



SPECIFICATIONS

SOLICITATION #: 19-58075

BUILDING: M-20
1200 Montreal Road
Ottawa, Ontario

PROJECT: M20- 1st Floor Accommodation

PROJECT #: M20-5604

Date: December 2019

SPECIFICATION

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Directions to the Ottawa Research Facilities – Montreal Road

1200 Montréal Road
Ottawa, Ontario, Canada K1A 0R6

Tel: 613-993-9101

NRC Institutes/Branch/Program	Buildings
Information/Security	M-1
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NRC Institute For Information Technology (NRC-IIT)	M-2, M-50
NRC Institute For Microstructural Sciences (NRC-IMS)	M-36, M-37, M-50
NRC Institute For National Measurements Standards (NRC-INMS)	M-35, M-36, M-51
NRC Institute For Research In Construction (NRC-IRC)	M-20, M-24, M-25, M-27, M-42, M-48, M-59
NRC Strategy and Development Branch (NRC-SDB)	M-58

By Road, from the OTTAWA International Airport

1. From the airport take the AIRPORT PARKWAY to RIVERSIDE DR EAST
2. Follow RIVERSIDE DR EAST to HIGHWAY 417 EAST
3. Take HIGHWAY 417 EAST, past the ST-LAURENT BLVD exit, where HIGHWAY 417 splits, continue LEFT on HIGHWAY 174 (ROCKLAND)
4. Exit HIGHWAY 174 on BLAIR RD NORTH
5. Proceed on BLAIR RD NORTH, cross OGILVIE RD, and continue on to the traffic lights at the intersection of BLAIR and MONTREAL RD
6. Turn left onto MONTREAL RD and take the first immediate right onto the ramp leading down to the traffic circle. Stop at Building M-1 on the north side of the traffic circle. Ask the commissionaires in M-1 for directions to the NRC building, institute or staff member you seek.

By Road, from MONTRÉAL

1. Take MÉTROPOLITAIN 40 WEST and follow signs for OTTAWA and HIGHWAY 417 WEST
2. Follow 417 WEST to reach OTTAWA
3. Exit at HIGHWAY 174 EAST (ROCKLAND) when entering OTTAWA
4. Follow 174 EAST and exit at BLAIR RD NORTH (first exit after entering 174 EAST)
5. Follow BLAIR RD NORTH, cross OGILVIE RD, and continue on to the traffic lights at the intersection of BLAIR and MONTREAL RD
6. Turn left onto MONTREAL RD and take the first immediate right onto the ramp leading down to the traffic circle. Stop at Building M-1 on the north side of the traffic circle. Ask the commissionaires in M-1 for directions to the NRC building, institute or staff member you seek.



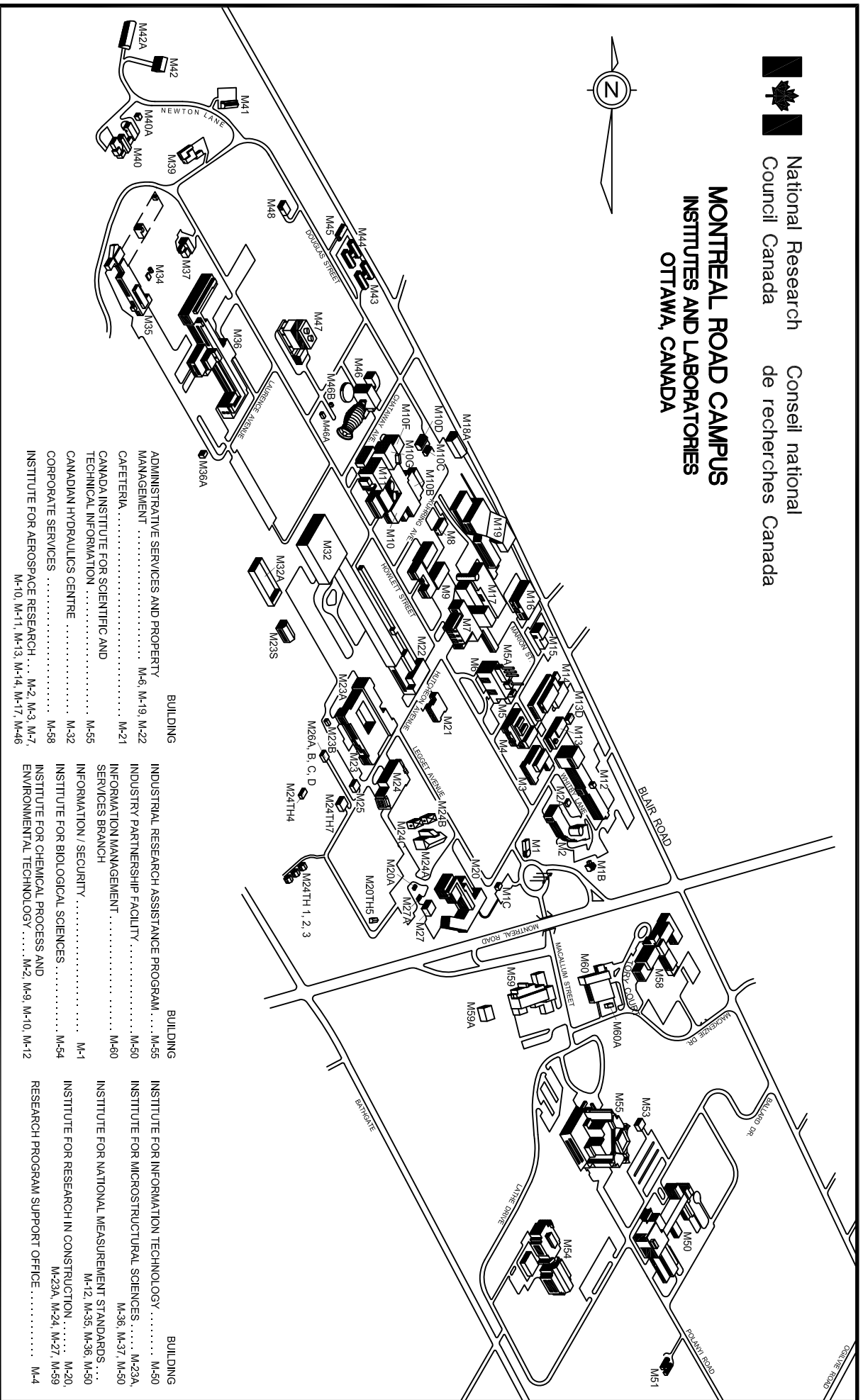
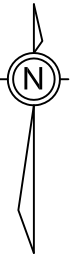


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|--|---|---|---|---|
|  NRC Institute |  Major HWY |  Airport |  Ferry |  Metro |
|  Trans Canada HWY |  Secondary HWY |  Train Station |  Bus Station | |



National Research Council Canada
 Conseil national de recherches Canada

MONTREAL ROAD CAMPUS INSTITUTES AND LABORATORIES OTTAWA, CANADA



- | | | | | |
|--|----------|---|----------|--|
| ADMINISTRATIVE SERVICES AND PROPERTY MANAGEMENT M-6, M-19, M-22 | BUILDING | INDUSTRIAL RESEARCH ASSISTANCE PROGRAM M-55 | BUILDING | INSTITUTE FOR INFORMATION TECHNOLOGY M-50 |
| CAFETERIA M-21 | | INDUSTRY PARTNERSHIP FACILITY M-50 | | INSTITUTE FOR MICROSTRUCTURAL SCIENCES M-23A, M-36, M-37, M-50 |
| CANADA INSTITUTE FOR SCIENTIFIC AND TECHNICAL INFORMATION M-55 | | SERVICES BRANCH | | INSTITUTE FOR NATIONAL MEASUREMENT STANDARDS M-12, M-35, M-36, M-50 |
| CANADIAN HYDRAULICS CENTRE M-32 | | INFORMATION / SECURITY M-1 | | INSTITUTE FOR RESEARCH IN CONSTRUCTION M-20, M-23A, M-24, M-27, M-59 |
| CORPORATE SERVICES M-58 | | INSTITUTE FOR BIOLOGICAL SCIENCES M-54 | | RESEARCH PROGRAM SUPPORT OFFICE M-4 |
| INSTITUTE FOR AEROSPACE RESEARCH M-2, M-3, M-7, M-10, M-11, M-13, M-14, M-17, M-46 | | | | |

National Research Council Conseil national de recherches
Canada Canada

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

Construction Tender Form

Project Identification **M20- 1st Floor Accommodation**

Tender No.: **19-58075**

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 increased or decreased in the manner provided for in GC22 of the General Conditions of the Contract Documents.

