3 Submit records to NRC Departmental Representative, after inspection indicating that planned and systematic maintenance have been accomplished.

.7 Revise and submit to NRC Departmental Representative.

1.4 MAINTENANCE SERVICE DURING WARRANTY PERIOD

.1 Provide services, materials, and equipment to maintain EMCS for specified warranty period. Provide detailed preventative maintenance schedule for system components as described in Submittal article.

.2 Emergency Service Calls:
- .1 Initiate service calls when EMCS is not functioning correctly.
- .2 Qualified control personnel to be available during warranty period to provide service to "CRITICAL" components whenever required at no extra cost.
- .3 Furnish NRC Departmental Representative with telephone number where service personnel may be reached at any time.
- .4 Service personnel to be on site ready to service EMCS within 2 hours after receiving request for service.
- .5 Perform Work continuously until EMCS restored to reliable operating condition.

.3 Operation: foregoing and other servicing to provide proper sequencing of equipment and satisfactory operation of EMCS based on original design conditions and as recommended by manufacturer.

.4 Work requests: record each service call request, when received separately on approved form and include:
- .1 Serial number identifying component involved.
- .2 Location, date and time call received.
- .3 Nature of trouble.
- .4 Names of personnel assigned.
- .5 Instructions of work to be done.
- .6 Amount and nature of materials used.
- .7 Time and date work started.
- .8 Time and date of completion.

.5 Provide system modifications in writing.
- .1 No system modification, including operating parameters and control settings, to be made without prior written approval of NRC Departmental Representative or his representative.

1.5 SERVICE CONTRACTS

.1 Provide in-depth technical expertise and assistance to NRC Departmental Representative and Commissioning Manager in preparation and implementation of service contracts and in-house preventive maintenance procedures.

.2 Service Contracts to include:
- .1 Annual verification of field points for operation and calibration.
- .2 Minimum of 4 visits per year for regular maintenance.

.3 Rresponses to emergency calls during day, per year.
.4 Complete inventory of installed system.

Part 2 Execution

2.1 FIELD QUALITY CONTROL

.1 Perform as minimum (3) three minor inspections and one major inspection (more often if required by manufacturer) per year. Provide detailed written report to NRC Departmental Representative as described in Submittal article.

.2 Perform inspections during regular working hours coordinated in advance with the NRC Departmental Representative.

.3 Following inspections are minimum requirements and should not be interpreted to mean satisfactory performance:
- .1 Perform calibrations using test equipment having traceable, certifiable accuracy at minimum 50% greater than accuracy of system displaying or logging value.
- .2 Check and Calibrate each field input/output device in accordance with Canada Labour Code - Part I and CSA Z204.
- .3 Provide dated, maintenance task lists, as described in Submittal article, as proof of execution of complete system verification.

.4 Minor inspections to include, but not limited to:
- .1 Perform visual, operational checks to BC's, peripheral equipment, interface equipment and other panels.
- .2 Check equipment cooling fans as required.
- .3 Visually check for mechanical faults, air leaks and proper pressure settings on pneumatic components.
- .4 Review system performance NRC Departmental Representative to discuss suggested or required changes.

.5 Major inspections to include, but not limited to:
- .1 Minor inspection.
- .2 Clean OWS(s) peripheral equipment, BC(s), interface and other panels, micro-processor interior and exterior surfaces.
- .3 Check signal, voltage and system isolation of BC(s), peripherals, interface and other panels.
- .4 Verify calibration/accuracy of each input and output device and recalibrate or replace as required.
- .5 Provide mechanical adjustments, and necessary maintenance on printers.
- .6 Run system software diagnostics as required.
- .7 Install software and firmware enhancements to ensure components are operating at most current revision for maximum capability and reliability.
  - .1 Perform network analysis and provide report as described in Submittal article.

.6 Rectify deficiencies revealed by maintenance inspections and environmental checks.

.7 Continue system debugging and optimization.

.8 Testing/verification of occupancy and seasonal-sensitive systems to take place during four (4) consecutive seasons, after facility has been accepted, taken over and fully occupied.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 – Mechanical General Requirements.
.2 Section 25 05 01 - EMCS: General Requirements:

1.2 REFERENCES

.1 Canadian Electrical Code

.2 Canadian Standards Association (CSA International).
- .1 CSA T529-95(R2000), Telecommunications Cabling Systems in Commercial Buildings (Adopted ANSI/TIA/EIA-568-A with modifications).
- .2 CSA T530-99(R2004), Commercial Building Standard for Telecommunications Pathways and Spaces (Adopted ANSI/TIA/EIA-569-A with modifications).

.3 Institute of Electrical and Electronics Engineers (IEEE)/Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements.
- .1 IEEE Std 802.3™-2002, Part 3: Carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

.4 Nova Scotia Department of Labour and Advanced Education
- .1 Electrical Bulletin 2011-02
- .2 Electrical Bulletin 2012-02

.5 Telecommunications Industries Association (TIA)/Electronic Industries Alliance (EIA)
- .1 TIA/EIA-568-March 2004, Commercial Building Telecommunications Cabling Standards Set, Part 1 General Requirements Part 2 Balanced Twisted-Pair Cabling Components Part 3 Optical Fiber Cabling Components Standard.
- .2 TIA/EIA-569-A-December 2001, Commercial Building Standard for Telecommunications Pathways and Spaces.

.6 Treasury Board Information Technology Standard (TBITS).
- .1 TBITS 6.9-2000, Profile for the Telecommunications Wiring System in Government Owned and Leased Buildings - Technical Specifications.

1.3 SUBMITTALS

.1 Make submittals in accordance with Section 00 10 00 – General Instructions and 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 21 05 01 – Mechanical General Requirments
.2 Section 25 05 01 - EMCS: General Requirements
.3 Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process
.4 Section 25 05 03 - EMCS: Project Record Documents

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
  .1 C22.2 No.205-M1983(R1999), Signal Equipment.

.2 Institute of Electrical and Electronics Engineers (IEEE).
  .1 IEEE C37.90.1-02, Surge Withstand Capabilities (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus.

1.3 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

1.4 SYSTEM DESCRIPTION

.1 General: Network of controllers comprising of MCU('s), LCU('s), ECU('s) or TCU('s) to be provided as indicated in System Architecture Diagram to support building systems and associated sequence(s) of operations as detailed in these specifications.
  .1 Provide sufficient controllers to meet intents and requirements of this section.
  .2 Controller quantity, and point contents to be reviewed by NRC Departmental Representative at time of preliminary design review.

.2 Controllers: stand-alone intelligent Control Units.
  .1 Incorporate programmable microprocessor, non-volatile program memory, RAM, power supplies, as required to perform specified functions.
  .2 Incorporate communication interface ports for communication to LANs to exchange information with other Controllers.
  .3 Capable of interfacing with operator interface device.
  .4 Execute its logic and control using primary inputs and outputs connected directly to its onboard input/output field terminations or slave devices, and without need to interact with other controller. Secondary input used for reset such as outdoor air temperature may be located in other Controller(s).
    .1 Secondary input used for reset such as outdoor air temperature may be located in other Controller(s).

.3 Interface to include provisions for use USB connector to a Laptop or Tablet PC.

1.5 DESIGN REQUIREMENTS

.1 To include:
- .1 Scanning of AI and DI connected inputs for detection of change of value and processing detection of alarm conditions.
- .2 Perform On-Off digital control of connected points, including resulting required states generated through programmable logic output.
- .3 Perform Analog control using programmable logic, (including PID) with adjustable dead bands and deviation alarms.
- .4 Control of systems as described in sequence of operations.
- .5 Execution of optimization routines as listed in this section.

.2 Total spare capacity for MCUs and LCUs: at least 25 % of each point type distributed throughout the MCUs and LCUs.

.3 Field Termination and Interface Devices:
- .1 To: CSA C22.2 No.205.
- .2 Electronically interface sensors and control devices to processor unit.
- .3 Include, but not be limited to, following:
  - .1 Programmed firmware or logic circuits to meet functional and technical requirements.
  - .2 Power supplies for operation of logics devices and associated field equipment.
  - .3 Lockable wall cabinet.
  - .4 Required communications equipment and wiring (if remote units).
  - .5 Leave controlled system in "fail-safe" mode in event of loss of communication with, or failure of, processor unit.
  - .6 Input Output interface to accept as minimum AI, AO, DI, DO functions as specified.
  - .7 Wiring terminations: use conveniently located screw type or spade lug terminals.
- .4 AI interface equipment to:
  - .1 Convert analog signals to digital format with 10 bit analog-to-digital resolution.
  - .2 Provide for following input signal types and ranges:
    - .1 4 - 20 mA;
    - .2 0 - 10 V DC;
    - .3 100/1000 ohm RTD input;
  - .3 Meet IEEE C37.90.1 surge withstand capability.
  - .4 Have common mode signal rejection greater than 60 dB to 60 Hz.
  - .5 Where required, dropping resistors to be certified precision devices which complement accuracy of sensor and transmitter range specified.
- .5 AO interface equipment:
  - .1 Convert digital data from controller processor to acceptable analog output signals using 8 bit digital-to-analog resolution.
  - .2 Provide for following output signal types and ranges:
    - .1 4 - 20 mA.
    - .2 0 - 10 V DC.
  - .3 Meet IEEE C37.90.1 surge withstand capability.

.6 DI interface equipment:
- .1 Able to reliably detect contact change of sensed field contact and transmit condition to controller.
- .2 Meet IEEE C37.90.1 surge withstand capability.
- .3 Accept pulsed inputs up to 2 kHz.

.7 DO interface equipment:
- .1 Respond to controller processor output, switch respective outputs. Each DO hardware to be capable of switching up to 0.5 amps at 24 V AC.
- .2 Switch up to 5 amps at 220 V AC using optional interface relay.

.4 Controllers and associated hardware and software: operate in conditions of -10 degrees C to 44 degrees C and 20 % to 90 % non-condensing RH.

.5 Controllers (MCU, LCU): mount in wall mounted cabinet with hinged, keyed-alike lockable door.
- .1 Provide for conduit entrance from top, bottom or sides of panel.
- .2 ECUs and TCUs to be mounted in equipment enclosures or separate enclosures.
- .3 Mounting details as approved by NRC Departmental Representative for ceiling mounting.

.6 Cabinets to provide protection from water dripping from above, while allowing sufficient airflow to prevent internal overheating.

.7 Provide surge and low voltage protection for interconnecting wiring connections.

Part 2 Products

2.1 MASTER CONTROL UNIT (MCU)

.1 General: primary function of MCU is to provide co-ordination and supervision of subordinate devices in execution of optimization routines such as demand limiting or enthalpy control.

.2 Include high speed communication LAN Port for Peer to Peer communications with OWS(s) and other MCU level devices.
- .1 MCU must support BACnet.

.3 MCU local I/O capacity as follows:
- .1 MCU I/O points as allocated in I/O Summary Table referenced in MD13800.
- .2 LCUs may be added to support system functions.

.4 Central Processing Unit (CPU).
- .1 Processor to consist of minimum 16 bit microprocessor capable of supporting software to meet specified requirements.
- .2 CPU idle time to be more than 30 % when system configured to maximum input and output with worst case program use.

.3 Minimum addressable memory to be at manufacturer's discretion but to support at least performance and technical specifications to include but not limited to:
.1 Non-volatile memory to contain operating system, executive, application, sub-routine, other configurations definition software, schedules, application parameters, operating data, etc.

.4 Include uninterruptible clock accurate to plus or minus 5 secs/month, capable of deriving year/month/day/hour/minute/second.

.5 Local Operator Terminal (OT): Provide OT for each MCU unless otherwise specified in Section 25 90 01 - EMCS: Site Requirements, Applications and System Sequences of Operation.
.1 Mount access/display panel in MCU or in suitable enclosure beside MCU as approved by NRC Departmental Representative.
.2 Support operator's terminal for local command entry, instantaneous and historical data display, programs, additions and modifications.
.3 Display simultaneously minimum of 16 point identifiers to allow operator to view single screen dynamic displays depicting entire mechanical systems..
.4 Functions to include, but not be limited to, following:
.1 Start and stop points.
.2 Modify setpoints.
.3 Modify PID loop parameters.
.4 Override PID control.
.5 Change time/date.
.6 Add/modify/start/stop weekly scheduling.
.7 Add/modify setpoint weekly scheduling.
.8 Enter temporary override schedules.
.9 Define holiday schedules.
.10 View analog limits.
.11 Enter/modify analog warning limits.
.12 Enter/modify analog alarm limits.
.13 Enter/modify analog differentials.
.5 Provide access to real and calculated points in controller to which it is connected or to other controller in network. This capability not to be restricted to subset of predefined "global points" but to provide totally open exchange of data between OT and other controller in network.
.6 Operator access to OTs: same as OWS user password and password changes to automatically be downloaded to controllers on network.
.7 Provide prompting to eliminate need for user to remember command format or point names. Prompting to be consistent with user's password clearance and types of points displayed to eliminate possibility of operator error.
.8 Identity of real or calculated points to be consistent with network devices. Use same point identifier as at OWS's for access of points at OT to eliminate cross-reference or look-up tables.

2.2 LOCAL CONTROL UNIT (LCU)

.1 Provide multiple control functions for typical built-up and package HVAC systems, hydronic systems and electrical systems.

.2 Minimum of 16 I/O points of which minimum be 4 AOs, 4 AIs, 4 DIs, 4 DOs.

.3 Points integral to one Building System to be resident on only one controller.

.4 Microprocessor capable of supporting necessary software and hardware to meet specified requirements as listed in previous MCU article with following additions:
- .1 Include minimum 2 interface ports for connection of local computer terminal.
- .2 Design so that shorts, opens or grounds on input or output will not interfere with other input or output signals.
- .3 Physically separate line voltage (70V and over) circuits from DC logic circuits to permit maintenance on either circuit with minimum hazards to technician and equipment.
- .4 Include power supplies for operation of LCU and associated field equipment.
- .5 In event of loss of communications with, or failure of, MCU, LCU to continue to perform control. Controllers that use defaults or fail to open or close positions not acceptable.
- .6 Provide conveniently located screw type or spade lug terminals for field wiring.

2.3 TERMINAL/EQUIPMENT CONTROL UNIT (TCU/ECU)

.1 Microprocessor capable of supporting necessary software and hardware to meet TCU/ECU functional specifications.
- .1 TCU/ECU definition to be consistent with those defined in ASHRAE HVAC Applications Handbook section 45.

.2 Controller to communicate directly with EMCS through EMCS LAN and provide access from EMCS OWS for setting occupied and unoccupied space temperature setpoints, flow setpoints, and associated alarm values, permit reading of sensor values, field control values (% open) and transmit alarm conditions to EMCS OWS.