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

1.3.1 Offer (continued)

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

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

1.4 Acceptance and Entry into Contract

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

1.5 Construction Time

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

1.6 Bid Security

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

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

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

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1.7 Contract Security

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

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

1.8 Appendices

This Tender Form includes Appendix No. ____N/A_____.

1.9 Addenda

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

NUMBER	DATE	NUMBER	DATE

(Tenderers shall enter numbers and dates of addenda)

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

Indicate below the business name of each of the following subcontractors:

Architectural Contractor _____

Mechanical Contractor _____

Electrical Contractor _____

Failure to include these names will result in your bid being disqualified. Any attempt to change the named subs after award may result in the contract being canceled, going to the next lowest bidder.

The cost breakdown must be included with your bid at closing date.

The proposed construction schedule must be included with your bid at closing date.

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

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

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

(Type or print the business name of the Tenderer)

AUTHORIZED SIGNATORY (IES)

(Signature of Signatory)

(Print name & Title of Signatory)

(Signature of Signatory)

(Print name & Title of Signatory)

SEAL

BUY AND SELL NOTICE

M20- 1st Floor Accommodation

The National Research Council Canada, 1200 Montreal Road Ottawa, ON has a requirement for a project that includes:

The work under this contract covers the ground floor west renovation of Building M-20.

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.

The cost breakdown must be included with your bid at closing date. Failure to include this may result in your bid being disqualified.

The proposed construction schedule must be included with your bid at closing date. Failure to include this may result in your bid being disqualified.

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 18th and December 19th, 2019 at **9:00**. Meet Benoit Huot at Building M20, Main Entrance, 1200 Montreal Road Ottawa, ON. Bidders who, for any reason, cannot attend at the specified date and time will not be given an alternative appointment to view the site and their tenders, therefore, will be considered as non-responsive. **NO EXCEPTIONS WILL BE MADE.**

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

3. CLOSING DATE

Closing date is January 23rd, 2020 at 14:00.

4. TENDER RESULTS

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

5. SECURITY REQUIREMENT FOR CANADIAN CONTRACTORS

5.1 MANDATORY SECURITY REQUIREMENT:

This procurement contains a mandatory security requirement as follows:

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

5.2 VERIFICATION OF SECURITY CLEARANCE AT BID CLOSING

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

6.0 WSIB (WORKPLACE SAFETY AND INSURANCE BOARD)

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

7.0 OFFICE OF THE PROCUREMENT OMBUDSMAN

- 1) Clause for solicitation documents and regret letters for unsuccessful bidders

The Office of the Procurement Ombudsman (OPO) was established by the Government of Canada to

provide an independent venue for Canadian bidders to raise complaints regarding the award of federal

contracts under \$25,300 for goods and under \$101,100 for services. Should you have any issues or concerns regarding the award of a federal contract below these dollar amounts, contact OPO by e-mail at boa.opo@boa-opo.gc.ca, by telephone at 1-866-734-5169, or by web at www.opo-boa.gc.ca. For more information about OPO, including the available services, please visit the OPO website.

- 2) Contract Clauses -Dispute Resolution

The Parties agree to make every reasonable effort, in good faith, to settle amicably all disputes or claims

relating to or arising from the Contract, through negotiations between the Parties' representatives authorized to settle. If the Parties do not reach a settlement within 10 working days, each party hereby consents to fully participate in and bear the cost of mediation led by the Procurement Ombudsman pursuant to Subsection 22.1(3)(d) of the *Department of Public Work and Government Services Act and Section 23 of the Procurement Ombudsman Regulations*.

The Office of the Procurement Ombudsman may be contacted by telephone at 1-866-734-5169, by e-mail at boa.opo@boa-opo.gc.ca, or by web at www.opo-boa.gc.ca.

- 3) Contract clause -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 complainant respecting the administration of the 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.

To file a complaint, the Office of the Procurement Ombudsman may be contacted by e-mail at boa.opo@boa-opo.gc.ca, by telephone at 1-866-734-5169, or by web at www.opo-boa.gc.ca.

The Departmental Representative or his designate for this project is: **Benoit Huot**
Telephone: **613 808-3650**.

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.

- 5) A proposal submitted by a bidder who's Board of Directors or proprietor (s) are in majority the same as a former vendor who has declared bankruptcy while performing work for NRC over the last 7-years from the date of issuance of this RFP may be rejected and not eligible for award at NRC's sole discretion. In such case, NRC will advise the ineligible proponent(s).
- 6) A proposal submitted by a bidder who has had a previous contracts cancelled by NRC due to lack of performance within 3 years from the issuance date of this RFP may be rejected and not eligible for award at NRC's sole discretion. In such case, NRC will advise the ineligible proponent (s).
- 7) If there is discrepancy between the English version and the French version of this document and any of the attachments and amendments, the English version will takes precedence.

Article 3 - Contract

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

Article 4 – Tender Destination

- 1a) Tenders are to be submitted in sealed envelopes to:
National Research Council Canada
Administrative Services and Property Management Branch
1200 Montreal Road
Building M-58
Ottawa, ON
K1A 0R6

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

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

Article 5 - Security

- 1a) Bid Security is required and must be submitted in one of the following forms:
 - i) a certified cheque payable to the Receiver General for Canada and drawn on a member of the Canadian Payments Association or a local cooperative credit society that is a member of a central cooperative credit society having membership in the Canadian Payments Association; **OR**
 - ii) bonds of the Government of Canada, or bonds unconditionally guaranteed as to principal and interest by the Government of Canada; **OR**
 - iii) a bid bond.

- 1b) Regardless of the Bid Security submitted, it should never be more than \$250,000 maximum, calculated at 10% of the first \$250,000 of the tendered price, plus 5% of any amount in excess of \$250,000.
- 2a) Bid Security shall accompany each tender or, if forwarded separately from the tender, shall be provided not later than the specified tender closing time. Bid Security must be in the ORIGINAL form. Fax or photocopies and NOT acceptable. FAILURE TO PROVIDE THE REQUIRED BID SECURITY SHALL INVALIDATE THE TENDER.
- 2b) If the tender is not accepted, the Bid Security submitted pursuant to Article 8 shall be returned to the tenderer.
- 3a) The successful tenderer is required to provide security within 14 days of receiving notice of tender acceptance. The tenderer must furnish EITHER:
- i) a Security Deposit as described in 1(b) above together with a Labour and Material Payment Bond in the amount of at least 50% of the amount payable under the contract, OR
 - ii) a Performance Bond and a Labour and Material Payment Bond – each in the amount of 50% of the amount payable under the contract.
- 3b) Should it not be possible to obtain a Labour Material Payment Bond as required under 3(a) above, on making application thereof to at least two acceptable Bonding Companies, an additional Security Deposit of a straight 10% of the amount payable under the contract must be furnished.
- 3c) Where a tender has been accompanied by a Security Deposit, as described in 1(b) above, the amount of the Security Deposit required under 3(a) above may be reduced by the amount of the Security Deposit which accompanied the tender.
- 3d) Bonds must be in an approved form and from the companies whose

bonds are acceptable to the Government of Canada. Samples of the approved form of Bid Bond, Performance Bond and Labour and Material Payment Bond and a list of acceptable Bonding Companies may be obtained from the Contracting Officer, National Research Council, Building M-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 is now in effect shall be considered an applicable tax for the purpose of this tender. However, the bidder shall NOT include any amount in the bid price for said HST. The successful contractor will indicate on each application for payment as a separate amount the appropriate HST the Owner is legally obliged to pay. This amount will be paid to the Contractor in addition to the amount certified for payment under the Contract in addition to the

amount certified for payment under the Contract and will therefore not affect the Contract Price.
The Contractor agrees to remit any HST collected or due to Revenue Canada.

Non-resident contractors

RST guide 804

Published August 2006

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

Publication Archived

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

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

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

Non-Resident Contractor Defined

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

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

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

Registration and Guarantee Deposit

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

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

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

Letter of Compliance

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

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

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

Calculation of RST

Fair Value

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

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

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

Machinery and Equipment - Leased

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

Machinery and Equipment - Owned by Contractor

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

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

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

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

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

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

net book value at date of import × tax rate

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

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

(See Completion of Contract section)

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

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

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

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

(See RST Guide 401 - Manufacturing Contractors)

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

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

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

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

E x e m p t i o n s

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

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

Status Indians, Indian Bands and Band Councils

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

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

Completion of Contract

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

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

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

All returns are subject to audit.

Legislative References

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

For More Information

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

Acceptable Bonding Companies

Published September 2010

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

1. Canadian Companies

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

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

2. Provincial Companies

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

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

3. Foreign Companies

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

Articles of Agreement

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

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

Articles of Agreement

These Articles of Agreement made in duplicate this day of .