.3 VAV Terminal Controller.
- .1 Microprocessor based controller with integral flow transducer, including software routines to execute PID algorithms, calculate airflow for integral flow transducer and measure temperatures as per I/O Summary required inputs. Sequence of operation to ASHRAE HVAC Applications Handbook.
- .2 Controller to support point definition; in accordance with Section 25 05 01 - EMCS: General Requirements.
- .3 Controller to operate independent of network in case of communication failure.
- .4 Controller to include damper actuator and terminations for input and output sensors and devices.

2.4 SOFTWARE

.1 General.

.1 Include as minimum: operating system executive, communications, application programs, operator interface, and systems sequence of operation - CDL's.
.2 Include "firmware" or instructions which are programmed into ROM, EPROM, EEPROM or other non-volatile memory.
.3 Include initial programming of Controllers, for entire system.

.2 Program and data storage.
.1 Store executive programs and site configuration data in ROM, EEPROM or other non-volatile memory.
.2 Maintain CDL and operating data including setpoints, operating constants, alarm limits in battery-backed RAM or EEPROM for display and modification by operator.

.3 Programming languages.
.1 Program Control Description Logic software (CDL) using English like or graphical, high level, general control language.
.2 Structure software in modular fashion to permit simple restructuring of program modules if future software additions or modifications are required.

.4 Operator Terminal interface.
.1 Operating and control functions include:
.1 Multi-level password access protection to allow user/manager to limit workstation control.
.2 Alarm management: processing and messages.
.3 Operator commands.
.4 Reports.
.5 Displays.
.6 Point identification.

.5 Pseudo or calculated points.
.1 Software to provide access to value or status in controller or other networked controller in order to define and calculate pseudo point. When current pseudo point value is derived, normal alarm checks must be performed or value used to totalize.
.2 Inputs and outputs for process: include data from controllers to permit development of network-wide control strategies. Processes also to permit operator to use results of one process as input to number of other processes (e.g. cascading).

.6 Control Description Logic (CDL):
.1 Capable of generating on-line project-specific CDLs which are software based, programmed into RAM or EEPROM and backed up to OWS. NRC Departmental Representative must have access to these algorithms for modification or to be able to create new ones and to integrate these into CDLs on BC(s) from OWS.
.2 Write CDL in high level language that allows algorithms and interlocking programs to be written simply and clearly. Use parameters entered into system (e.g. setpoints) to determine operation of algorithm. Operator to be able to alter operating parameters on-line from OWS and BC(s) to tune control loops.

.3 Perform changes to CDL on-line.
.4 Control logic to have access to values or status of points available to controller including global or common values, allowing cascading or inter-locking control.
.5 Energy optimization routines including enthalpy control, supply temperature reset, to be LCU or MCU resident functions and form part of CDL.
.6 MCU to be able to perform following pre-tested control algorithms:
.1 Two position control.
.2 Proportional Integral and Derivative (PID) control.
.7 Control software to provide ability to define time between successive starts for each piece of equipment to reduce cycling of motors.
.8 Provide protection against excessive electrical-demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.
.9 Power Fail Restart: upon detection of power failure system to verify availability of Emergency Power as determined by emergency power transfer switches and analyze controlled equipment to determine its appropriate status under Emergency power conditions and start or stop equipment as defined by I/O Summary. Upon resumption of normal power as determined by emergency power transfer switches, MCU to analyze status of controlled equipment, compare with normal occupancy scheduling, turn equipment on or off as necessary to resume normal operation.

.7 Event and Alarm management: use management by exception concept for Alarm Reporting. This is system wide requirement. This approach will insure that only principal alarms are reported to OWS. Events which occur as direct result of primary event to be suppressed by system and only events which fail to occur to be reported. Such event sequence to be identified in I/O Summary and sequence of operation. Alarms to be reported include those listed in the sequence of operation and the following:
.8 Operational temperature alarms limits which are exceeded (eg DHW temperature too high, room temperature too low below 10 °C)
.9 A/C unit not running when scheduled to be 'on'.

.10 Energy management programs: include specific summarizing reports, with date stamp indicating sensor details which activated and or terminated feature.
.1 MCU in coordination with subordinate LCU, TCU, ECU to provide for the following energy management routines:
.1 Time of day scheduling.
.2 Calendar based scheduling.
.3 Holiday scheduling.
.4 Temporary schedule overrides.
.5 Optimal start stop.
.6 Night setback control.
.7 Peak demand limiting.
.8 Temperature compensated load rolling.
.2 Programs to be executed automatically without need for operator intervention and be flexible enough to allow customization.
.3 Apply programs to equipment and systems as specified.

.11 Function/Event Totalization: features to provide predefined reports which show daily, weekly, and monthly accumulating totals and which include high rate (time stamped) and low rate (time stamped) and accumulation to date for month.
- .1 MCUs to accumulate and store automatically run-time for binary input and output points.
- .2 MCU to automatically sample, calculate and store consumption totals on daily, weekly or monthly basis for user-selected analog or binary pulse input-type points.
- .3 MCU to automatically count events (number of times pump is cycled off and on) daily, weekly or monthly basis.
- .4 Totalization routine to have sampling resolution of 1 min or less for analog inputs.
- .5 Totalization to provide calculations and storage of accumulations up to 99,999.9 units (eg. kWH, litres, tonnes, etc.).
- .6 Store event totalization records with minimum of 9,999,999 events before reset.
- .7 User to be able to define warning limit and generate user-specified messages when limit reached.

2.5 LEVELS OF ADDRESS

.1 Upon operator's request, EMCS to present status of any single 'point', 'system' or point group, entire 'area', or entire network on printer or OWS as selected by operator.
- .1 Display analog values digitally to 1 decimal place with negative sign as required.
- .2 Update displayed analog values and status when new values received.
- .3 Flag points in alarm by blinking, reverse video, different colour, bracketed or other means to differentiate from points not in alarm.
- .4 Updates to be change-of-value (COV)-driven or if polled not exceeding 2 second intervals.

2.6 POINT NAME SUPPORT

.1 Controllers (MCU, LCU) to support PWGSC point naming convention as defined in Section 25 05 01 - EMCS: General Requirements.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 LOCATION

.1 Location of Controllers to be shown on shop drawings submitted for review by NRC Departmental Representative.

3.3 INSTALLATION

.1 Install Controllers in lockable enclosures.

.2 Provide necessary power from local 120 V branch circuit panel for equipment.

.3 Install tamper locks on breakers of circuit breaker panel.

.4 Use uninterruptible Power Supply (UPS) and emergency power where shown.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 These specifications together with the drawings are intended to provide for the complete supply and installation of the complete electrical systems as further described and as indicated on the drawings. There shall be no omission of the items necessary or required to make a finished, workmanlike, first class installation, even though each and every item of labour and material may not be mentioned or shown on the plans and in these specifications.

1.2 CODES AND STANDARDS

.1 Do complete installation in accordance with CSA C22.1-2018 except where specified otherwise.

.2 Abbreviations for electrical terms: to CSA Z85-1983.

.3 CSA Electrical Bulletins in force at the time of tender submission, while not identified and specified by number in this division, are to be considered as forming part of the related CSA Part II standard and must be complied with.

1.3 CONTRACT DRAWINGS

.1 No omissions in the drawings or specifications are intended and the Contractor shall give due consideration to this matter. Any work or material referred to in the drawings and not in the specifications, or vice versa, shall be furnished and performed as though fully covered in both. This shall apply particularly to the drawings where descriptions are sufficiently detailed so as to require little or no mention in the specifications. Items indicated on floor plans and not on riser diagrams, or vice versa, shall be considered fully covered by both.

.2 Runs of conduit and outlet locations indicated on the drawings are diagrammatic and exact locations must be determined by the Contractor as the work proceeds, with due regard to the structure and the work of other trades. The Engineer reserves the right to alter locations of conduit and outlets up to [3000 mm] without extra

cost, provided that the Contractor is advised prior to roughing in. The Contractor shall make any changes dictated by structural requirements, or conflicts with other trades, without charge to the NRC Departmental Representative.

.3 Any error or omission shall be referred to the Engineer whose decision shall be final.

.4 Building dimensions shall not be scaled from the electrical drawings but shall be obtained from the Architectural and/or Structural drawings. Any discrepancy between the drawings and the building shall be questioned before proceeding with the installation.

1.4 EXAMINATION OF THE SITE

.1 Prior to Tender, the Contractor shall visit the site and familiarize himself with all matters which may affect his work. No consideration will be given to items arising from the Contractor's failure to do so.

1.5 WORK INCLUDED

.1 The specifications complement the drawings in describing the supply and installation of the complete electrical systems. These systems shall include but not be limited to the following:

.1 120/208V - 3 phase, 4 wire Light & Power Systems.
.2 347/600V - 3 phase, 4 wire Power Systems.
.3 Communications Systems

1.6 PROPOSED CHANGES, SUBSTITUTIONS, ETC.

.1 Wherever it is proposed to make a change or changes in the design arrangement or type of equipment as called for in this specification, and upon written request by the Engineer, the Contractor shall estimate the cost of same and submit in triplicate detailed itemized estimates of the costs of all apparatus, material and labour entering into the change or substitution. Work shall be carried out upon written request by the Engineer.

1.7 CARE, OPERATION AND START-UP

.1 At the conclusion of the job, the Contractor shall review and demonstrate to the NRC Departmental Representative, all electrical equipment and their respective functions and operation. Such demonstration shall be provided for such reasonable periods of time as the complexity of the job warrants, and as approved by the Engineer. Such review and demonstration shall be made by an authorized representative of the Contractor, who shall be fully knowledgeable of the project, its installation and operation.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.8 VOLTAGE RATINGS

.1 Operating voltages: to CAN3-C235-83.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.9 PERMITS, FEES AND INSPECTION

.1 The Contractor shall obtain all inspections and permits required by all laws, ordinances, rules, and regulations by public authority having jurisdiction in this district, and shall obtain certificates of such inspections and shall pay all charges in connection therewith. The final certificate of inspection shall be obtained before final payment for work shall be considered due.

.2 In no instance shall the standard established by the drawings and specification be reduced by any codes, etc..

1.10 MATERIALS AND EQUIPMENT

.1 Contract materials shall be new and C.S.A. approved for their specific use.

.2 Specific manufacturers' names are so noted only to establish a standard of acceptable quality. Other manufacturers are acceptable as alternates provided they meet or exceed this established standard. Final acceptance of an alternate's standard of quality shall rest solely with the Engineer.

.3 For the purposes of uniformity similar materials shall be of one manufacturer (i.e. all panels and switchgear; all motor control equipment; all light fixtures in as much as is possible; etc.).

.4 To avoid the possibility of the work being delayed, the Contractor shall order all materials as soon as possible, and he shall report at once to the Engineer any delays in the delivery of materials which would hold up the completion of the job.

.5 "Approved Manufacturers" catalogue designations are included in portions of this specification. Manufacturers and equipments not listed, are not acceptable. Requests for approval of alternatives to the equipment specified, may be submitted

to the Engineer for consideration ten (10) days prior to Tender closing. Where such approvals are granted, the Contractor shall assume full responsibility for the use of alternates with respect to conformance with the specifications, and physical limitations incurred.

1.11 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 All power and control wiring associated with the mechanical systems of this project shall be performed by the electrical contractor but only to the limits of what is actually shown on the electrical drawings.

.2 The Contractor shall obtain from the mechanical and other trades complete detailed wiring diagrams of equipment requiring connections and shall be responsible for pointing out any discrepancies or the reason why they cannot be adhered to.

.3 Supplier and installer responsibility is indicated in Motor Control and Equipment Schedules on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

1.12 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment green finish to EEMAC Y1-1-1955.

.2 Paint 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.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.13 EQUIPMENT IDENTIFICATION

.1 All switchgear, switchboards, panel boards, disconnect switches, receptacles, and cable T.V. outlets, MCC's, transformers, control panels, magnetic starters, TOL's, etc. are to be provided with "lamicoid" nameplates as further described herein. Care is to be taken to ensure that all nameplates are affixed true and level, and plumb in all instances. In no instance shall the nameplate cover manufacturer's model and serial numbers and similar information.

.2 Nameplates are to be affixed to all "metal" surfaces with steel type "pop-rivets".

.3 Nameplates are to be affixed to other types of surfaces with contact type cement.

.4 Nameplates are to be affixed to building "exterior" surfaces with nylon inserts and self-tapping screws unless specifically indicated otherwise.

.5 Contact type cement is to be applied (buttered) to complete rear side of plate, as opposed to several locations or areas on same.

.6 Lamicoid nameplates installed on distribution panel boards, motor control centres, splitter troughs, transformers, etc. shall indicate the following:

.1 Designated name of equipment.
.2 Amperage of overcurrent protection device.
.3 Voltages, number of phases and wires.
.4 Designation of power source.
.1 Example:

PANEL 131 – 150 AMPS 120/208V–
3PH–4W
FED FROM MAIN SWITCHBOARD

.7 Lamicoid nameplates installed on combination starters, magnetic starters, manual starters, and all various system controls, control panels, disconnect switches, etc. shall contain the following information.

.1 Designated name of equipment.
.2 Designated name of power source.
.3 Branch circuit breaker number(s) where possible.
.4 Voltage(s).
.1 Examples:

EXHAUST FAN NO. 5
LOCATION: GROUND LEVEL
PANEL 111 – 120V
CCT. NO.17

SUPPLY FAN NO. 3
LOCATION: PENTHOUSE LEVEL
M.C.C. NO.1
600V–3PH

.8 Lamicoid nameplates installed on fusible type disconnect switches are to also indicate maximum designated/designed fuse size.

.9 Lamicoid nameplates are to be installed on all junction and/or pull boxes sized [150 mm x 150 mm] and larger indicating name of system, designated panel name and electrical characteristics where applicable.

.10 Lamicoid nameplates are to be installed adjacent to each overcurrent devices located in switchboards, CDP panels, etc.. They need only indicate designated name and/or number of equipment they feed. Unused O.C. devices are to be identified as spare(s).

.11 Lamicoid nameplates installed on "main" service entrance switches, or "main" entrance switchbaords to indicate the following information on minimum size 150 mm x 50 mm plate complete with two lines of 13 mm high lettering. Size #8 nameplate.

.1 Examples:

MAIN BREAKER 600 AMPS
120/208V-3PH-4W

.12 Install an additional "lamicoid" nameplate on all, or any piece of electrical equipment, or apparatus (i.e.: main switchgear, switchboard, CDP panels, panelboards, motor control centres, etc.) that may contain overcurrent devices, i.e. circuit breakers and/or fuses, that have been designed for, and incorporate interrupting capacity sized "larger" than 10 kAIC.

.1 Examples:

Minimum interrupting capacity of breakers installed in this panel to be not less than 25kAIC.

Minimum interrupting capacity of fuses installed in this MCC to be not less than 25AIC.

.13 Lamicoid nameplates are to be installed above all types of receptacles and abutted directly to tops of their respective device plates. Identification is to indicate respective panel source complete with associated circuit breaker number(s).

.1 1.5 mm thick x 13 mm high complete with 6 mm black letters on white face, directly above all flush receptacles. Plate to be identical width as finish device plate.

.1 Example:

PANEL 131-20

.14 General purpose receptacles located in rooms or areas containing additional receptacles intended for computer, electronic or other sensitive types of electronic equipment, etc. are to be identified as per the following:

.1 1.5 mm thick x 18.5 mm high complete with 6 mm black letters on white face, directly above all flush receptacles. Identical width as finish device plate.

General Purpose Only
PANEL 131-24

.15 Lamicoid nameplate(s) for Cable T.V. and voice/data outlets are to be installed

above the outlets and abutted directly to tops of their respective coverplates.

.16 Allow for an "average" of forty letters for each lamicoid nameplate.

.1 Lamicoid 3 mm thick plastic engraving sheet, black letters, white face, for all electrical systems except fire alarm and emergency power systems which shall have white letters on red face.

.2 1.5 mm thick nameplates above receptacles as previously indicated, with top left and right corners to be rounded off.

.3 Lettering on lamicoid nameplates shall not "start" or "end" nearer than 8 mm from either, or both ends of said plates. Size of lettering, including overall lengths of various plates shall be as indicated in the following chart.

Nameplate Sizes

Size 1 10mm x 50mm	1 line – 5mm high letters
Size 2 13mm x 75mm	1 line – 6mm high letters
Size 3 16mm x 75mm	2 lines – 5mm high letters
Size 4 19mm x 87.5mm	1 line - 10mm high letters
Size 5 37.5mm x 87.5mm	2 lines - 13mm high letters
Size 6 25mm x 100mm	1 line - 13mm high letters
Size 7 37.5mm x 100mm	2 lines - 6mm high letters
Size 8 50mm x 150mm	2 lines - 13mm high letters

.17 Labelling of all branch circuit phase and neutral conductors to be done on both ends of all circuit conductors plus in "all" junction and/or pull boxes located in between. Use write-on, self-laminating labels sized as necessary. To be installed in a "flagged" manner around individual conductor(s).

.18 Coverplates for junction and/or pull boxes located above finish ceilings housing branch circuits are to have each branch circuit number neatly identified on coverplate. Felt marker-pen may be used for this purpose.

.19 All of the following conductors are to have their insulation colours identified as indicated:

Phase A	Red
Phase B	Black
Phase C	Blue
Neutral	White/Grey
Bond	Green
Ground	Green
Isolated Ground	Green c/w Yellow Strip

.1 Colour code conductor insulation and others as per the following:

.1 All sizes of phase conductors up to and including #2 AWG.

.2 All sizes of neutral, bond and/or ground conductors, up to and

including #3/0 AWG.

.2 Approved coloured tapes in lieu of insulation colouring may be used to identify conductors that exceed sizes as indicated in items .19.1.1 and .19.1.2 above, and is to take place on both ends of runs for a minimum of [300 mm] from where terminations take place.

.20 Some examples of electrical apparatus that could have identical types of removable covers, and will require to have their lamicoid nameplates installed on wall(s) adjacent to control, rather than directly to their covers are the following.

.1 Magnetic starters.
.2 Manual TOL switches.
.3 Magnetic contactors.
.4 Relays.

.21 Lamicoid nameplates shall be provided and installed on, or adjacent to, all various systems' control panels and/or cabinets, etc. complete with information as indicated. Plates are to reflect system's assigned name, and where applicable, shall also indicate both, designated panel name and associated branch circuit breaker number(s).

.1 Fire alarm panels.
.2 Security intrusion panels.
.3 Energy management panels.
.4 Television cabinets.
.5 Communication panels.

.22 Control Transformers:

.1 Concealed control transformers located within ceiling spaces are to have lamicoid nameplates installed adjacent to same indicating their identified system, primary power source including designated panel name, and associated branch circuit breaker number(s).
.2 A second plate with identical information is to be installed on underside of room grid system or access opening frame so as to identify concealed location of same control transformer.
.3 All control transformers installed in control cabinets, and/or on walls adjacent to same, are to be identified with lamicoid nameplates containing information as previously indicated.

.23 All various pieces of mechanical equipment are to be identified with identical information as indicated on electrical equipment nameplate feeding same mechanical equipment.

.24 Both plates are to be supplied and installed by the electrical contractor in the absence of any mechanical trade identification.

.25 Bonding conductors require labelling on both ends of runs where they are "dedicated" solely to the designated branch circuit they accompany. Identify with same number(s) being used to identify accompanying branch circuit phase and neutral conductor.

.26 All junction and/or pull boxes, condulet fittings (and covers), etc., complete with their respective coverplates are to be colour coded as per the following. Boxes are to be coloured both inside and outside, where "one" colour only is required. Boxes are to be coloured on inside only where "two" colours are required. Metal coverplates are to have both colours applied diagonally where "two" colours are required. Complete plate is to be painted where one colour only is required.

.27 Refer to the following chart for specifics:

Various Systems	18mm Disc	6mm Disc
241 to 600 volts	Orange	
51 to 240 Volts	Yellow	
Telephone	Green	
Other Communication Systems	Green	Blue

1.14 WIRING IDENTIFICATION

.1 Branch circuit wiring shall be identified at both ends by circuit number at all panelboards, pull and junction boxes, outlet and equipment connections, and all devices. Labels shall be Panduit PLD-1 or PLD-2 as required. Labels to be installed in such a manner as to present white area with information in "flagged" position. Wrap around conductor in "U" fashion and have it adhere to itself. Identify neutrals and bond wires indicating which circuits with which they are used.

1.15 WIRING TERMINATIONS

.1 Lugs, terminals, screws used for termination of wiring to be suitable for copper conductors.

1.16 MANUFACTURERS AND CSA LABLES

.1 Visible and legible, after equipment is installed.

1.17 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department and NRC Departmental Representative.

.2 Decal signs, minimum size 175 x 250 mm

1.18 LOCATION OF OUTLETS

.1 Do not install outlets back-to-back in walls; allow a minimum of 305 mm horizontal clearance between boxes.

.2 Locate light switches on the latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on the latch side of doors.

1.19 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1 Local switches: 1220mm

.2 Wall receptacles:

.1 General: 305mm

.2 Above top of counters or counter back splash: 152mm.

.3 Panel boards: 1829mm to top as required by Code or as indicated.

.4 Telephone outlets:

.1 General: 305mm

.5 Wall mounted telephone outlets: 1220mm

.6 Fire alarm stations: 1220mm

.7 Fire alarm bells: 2286mm

.8 Television outlets:

.1 General: 305mm

.9 Fused and Non Fused Disconnect switches: 1270mm

.10 Starters, Combination Starters: 1270mm

.11 Contactors: 1270mm

1.20 TESTS

.1 Balance all phase currents of transformers, main switchboards, distribution panelboards, etc., and where applicable, adjust transformer taps to obtain within 2% of the rated voltage of the load being supplied. Such adjustments shall be made under normal load conditions.

.2 Test all wiring included in the Contract, to ensure there are no shorts or grounded conductors and that insulation values are as required by the Canadian Electrical

Code.

.3 The Engineer reserves the right to use any piece of electrical equipment, device, or material installed under this Contract for such reasonable lengths of time and at such times as he may require to make a complete and thorough test of the same, before the final completion and acceptance of the work.

.4 The following wiring methods detailed below are designed to enhance the ability to perform capacitive leakage tests; these methods are to be strictly followed and tests performed under this Contract.

.1 All circuit conductors are to be individually tie wrapped to their corresponding labelled neutral conductor in all panelboards, pull boxes and junction boxes. Enough slack conductor length should be left to enable the ability to clamp the ground detector around the individually tie wrapped circuit conductor and its corresponding labelled neutral. This wiring method is to be neat and of good workmanship quality.

.2 The tie wrapping of the neutral with its respective phase conductors is to be made at the closest point of entry into panelboards, pull boxes and junction boxes.

.3 The main switchgear, switchboards, CDP's, panelboards, MCC's, etc. are to have their respective feeder phase and neutral conductors tie wrapped together and enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality.

.4 After all electrical wiring has been completed by the Electrical Sub-Contractor, he is to test the grounded electrical distribution system to ensure there are not ground shorts, and capacitive leakage in the system is within acceptable limits.

.5 All feeders or branch circuits which do not have neutral conductors are to have their respective phase conductors tie wrapped together in accordance with the methods described previously.

.5 Submit properly prepared and bound reports of all tests indicating:

.1 The date and time of the test.

.2 The name or names of those who conducted the test.

.3 The purpose of the test.

.4 The results of the test.

.5 Any applicable code limits or bounds.

.6 Such tests shall not be construed as evidence of acceptance of any part of the Contract, and it is agreed and understood that no claim for damage will be made for any injury or breakage to any part or parts of the above, due to the aforementioned tests, where caused by weakness or inaccuracy of parts, or by defective materials or workmanship of any kind whatsoever.

1.21 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to the pouring of concrete, laying of concrete block, and the installation of drywall partitions.

.2 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and close to the building structure so that furring can be kept to a minimum.

1.22 SUPERVISION

.1 The Contractor shall provide supervision and sufficiently qualified foreman to ensure that the job proceeds in a proper and efficient manner. If in the opinion of the Engineer, such personnel are not competent to carry out their work, the Contractor shall replace these men immediately upon written request of the Engineer.

1.23 MINIMUM STANDARDS

.1 All work shall be performed in accordance with Canadian Electrical Code, National Building Code, and CAN/ULC-S524-M06, as minimum standards. These standards together with all Local or Municipal Rules, Regulations, and Ordinances shall be considered as the Latest Approved Editions at the time of Tender Closing. In no instance, shall the standard established by the drawings and specifications, be reduced by any codes.

.2 "Approved Manufacturers" catalogue designations are included in portions of this specification. Manufacturers and equipments not listed, are not acceptable. Requests for approval of alternatives to the equipment specified, may be submitted to the Engineer for consideration ten (10) days prior to Tender closing. Where such approvals are granted, the Contractor shall assume full responsibility for the use of alternates with respect to conformance with the specifications, and physical limitations incurred.

1.24 OTHER TRADES

.1 The Contractor shall co-operate and investigate with other trades to make maximum use of the spaces and avoid conflict with pipes, ducts, equipment radiation, etc. Shop drawings shall be prepared by the Contractor indicating the route of main conduits and ducts which shall be submitted to the Engineer for review.

.2 The Contractor shall co-operate with other Contractors on the site and carry out the

work, in such a way, as not to hinder or hold-up the work of other trades.

.3 The Contractor shall consult with other Contractors, where their respective installations conflict and shall re-route conduits, ducts, outlets, equipments, etc., as required, subject to the approval of the Engineer.

.4 The Contractor shall obtain from the mechanical and other trades complete detailed wiring diagrams of equipment requiring connections and shall be responsible for pointing out any discrepancies or the reason why they cannot be adhered to.

.5 Prior to rough in of any mechanical equipment, the contractor shall co-ordinate the location of all mechanical equipment with the mechanical contractor.

1.25 FIRE PENETRATIONS

.1 Where conduits and cables pass through fire separations and sound rated separations, including floors, walls, membranes, etc., provide a metallic sleeve, or core drill to [25mm] radius larger than the conduit or cable passing through the fire separation. Construct a ceramic fibre insulation dam, or dams as required, and fill the penetration with 3M PUTTY 303 or 3M CAULK CP25. A minimum depth of [50mm] of putty or caulk is required. As an alternate system, pack the space with ceramic fibre insulation to within 1 inch of each face of the separation, and fill the remaining voids with [25mm] of Electrovert AA-400 FLAMESEAL PUTTY, on each side. Either installation shall be in strict accordance with manufacturers recommendations and to suit UL and/or ULC requirements. All such work shall be performed by personnel familiar and experienced with this type of work.

1.26 ACCESS DOORS

.1 Supply access doors for furred ceilings or spaces for servicing equipment and accessories or for inspection of safety, operating or fire devices for installation under section erecting the walls or ceilings.

.2 Access doors shall be flush mounted 600 x 600 mm for body entry and 300 x 300 mm for hand entry, unless otherwise noted. Doors shall open 180 degrees, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps. Doors shall be of approved manufacturer with published literature. Access doors shall be minimum 1.984375mm thick.

.1 General: Prime coated steel.

.2 Special areas such as tiled or marble surfaces: stainless steel.

1.27 COMPLETION

.1 On completion of this project, the Contractor shall remove all debris and leave the site neat and tidy. Equipment shall be checked for proper fitting and alignment, adjusted, cleaned, repainted where necessary, and left in first class condition.

1.28 CUTTING AND PATCHING

.1 The cutting of walls, ceilings, floors, etc., smaller than 200 mm. during the regular course work, is to be performed by the electrical contractor. Should the electrical contractor be late or negligent in the placing of conduits, boxes, etc. during the rough-in period, then any patching or cutting required to accommodate the equipment shall be done by the General Contractor, but the cost for the same shall be the responsibility of, and be borne by, the electrical contractor.

.2 Cutting and patching to be performed under Section 01015.

.3 Make every effort to minimize cutting and patching by providing dimensions, locations and other data for bases, sleeves, boxes, etc., to be built in as construction proceeds. Set sleeves and mark openings in concrete forms and masonry before placing concrete and masonry.

1.29 MOTOR AND EQUIPMENT CONNECTIONS

.1 Provide final connections to all motors, equipments, controls, etc. indicated on the drawing. These motors, equipment, controls, etc. shall include those supplied under other sections of this specification, as well as NRC Departmental Representative supplied items. Ensure that equipment will operate properly (e.g. proper rotation) and report any instance of defective equipment to the Engineer.

1.30 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

.1 The Contractor shall prepare shop drawings showing in detail the design and construction of all equipment, panels, cabinets, lighting fixtures, etc. Copies of all such drawings shall be submitted to the Engineer for review, and the work shall not be executed until such review has been obtained.

.2 All shop drawings, other than standard manufacturers' dimensions and data sheets, shall bear the stamp of a registered professional Engineer who shall be fully responsible for the Engineering content of such drawings.

.3 Prior to submission the Contractor shall carefully check all shop drawings to ensure that they comply with the drawings and specifications in both intent and detail. No consideration will be given to shop drawings submitted without this approval and

review from the Contractor. **Appendix A at the end of this section must be completed and signed and must accompany all shop drawing submissions. Submissions not accompanied by Appendix A will be returned for re-submission.**

.4 The Engineer's review of these drawings is general and is not intended to serve as a check and shall not release the Contractor from responsibility for errors or from the necessity of checking the drawings himself, or of furnishing the materials and performing the work as required by the plans and specifications.