Between

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

and

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

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

A1 Contract Documents

(23/01/2002)

- 1.1 Subject to A1.4 and A1.5, the documents forming the contract between Her Majesty and the Contractor, referred to herein as the contract documents, are
 - 1.1.1 these Articles of Agreement,
 - 1.1.2 the document attached hereto, marked “A” and entitled “Plans and Specifications”, referred to herein as the Plans and Specifications,
 - 1.1.3 the document attached hereto, marked “B” and entitled “Terms of Payment”, referred to herein as the Terms of Payment,
 - 1.1.4 the document attached hereto, marked “C” and entitled “General Conditions”, referred to herein as the General Conditions,
 - 1.1.5 the document attached hereto, marked “D” and entitled “Labour Conditions”, referred to herein as the Labour Conditions,
 - 1.1.6 the document attached hereto, marked “E” and entitled “Insurance Conditions”, referred to herein as the Insurance Conditions,
 - 1.1.7 the document attached hereto, marked “F” and entitled “Contract Security Conditions”, referred to herein as the Contract Security Conditions, and
 - 1.1.8 any amendment or variation of the contract documents that is made in accordance with the General Conditions.
 - 1.1.9 the document entitled Fair Wage Schedules for Federal Construction Contracts referred to herein as Fair Wage Schedules
 - 1.1.10

Articles of Agreement

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

1.2 In the contract

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

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

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

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

A2 Date of Completion of Work and Description of Work

(23/01/2002)

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

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

Articles of Agreement

A3 Contract Amount

(23/01/2002)

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

A4 Contractor's Address

(23/01/2002)

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

Articles of Agreement

A5 Unit Price Table

(23/01/2002)

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

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

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

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

Articles of Agreement

Signed on behalf of Her Majesty by

as Senior Contracting Officer

and _____

as _____

of the **National Research Council Canada**

on the _____

day of _____

Signed, sealed and delivered by

as _____ and
Position

by _____

as _____ and
Position

of

on the _____

day of _____

Seal

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END OF TABLE

1. SCOPE OF WORK

- .1 Work under this contract covers the accommodation renewal for the ground floor west in the Council's Building M20 of the National Research Council.

2. DRAWINGS

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

Architectural drawings: 5604-A01 to A11

Structural drawings: 5604- S101, S201 to S202

Mechanical drawings: 5604- M001 to M07

Electrical Drawings: 5604- E01 to E05

3. COMPLETION

- .1 **All workstations and furniture items are to be in storage in Ottawa, ready to ship to site prior to March 31, 2020.** Complete all work within 17 week(s) after receipt of notification of acceptance of tender by letter of intent.

4. GENERAL

- .1 The word "provide" in the contract documents means to supply and install.

5. SPECIFIED ACCEPTABLE & ALTERNATIVE EQUIPMENT & MATERIALS

- .1 Materials and equipment scheduled and/or specified on the drawings or in the specifications have been selected to establish a performance and quality standard. In most cases, acceptable manufacturers are stated for any material or equipment specified by manufacturer's name and model number. Contractors may base their tender price on materials and equipment supplied by any of the manufacturers' names as acceptable for the particular material or equipment.
- .2 In addition to the manufacturers specified or named as acceptable, you may propose alternative manufacturers of materials or equipment to the Contracting Authority for acceptance. For a product to be considered as an alternative product substitute, make a written application to the Contracting Authority 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 be considered.

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. 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 on site to the workers and the Departmental Representative, Material Safety Data Sheets (MSDS) for these controlled products;
 - .3 To train own workers about WHMIS, and about the controlled products that they use on site;
 - .4 To inform other contractors, sub-contractors, the Departmental Representative, authorized visitors and outside inspection agency personnel about the presence and use of such products on the site.
 - .5 The site foreman or superintendent must be able to demonstrate, to the satisfaction of the Departmental Representative, that he/she has had WHMIS training and is knowledgeable in its requirements. The Departmental Representative can require replacement of this person if this condition or implementation of WHMIS is not satisfactory.

8. REQUIREMENTS OF BILL 208, SECTION 18(a)

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

- .1 Acrylonitrile, Isocyanates, Arsenic, Lead, Asbestos, Mercury, Benzene, Silica, Coke Oven Emissions, Vinyl Chloride, and Ethylene Oxide
- .1 It is the responsibility of the general contractor to ensure that each prospective subcontractor for this project has received a copy of the above list.

9. COST BREAKDOWN

- .1 Submit, for approval by the Departmental Representative. The breakdown is to include a breakout of 5% of the value of the contract from a minimum of \$5,000 to a maximum of \$50,000 for contract closeout documentation.
- .2 The breakdown will be reviewed for the successful contractor and revised as per Departmental Representatives comment. The revised and approved cost breakdown is the basis for submitting all claims.
- .3 Request Departmental Representative's written approval to amount of claim prior to preparing and submitting the claim in its final form.

10. SUB-TRADES

- .1 Submit a complete list of sub trades for the Departmental Representative's review.

11. PERSONNEL SECURITY AND IDENTIFICATION

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

12. WORKING HOURS AND SECURITY

- .1 Normal working hours on the NRC property are from 8:00 a.m. until 4:00 p.m., Monday to Friday inclusive, except statutory holidays and NRC December shutdown.
- .2 At all other times written approval is required for access to the building site from the Departmental Representative.
- .3 An escort shall be required whenever working outside normal hours. Contractor to bear the associated costs.

13. WORK RESTRICTIONS

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with NRC Departmental Representative to facilitate work as stated.
- .2 Any work to be performed by the general Contractor and/or its sub-contractors requiring shutdowns, generating excessive noise, odors and/or any kind of discomfort to building occupants shall be executed outside of the NRC normal business hours, at the discretion of the Departmental Representative. If unsure, check with Departmental Representative prior to performing any work that may cause a disturbance to building users.

- .3 The contractor will be held responsible to compensate NRC for any financial losses as a result of non-compliance with this section.
- .4 **Client access to room 114 will be maintained, hoarding and temporary connections to be installed as required. Work for this area will be coordinated and phased to limit shut down time.**

14. SCHEDULE

- .1 The contractor shall prepare a detailed schedule, fixing the date for commencement and completion of the various parts of the work and update the said schedule. Such schedule shall be made available to the Departmental Representative prior to commencement of any work on site.
- .2 Notify Departmental Representative in writing of any changes in the schedule. Update schedule and resubmit as requested following the Departmental Representative written approval.
- .3 10 day(s) before the scheduled completion date, arrange to do an interim inspection with the Departmental Representative.

15. PROJECT MEETINGS

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

16. SHOP DRAWINGS

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

17. SAMPLES AND MOCK-UPS

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

18. 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.
- .3 Only competent/certified workers will be allowed on site, certification to be provided as requested by Departmental Representative.

19. WORK & MATERIALS SUPPLIED BY OWNER

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

20. MATERIALS RETURNED TO OWNER

- .1 Deliver to a storage place, as directed by the Departmental Representative, all materials returned to the Owner as indicated in contract documents.

21. SITE ACCESS

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

- .2 Obtain approval of Departmental Representative for regular means of access during the construction period.
- .3 Obtain approval of Departmental Representative before temporarily suspending operations on site; before returning to the site and before leaving the site at the end of the job.
- .4 Provide and maintain access to site.
- .5 Build and maintain temporary roads and provide snow removal during period of work.
- .6 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.
- .8 Provide all required bilingual directional signage and barricades as indicated in contract documents and/or as directed by Departmental Representative.

22. USE OF SITE

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

23. ACCEPTANCE OF SITE

- .1 Inspect the site before commencing work, review any unexpected conditions with the Departmental Representative.
- .2 Commencement of work will imply acceptance of existing conditions.

24. SITE OFFICE & TELEPHONE

- .1 Contractor to obtain permission from the Departmental Representative to use the existing office facilities in the building or Contractor to erect a temporary site office at his own expense and bear all associated costs.
- .2 Install and maintain a telephone, if necessary.
- .3 Use of NRC phones is not permitted unless in the case of an emergency.

25. SANITARY FACILITIES

- .1 Contractor to obtain permission from the Departmental Representative to use the existing washroom facilities in the building or provide sanitary facilities, and bear all associated costs.

26. TEMPORARY SERVICES

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

27. DOCUMENTS REQUIRED AT WORK SITE

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

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

29. PROTECTION AND WARNING NOTICES

- .1 Provide all materials required to protect existing equipment.
- .2 Erect dust barriers to prevent dust and debris from spreading through the building.
- .3 Place dust protection in the form of cover sheets over equipment and furniture and tape these sheets to floors, to ensure no dust infiltration.