.5 Faxed copies of shop drawings will be rejected.

1.31 DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS

.1 At the conclusion of the job, the Contractor shall review and demonstrate to the NRC Departmental Representative, all electrical equipment and their respective functions and operation. Such demonstration shall be provided for such reasonable periods of time, as the complexity of the job warrants, and as approved by the Engineer. Such review and demonstration shall be made by an authorized representative of the Contractor, fully knowledgeable of the project, its installation and operation. Three bound maintenance and operational manuals shall be reviewed and left with the NRC Departmental Representative. These manuals shall be custom written for materials and systems supplied for this project. Generic information may accompany the manuals but must only be supplemental information. These manuals shall include, but not be limited to, approved copies of all shop drawings, guarantees, manufacturers maintenance instructions, diagrams, and parts lists, all packaging and installation instructions, and all operating instructions. Where manufacturers' literature is not available, or appropriate, the Contractor shall provide same in written form. This shall apply particularly to the general light, power and control system. Refer also to Section 01730. Prior to final inspection, submit these manuals to the Engineer for review.

1.32 GUARANTEE

.1 The Contractor shall guarantee all work, under this Division, free from defects, for a period of one (1) year, after final acceptance of the entire project. The Contractor shall make good all defects, other than normal wear and tear, during the life of the guarantee. Notwithstanding the above, longer guarantees may be required for specific installations or equipments, as indicated in other sections of the specifications.

.2 Guarantees shall be submitted in writing, bound where more than one is required, and submitted to the Engineer for review. Each guarantee shall include:

.1 Project name and address.
.2 Guarantee time period (commencement date shall be the date as shown on the project final certificate of completion, unless otherwise indicated).
.3 Clear and concise definition of what is guaranteed.
.4 Signatures of company officers of the Contractor and/or manufacturers, as applicable.

1.33 RECORD DRAWINGS

.1 One (1) set of white prints and one (1) set of reproducibles will be provided for record drawing purposes. Maintain project "as-built" record drawings and accurately record significant deviations from the Contract documents, caused by site condition or Contract change. Mark changes on white prints in "RED".

.2 Prior to start of testing, balancing and adjusting, finalize production of as-built drawings. Neatly transfer as-built corrections and notations to reproducible transparencies. Drafting standards shall be to the same standard as the Contract Drawings.

.3 Identify each drawing in the lower right hand corner in letters at least 13mm {1/2"} high as follows:

"AS-BUILT DRAWINGS"
This drawing has been revised to show electrical systems as installed
Signature of Contractor
Date.

.4 Submit to Engineer for approval. Make all corrections as directed.

.5 Testing, balancing and adjusting to be performed using as-built drawings.

1.34 OPERATIONS AND MAINTENANCE MANUALS

.1 Provide operations and maintenance data for the electrical work for incorporation into maintenance manuals as specified in the General Requirements.

.2 Submit three (3) copies of Operations and Maintenance Manuals, individually bound in three ring, hard covered binders, all properly titled, dated, and indexed.

.3 Include in the operation and maintenance manuals:
.1 Details with respect to design elements, construction features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension, and expansion of any portion or feature of the installation.
.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts

lists.

.3 Wiring and schematic diagrams and performance curves.

.4 Names and addresses of local suppliers, local service representatives, and those of the manufacturers for all items included in the manuals.

.5 Copies of all test procedures carried out in the commissioning of the works.

.6 Copies of all Manufacturers' certificates as required by specific sections of these specifications.

.7 Copies of all Manufacturers' shop drawings as required by specific sections of these specifications.

1.35 SPRINKLER PROTECTION

.1 All equipment such as panelboards, transformers, switchboard, relay cabinets, control cabinets, etc., installed in areas equipped with sprinkler protection, shall be fitted with sprinkler hoods and shall comply with the intent of C.E.C. Sections 26-008 and Appendix B-26-008.

1.36 RENOVATION WORK

.1 Co-ordinate removal or shutdown of existing services with the NRC Departmental Representative. Indicate intent to remove, disconnect, or shut down services in writing, and receive an affirmative written reply, prior to the start of such work.

.2 Remove all equipment and services indicated on the drawings or made redundant by renovation. If doubt exists, with reference to the removal of same items, obtain clarification from the Engineer before proceeding. All equipment removed shall be brought to the attention of the NRC Departmental Representative, or his representative, who shall take possession of such items. If the NRC Departmental Representative, or his representative, deems such equipment redundant, the Contractor shall remove and dispose of such items at his own cost.

.3 Maintain services to, and reconnect all equipment and apparatus to remain, should such services be disrupted during the renovation work.

.4 Where circuitry to an existing panelboard has been changed, revise the existing directory accordingly. In the absence of a directory, provide one and detail the new and/or revised circuitry.

.5 Remove existing T-Bar ceiling tiles to perform work in ceiling space with areas of T-Bar ceilings and replace ceiling tiles upon completion.

END OF SECTION

1.37 APPENDIX A Job Number: 18-289

SHOP DRAWING SUBMITTAL FORM

General Contractor:	
Phone Number:	Fax No:

Electrical Contractor:	
Phone Number:	Fax No:

Electrical Contractor Project Representative:	
Phone Number:	Fax No:

Shop Drawing Items:
Number of Shop Drawing Copies:
Supplier of Shop Drawings:
Manufacturer of Shop Drawings:
Specification Section and Items:

Drawing Reference:

Specified Options Indicated ☐ *Yes* ☐ ***No***

Items are in Conformance with Plans and Specifications Confirmed by Contractor.
□ ***Yes*** ☐ ***No***

(If No, explain): _____

Contractor's Signature: _____

Date: _____

Part 1 General

1.1 RELATED WORK

.1 Section 26 05 00 - Common Work Results – Electrical.

.2 Section 26 05 21 - Wires and Cables.

.3 Section 26 05 32 - Outlet Boxes.

Part 2 Products

2.1 MATERIALS

.1 For branch circuit wiring #10 AWG and smaller, use spring type pressure wire connectors with current carrying parts of copper, or copper alloy, and insulating cap, all to fit copper conductors as required. Standard of acceptable quality: Ideal "wing nuts".

.2 Joints for all other wiring shall be made using T & B colour keyed compression type connectors, 54000 series, and T & B series compression tools. Insulation shall consist of a first layer of compound type tape followed by a layer of Scotch #33 vinyl tape.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:
- .1 Install spring type wire connectors for branch circuit and control wiring #10 AWG and smaller. Plier tighten all wire nut joints and connections.
- .2 Install pressure type wire connectors for branch circuit wiring larger than #10 AWG. Insulating tapes to overlap successive wraps by a minimum of 50%.
- .3 The splicing of feeders conductors is not acceptable.

.2 All connections shall be made electrically and mechanically secure. The sizes of

connectors shall be according to manufacturer's recommendations for each wire size and combination of wires.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

Part 2 Products

2.1 GENERAL

.1 Wire and cable shall conform fully to the latest specifications of the Canadian Standards Association (C.S.A.), Electrical and Electronic Manufacturers Association Of Canada (EEMAC), the Insulated Power Cable Engineers Association (IPCEA), and the American Society of Testing Materials (ASTM).

2.2 BUILDING WIRES

.1 Wiring on circuits exceeding 50 volts to ground shall be of soft drawn stranded copper of 98% conductivity and of full size and AWG gauge. Insulation shall be cross-linked polyethylene RW-90 rated 600 volts. Wiring shall be continuously colour coded as follows:

Phase A - Red
Phase B - Black
Phase C - Blue
Neutral - White/Grey
Ground - Green

Where extra colours are required for three way switches, etc., they shall be yellow.

.2 Conductors pertaining to the wiring of thermostats, motorized valves, damper actuators, and electric pneumatic relays shall be stranded copper conductor of 95% conductivity and of full size and AWG gauge. Insulation shall be thermoplastic "TW" rated 600 volts. Colour code shall be orange and brown. Minimum size shall be No. 18 AWG.

.3 Minerally insulated cables shall be of solid copper conductor; magnesium oxide insulation rated 600 volts; continuous, seamless, copper sheath.

.4 RA-90 cables shall be of stranded copper conductor, RW-90 insulation rated 600 volts; continuous, seamless, corrugated aluminum sheath; and P.V.C. outer jacket.

.5 Colour coding shall be by insulation colour as follows:

1. Phase conductors on sizes up to and including No. 2 AWG.
2. Neutral, ground and bond conductors on sizes up to and including No. 3/0 AWG.
3. Approved coloured tape, in lieu of coloured insulation, may be used for phase conductors sized No. 1 AWG and larger, neutral, ground and bond conductors sized No. 4/0 AWG and larger.

2.3 ARMOURED CABLES

.1 AC-90 cables shall be soft drawn solid copper of 98% conductivity and of full size and AWG gauge. Insulation shall be cross-linked polyethylene rated 600 volts. Outer armour shall be of interlocking aluminum. Refer to section 26 05 21 - 3.3 for use of AC-90 cable. Colour coding of AC-90 cable shall be as follows:

Phase Conductors - Black or Red
Neutral Conductor - White
Ground Conductor - Bare

Part 3 Execution

3.1 GENERAL

.1 The Contractor shall run all circuits so that the voltage drop, in no case exceeds 3% of the line volts. The neutral wire, wherever it is run shall be continuous with no fuses, switches, or breaks of any kind.

.2 The installation of more than 3 conductors in a run of conduit is permissible provided C.E.C. Section 4-004(1) is adhered to with respect to the derating of the conductors.

.3 The minimum conductor size for all 15-amp branch circuits is to be #12 AWG. For 15 amp 120 volt branch circuits, the following table shall be followed:

Branch Circuit One-Way Length from Panel to Load (Including Vertical Drops)	**Phase Wire Size**	**Dedicated Neutral Wire Size**	**Shared Neutral Wire Size**	**Bond Wire Size**
Up to (24.38 m)	**#12 AWG**	**#12 AWG**	**#10 AWG**	**#12 AWG**
	#10 AWG	**#10 AWG**	**#8 AWG**	**#12 AWG**

(24.68 m to 38.1 m)				
(38.4 m to 56.38 m)	**#8 AWG**	**#8 AWG**	**#6 AWG**	**#10 AWG**

.4 The requirements for accommodating larger common or "shared" branch circuit neutral conductors where the application might warrant such, could restrict the use of some types of AC-90 cables. In certain instances however, the installation of AC-90 cable (where permissible), and the use of "oversized" neutral conductors where required, is more than acceptable.

.5 Oversized #10 AWG branch circuit wiring conductors to be extended to outlet box of device they feed. Oversized #8 or #6 AWG branch circuit wiring conductors to be extended from panelboard to junction box located on wall or in ceiling space directly above outlet or device they feed. A #8 or #6 AWG wire can be reduced to #10 AWG for vertical portion of drop only.

.6 All "stranded" conductors are to be "twisted together" prior to any types of terminations taking place, but not necessarily limited to, some of the following areas:

.1 Receptacles.
.2 Light switches.
.3 Neutral terminal strips.
.4 Bonding terminal strips.
.5 Circuit breakers.
.6 Disconnect switches.
.7 Magnetic and manual starters.
.8 Magnetic contactors.
.9 Relays.
.10 Terminating lugs, etc.

.7 Branch circuit wiring for lighting and mechanical equipment shall be installed in independent conduit systems. Each run shall have an oversized pull box strategically located to allow for the installation of future CT for metering purposes.

3.2 BUILDING WIRES

.1 Where pulling wires and cables, the use of an approved lubricant only will be permitted. No wires or cables shall be pulled in conduits until such conduits are free from moisture and in no case shall wires be pulled until approval of the

Engineer is obtained.

.2 All various types of cables are to be installed parallel or perpendicular to building lines and shall be adequately secured to the building structure at not more than [1500 mm] intervals or as otherwise indicated, in such a manner as to ensure they are protected from potential types of mechanical damage occurring. Install independent supports for cabling in ceiling spaces, and do not use those of other trades. Do not secure cables to mechanical systems piping or ducts, suspended ceiling support wires, etc.. The laying of "unsupported" cables of any types whatsoever directly atop ceiling grid system is strictly prohibited.

.3 Install and secure surface cables directly to underside of metal decking and/or ceiling slab where installed in any concealed ceiling spaces.

.4 Cables are "always" to be installed as high as possible to underside of structure.

.1 Where cables are installed in same direction as steel joists, they are also to be secured as high as possible to underside of metal decking and/or structure.

.5 The grouping together of cables to form a "bundle" for securing purposes, is acceptable provided that the following procedures are adhered to.

.1 In addition to securing cables at 1500 mm intervals to structure, multiple or bundled groups of cables (including low voltage types), shall be tye-wrapped together at mid-point between each structure support, or every 750 mm. Secure to structure at 1500 mm intervals, and secure together (between structure supports) at 1500 mm intervals.

.6 Where mineral insulated cables are specified on the drawings, they shall be installed in strict accordance with the Manufacturers Recommendations. Single conductor MI cables shall be banded together using approved stainless steel bands and steel wall support brackets. All MI cable applications are designed to carry sheath currents and as a result; single conductor cables rated at 200 amps or more shall terminate in steel cabinets with the use of brass plates.

.7 Where RA-90 cable is specified on the drawings, they shall be installed in strict accordance with the Manufacturers Recommendations and as detailed on the drawings. Single conductor cables rated 200 amps or more, may or may not be designated to carry sheath currents; therefore the Contractor shall pay particular note to metallic or non-metallic entry plates specified on the drawings. Metallic entry plates shall be electrolytically compatible with the respective cable terminators. Cable separations for single conductor cables shall be specifically

noted on the drawings for flat type spacings.

.8 AC-90 cable used in wood frame construction shall be run parallel to building lines and secured in accordance with C.E.C. 12-610. The incoming (Panel Side) grounding conductor shall be secured to the grounding screw of each outlet box, before connecting to the other grounding conductors. Twist all grounding conductors together and install connector. Push all grounding conductors to the back of the outlet box, such that the grounding conductors obstruct as little room as possible.

.9 After all wiring devices have been installed, the Contractor shall test all systems to make sure there are no grounds, leaks, or shorts. Such tests shall be performed to the satisfaction of both the inspection authority having jurisdiction and the Engineer.

3.3 ARMOURED CABLES

.1 All AC-90 cable shall be run parallel to building lines, secured in accordance with C.E.C. 12-618 and shall be adequately clamped and "ty-rapped" to the building structure in such a manner that they are protected from mechanical damage. This contractor shall install his own supports for cabling in ceiling spaces and he shall not use those of other trades or secure cabling to pipes, ducts, suspended ceiling support wires, etc.. The laying of cables directly atop ceiling grids is strictly prohibited. The incoming (Panel Side) grounding conductor shall be secured to the grounding screw of each outlet box, before connecting to the other grounding conductors. Twist all grounding conductors to the back of the outlet box, such that the grounding conductors obstruct as little room as possible.