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

30. BILINGUALISM

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

31. LAYOUT OF WORK

- .1 Location of equipment, fixtures, outlets and openings indicated on drawings or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with the manufacturer's recommendations for safety, access and maintenance.
- .3 Employ competent person to lay out work in accordance with the contract documents.

32. DISCREPANCIES & INTERFERENCES

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

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

33. MANUFACTURER'S INSTRUCTIONS

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

34. TEMPORARY HEATING AND VENTILATING

- .1 Bear the costs of temporary heat and ventilation during construction including costs of installation, fuel, operation, maintenance, and removal of equipment.
- .2 Use of direct-fired heaters discharging waste products into the work areas will not be permitted unless prior approval is given by the Departmental Representative.
- .3 Furnish and install temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of work.
 - .2 Protect work and products against dampness and cold.
 - .3 Reduce moisture condensation on surfaces to an acceptable level.
 - .4 Provide ambient temperature and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for a safe working environment.
- .4 Maintain minimum temperature of 10 °C (50 °F) or higher where specified as soon as finishing work is commenced and maintain until acceptance by the Departmental Representative. Maintain ambient temperature and humidity levels as required for comfort of NRC personnel.
- .5 Prevent hazardous or unhealthy accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction including also, storage areas and sanitary facilities.

- .1 Dispose of exhaust materials in a manner that will not result in a harmful or unhealthy exposure to persons.
- .6 Maintain strict supervision of operation of temporary heating and ventilating equipment.
 - .1 Enforce conformance with applicable codes and standards.
 - .2 Comply with instructions of the Departmental Representative including provision of full-time watchperson services when directed.
 - .3 Enforce safe practices.
 - .4 Vent direct-fired combustion units to outside.
- .7 Submit tenders assuming existing or new equipment and systems will not be used for temporary heating and ventilating.
- .8 After award of contract, Departmental Representative may permit use of the permanent system providing agreement can be reached on:
 - .1 Conditions of use, special equipment, protection, maintenance, and replacement of filters.
 - .2 Methods of ensuring that heating medium will not be wasted and in the case of steam, agreement on what is to be done with the condensate.
 - .3 Saving on contract price.
 - .4 Provisions relating to guarantees on equipment.

35.

CONNECTIONS TO AND INTERRUPTIONS TO EXISTING SERVICES

- .1 Where work involves breaking into or connecting to existing services, carry out work at times and in the manner agreed to by the Departmental Representative and by authorities having jurisdiction, with minimum disruption to NRC Personnel and vehicular traffic and minimum service interruption. Do not operate any NRC equipment or plant. Shut downs affecting other areas or occupants shall be completed outside of normal working hours.
- .2 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.
- .3 Submit a schedule to and obtain approval from the Departmental Representative for any shut-down or closure of active service or facility; allow minimum 72 hours notice. Adhere to approved schedule and provide notice to the Departmental Representative.
- .4 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .5 Provide detours, bridges, alternate feeds, etc., as required to minimize disruptions.
- .6 Protect existing services as required and immediately make repairs if damage occurs.
- .7 Remove any abandoned service lines as indicated on the contract documents and as approved by the Departmental Representative; cap or otherwise seal lines at cut-off

points. Record and provide a copy to the Departmental Representative of locations of maintained, re-routed and abandoned service lines.

36. CUTTING AND PATCHING

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

37. FASTENING DEVICES

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

38. 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.

39. DRAINAGE

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

40. 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 Departmental Representative and security personnel when requested.
- .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.

41. STORAGE

- .1 Provide storage as required to protect all tools, materials, etc., from damage or theft and be responsible for the same.

42. GENERAL REVIEW

- .1 Periodic review of the contractor's work by the Departmental Representative does not relieve the contractor of the responsibility of making the work in accordance with contract documents. Contractor shall carry out his own quality control to ensure that the construction work is in accordance with contract documents.

43. 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.

44. TESTING

- .1 On completion, or as required by local authority inspectors and/or Departmental Representative during progress of work and before any services are covered up and

flushing is complete, test all installations in the presence of the Departmental Representative.

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

45. 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.

46. DISPOSAL OF WASTES

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

47. 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.

48. FINAL CLEAN-UP

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

49. 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.

50. AS-BUILT DRAWINGS

- .1 Submit completed full size reproducible as-built drawings for all divisions.

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- .2 Include copies of as-built drawings in maintenance manuals.

51. MAINTENANCE MANUALS

- .1 Provide two (2) bilingual copies of maintenance manuals or two English and two French 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, performance data and reports. Commissioning reports, TAB reports, all guarantees and warranties, certificates, approved shop drawings, technical data, etc., for the material, equipment and apparatus supplied under this contract.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 011000 - General Instructions Ontario

1.2 ADMINISTRATIVE

- .1 Submit to Departmental Representative for review, shop drawings, product data and samples specified within two weeks after contract award.
 - .1 Submit promptly and in orderly sequence to not cause delay in Work
 - .2 Failure to submit in the prescribed time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.

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- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
 - .4 Allow 5 week days for Departmental Representative's review of each submission.
 - .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
 - .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental in writing of revisions other than those requested.
 - .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.

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- .9 After Departmental Representative's review, distribute copies.
 - .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
 - .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
 - .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within [3] years of date of contract award for project.
 - .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
 - .14 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
 - .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
 - .16 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
 - .17 Delete information not applicable to project.
 - .18 Supplement standard information to provide details applicable to project.
 - .19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
 - .20 The review of shop drawings by National Research Council Canada (NRC) is for sole purpose of ascertaining conformance with general concept.

- .1 This review shall not mean that NRC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
- .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.4 SAMPLES

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

1.5 MOCK-UPS

- .1 Construct field mock-ups at locations acceptable to Departmental Representative.
- .2 Reviewed mock-ups will become standards of workmanship and material against which installed work will be checked on the project.

END OF 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 the Occupational Health and Safety Act and the Workplace Safety and Insurance Board. In the event of any conflict between any provisions in legislation or codes, the most stringent provisions shall apply.
- .4 Periodic review of the contractor's work by the Departmental Representative, using the criteria of the contract documents, does not relieve the contractor of his safety responsibilities in carrying out the work in accordance with the contract documents. The contractor shall consult with the Departmental Representative to ensure that this responsibility is carried out.
- .5 The Contractor shall ensure that only competent personnel are permitted to work 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 Ontario Health and Safety Act
 - .4 Building Schematic showing emergency exits
 - .5 Building emergency procedures
 - .6 Contact list for NRC, Contractor and all involved sub-contractors
 - .7 Any related MSDS sheets
 - .8 NRC Emergency phone number
- .8 The Contractor shall provide competent personnel to implement its safety program and those of any Health and Safety Act legislation applicable at this project location, and to ensure they are being complied with.
- .9 The Contractor shall provide safety orientation to all its employees as well as those of any subcontractors under its jurisdiction.

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

2. FIRE SAFETY REQUIREMENTS

.1 Authorities

- 1. The Fire Commissioner of Canada (FC) is the authority for fire safety at NRC.
- 2. For the purpose of this document, "Departmental Representative" will be deemed as the NRC person in charge of the project and who will enforce these Fire Safety Requirements.
- 3. Comply with the following standards as published by the Office of the Fire Commissioner of Canada:
 - 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 Departmental Representative.
- .2 Prior to commencement of "Hot Work", review the area of hot work with the Departmental Representative to determine the level of fire safety precautions to be taken.

.4 Reporting Fires

- .1 Know the exact location of the nearest Fire Alarm Pull Station and telephone, including the emergency phone number.
- .2 REPORT immediately, all fire incidents as follows:

- .1 Activate nearest fire alarm pull station and;
- .2 Telephone the following emergency phone number as appropriate:

FROM AN NRC PHONE 333
FROM ANY OTHER PHONE (613) 993-2411

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 DEPARTMENTAL REPRESENTATIVE.
- .2 WHEN ANY FIRE PROTECTION EQUIPMENT IS TEMPORARILY SHUT DOWN, ALTERNATIVE MEASURES AS PRESCRIBED BY THE DEPARTMENTAL REPRESENTATIVE SHALL BE TAKEN TO ENSURE THAT FIRE PROTECTION IS MAINTAINED.
- .3 DO NOT LEAVE FIRE PROTECTION OR ALARM SYSTEMS INACTIVE AT THE END OF A WORKING DAY WITHOUT NOTIFICATION AND AUTHORISATION FROM THE DEPARTMENTAL REPRESENTATIVE. THE DEPARTMENTAL REPRESENTATIVE WILL ADVISE THE (FPO) OF THE DETAILS OF ANY SUCH EVENT.
- .4 DO NOT USE FIRE HYDRANTS, STANDPIPES AND HOSE SYSTEMS FOR OTHER THAN FIRE FIGHTING PURPOSES UNLESS AUTHORISED BY DEPARTMENTAL REPRESENTATIVE.