.2 All flexible conduit or AC-90 fixture feeds shall originate from the side of the outlet box and not from the box cover. Where 3 or 4 drops extend from one outlet box, the box shall be a minimum 119 mm square. There shall be no more than 4 drops from any one box. All flex or AC-90 cables used for fixture drops are to be secured within 300mm of the junction box.

.3 Grouping of AC-90 cables shall be limited to a maximum of eight current carrying conductors, including associated oversized neutral conductors where phase sharing occurs.

.4 The following examples incorporate uses of both common and dedicated (separate) branch circuit neutral conductors:

.1 Maximum of two runs of #12/4 conductor cables, including common

(oversized) branch circuit neutral in each.

.2 Maximum of two runs of #12/3 conductor cables, including (oversized) branch circuit neutrals (if not 3 phase, 3 wire), plus one run of #12/2 cable.

.3 Maximum of four runs of #12/2 conductor cables, each including a separate, dedicated branch circuit neutral conductor.

.5 Where dedicated or separate branch circuit neutral conductors are non phase sharing, they need not be sized larger than phase conductors they accompany unless specifically indicated otherwise.

.6 AC90 may be utilized as a fixture drop. A fixture drop is defined as that portion of AC-90 cable or flexible conduit being used to make final connection between "accessible" type junction or outlet box located in ceiling space (above T-bar ceiling) and its respective light fixture.

.1 There shall be not more than four drops from any one box regardless of size. All AC-90 cables used for fixture drops are to be secured within 300 mm of the junction box. Each fixture is to be complete with its own separate fixture drop originating from junction box located within same room. Fixture drops are not to exceed 4500 mm in total length unless noted otherwise.

.2 Provide 20 amp O.C. protection for "all" lighting branch circuits, unless specifically indicated otherwise.

.3 No. 12 AWG and No. 14 AWG Type AC-90 cables may be used where total fixture drop "loads" do not exceed the following:

.1 Maximum of 1800 watts at 120 volts using #12 AWG drop.

.2 Maximum of 1300 watts at 120 volts using #14 AWG drop.

.7 Separate pig-tail type leads shall be provided in each light fixture junction/outlet box for "final" connections to fixture drops. These pig-tail leads are to be "only" connected to light fixture "returns" and associated "neutral" conductors.

.8 AC90 may be utilized as a wiring device drop. A wiring device drop (drop to receptacle and light switches) is defined as that portion of AC-90 cable being used to make final connection between "accessible" type junction or outlet box located in ceiling space (above T-bar ceiling) and its respective wiring device.

.1 There shall be not more than four drops from any one box regardless of size. All AC-90 cables used for fixture drops are to be secured within [300 mm] of the junction box. Each wiring device is to be complete with its own separate wiring drop originating from junction box located within same room.

.9 AC90 may be not be utilized as a home run to any panelboard.

3.4 STRANDED CONDUCTORS

.1 All stranded conductors prior to terminating under device bolts such as circuit breakers, switches, receptacles, etc., are to be twisted together so as to form a single conductor to ensure a reliable mechanical connection.

.2 All undersized conductors, prior to termination in oversized lugs (eg. #3 AWG in a 225 amp lug), shall be folded or doubled over to ensure that a larger volume of copper mass is provided within the lug where connection takes place.

3.5 CAPACITIVE LEAKAGE WIRING METHODS

.1 The following wiring methods detailed below are designed to enhance the ability of the NRC Departmental Representative to perform capacitive leakage tests in the future:

.1 All circuit conductors are to be individually ty-wrapped to their corresponding labelled neutral conductor in all panelboards, pull boxes and junction boxes. Enough slack conductor length should be left to enable the ability to clamp the ground detector around the individually ty- wrapped circuit conductor and its corresponding labelled neutral. This wiring method is to be neat and of good workmanship quality.

.2 The ty-wrapping of the neutral with its respective phase conductors is to be made at the closest point of entry into panelboards, pull boxes and junction boxes.

.3 The main switchgear, switchboard, CDP's, panelboards, etc. are have their respective feeder phase and neutral conductors ty-wrapped together with enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality. This ty-wrapping is to be located such that ease of clamping the ground detector can be accomplished without excessive exposure to live bussing.

.4 After all electrical wiring has been completed by the Electrical Sub-Contractor, he is to test the grounded electrical distribution system to ensure there are no ground shorts or grounds.

.5 All feeders or branch circuits which do not have neutral conductors are to have their respective phase conductors ty-wrapped together in accordance to the methods described previously.

3.6 CONTROL CIRCUIT WIRING 50 VOLTS OR LESS

.1 The installation of "surface" wiring on walls or in open (non-enclosed) type ceilings, shall be Type EMT conduit, minimum 21mm, complete with associated steel type connectors and couplings.

.2 EMT conduit is to be extended to within 600 mm of "all" various control devices associated with the operation of any given piece of mechanical equipment.

.3 Unless specifically indicated otherwise, liquid tight, flexible metal type conduit complete with steel type connector and steel locknut may be used for the "final" [600 mm] connection between the end of the EMT conduit and the applicable control device.

.4 EMT or PVC type conduit "wall stubs" complete with flush installed device box shall be installed in all masonry or concrete partitions where, and as may be required, where plenum rated cabling is used.

.5 EMT connectors complete with nylon insulated throat or threaded type bushing shall be installed on end of EMT stub above "finish" type ceilings, etc., where plenum rated cabling is used.

.6 All EMT conduit stubs are to be "bonded" to ground as per CEC.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

Part 2 Products

2.1 EQUIPMENT

.1 Grounding equipment shall be to CSA C22.2 No.41.

.2 Clamps for grounding of conductors to be sized as required to make for an electrically conductive connection to water piping.

.3 Ground conductors to be to ASA-G7.1.

.4 Ground rods to be copper clad steel, 3048 mm long, by 19 mm diameter.

.5 Ground bus in main electrical room shall be copper, 100 mm x 6 mm minimum, of length as per the drawings.

.6 All ground rod clamps and fittings to be bronze or brass.

.7 Insulated ground conductors are to be RW90, green, for sizes up to and including #2. Insulated ground conductors #1 and larger to be TWH, green. All ground conductors to be copper without exception.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 All equipment and exposed non-current-carrying metal, conduits and parts shall be permanently and effectually grounded to meet minimum requirements of the C.E.C., and as indicated on the drawings and further specified. Standards set either by drawings or specifications which are above those covered by C.E.C. shall not be reduced under any circumstances.

.2 A complete grounding system shall be installed as indicated, which shall include but not be limited to the following:

.1 All panel board ground busses.
.2 The neutral point of the main incoming service.
.3 The neutral point of all transformers.
.4 The wall mounted ground busses in all communications rooms.
.5 The wall mounted ground busses in all electrical rooms.

.3 Generally, minimum grounding shall be provided by the metallic conduit/outlet box system and by the bond wire in cables. Additional insulated ground wires, sized as per the drawings, shall be provided as follows:
.1 In all EMT conduit feeders that supply panelboards, CDP panels, FDP panels, and transformers - all sized as per C.E.C. Table 16.
.2 All non-metallic conduit systems (i.e.- PVC conduit).
.3 A separate green bond conductor sized as per Table 16 of the C.E.C. shall be installed in each EMT conduit run for branch circuit wiring.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

Part 2 Products

2.1 SUPPORT COMPONENTS

.1 U shaped strut, size 41 mm x 41 mm x 2.6 mm thick as required, equal to Burndy, Canstrut, or Unistrut.

.2 All strut to be galvanized.

.3 All threaded hanger rods to be minimum 10 mm diameter, larger if required, made from mild steel.

.4 In concrete use cast-in threaded inserts wherever possible. Should additional inserts be required use a "red-head" type of insert capable of carrying at least 227 kg.

.5 Supports for all conduit work shall be one hole steel pipe straps; unistrut, or equal, with necessary fittings, approved for their respective use.

.6 All pull and junction boxes, wireways, and multiple conduits shall be supported by a steel channel support system with all components, hangers, wall supports, cable clamps, etc., specifically manufactured and approved for their application.

.7 Fastening devices for cabinets, boxes, supports etc., shall be nut and bolt, expansion shields, wedge anchors, or toggle bolts, size and number to suit the application or as detailed on the drawings. Toggle bolts may not be used in plasterboard construction.

.8 Fastening devices for outlet boxes shall be nut and bolt, expansion shields, wedge anchors or caddy clips, size and number to suit the application or as detailed on the drawings.

.9 Where outlet boxes are set in drywall construction, a piece of steel stud shall be secured to either side of the outlet box or use caddy quick-mount box supports, or caddy J-1-A for side box supports.

Part 3 Execution

3.1 INSTALLATION

.1 Secure all equipment in a manner so as not to distort or cause undue stress on any components.

.2 Secure equipment to masonry, tile and plaster surfaces with lead anchors or nylon shields.

.3 Secure equipment to poured concrete with expandable inserts.

.4 Secure equipment to hollow masonry walls with toggle bolts. Toggle bolts shall not be used to secure equipment to plasterboard, drywall, or acoustic tile surfaces.

.5 Secure surface-mounted equipment with twist clip fasteners to inverted T-bar ceilings. Ensure that T-bars are adequately supported to carry weight of equipment specified before installation.

.6 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.7 Fasten exposed conduit or cables to building construction or support system using straps.

- .1 One-hole steel straps to secure surface conduits and cables 35 mm and smaller.
- .2 Two-hole steel straps for conduits and cables 41 mm and larger.
- .3 Beam clamps to secure conduit to exposed steel work.

.8 Suspended support systems:

- .1 Support individual cable or conduit runs with 10 mm diameter threaded rods and spring clips.
- .2 Support two or more cables or conduits on channels supported by 10 mm diameter threaded rod hangers where direct fastening to building construction is impractical.

.9 In addition to the C.E.C. conduit support requirements, all suspended conduit runs containing horizontal or vertical elbows shall have one additional support installed not greater than 305 mm from the midpoint of the 90° bend.

.10 For surface mounting of two or more conduits use channels at 1524 mm o/c spacing.

.11 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.12 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.13 Do not use wire lashing or perforated strap to support or secure raceways or cables. Do not support any electrical conduits, wire or equipment from ceiling system support cables, ceiling systems support cables may be utilized to marshal AC90 drops to fixtures.

.14 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of the other trade and the approval of the Engineer.

.15 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

.1 Pull and junction boxes, where larger than standard boxes shall be the equivalent to Type "C" or "D" boxes sized according to C.E.C. Sections 12-3000 to 12-3038. Use Type "D" for boxes up to 300 x 300mm and Type "C" for boxes 300 x 300mm or larger.

.2 Pull boxes shall be of sheet metal construction with all welded steel corners and screw-on flat covers for surface mounting.

.3 All flush installed boxes shall be Type “D”. Covers for flush mounted pull boxes shall extend a minimum of 25 mm all around.

.4 Concealed junction boxes (within ceiling space) shall not be smaller than 100 mm square.

2.2 CABINETS

.1 Cabinets shall be steel, fabricated to C.S.A. & EEMAC Standards with baked enamel finish. Cabinet shall be EEMAC Standard Types "C", "D", or "T" as indicated on the drawings. Type "T" cabinets shall be complete with door lock, and handle, and be lined with 19 mm plywood.

Part 3 Execution

3.1 JUNCTION AND PULL BOXES INSTALLATION

.1 Install pull boxes in accessible locations and secure them adequately to the building structure. Pull boxes installed in the middle of conduit runs without backing are not acceptable.

.2 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed [30.5m] of conduit run between pull boxes.

.3 The location of junction and/or pull boxes in suspended ceiling spaces, i.e. - dry wall, T-Bar, etc., is not to be greater than 762 mm above the finished ceiling and must be easily accessible.

.4 All suspended junction, pull and outlet boxes shall be supported with minimum size 9.5 mm threaded rods, nuts and flat washers. Threaded rods shall be secured to boxes with one flat washer and nut installed on both sides of box. One rod required for all boxes sized up to and including 119 mm square. Two rods required for boxes larger than 119 mm square, up to and including 203 mm square. A minimum of four rods required for all boxes larger than 203 mm square.

3.2 CABINETS

.1 Install cabinets secure to walls with top of this 1980 mm above the finished floor.

3.3 IDENTIFICATION

.1 All junction and pull boxes shall be color coded as per the color coding legend for conduits and cables. Refer to Specification Section 260500. Co-ordinate the color coding scheme with Division 15 as per Specification Section 260500. Boxes are to be color coded inside and out where only one color is required. Where two colors are required, boxes shall be colored only on the inside, and covers shall have both colors diagonally applied to each half.

.2 All major pull boxes (152 mm x 152 mm and larger) are to be identified with lamicoid nameplates in accordance with Section 260500.

.3 Junction and pull boxes which contain branch circuit wiring and which are located above finished ceilings, are to have the branch circuit number(s) neatly identified on the cover plate. Felt tip marker may be used for this purpose.

.4 All various systems junction or pull boxes etc., where located above accessible ceiling grid systems, shall have their location identified on the underside (or room side) of the T-Bar spline by use of 19 mm self-adhering, colour coded circular shaped discs affixed directly onto the spline in closest proximity to where the concealed box is located. The same type of discs are to be installed on ceiling or wall access doors. Where two colours are required, the primary disc shall be 19 mm in diameter and the secondary coloured disc shall be 6 mm in diameter and shall be centered in the middle of the prime disc.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

Part 2 Products

2.1 OUTLET BOXES

.1 Outlet boxes for use in dry, framed, concealed construction shall be one piece, galvanized, pressed steel. Where wire fill dictates larger boxes for outlets use suitably sized square boxes, with raised "plaster ring" style extension.

.2 In masonry walls use "concrete masonry" type boxes of the "MBS" or "MBD" series. Where wire fill dictates larger boxes for single gang outlets use suitably sized square boxes, with raised "plaster ring" style extension.

.3 Surface outlet boxes installed below 2500 mm shall be hot dipped galvanized cast "FS", or "FD" series boxes with metal coverplates.

.4 Outlet boxes for use with EMT or rigid conduit in frame construction shall be one piece, galvanized, pressed steel. Sectional boxes are intended for flexible conduit and cabling systems only and are not intended for use with conduit systems. Where wire fill dictates larger boxes for outlets, refer to 2.1.1 above.

.5 Outlet boxes for concealed use in frame construction, and use with AC-90, shall be sectional, galvanized, pressed steel, with built in cable clamps. Where wire fill dictates larger boxes for outlets, refer to 2.1.1 above.

.6 Single gang “sectional” type device boxes being utilized in steel stud walls for the installation metallic and shall not be sized smaller than 245 milliliter, and equal to Series #3104-SS or #3104-LSSA as manufactured by Iberville, Commander, etc. complete with wrap-around type bracket.