.6 Fire Extinguishers

- .1 Provide a minimum of 1-20 lb. ABC Dry Chemical Fire Extinguisher at each hot work or open flame location.
- .2 Provide fire extinguishers for hot asphalt and roofing operations as follows:
 - 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 (CO₂) extinguishers will not be considered as substitutes for the above.

.7 Roofing Operations

.1 Kettles:

- .1 Arrange for the location of asphalt kettles and material storage with the Departmental Representative before moving on site. Do not locate kettles on any roof or structure and keep them at least 10m (30 feet) away from a building.
- .2 Equip kettles with 2 thermometers or gauges in good working order; a hand held and a kettle-mounted model.
- .3 Do not operate kettles at temperatures in excess of 232°C (450 °F).
- .4 Maintain continuous supervision while kettles are in operation and provide metal covers for the kettles to smother any flames in case of fire. Provide fire extinguishers as required in article 2.6.
- .5 Demonstrate container capacities to Departmental Representative prior to start of work.
- .6 Store materials a minimum of 6m (20 feet) from the kettle.

.2 Mops:

- .1 Use only glass fibre roofing mops.
- .2 Remove used mops from the roof site at the end of each working day.

.3 Torch Applied Systems:

- .1 DO NOT USE TORCHES NEXT TO WALLS.
- .2 DO NOT TORCH MEMBRANES TO EXPOSED WOOD OR CAVITY
- .3 Provide a Fire Watch as required by article 2.9 of this section.

- .4 Store all combustible roofing materials at least 3m (10 feet) away from any structure.

- .5 Keep compressed gas cylinders a minimum of 6m (20 feet) away from the kettle, protected from mechanical damage and secured in an upright position.

.8 Welding / Grinding Operations

- .1 Contractor to provide fire blankets, portable fume extraction devices, screens or similar equipment to prevent exposure to welding flash, or sparks from grinding.

.9 Fire Watch

- .1 Provide a fire watch for a minimum of one hour after the termination of any hot work operation.
- .2 For temporary heating, refer to General Instructions Section 00 010 00.

- .3 Equip fire watch personnel with fire extinguishers as required by article 2.6.

.10 Obstruction of access/egress routes-roadways, halls, doors, or elevators

- .1 Advise the Departmental Representative in advance of any work that would impede the response of Fire Department personnel and their apparatus. This includes violation of minimum overhead clearance, erection of barricades and the digging of trenches.
- .2 Building exit routes must not be obstructed in any way without special permission from the Departmental Representative, who will ensure that adequate alternative routes are maintained.
- .3 The Departmental Representative will advise the FPO of any obstruction that may warrant advanced planning and communication to ensure the safety of building occupants and the effectiveness of the Fire Department.

.11 Rubbish and Waste Materials

- .1 Keep rubbish and waste materials to a minimum and a minimum distance of 6m (20 feet) from any kettle or torches.
- .2 Do not burn rubbish on site.
- .3 Rubbish Containers
 - .1 Consult with the Departmental Representative to determine an acceptable safe location for any containers and the arrangement of chutes etc. prior to bringing the containers on site.
 - .2 Do not overfill the containers and keep area around the perimeter free and clear of any debris.
- .4 Storage
 - .1 Exercise extreme care when storing combustible waste materials in work areas. Ensure maximum possible cleanliness, ventilation and that all safety standards are adhered to when storing any combustible materials.
 - .2 Deposit greasy or oily rags or materials subject to spontaneous combustion in CSA or ULC approved receptacles and remove at the end of the work day or shift, or as directed.

.12 Flammable Liquids

- .1 The handling, storage and use of flammable liquids is governed by the current National Fire Code of Canada.
- .2 Flammable Liquids such as gasoline, kerosene and naphtha may be kept for ready use in quantities not exceeding 45 litres (10 imp gal), provided they are stored in approved safety cans bearing the ULC seal of approval and kept away from buildings, stockpiled combustible materials etc. Storage of quantities of

flammable liquids exceeding 45 litres (10 imp gal) for work purposes, require the permission of the Departmental Representative.

- .3 Flammable liquids are not to be left on any roof areas after normal working hours.
- .4 Transfer of flammable liquids is prohibited within buildings.
- .5 Do not transfer flammable liquids in the vicinity of open flames or any type of heat producing device.
- .6 Do not use flammable liquids having a flash point below 38 °C (100 °F) such as naphtha or gasoline as solvents or cleaning agents.
- .7 Store flammable waste liquids for disposal in approved container located in a safe, ventilated area. Waste flammable liquids are to be removed from the site on a regular basis.
- .8 Where flammable liquids, such as lacquers or urethane are used, ensure proper ventilation and eliminate all sources of ignition. Inform the Departmental Representative prior to, and at the cessation of such work.

3. Questions and/or clarifications

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Acronyms:
 - .1 AFD - Alternate Forms of Delivery, service provider.
 - .2 BMM - Building Management Manual.
 - .3 Cx - Commissioning.
 - .4 EMCS - Energy Monitoring and Control Systems.
 - .5 O&M - Operation and Maintenance.
 - .6 PI - Product Information.
 - .7 PV - Performance Verification.
 - .8 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
 - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
 - .2 Ensure appropriate documentation is compiled into the BMM.
 - .3 Effectively train O&M staff.
- .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
 - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
 - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
- .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

- .1 Section 01 91 31 - Commissioning (Cx) Plan.
- .2 Cx to be a line item of Contractor's cost breakdown.
- .3 Cx activities supplement field quality and testing procedures described in relevant technical sections.

- .4 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the renovation is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .5 Departmental Representative will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

1.5 PRE-CX REVIEW

- .1 Before Construction:
 - .1 Review contract documents, confirm by writing to Departmental Representative.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
 - .1 Have completed Cx Plan up-to-date.
 - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
 - .3 Fully understand Cx requirements and procedures.
 - .4 Have Cx documentation shelf-ready.
 - .5 Understand completely design criteria and intent and special features.
 - .6 Submit complete start-up documentation to Departmental Representative.
 - .7 Have Cx schedules up-to-date.
 - .8 Ensure systems have been cleaned thoroughly.
 - .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
 - .10 Ensure "As-Built" system schematics are available.

- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.7 SUBMITTALS

- .1 Submittals: in accordance with Section 01 10 00 – General Instructions.
 - .1 Submit no later than four (4) weeks after award of Contract:
 - .1 Name of Contractor's Cx agent.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least two (2) weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least two (2) weeks prior to start of Cx.
 - .4 Provide additional documentation relating to Cx process as requested by Departmental Representative.

1.8 COMMISSIONING DOCUMENTATION

- .1 Departmental Representative to review and approve Cx documentation.
- .2 Provide completed and approved Cx documentation to Departmental Representative.

1.9 COMMISSIONING SCHEDULE

- .1 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
 - .1 Approval of Cx reports.
 - .2 Verification of reported results.
 - .3 Repairs, retesting, re-commissioning, re-verification.
 - .4 Training.

1.10 COMMISSIONING MEETINGS

- .1 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .2 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

- .3 At 60% construction completion stage Contractor shall call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .4 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .5 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.
- .6 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

1.12 WITNESSING OF STARTING AND TESTING

- .1 Provide five (5) days notice prior to commencement.
- .2 Departmental Representative to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by Departmental Representative.
 - .3 Arrange for Departmental Representative to witness tests.
 - .4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems.
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative but cost shall be borne by the Contractor. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
 - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
 - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
- .2 Start-up documentation to include:
 - .1 Factory and on-site test certificates for specified equipment.
 - .2 Pre-start-up inspection reports.
 - .3 Signed installation/start-up check lists.
 - .4 Start-up reports,
 - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

1.18 START OF COMMISSIONING

- .1 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

- .1 Submit to Departmental Representative for review and approval:
 - .1 Complete list of instruments proposed to be used.
 - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

- .1 2-way radios.
- .2 Ladders.
- .3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

- .1 Under actual or accepted simulated operating conditions, over entire operating range, in all modes.
- .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

1.21 WITNESSING COMMISSIONING

.1 Departmental Representative to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within five (5) days of test and with Cx report.

1.23 EXTRAPOLATION OF RESULTS

.1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.24 EXTENT OF VERIFICATION

.1 Everywhere:

- .1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.
- .2 Number and location to be at discretion of Departmental Representative.
- .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.

- .4 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .5 Perform additional commissioning until results are acceptable to Departmental Representative.

1.25 REPEAT VERIFICATIONS

- .1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:
 - .1 Verification of reported results fail to receive Departmental Representative's approval.
 - .2 Repetition of second verification again fails to receive approval.
 - .3 Departmental Representative deems Contractor's request for second verification was premature.

1.26 SUNDRY CHECKS AND ADJUSTMENTS

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

1.27 DEFICIENCIES, FAULTS, DEFECTS

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.
- .2 Report problems, faults or defects affecting Cx to [Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

1.28 COMPLETION OF COMMISSIONING

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

1.29 ACTIVITIES UPON COMPLETION OF COMMISSIONING

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

1.30 TRAINING

- .1 In accordance with Section 01 10 00 – General Instructions.

1.31 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract and in accordance with Section 01 10 00 – General Instructions.

1.32 OCCUPANCY

- .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

1.33 INSTALLED INSTRUMENTATION

- .1 Use instruments installed under Contract for TAB and PV if:
 - .1 Accuracy complies with these specifications.
 - .2 Calibration certificates have been deposited with Departmental Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.34 PERFORMANCE VERIFICATION TOLERANCES

- .1 Application tolerances:
 - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 5% of specified values.
- .2 Instrument accuracy tolerances:
 - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
 - .1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 **Execution**

3.1 **NOT USED**

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Water Works Association (AWWA)
- .2 Public Works and Government Services Canada (PWGSC)
 - .1 PWGSC - Commissioning Guidelines CP.4 -3rd edition-[03].
- .3 Underwriters' Laboratories of Canada (ULC)

1.2 GENERAL

- .1 Provide a fully functional renovation area:
 - .1 Systems, equipment and components meet user's functional requirements before date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under normal loads.
 - .2 O&M personnel have been fully trained in aspects of installed systems.
 - .3 Optimized life cycle costs.
 - .4 Complete documentation relating to installed equipment and systems.
- .2 Term "Cx" in this section means "Commissioning".
- .3 Use this Cx Plan as master planning document for Cx:
 - .1 Outlines organization, scheduling, allocation of resources, documentation, pertaining to implementation of Cx.
 - .2 Communicates responsibilities of team members involved in Cx Scheduling, documentation requirements, and verification procedures.
 - .3 Sets out deliverables relating to O&M, process and administration of Cx.
 - .4 Describes process of verification of how built works meet design requirements.
 - .5 Produces a complete functional system prior to issuance of Certificate of Occupancy.
 - .6 Management tool that sets out scope, standards, roles and responsibilities, expectations, deliverables, and provides:
 - .1 Overview of Cx.
 - .2 General description of elements that make up Cx Plan.
 - .3 Process and methodology for successful Cx.
- .4 Acronyms:
 - .1 Cx - Commissioning.
 - .2 BMM - Building Management Manual.
 - .3 EMCS - Energy Monitoring and Control Systems.
 - .4 MSDS - Material Safety Data Sheets.
 - .5 PI - Product Information.
 - .6 PV - Performance Verification.
 - .7 TAB - Testing, Adjusting and Balancing.

.8 WHMIS - Workplace Hazardous Materials Information System.

.5 Commissioning terms used in this Section:

.1 Bumping: short term start-up to prove ability to start and prove correct rotation.

.2 Deferred Cx - Cx activities delayed for reasons beyond Contractor's control due to lack of occupancy, weather conditions, need for heating/cooling loads.

1.3 DEVELOPMENT OF 100% CX PLAN

.1 Cx Plan to be 95% completed before added into Project Specifications.

.2 Cx Plan to be 100% completed within two (2) weeks of award of contract to take into account:

.1 Approved shop drawings and product data.

.2 Approved changes to contract.

.3 Contractor's project schedule.

.4 Cx schedule.

.5 Contractor's, sub-contractor's, suppliers' requirements.

.6 Project construction team's and Cx team's requirements.

.3 Submit completed Cx Plan to Departmental Representative and obtain written approval.

1.4 REFINEMENT OF CX PLAN

.1 During construction phase, revise, refine and update Cx Plan to include:

.1 Changes resulting from Client program modifications.

.2 Approved design and construction changes.

.2 Revise, refine and update every week during construction phase. At each revision, indicate revision number and date.

.3 Submit each revised Cx Plan to Departmental Representative for review and obtain written approval.

.4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.5 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

.1 Departmental Representative to maintain overall responsibility for project and is sole point of contact between members of commissioning team.

.2 Project Manager will select Cx Team consisting of following members:

.1 Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.

- .2 Quality Assurance Commissioning Manager: ensures Cx activities are carried out to ensure delivery of a fully operational project including:
 - .1 Review of Cx documentation from operational perspective.
 - .2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.
 - .3 Protection of health, safety and comfort of occupants and O&M personnel.
 - .4 Monitoring of Cx activities, training, development of Cx documentation.
 - .5 Work closely with members of Cx Team.
- .3 Departmental Representative is responsible for:
 - .1 Organizing Cx.
 - .2 Monitoring operations Cx activities.
 - .3 Witnessing, certifying accuracy of reported results.
 - .4 Witnessing and certifying TAB and other tests.
 - .5 Developing BMM.
 - .6 Ensuring implementation of final Cx Plan.
 - .7 Performing verification of performance of installed systems and equipment.
 - .8 Implementation of Training Plan.
- .4 Construction Team: contractor, sub-contractors, suppliers and support disciplines, is responsible for construction/installation in accordance with contract documents, including:
 - .1 Testing.
 - .2 TAB.
 - .3 Performance of Cx activities.
 - .4 Delivery of training and Cx documentation.
 - .5 Assigning one person as point of contact with Consultant and PWGSC Cx Manager for administrative and coordination purposes.
- .5 Contractor's Cx agent implements specified Cx activities including:
 - .1 Demonstrations.
 - .2 Training.
 - .3 Testing.
 - .4 Preparation, submission of test reports.

1.6 CX PARTICIPANTS

- .1 Employ the following Cx participants to verify performance of equipment and systems:
 - .1 Installation contractor/subcontractor:
 - .1 Equipment and systems except as noted.
 - .2 Equipment manufacturer: equipment specified to be installed and started by manufacturer.
 - .1 To include performance verification.
 - .3 Specialist subcontractor: equipment and systems supplied and installed by specialist subcontractor.

- .4 Specialist Cx agency:
 - .1 Possessing specialist qualifications and installations providing environments essential to client's program but are outside scope or expertise of Cx specialists on this project.
- .5 Client: responsible for intrusion and access security systems.
- .6 Ensure that Cx participant:
 - .1 Could complete work within scheduled time frame.
 - .2 Available for emergency and troubleshooting service during first year of occupancy by user for adjustments and modifications outside responsibility of O&M personnel, including:
 - .1 Modify ventilation rates to meet changes in off-gassing.
 - .2 Changes to heating or cooling loads beyond scope of EMCS.
 - .3 Changes to EMCS control strategies beyond level of training provided to O&M personnel.
 - .4 Redistribution of electrical services.
 - .5 Modifications of fire alarm systems.
 - .6 Modifications to voice communications systems.
- .7 Provide names of participants to Departmental Representative and details of instruments and procedures to be followed for Cx prior to starting date of Cx for review and approval.

1.7 EXTENT OF CX

- .1 Cx mechanical systems and associated equipment:
 - .1 HVAC systems:
 - .1 Terminal Units (FCUs) c/w noise and vibration control systems.
 - .2 Fresh Air Supply System.
 - .3 Conditioned Supply Air System.
 - .4 Return Air Systems.
 - .5 Exhaust Air Systems.
 - .6 Heating Systems.
 - .2 EMCS:
 - .1 Ensure building EMCS has control of installed systems in accordance with design intent.

- .2 Commission electrical systems and equipment:
 - .1 Lighting systems:
 - .1 Lighting equipment.
 - .2 Distribution systems.
 - .3 Emergency lighting systems, including battery packs.
 - .4 Fire exit emergency signage.
 - .2 Fire alarm systems, equipment:
 - .1 Annunciators.
 - .2 Control panels.
 - .3 Fire alarm battery banks.

1.8 DELIVERABLES RELATING TO O&M PERSPECTIVES

- .1 General requirements: in accordance with Section 01 10 00 – General Instructions.