.7 Outlet boxes used in ceiling spaces for fixture drops are to be minimum 102 mm square.

Part 3 Execution

3.1 INSTALLATION

.1 At each local switch, convenience outlet, receptacle, ceiling or wall fixture, continuous row of fixtures, or system unit (i.e. fire alarm, etc.) provide and install a standard pressed steel outlet box unless specifically noted otherwise. All outlet boxes shall be galvanized inside and out and set flush with finished surfaces. They shall be rigidly and securely set. Boxes shall not be mounted back to back, but separated by a minimum of 305 mm to prevent noise transmission.

.2 In centering outlets, the Contractor is cautioned to allow for radiation, pipes, ducts, etc., and for the variation in arrangement and thickness of finishes, etc.. His failure to comply with this will not relieve him from the cost of necessary alterations.

.3 The Contractor shall allow for the relocation of an outlet up to 3048 mm from where shown, provided he has been notified so prior to rough-in of the same.

.4 No outlet or junction box may be installed more than 762 mm above a finished ceiling.

.5 All suspended boxes are to be supported with minimum size 19 mm threaded rod(s).

.6 All flexible conduit fixture feeds shall originate from the side of the outlet box and not from the box cover.

.7 Flush installed 100 mm square or a 119 mm square box being used as a junction or pull box that requires a blank metal coverplate, is to have an appropriate sized, one or two gang “plaster ring” installed on same. This permits the use of a standard, one or two gang (blank) finish metal coverplate to be used, and avoids the necessity of acquiring an oversized, custom-made coverplate.

.8 When installing flush boxes in metal drywall partitions, always screw a short piece of metal stud (same width as partition) to non-supported side of box.

.9 Concealed boxes installed above drywall ceilings or behind walls, are to have their locations identified on room sides of access opening frames with properly colour coded identification discs.

.10 Condulet fittings (LB, LL, LR, etc.) and their respective covers/plates are to be painted, and where concealed, have their locations identified with appropriate colour coded, [19 mm], self-adhering discs, applied to T-bar splines and/or access opening frames, in similar manner as for concealed junction and/or pull boxes, etc..

.11 Plaster/Tile type extension rings are not to be used on boxes that have not been "flush" installed. They are not intended, not acceptable for "surface" type application.

.12 Install floor boxes in concrete formwork, prior to concrete pour, securely set to ensure finished collar is flush with the finished floor.

3.2 IDENTIFICATION

.1 All outlet boxes shall be colour coded as per the colour coding legend for conduits and cables. Refer to Specification Section 26 05 00. Outlet boxes are to be coloured only on the inside.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

Part 2 Products

2.1 CONDUITS

.1 Thinwall Type "EMT" conduit shall conform to C.S.A. C22.2 No. 83-M1985(R1992), galvanized, sized as indicated.

.2 Flexible galvanized steel liquid tight conduit shall conform to C.S.A. C22.2 No. 56-M1997(R1997), sized as indicated.

.3 Rigid P.V.C. conduit shall conform to C.S.A. C22.2 No. 211.2-M1984(R1992), sized as indicated.

2.2 COUPLING AND CONNECTORS

.1 Couplings for thinwall Type "EMT" shall be set screw type, galvanized steel. Locknuts shall be case hardened steel.

.2 Connectors for thinwall Type "EMT" shall be set screw type, galvanized steel. Locknuts shall be case hardened steel.

- .1 Connectors 32 mm and larger shall be complete with threaded plastic bushings.
- .2 Connectors less than 32 mm shall be complete with insulated throats.

.3 Couplings and connectors for P.V.C. rigid conduit shall be C.S.A. Approved for their respective use. All P.V.C. fittings shall be solvent weld type.

.4 Connectors for flexible conduit, armoured cable shall be set screw galvanized steel. Units shall be equal to T&B #3110 series, steel, and be complete with case hardened locknuts.

.5 Connectors for liquid tight flexible conduit shall be watertight, compression type aluminum. Locknuts shall be case hardened.

2.3 CONDUIT FITTINGS

.1 Fittings: Manufactured for use with conduit specified. Coating same as conduit.

.2 Factory “ells” where 90° bends are required.

.3 Screwed galvanized feraloy for rigid conduit, set screw steel for EMT and solvent welded PVC for PVC.

Part 3 Execution

3.1 CONDUIT

.1 Thinwall Type "EMT" (minimum 21mm) shall be used for all branch circuit wiring and all systems installed exposed on ceilings and walls unless noted otherwise. Bends, offsets, or elbows made on the job for steel conduits shall be made so that the conduit is not injured or flattened.

.2 All branch circuit wiring run in thinwall Type EMT conduit shall be complete with a No. 12 AWG minimum green insulated bonding conductor, increasing as required by Table 16 of the C.E.C..

.3 P.V.C. conduits sized 25 mm in diameter and larger shall be installed in trenches not less than 305 mm in depth from underside of concrete floor slab to bottom of trench. Conduits shall be placed on a 50 mm bed of sand and have a second 50 mm of sand placed on top (completely around) of conduits prior to backfilling.

.4 All concealed and exposed conduit shall be kept parallel to building lines and run "on the square". All conduits shall be installed to avoid proximity to steam and hot water pipes by 150 mm Conduits shall run through ceiling spaces and down in walls. No conduit shall run in or under floor slabs unless specifically indicated.

.5 All conduits shall be securely held in place by means of approved supports and in accordance with C.E.C. Sections 12-1010, 12-1114 and 12-1404. All EMT conduit straps shall be steel. Cast straps are not acceptable. EMT conduit shall be installed as a complete system and shall be securely fastened in place within one meter of each outlet box, junction box, cabinet, couplings or fittings and the spacing between supports as follows:

.1 Less than 1524 mm for 13 mm and 19 mm EMT;

.2 Less than 2286 mm for 25 mm and 32 mm EMT;

.3 Less than 3048 mm for 38 mm EMT or larger.

.6 Code approved P.V.C. rigid conduit shall be used for underground circuits and where otherwise specifically noted. Conduit shall be joined with approved connectors and P.V.C. solvent cement. The proper size bonding conductor, as per the C.E.C., shall installed in all P.V.C. conduits.

.7 No Branch circuit wiring shall run in concrete slabs. Conduit stubs in concrete shall be protected from damage during construction. Conduit openings shall be sealed with plugs or caps to prevent entrance of foreign materials. Where conduits pass through a waterproof membrane an oversize sleeve shall be installed and caulking applied to maintain the waterproof properties of the membrane. A cold cure mastic shall then be applied between sleeve and conduit.

.8 Flexible conduit, not smaller than 10 mm I.D., or flexible armoured cable with separate grounding conductor, and complete with insulating anti-shorts, shall be used between lighting fixtures and their respective junction boxes, and where rigid or "EMT" conduit cannot be used, such as in cabinet work.

.9 Liquid tight flexible conduit (c/w bonding conductor), not smaller than 10 mm I.D., shall be used for connections to all transformers, motors and equipments, in both wet and dry areas.

.10 Upon installation of all conduits, terminate in boxes, cabinets, and fittings, or install suitable plugs or caps, to prevent the entrance of foreign materials. Conduits shall be swabbed out using a drag, consisting of tight-fitting rubber washers and shall be dry before conductors are pulled in.

.11 All conduit subject to corrosive elements shall be treated with corrosion resistant compounds.

.12 Conduit shall not pass through structural members without the permission of the Engineer.

.13 A sufficient number of fittings shall be used to permit easy pulling of wires. Conduits shall be continuous and shall be made electrically and mechanically secure throughout.

.14 Conduits shall not run directly between outlets on the opposite sides of a common partition, in order to prevent sound transmission.

3.2 COUPLINGS AND CONNECTORS

.1 Thinwall Type "EMT" couplings shall be securely tightened.

.2 Connectors for thinwall Type "EMT", liquid tight and flexible conduit or cable shall terminate at boxes and cabinets with one case hardened locknut. Painted area shall be scraped clean, and locknut screwed tight to ensure ground continuity.

.3 Couplings and connectors for rigid P.V.C. shall be cleaned with solvent and joined with cement C.S.A. approved for the purpose.

3.3 CONDUIT FITTINGS

.1 Install conduit fittings where required. Secure conduit in fittings and secure conduit to structure within 300 mm of fitting.

.2 Colour code coverplates, ceiling splines and access covers in accordance with 26 05 00.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This work shall include the supply, installation and connection of all transformers specified hereinafter as well as the receiving, storing and testing of same.

1.2 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Indicate on shop drawings:

- .1 Dimensioned drawing showing enclosure, mounting devices, terminals, taps, internal and external component layout.
- .2 KVA rating.
- .3 Primary and secondary voltages.
- .4 Frequency.
- .5 Single or Three phase.
- .6 Full load efficiency.
- .7 Regulation at unity pf.
- .8 Insulation type.
- .9 Percent Impedance
- .10 Sound levels.
- .11 'K' rating.

Part 2 Products

2.1 TRANSFORMERS

.1 Use transformers of one manufacturer throughout project.

.2 Dry-type transformers: to CSA C802.2.

.3 Bushings: to EEMAC GL1-2-1978.

.4 Design details:

- .1 Type: ANN - dry type, air cooled.
- .2 Three phase with primary and secondary characteristics as noted.
- .3 150 degree C temperature rise insulation system, class 'H'.
- .4 Impedance levels shall not be less than those indicated on the drawings.
- .5 Voltage taps: 2 x 2½% full capacity taps above neutral, and 2 x 2½% full capacity taps below neutral.
- .6 Average sound levels: standard.
- .7 Transformers shall be 'K' rated for harmonic content. 'K' factors shall be as

indicated on the drawings.

.8 Transformers shall be supplied with sprinkler shields.

.9 Dry transformers to be equipped with dual spade transformer lugs, PET-4-250 type, secured to transformer chassis for grounding.

2.2 ENCLOSURE

.1 Enclosures to be fabricated from sheet steel, complete with removable metal front panel. Enclosures and ventilation grills shall be drip proof in accordance with C.E.C. 26-008.

.2 Transformers shall be mounted on vibration isolators to reduce noise transmission. These isolators shall be located between the enclosure and the housekeeping pad and shall be in addition to isolators located between the core and coil assembly and the enclosure.

.3 Finishes to be light grey enamel.

2.3 WINDINGS

.1 Primary and secondary coils shall be of copper conductor. Taps are to be located at front of coils for ease of accessibility.

.2 Windings shall be of the three-coil configuration, delta to wye connected. "TEE" connected, 2 coil transformers, are not acceptable.

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical

Part 3 Execution

3.1 INSTALLATION

.1 Mount dry type transformers on floor .

.2 Liquid tight flexible conduit and weathertight connectors shall be used for final connections.

.3 Ensure adequate clearance around transformer for ventilation.

.4 Install transformers in level upright position.

.5 Remove shipping supports only after transformer is installed and just before putting into service.

.6 Loosen isolation pad bolts until no compression is visible.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

.2 Moulded Case Circuit Breakers - Section 26 28 16.02.

1.2 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Section 26 05 00 – Common Work Results - Electrical.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity, voltage and phase characteristics, and enclosure dimensions, as well as any special options called for on the drawings.

Part 2 Products

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29.

.2 All panelboards to be the product of the same manufacturer.

.3 All panelboard busses and breakers are to be rated for 10,000A (symmetrical) minimal interrupting capacity or as indicated on the drawings or panel schedules.

.4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated on the drawings or panel schedules.

.6 Each panelboard is to be complete with two keys and all panelboards are to be keyed alike.

.7 All bussing shall be aluminum, tin plated with a full capacity neutral, with an ampere rating as per the drawings.

.8 All mains shall be suitable for bolt on breakers.

.9 All panelboard trims and door finishes are to be baked grey enamel. All enclosures to be EEMAC 1, suitable for flush or surface mounting as indicated on the

drawings.

.10 All panelboard tubs shall be minimum 14 gauge galvanized steel, minimum 500mm wide.

2.2 GROUND BUSSES

.1 All panel boards shall be complete with a chassis/system ground buss.

2.3 BREAKERS

.1 Breakers shall be to Section 26 28 16.02.

2.4 EQUIPMENT IDENTIFICATION

.1 Install lamicoid nameplates on all panels, all as per Section 26 05 00, indicating:
- .1 Panel number as per the drawings.
- .2 Voltage and phase characteristics of panel.
- .3 Amperage of panel.
- .4 Where panel is fed from.

2.5 MANUFACTURERS

.1 Standard of acceptability:
- .1 Panelboards: Siemens "P2" Series.
- .2 Other acceptable manufacturers: Square 'D' and Eaton.

Part 3 Execution

3.1 INSTALLATION

.1 Panels shall be installed with the top of the tub approximately 1980mm above the finished floor, unless floor mounted type.

.2 Emergency, exit, fire alarm, sprinkler excess pressure pump and bells, and night lighting, circuit breakers shall have locking devices on the handles to prevent unauthorized operation.

.3 A typed directory under transparent cover shall be provided on the inside of each panel showing the location and load connected to each circuit.

.4 Wiring in panelboards shall extend beyond the respective breakers, forming a [150mm] loop before returning to connect to the breaker terminals, so there will be

flexibility for reconnecting within the panel. Wiring shall be secured with Ty-wraps or equivalent means to present a neat workmanlike appearance.

.5 Rigidly anchor panels panels to the walls and or unistrut system.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

Part 2 Products

2.1 RECEPTACLES

.1 Duplex receptacles, CSA type 5 20R, 125 V, 15/20 A, U ground, to: CSA C22.2 No.42 with following features:
- .1 Industrial grade.
- .2 Ivory urea moulded housing.
- .3 Suitable for No. 10 AWG for back and side wiring.
- .4 Break off links for use as split receptacles.
- .5 Eight back wired entrances, four side wiring screws.
- .6 Triple wipe contacts and rivetted grounding contacts.

.2 Other receptacles with ampacity and voltage as indicated.

.3 Receptacles of one manufacturer throughout project.

.4 Acceptable materials:
- .1 Hubbell Cat. No. HBL5362-I
- .2 Pass & Seymour Cat. No. 5362 AICN
- .3 Leviton Cat. No. 5362-I

2.2 SPECIAL RECEPTACLES

.1 Receptacles of specified amperage and voltage shall be supplied and installed where noted on the drawings. Where such units are noted they shall be best quality, specification grade and conform to the noted rating and applicable C.S.A. configuration.

.2 See below for coverplates for all receptacles noted in .1. Receptacles shall be complete with lamicoid nameplates indicating voltage, amperage, & phase characteristic.

2.3 COVERPLATES

.1 Coverplates for wiring devices to: CSA C22.2 No.42.1.

.2 Coverplates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in surface mounted utility boxes.

.4 Ivory thermoplastic cover plates, for wiring devices mounted in flush mounted outlet box.