1.9 DELIVERABLES RELATING TO THE CX PROCESS

- .1 General:
 - .1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.
 - .2 Definitions:
 - .1 Cx as used in this section includes:
 - .1 Cx of components, equipment, systems, subsystems, and integrated systems.
 - .2 Factory inspections and performance verification tests.
 - .3 Deliverables: provide:
 - .1 Cx Specifications.
 - .2 Startup, pre-Cx activities and documentation for systems, and equipment.
 - .3 Completed installation checklists (ICL).
 - .4 Completed product information (PI) report forms.
 - .5 Completed performance verification (PV) report forms.
 - .6 Results of Performance Verification Tests and Inspections.
 - .7 Description of Cx activities and documentation.
 - .8 Description of Cx of integrated systems and documentation.
 - .9 Training Plans.
 - .10 Cx Reports.
 - .11 Prescribed activities during warranty period.
 - .4 Departmental Representative to witness and certify tests and reports.

1.10 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:

-
- .1 Pre-Start-Up inspections: by Departmental Representative prior to permission to start up and rectification of deficiencies to Departmental Representative's satisfaction.
 - .2 Include completed documentation with Cx report.
 - .3 Conduct pre-start-up tests: conduct pressure, static, flushing, cleaning, and "bumping" during construction as specified in technical sections. To be witnessed and certified by Departmental Representative and does not form part of Cx specifications.
 - .4 Include completed documentation in Cx report.
 - .2 Pre-Cx activities - MECHANICAL:
 - .1 HVAC equipment and systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 At this time, complete pre-start-up checks and complete relevant documentation.
 - .3 After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - .4 Perform TAB on systems. TAB reports to be approved by Departmental Representative.
 - .2 EMCS:
 - .1 EMCS trending to be available as supporting documentation for performance verification.
 - .2 Perform point-by-point testing in parallel with start-up.
 - .3 Carry out point-by-point verification.
 - .4 Demonstrate performance of systems, to be witnessed by Departmental Representative prior to start of Final Acceptance Test period.
 - .5 Perform final Cx and operational tests during demonstration period.
 - .6 Only additional testing after foregoing have been successfully completed to be "Off-Season Tests".
 - .3 Pre-Cx activities - LIFE SAFETY SYSTEMS
 - .1 Include equipment and systems identified above.
 - .2 Reports of test results to be witnessed and certified by Departmental Representative before verification.
 - .4 Pre-Cx activities - ELECTRICAL:
 - .1 Lighting systems:
 - .1 Emergency lighting systems:
 - .1 Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
 - .2 Fire alarm systems: test after other safety and security systems are completed. Testing to include a complete verification in accordance with ULC requirements. Departmental Representative has witnessed and certified report, demonstrate devices and zones.

1.11 START-UP

- .1 Start-up components, equipment and systems.
- .2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:
- .3 Departmental Representative to monitor all of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of Departmental Representative.
- .4 Performance Verification (PV):
 - .1 Approved Cx Agent to perform.
 - .1 Repeat when necessary until results are acceptable to Departmental Representative.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 Departmental Representative to approve completed PV reports.
 - .4 Departmental Representative reserves right to verify up to 30% of reported results at random.
 - .5 Failure of randomly selected item shall result in rejection of PV report or report of system start-up and testing.

1.12 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Perform Cx by specified Cx agency using procedures developed in consultation with Cx agency and Departmental Representative.
- .2 Departmental Representative to monitor Cx activities.
- .3 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report.
- .4 Departmental Representative to witness, certify reported results of Cx activities.
- .5 Departmental Representative reserves right to verify a percentage of reported results at no cost to contract.

1.13 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Cx to be performed by specified Cx specialist, using procedures developed in consultation with Cx agency and Departmental Representative.
- .2 Tests to be witnessed by Departmental Representative.
- .3 Upon satisfactory completion, Cx specialist to prepare Cx Report.
- .4 Departmental Representative reserves right to verify percentage of reported results.
- .5 Integrated systems to include:
 - .1 HVAC and associated systems forming part of the integrated base-building HVAC systems.
 - .2 Fire alarm systems.

.3 Emergency lighting systems.

.6 Identification:

.1 In later stages of Cx, before hand-over and acceptance Departmental Representative and Cx Manager to co-operate to complete inventory data sheets and provide assistance to O&M in full implementation of PM identification system of components, equipment, sub-systems, systems.

1.14 INSTALLATION CHECK LISTS (ICL)

.1 Refer to Section 01 91 13 – General Cx Requirements.

1.15 PRODUCT INFORMATION (PI) REPORT FORMS

.1 Refer to Section 01 91 13 – General Cx Requirements.

1.16 PERFORMANCE VERIFICATION (PV) REPORT

.1 Refer to Section 01 91 13 – General Cx Requirements.

1.17 CX SCHEDULES

.1 Prepare detailed Cx Schedule and submit to Departmental Representative for review and approval same time as project Construction Schedule. Include:

.1 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:

.1 Design criteria, design intents.

.2 Pre-TAB review.

.3 Cx agents' credentials.

.4 Cx procedures.

.5 Cx Report format.

.6 Discussion of heating/cooling loads for Cx.

.7 Submission of list of instrumentation with relevant certificates.

.8 Notification of intention to start TAB.

.9 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.

.10 Notification of intention to start Cx.

.11 Notification of intention to start Cx of integrated systems.

.12 Identification of deferred Cx.

.13 Implementation of training plans.

.14 Cx reports, immediately upon successful completion of Cx.

.2 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Owner.

.2 After approval, incorporate Cx Schedule into Construction Schedule.

.3 Consultant, Contractor, Contractor's Cx agent, and Departmental Representative will monitor progress of Cx against this schedule.

1.18 CX REPORTS

- .1 Submit reports of tests, witnessed and certified by Departmental Representative who will verify reported results.
- .2 Include completed and certified PV reports in properly formatted Cx Reports.
- .3 Before reports are accepted, reported results to be subject to verification by Departmental Representative.

1.19 ACTIVITIES DURING WARRANTY PERIOD

- .1 Cx activities must be completed before issuance of Interim Certificate, it is anticipated that certain Cx activities may be necessary during Warranty Period, including:
 - .1 Fine tuning of HVAC systems.
 - .2 Adjustment of ventilation rates to promote good indoor air quality and reduce deleterious effects of VOCs generated by off-gassing from construction materials and furnishings.
 - .3 Full-scale emergency evacuation exercises.

1.20 TESTS TO BE PERFORMED BY OWNER/USER

- .1 None is anticipated on this project.

1.21 TRAINING PLANS

- .1 Refer to Section 01 10 00 – General Instructions.

1.22 FINAL SETTINGS

- .1 Upon completion of Cx to satisfaction of Departmental Representative lock control devices in their final positions, indelibly mark settings marked and include in Cx Reports.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 Protection

- .1 Protect existing items designated to remain and materials designated for salvage. In event of damage, immediately replace such items or make repairs to approval of Departmental Representative and at no additional cost to Departmental Representative.

Part 2 PRODUCTS

2.1 N/A

Part 3 EXECUTION

3.1 Preparation

- .1 Inspect site and verify with Departmental Representative items designated for removal and items to be preserved.
- .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site.

3.2 Removal

- .1 Remove items indicated.
- .2 Do not disturb adjacent items designated to remain in place.

3.3 Salvage

- .1 Carefully dismantle items containing materials directed or indicated for salvage. Store salvaged materials at locations directed or indicated.

3.4 Disposal of Material

- .1 Dispose of materials not designated for salvage or re-use in work, off-site.

3.5 Restoration

- .1 Upon completion of work, remove debris, trim surfaces and leave work site clean.

- .2 Reinststate areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.

END OF SECTION

Part 1 GENERAL

1.1 Scope of Work

- .1 Provide interior protection prior to demolition work.
- .2 Protection to be constructed in such a fashion so as to afford security, dust and weather resistance.
- .3 Barriers to be constructed continuously on the interior perimeter.

Part 2 PRODUCTS

2.1 Materials

- .1 12mm x 1220mm x 2440mm wood sheathing.
- .2 92mm metal studding.
- .3 38x89mm spruce wood, construction grade studding.
- .4 6 mil. polyethylene.
- .5 Vinyl reinforced tarps.
- .6 Zipper closure, heavy duty, 75mm, self-adhesive zipper.

2.2 Erection

- .1 Construct a solid barrier in all locations where window, modifications are to occur.
- .2 Construct barriers full height and line with polyethylene to ensure dust and water tightness.
- .3 Have a mock-up assembly approved by the Departmental Representative prior to proceeding with the erection.

Part 3 SECONDARY PROTECTION

3.1 Dust Walls

- .1 As the work progresses and after all structural work and wall framing have been completed, remove the temporary interior protection walls and construct a 6 mill polyethylene dust wall in its place, to allow finish work to proceed.