.5 Sheet metal utility style cover plates for wiring devices mounted in surface mounted FS or FD type conduit boxes.

Part 3 Execution

3.1 RECEPTACLES

.1 All receptacles, and their wall plates, shall be installed plumb, with long axis in the vertical position, U-ground terminal on the top. Pigtail branch circuit conductors shall be used for connection to receptacles in cases where more than one phase conductor or neutral conductor exist in the outlet box. Do not use feed through features on receptacles. Twist stranded conductors and form under head of terminal screw. Tighten terminal screw to specified torque.

.2 Power and neutral conductor terminations shall be made using the back wiring feature on the receptacle for conductor sizes #12 and #10. Where voltage drop considerations require #8 AWG conductors to feed a receptacle, the #8 conductor shall be extended to a surface mounted junction box located in the ceiling space directly above the receptacle. The #8 AWG conductor shall be reduced to #10 AWG in the junction box before extending on down in the vertical drop to the receptacle.

.3 Install a green insulated bonding conductor, equal in ampacity to the receptacle ampacity, between the grounding terminal of the receptacle and the grounding screw or stud of the outlet box.

.4 Group receptacles under one wall plate, in multi-outlet boxes, where more than one outlet is shown at one location.

.5 See 26 05 00 for mounting heights.

.6 Receptacles above counters shall be installed above the splashback to a height as indicated on the drawings and co-ordinated on the site.

.7 All receptacles are to be polarity tested.

.8 All receptacles are to be identified with Lamicoid nameplates in accordance with specification Section 26 05 00. The nameplate for each receptacle shall indicate the panel from which the receptacle is fed, as well as the branch breaker circuit number(s). In addition, a Ty-Rap Cat. No. TY5532M identifying tag shall be secured in the outlet box, marked with the same identification and arrange to be visible when the coverplate is removed, without removal of the receptacle.

3.2 COVERPLATES

.1 Protect all coverplates until final painting has been completed.

.2 Install suitable ganged coverplates where wiring devices are grouped.

.3 Flush mounted coverplates are not acceptable on surface mounted outlet boxes.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results – Electrical - Section 26 05 00.

1.2 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Section 26 05 00 – Common Work Results - Electrical.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded case circuit breakers: to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breakers to be quick-make, quick-break type, have de-ionizing arc chambers, be trip free of operating handles on overloads with a definite indication when tripping has taken place, all for manual and automatic operation with temperature compensation for 40°C ambient.

.3 Multipole breakers shall be equipped with common-trip mechanisms with single handles -tie handles will not be acceptable.

.4 All circuit breakers shall have magnetic instantaneous trip elements operating only when the value of the current reaches 10 to 12 times the breaker setting. They shall also have inverse time thermal overload elements set to operate at and above the full load trip rating specified. Trip settings on breakers with adjustable trips to range from 5 to 10 times current rating. Circuit breakers with solid state trip units shall be specifically noted on the drawings and/or panel schedules.

.5 Minimum acceptable circuit breaker interrupting rating shall be 10,000 RMS symmetrical amperes. Otherwise, interrupting ratings shall comply with C.S.A. and EEMAC standard for the particular frame size and rating and as indicated on the drawings.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breakers shall operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

Part 3 Execution

3.1 INSTALLATION

.1 Circuit breakers shall be securely mounted in panelboards and tightened down to the bussing as per the manufacturer's recommended torque levels.

.2 Install breakers in quantities as indicated.

.3 Supply and install blank sections in panelboards for all unused breaker spaces.

.4 Set trip units as required by the co-ordination.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results – Electrical – Section 26 05 00.

1.2 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Section 26 05 00 – Common Work Results – Electrical.

.2 Indicate on shop drawings:
- .1 Fuse clip arrangement/class.
- .2 Overall length, height and depth of each type of switch.
- .3 Number of poles, including neutrals where required, amperage rating, and voltage rating of each type of disconnect required.

Part 2 Products

2.1 GENERAL PURPOSE DISCONNECT SWITCHS

.1 Fusible and non-fusible disconnect switches in CSA rated enclosures, size as indicated, Type "A".

.2 Provision for padlocking in "ON" and "OFF" position.

.3 Mechanically interlocked door to prevent opening when handle in "ON" position.

.4 Fuses as indicated on drawing or in Section 26 28 13.01.

.5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 "ON-OFF" switch position indication on switch enclosure cover.

.8 Fuseholder assemblies to CSA C22.2 No. 39.

2.2 EQUIPMENT IDENTIFICATION

.1 Install lamicoid nameplates on all fusible and non-fusible disconnect switches, all as per Section 26 05 00, indicating:

.1 Voltage and phase characteristics.
.2 Amperage rating.
.3 For fusible units, maximum fuse size intended.
.4 Where fed from.

2.3 MANUFACTURERS

.1 Standard of acceptability for General Purpose Disconnects Switch:
.1 Cutler-Hammer, Hubbell, Square 'D' and Siemens.

Part 3 Execution

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses as indicated.

.2 Supply all necessary mounting hardware and channel as required to mount switches.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Common Work Results - Electrical - Section 26 05 00.

1.2 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Section 26 05 00.

Part 2 Products

2.1 MANUAL STARTERS

.1 Manual starters for single phase motors shall have toggle operating handle, quick-make, quick-break mechanism operating heavy sliding contacts. Overload devices of either eutectic alloy or bimetal construction shall be supplied and installed based on the motor name plate data. Starters for surface mounting shall be in general purpose EEMAC I enclosures, those for flush mounting complete with stainless steel cover plates. Starters shall be complete with locking tabs. Starters shall be surface or flush mounted as indicated on the drawings, or as dictated by the room finish schedule. Pilot lights shall be of the LED type and shall be included on all manual starters, unless specifically noted otherwise.

.2 Manual starters shall be complete with an adjustable knob that allows a 10%, plus or minus, adjustment of the nominal thermal overload rating.

.3 Standard of Acceptance: Cutler-Hammer MST01 Series.

.4 Acceptable Alternate Manufacturers: Allen-Bradley, Furnas, Siemens, Square 'D'.

2.2 MAGNETIC STARTERS

.1 Individually mounted magnetic starters for all motors shall be c/w integral, solid state, electronic, overload protection.

.2 Combination starters shall be equipped with moulded case magnetic only circuit breaker C.S.A. approved for the application, and with adjustable magnetic trip settings. The operating handle of combination starters shall have provision for locking in the off position. Starters shall be provided in EEMAC I general purpose enclosures unless specifically noted otherwise. .

.3 Accessories for each magnetic starter shall be as noted on the drawings. Pilot lights shall be of the LED type and shall be included on all magnetic starters..

.4 Half size starters are not acceptable.

.5 Standard of acceptance: Cutler Hammer “ECN” Series.

.6 Acceptable alternate manufacturers: Allen-Bradley, Furnas, Square 'D', Siemens.

2.3 IDENTIFICATION

.1 Identify all starters with lamicoid nameplates in accordance with Section 26 05 00.

Part 3 Execution

3.1 MOTOR STARTERS

.1 Manual and magnetic starters shall be provided for all motors, unless specifically noted otherwise.

.2 Mount all starters in a secure manner, easily accessible, and 1372 mm to centre, above the floor unless indicated otherwise.

.3 Obtain full load ampere ratings of respective motors and install thermal overloads of appropriate size.

.4 Adjust magnetic settings on circuit breakers to minimum setting consistent with normal motor starting requirements, in accordance with manufacturers recommendations.

3.2 TESTS

.1 Perform tests in accordance with manufacturer's recommendations and instructions.

.2 Perform starting and stopping sequences of all contactors and relays.

.3 Check that the sequence of controls, interlocks with other separate related starters, equipment, control devices, etc., all operate as indicated.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 Common Work Results - Electrical.

1.2 REFERENCES

.1 Illuminating Engineering Society of North America (IESNA):

.1 IES-LM-79-08, Electrical and Photometric Measurements of Solid-State Lighting Products.

.2 IES-LM-80-15, Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules.

.3 IES-TM-21, Projecting Long Term Lumen Maintenance of LED Light Sources.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE):

.1 ANSI/IEEE C62.41-1991 (R1995), Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.3 ASTM International Inc.:

.1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Canadian Standards Association (CSA International).

.5 ICES-005-07, Radio Frequency Lighting Devices.

.6 Underwriters' Laboratories of Canada (ULC).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Provide complete photometric data prepared by independent testing laboratory for the manufacturer’s standard production model luminaire, for review by Departmental Representative. The report shall include all

photometric and electrical measurements, as well as all other pertinent data outlined under "14.0 Test Report" in IES-LM-79.

.3 LEDs shall be tested per IES-LM-79, IES-LM-80, and IES-TM-21 parameters.

.3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.

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

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse pallets, crates, paddling and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.4 Divert unused metal materials from landfill to metal recycling facility.

.5 Disposal and recycling of fluorescent lamps as per local regulations.

Part 2 Products

2.1 DRIVERS

.1 Rated life: 50,000 hours (minimum) at Tcase of ≤ 70° C.

.2 Flicker free dimming range.

.3 Power factor 90% minimum.

.4 Class "A" sound rating.

.5 Thermally protected.

.6 Dynamic end of life protection circuit.

.7 Rated for 60 Hz and voltage as indicated by the circuit on the drawings.

.8 0-10V dimming to 1%, standard in laboratory areas. 0-10V dimming to 10% otherwise.

.9 LEDs of the same luminaire supplied from the same batch during manufacturing.

2.2 FINISHES

.1 Baked enamel finish:

.1 Conditioning of metal before painting:

.1 For corrosion resistance conversion coating to ASTM F1137.

.2 For paint base, conversion coating to ASTM F1137.

.2 Metal surfaces of luminaire housing and reflectors finished with high gloss baked enamel or polyester powdercoat to give smooth, uniform appearance, free from pinholes or defects.

.3 Reflector and other inside surfaces finished as follows:

.1 White, minimum reflection factor 85%.

.2 Colour fastness: yellowness factor not above 0.02 and after 250 hours exposure in Atlas fade-ometer not to exceed 0.05.

.3 Film thickness, not less than 0.03mm average and in no areas less than 0.025mm.

.4 Gloss not less than 80 units as measured with Gardner 60E gloss meter.

.5 Flexibility: withstand bending over 13mm mandrel without showing signs of cracking or flaking under 10 times magnification.

.6 Adhesion: 25mm square lattice made of 3mm squares cut through film to metal with sharp razor blade. Adhesive cellulose tape applied over lattice and pulled. Adhesion satisfactory if no coating removed.

.2 Alzak finish:

.1 Aluminium sheet fabricated from special aluminum alloys and chemically brightened, subsequently anodically treated to specifications established by Alcoa, to produce:

.1 Finish for mild commercial service, minimum density of coating 7.8 g/m^2, minimum reflectivity 83% for specular, 80.5% for semi-specular and 75% for diffuse.

.2 Finish for regular industrial service, minimum density of coating 14.8 g/m^2, minimum reflectivity 82% for specular and 73% for diffuse.

.3 Finish for heavy duty service, minimum density of coating 21.8 g/m^2, minimum reflectivity 85% for specular, 65% for diffuse.

2.3 LUMINAIRES

.1 As indicated in luminaire schedule.

Part 3 Execution

3.1 INSTALLATION

.1 Supply, store and install all luminaires in such a manner that their attachment to the ceiling shall be secure in all respects. In order to avoid any danger that the weight of the fixtures might distort hung ceilings (where such occur), provide approved type independent supports to the satisfaction of the Departmental Representative.

.2 Luminaires shall not be hung directly from plasterboard ceilings, but shall derive their support from channels independently mounted in the ceiling space.

.3 Provide any supporting angles, channels, unistrut, caddy clips, etc., required to adequately secure and support the luminaires. Exposed supporting system shall be painted white and blended in with the background colours.

3.2 WIRING

.1 Connect luminaires to lighting circuits:

.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.4 CLEANING

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

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Division 1 and the General Conditions of the Contract between the NRC Departmental Representative and the Contractor shall deem to apply and be part of this section.

1.2 SYSTEM DESCRIPTION

.2 Structured system of telecommunications cables installed within buildings for distributing voice and data signals.

1.3 RELATED SECTIONS

.3 Section 26 05 01 - Common Work Results - Electrical.

.4 Section 27 11 19 - Terminals and connectors for building communications conductors.

.5 Section 27 05 28 Pathways for Communications Systems

1.4 REFERENCES

.1 CAN/CSA-T530-M99, Building Facilities, Design Guidelines for Telecommunications.

.2 CAN/CSA-T529-M95, Design Guidelines for Telecommunications Wiring System in Commercial Buildings.

.3 CAN/CSA-T528-M97, Design Guidelines for Administration of Telecommunications Infrastructure in Commercial Buildings.

.4 CAN/CSA-T527-M94, Design Guidelines for Grounding and Bonding for Telecommunications in Commercial Buildings.

.5 CAN/CSA-C22.2 No. 214-M90, Communications Cables.

.6 CAN/CSA-C22.2 No. 182.4-M90, Plugs, Receptacles, and Connectors for Communication Systems.

.7 ANSI/TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard.

.8 ANSI/TIA/EIA0568-B.2, Balanced Twisted Pair Cabling Components Standard.

.9 ANSI/TIA/EIA-568-B.3, Optical Fibre Cabling Components Standard.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.2 Fold up metal banding, flatten and place in designated area for recycling.

1.6 Shop Drawings and Product Data

.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit product data sheets for patch cords, cabling, jacks, frames, patch panels, blocks and racks exit signs. Include product characteristics, performance criteria, physical size, limitations and finish.

Part 2 Products

2.1 MATERIAL

.1 Provide a Category 6a structured wiring system, end to end, to ANSI/TIA/EIA- 568-B standard and as indicated on the drawings. This shall include voice and data link outlets, horizontal wiring and backbone wiring.

2.2 COPPER HORIZONTAL VOICE AND DATA COMMUNICATION WIRE

.1 Provide a Category 6a structured wiring system, end to end, to ANSI/TIA/EIA-568-B standard and as indicated on the drawings. This shall include voice and data link outlets, horizontal wiring and backbone wiring.

.2 Wire shall be 4 pair No. 24 gauge EIA/TIA, Level 6, FT6 rated cable, as noted on the drawings. Cables shall be installed in conduit in rooms without suspended ceilings. Cables may be installed through ceiling spaces or frame construction without the use of conduit. In such instances, cable shall be run parallel to building lines and secured within (305 mm) of termination and at intervals not exceeding (1220 mm). Cables to be secured to metal decking, beams and joists using Erico Cable Cat. Series J-hooks (J-hooks sized for 50% fill). Where cables run to outlets, devices or equipments in walls, they shall be in thinwall Type “EMT” conduit as previously specified. Where conduit drops are required from the ceiling space through a wall to an outlet box, the conduit termination in the ceiling space shall be made with an insulated throat connector. The conduit stub shall be turned out into the accessible ceiling space (within the

same room where possible). Routing of cables shall be from outlet to corridor and through corridor to telecommunications room or closet.

.3 Provide cable slack at each end of all horizontal cables, including three meters at the telecommunications room and one meter at the telecommunications outlet.

.4 Provide colour coded horizontal cable jackets as noted on the drawings.

.5 Provide one thinwall Type EMT conduit (minimum 53 mm) from the cable tray in the corridor to the accessible ceiling space of each room that contains telecommunications outlet(s).

2.3 VOICE AND DATA OUTLETS

.1 Generally, each communication outlet consists of two or three category 6a (refer to drawings), RJ45 jacks on a single plate and installed in a 4" square box with raised single gang plaster ring or on modular plate as indicated on the drawings. Jacks shall be EIA/TIA568A configuration complete with coverplates and icons. Provide matching coverplate.

2.4 MANUFACTURERS

.1 Acceptable manufacturers: Berk-Tek, Leviton, Belden, Ortronics, Panduit, Superior Essex.

Part 3 Execution

3.1 INSTALLATION OF CABLES

.1 Provide a structured wiring system, end to end, to ANSI/TIA/EIA-568-B.2.1 Category 6 Standard and as indicated on the drawings.

.2 Connect jacks to wiring at outlets and tag cables.

.3 All work shall be in accordance with the CAN/CSA-T529-M95 and ANSI/TIA/EIA-568-B. Testing of outlets, jacks, wiring, and patch panels shall be performed for each run at 500 megahertz. **Testing results shall be submitted for review**. Termination and testing shall be performed by personnel with a demonstrated experience in this specific line of work for a period of not less than the last five consecutive years.

.4 Colour code and identify all work in accordance with CAN/CSA-T528-97. Provide complete administrative records in accordance with the recommended practice for this Standard.

.5 Voice, data and radio cables shall be installed through ceiling spaces utilizing support hooks. Voice and data cables installed concealed in partition wall systems (i.e. drywall and studs) do not require vertical conduits, provide protection of cables where they pass through steal studs.

.6 Coaxial cables shall be installed as noted in .5 above.

3.2 WIRING

.1 Horizontal voice and data cables shall be installed in conduit in rooms without suspended ceilings. They may be installed through ceiling spaces or frame construction without the use of conduit. In such instances, cable shall be run parallel to building lines and secured with (300 mm) of termination and at intervals not exceeding (1200 mm). Cables to be secured to metal decking, beams and joists using Erico Cable Cat. Series J-hooks (J-hooks sized for 50% fill). Cables installed above T-bar ceilings are to be within reach of T-bar ceilings. Where the cables run to outlets, devices or equipment in walls, they shall be in thinwall "EMT" conduit as previously specified. Where conduit drops are required from the ceiling space through a concrete or masonry wall to an outlet box, the conduit termination in the ceiling space shall be made with an insulated throat connector. The conduit stub shall be turned out into the accessible ceiling space (within the same room where possible). Cables shall not be bundled together using "zip ties", only the use "Velco" or other such approved bundling methods is accepted.

3.3 FIELD QUALITY CONTROL

.2 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.

.3 All product supplied under this contract shall be installed and tested under a CSV.

.4 The CSV Contractor shall provide a five (5) year warranty on all product. This warranty shall warrant that the system will be free from defects in material, installation or workmanship.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Division 1 and the General Conditions of the Contract between the NRC Departmental Representative and the Contractor shall deem to apply and be part of this section

1.2 RELATED SECTIONS

.1 Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.2 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 MATERIAL

.1 Conduits: EMT type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Outlet boxes (102mm) square with single gang raised plaster ring.: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.3 Pull boxes shall be Type D & E of minimum length eight times the internal diameter of the largest conduit.

Part 3 Execution

3.1 INSTALLATION

.1 Install raceway system, including outlet boxes, pull boxes, coverplates, conduit, wire basket, miscellaneous and positioning material to constitute complete system. Conduits shall be reamed to ensure all burghs are removed.

.2 Conduits shall enter outlet boxes to either side or centre, to prevent cable damage by coverplate retaining screws.

.3 Install pull boxes in runs at 30 m intervals, or lesser distances, as dictated by the number of bends.

.4 A (6 mm) stranded nylon pull rope, or equivalent, shall be supplied and installed in each conduit run, for use by NRC-ITSS or local telephone utility.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

.1 Division 1 and the General Conditions of the Contract between the NRC Departmental Representative and the Contractor shall deem to apply and be part of this section.

1.2 SYSTEM DESCRIPTION

.1 Termination, patch cords, and cross-connection equipment installed inside building for voice and data for telecommunications systems employing unshielded-twisted-pair (UTP), shielded-twisted-pair (STP), coaxial (CXC), and optical fibre (OFC) cables.

1.3 RELATED SECTIONS

.1 Section 26 05 01 - Common Work Results - Electrical.

1.4 REFERENCES

.1 CAN/CSA T530-M99, Building Facilities, Design Guidelines for Telecommunications.
.2 CAN/CSA T529-M95, Design Guidelines for Telecommunications Wiring System in Commercial Buildings.
.3 CAN/CSA-T528-M97, Design Guidelines Administration of Telecommunications Infrastructure in Commercial Buildings.
.4 CAN/CSA-T527-M94, Design Guidelines for Grounding and Bonding for Telecommunications in Commercial Buildings.
.5 CAN/CSA C22.2 No. 182.4-M90, Plugs, Receptacles and Connectors for Communication Systems.
.6 Canadian Open Systems Application Criteria (COSAC) Profile for the Telecommunications Wiring System in Government Owned and Leased Buildings, Treasury Board Information Technology Standards TBITS-6.9.
.7 ANSI/TIA/EIA-568-B.1, Commercial Building Telecommunications Cabling Standard.
.8 ANSI/TIA/EIA-568-B.2, Balanced Twisted Pari Cabling Components Standard.
.9 ANSI/TIA/EIA-568-B.3, Optical Fibre Cabling Components Standard.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

.2 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 TERMINATIONS AND CROSS-CONNECTION SYSTEM FOR UNSHIELDED-TWISTED-PAIR (UTP) CABLE

.1 Supply and install a system of conduits, racks, outlets, wire, terminal blocks, patch panels, all associated fittings, hardware, etc., as indicated on the drawings and as further specified.

.2 Provide a Category 6 FT6 structured wiring system, end to end, to ANSI/TIA/EIA-568-B.2.1 Standard and as indicated on the drawings. This shall include voice and data link outlets and horizontal wiring.

.3 Each single communication outlet shall consist of one RJ45 jack, one 106 adapter and one single gang, stainless steel coverplate installed on a 102 mm square box with single gang plaster ring. Three blanks shall be provided to fill the unused ports.

.4 Each double communication outlet shall consist of two RJ45 jacks, one 106 adapter and one single gang, stainless steel coverplate installed on a 102 mm square box with single gang plaster ring. Two blanks shall be provided to fill the unused ports.

.5 Each triple communication outlet shall consist of three RJ45 jacks, one 106 adapter and one single gang, stainless steel coverplate installed on a 102 mm square box with single gang plaster ring. One blank shall be provided to fill the unused port.

.6 Supply and install plywood backboards treated with flame retardant finish in communications rooms. Plywood shall be securely attached to support the weight of terminals, hardware and cables.

.7 Terminal block mounting hardware shall be Belden BIX No. QMBIX10A mounts complete with QCBIX1A connectors.

.8 Category 6 copper patch panels shall be EIA T568A configuration, complete with mounting brackets, 24 or 48 port as indicated on the drawings. Patch panels shall be rack mounted in free standing steel equipment frames, anchored to the floor, minimum (1828 mm) high. All racks shall be fitted with wire managers and cable troughs, all to make for orderly routing of cabling.

.9 Copper patch cords shall be 24 AWG, stranded, 8 MOD to 8 MOD as specified on drawings.

.10 Fibreoptic patch panels shall be 24 or 48 port as indicated on the drawings.

.11 Fibre patch cords shall be single mode where noted and multimode, 50 micron, 62.5 micron, duplex SC as specified on the drawings.

.12 Horizontal cable management as specified on the drawings.

.13 Alternate manufacturers, provided they comply, are Berk-Tek, Hubbell, Leviton, and Panduit.

Part 3 Execution

3.1 INSTALLATION

.1 Supply and install a system of wire basket, conduits, hooks, cables, outlet boxes, all associated fittings, hardware, etc., as indicated on the drawings, and as required for a complete communication system.

.2 Supply and install plywood backboards in communications rooms, securely attached to the building partition walls, to support the weight of the telephone utility's relaypanels, terminals, power equipments, and other hardware.

.3 For block walls and poured concrete construction conduits shall enter outlet boxes to either side or centre, to prevent cable damage by coverplate retaining screws.

.4 Conduits shall enter outlet boxes to either side or centre, to prevent cable damage by coverplate retaining screws. Extend conduit to ceiling space.

.5 Connect jacks to wiring at outlets and tag cables.

.6 Connect wiring to patch panels in Communications Room.

.7 All work shall be in accordance with ANSI/TIA/EIA-568-B.2.1. Testing of outlets, jacks, wiring, and patch panels shall be performed for each run at 250 megahertz. Testing results shall be submitted for review. Termination and testing shall be performed by personnel with a demonstrated experience in this specific line of work for a period of not less than the last five consecutive years.

.8 Colour code and identify all work in accordance with CAN/CSA-T528-97. Provide complete administrative records in accordance with the recommended practice for this Standard.

END OF SECTION

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 be 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 Nothwithstanding 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 that 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.

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 or 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 "superintendant" 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 ths 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 o 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 proved 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 GC303.3 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, ar 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 wiring 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 that

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 n 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 Contactor.

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 INSUANCE 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 a t 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.

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
811526
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: National Research Council	2. Branch or Directorate / Direction générale ou Direction: ASPM
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

Contractor not in place yet. PR needed to be created for the Procurement process.
Work will primarily take place around rooms 216 to 226 at HFX01 with overlap into other parts of the building.

5. a) Will the supplier require access to Controlled Goods? Le fournisseur aura-t-il accès à des marchandises contrôlées?	☑ No / Non	☐ 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?	☑ No / Non	☐ 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)	☑ No / Non	☐ Yes / Oui
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.	☐ No / Non	☑ Yes / Oui
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?	☑ No / Non	☐ Yes / Oui

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 ☑	NATO / OTAN ☐	Foreign / Étranger ☐
7. b) Release restrictions / Restrictions relatives à la diffusion		
No release restrictions / Aucune restriction relative à la diffusion ☑	All NATO countries / Tous les pays de l'OTAN ☐	No release restrictions / Aucune restriction relative à la diffusion ☐
Not releasable / À ne pas diffuser ☐		
Restricted to: / Limité à : ☐	Restricted to: / Limité à : ☐	Restricted to: / Limité à : ☐
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 ☐	NATO UNCLASSIFIED / NATO NON CLASSIFIÉ ☐	PROTECTED A / PROTÉGÉ A ☐
PROTECTED B / PROTÉGÉ B ☐	NATO RESTRICTED / NATO DIFFUSION RESTREINTE ☐	PROTECTED B / PROTÉGÉ B ☐
PROTECTED C / PROTÉGÉ C ☐	NATO CONFIDENTIAL / NATO CONFIDENTIEL ☐	PROTECTED C / PROTÉGÉ C ☐
CONFIDENTIAL / CONFIDENTIEL ☐	NATO SECRET / NATO SECRET ☐	CONFIDENTIAL / CONFIDENTIEL ☐
SECRET / SECRET ☐	COSMIC TOP SECRET / COSMIC TRÈS SECRET ☐	SECRET / SECRET ☐
TOP SECRET / TRÈS SECRET ☐		TOP SECRET / TRÈS SECRET ☐
TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) ☐		TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) ☐

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
811526
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? — ☑ No / Non ☐ Yes / Oui
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 :

9. Will the supplier require access to extremely sensitive INFOSEC information or assets? — ☑ No / Non ☐ Yes / Oui
Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate?

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

☑ RELIABILITY STATUS COTE DE FIABILITÉ	☐ CONFIDENTIAL CONFIDENTIEL	☐ SECRET SECRET	☐ TOP SECRET TRÈS SECRET
☐ TOP SECRET– SIGINT TRÈS SECRET – SIGINT	☐ NATO CONFIDENTIAL NATO CONFIDENTIEL	☐ NATO SECRET NATO SECRET	☐ COSMIC TOP SECRET COSMIC TRÈS SECRET
☐ 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? — ☐ No / Non ☑ Yes / Oui
Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail?

If Yes, will unscreened personnel be escorted? — ☐ No / Non ☑ Yes / Oui
Dans l'affirmative, le personnel en question sera-t-il escorté?

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? — ☑ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS?

11. b) Will the supplier be required to safeguard COMSEC information or assets? — ☑ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC?

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? — ☑ No / Non ☐ Yes / Oui
Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ?

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? — ☑ No / Non ☐ Yes / Oui
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?

11. e) Will there be an electronic link between the supplier's IT systems and the government department or agency? — ☑ No / Non ☐ Yes / Oui
Disposera-t-on d'un lien électronique entre le système informatique du fournisseur et celui du ministère ou de l'agence gouvernementale?

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UNCLASSIFIED

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

For users completing the form **manually** use the summary chart below to indicate the category(ies) 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 A	PROTECTED / PROTÉGÉ B	PROTECTED / PROTÉGÉ C	CONFIDENTIAL / CONFIDENTIEL	SECRET	TOP SECRET / TRÈS SECRET
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?
La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE?

☑ No / Non ☐ Yes / Oui

If Yes, classify this form by annotating the top and bottom in the area entitled "Security Classification".
Dans l'affirmative, classifier 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?
La documentation associée à la présente LVERS sera-t-elle PROTÉGÉE et/ou CLASSIFIÉE?

☑ No / Non ☐ Yes / 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, classifier le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire et indiquer qu'il y a des pièces jointes (p. ex. SECRET avec des pièces jointes).

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PART D - AUTHORIZATION / PARTIE D - AUTORISATION

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

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature
Lee Petter	Site Operations Supervisor	

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
(902)426-9487	(902)426-9413	Lee.Petter@nrc-cnrc.gc.ca	07 Dec 2018

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

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature
Richard Bramucci	Analyst, Security in Contracting	

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
(613) 991-1093	(613) 990-0946	richard.bramucci@nrc-cnrc.gc.ca	2018.12.07

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?

☑ No / Non ☐ Yes / Oui

16. Procurement Officer / Agent d'approvisionnement

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature
Alain Lebrun	Senior Procu. Officer	

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
613 991-9960		alain.lebrun@nrc-cnrc.gc.ca	10-12-2018

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

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date