-
- .2 Install wood sheathing in the new window openings temporarily until the new glazing units have been received.
 - .3 Inspect walls on a regular basis to ensure integrity of the assembly and to avoid dust and water infiltration to the interior of the building.
 - .4 Remove interior protections only when approved by the Departmental Representative.

Part 4 REINSTATEMENTS

4.1 Finishes

- .1 Reinstall the interior finishes affected by this work to the satisfaction of the Departmental Representative.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/NPA A208.1-[1999], Particleboard, Mat Formed Wood.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-[05a], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - .2 ASTM C36/C36M-[03], Standard Specification for Gypsum Wallboard.
 - .3 ASTM D1761-[88(2000)], Standard Test Methods for Mechanical Fasteners in Wood.

1.2 PRODUCTS

1.3 Lumber Material

- .1 Except as indicated or specified otherwise lumber shall be softwood, S4S, moisture content (MC) not greater than 19% at time of installation, in accordance with following standards:
 - .1 CSA O141-91.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 Forest Stewardship Council (FSC) certified.
- .2 Furring, blocking, nailing strips, grounds, rough bucks:
 - .1 Use S2S or S4S material.
 - .2 Board sizes: "Standard or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.
 - .4 Forest Stewardship Council (FSC) certified.

1.4 Fastenings & Hardware

- .1 Nails, spikes and staples to CSA B111.
- .2 Use common spiral nails and spiral spikes except where indicated otherwise.
- .3 Use hot galvanized finish steel for exterior work, interior high humidity areas and for pressure treated lumber except where indicated otherwise.
- .4 Bolt, nut, washer, screw and pin type fasteners: with hot-dip galvanized finish to CSA G164-M92 for exterior work, interior high humidity areas and for pressure treated lumber.

- .5 Use surface fastenings of following types, except where specific type is indicated.
 - .1 To hollow masonry, plaster and panel surfaces use toggle bolt.
 - .2 To solid masonry and concrete use expansion shield with lag screw, jute fibre or lead plug with wood screw.
 - .3 To structural steel use bolts through drilled hole, or welded stud-bolts or power driven self-drilling screws.
 - .4 Submit alternate fasteners for NRC Departmental Representative's approval.

Part 2 EXECUTION

2.1 Furring & Blocking

- .1 Install furring and blocking as required to space-out and support surface applied materials or other work as indicated.
- .2 Align and plumb faces of furring and blocking to tolerance of 1:600.

2.2 Nailers

- .1 Install wood nailers as indicated.
- .2 Except where indicated otherwise use material at least 40 mm (1-1/2") thick secured with 10 mm (3/8") bolts located within 300 mm (1 ft.) from ends of members and uniformly spaced at 1200 mm (4 ft.) between.
- .3 Countersink bolts where necessary to provide clearance for other work.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 07 90 00 – Sealant.
- .2 Division 22 Plumbing.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-2009, Particleboard.
- .2 Architectural Woodwork Institute (AWI) and Architectural Woodwork Manufacturers Association of Canada (AWMAC).
 - .1 Architectural Woodwork Standards 2016 edition.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
 - .2 CAN/CGSB-69.25-M90/ANSI/BHMA A156.9-1982 Cabinet Hardware.
 - .3 CAN/CGSB-69.27-93/ANSI/BHMA A156.11-1991 Cabinet Locks.
- .4 Canadian Standards Association (CSA)
 - .1 CSA O112.5-Series-M-1977(2016), Urea Resin Adhesives for Wood (Room- and High-Temperature Curing).
 - .2 CSA O151-M09, Canadian Softwood Plywood.
 - .3 CSA O153-M1980 (R2008), Poplar Plywood
- .5 National Electrical Manufacturers Association (NEMA)
 - .1 NEMA LD-3-2005.
- .6 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.

1.3 QUALITY ASSURANCE

- .1 Work of this section shall be performed by a custom wood casework fabricator with a minimum of 5 years of documented and acceptable experience in the fabrication and installation of institutional casework.
- .2 The Consultant may visit the fabrication plant at various stages in the fabrication process to review of the materials, quality and progress of the Work of this section and to ensure that casework is being fabricated in accordance with the specifications.
- .3 Coordinate visits to fabrication plant with Consultant to review fabrication of mockup, and fabrication of casework to be installed.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with submittal procedures of Section 013300 - Submittal Procedures.
- .2 Include complete dimensioned plans and elevations
- .3 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .1 Scales: profiles full size, details 1/2 full size.
- .4 Indicate materials, thicknesses, finishes and hardware.
- .5 Indicate locations of service outlets in casework, typical and special installation conditions, and all connections, attachments, anchorage and location of exposed fastenings.
 - .1 Indicate locations of joints in countertops.
- .6 Indicate governing dimensions to be established before fabricating items which are to accommodate or abut appliances, equipment and other materials.
- .7 Coordinate openings in casework with dimensions of built in equipment and systems.
 - .1 Show built-in equipment and systems of other trades and Owner supplied items in casework shop drawings.
 - .2 Obtain coordination information from affected trades and Other Contractors.
- .8 Indicate critical field dimensions verified and established by field measurement.
 - .1 No extra payment will be made by the Owner for Contractor's failure to verify and coordinate millwork fabrication with field dimensions of existing construction and new Work.
- .9 Do not commence fabrication of casework until all shop drawings, samples and other submittals have been reviewed and accepted by the Consultant.

1.5 SAMPLES

- .1 Submit samples in accordance with submittal procedures of Section 013300 - Submittal Procedures.
- .2 Submit duplicate samples of each material proposed for use in fabrication of cabinets, including hardware, veneers, cores, trim, finishes, accessories: sample size 300 mm x 300 mm or 300 mm long unless specified otherwise, except manufacturer's standard samples.
- .3 Submit duplicate colour samples of laminated plastic for colour selection.
- .4 Submit duplicate samples of laminated plastic joints, edging, cutouts and postformed profiles.
- .5 Provide complete product information for all products specified, details of finishing procedures and materials, including finish manufacturer's name and complete product information, certification to specified standards and grades.

1.6 JOB CONDITIONS

- .1 Where units are required to be fitted neatly into finished walls or openings, fabrication from drawing information shall be supplemented with actual job site conditions and measurements.
- .2 Examine the drawings, specifications and the site to ascertain fabrication and installation procedures so that the Work may be completed with a minimum of job site cutting and fitting.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Cover finished surfaces with heavy kraft paper or put in cartons during shipment. Protect installed surfaces by approved means. Do not remove protection until immediately before final inspection.
- .2 Protect casework against dampness and damage during and after delivery.
- .3 Store casework in ventilated areas, protected from extreme changes of temperature or humidity.
- .4 All units or components that are cracked, bent, chipped, scratched or otherwise unsuitable for installation shall be replaced by the Contractor with new units or components at no additional cost to the Owner.

1.8 WARRANTY

- .1 Contractor hereby warrants that custom wood casework has been fabricated and installed as specified, in accordance with the General Conditions of the Contract Documents, but for two years.
- .2 Warranty shall cover replacing and re-finishing to make good any defects caused by faulty workmanship or defective materials.

Part 2 Products

2.1 LUMBER MATERIALS

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content range 5-9%, with average 7% or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWMAC Custom grade, moisture content as specified.
- .2 Machine stress-rated lumber is acceptable for all purposes.
- .3 Hardwood lumber in accordance with following standards:
 - .1 Maple, birch or cherry species as indicated, Selects and Better, in accordance with National Hardwood Lumber Association (NHLA), and requirements of AWMAC Custom grade specifications;

- .2 S4S unless specified otherwise, moisture content range 5-9%, with average 7% or less;
- .3 National Hardwood Lumber Association (NHLA);
- .4 AWI/AWMAC custom grade.

2.2 PANEL MATERIALS

- .1 Interior mat-formed wood particleboard: to ANSI A208.1, grade R (High Quality Furniture Core), minimum density 45 lb/cu.ft.
- .2 Hardboard products shall:
 - .1 Conform to CAN/CGSB-11.3.
 - .2 Be manufactured such that formaldehyde emissions do not exceed 0.15 ppm (180 micro-g/m³) when tested in accordance with ASTM E1333.
 - .3 If manufactured using a wet process:
 - .1 be made by a process that does not release matter in the undiluted product plant effluent generating a BOD₅ in excess of 50 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment;
 - .2 be made by a process that does not release TSS in excess of [60] mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment;
 - .4 Contain at least 50 % recycled materials.

2.3 PLASTIC LAMINATE

- .1 Consultant will select plastic laminates from the full range of colour and pattern manufactured by the following manufacturers:
 - .1 Nevamar.
 - .2 Formica.
 - .3 Arborite.
 - .4 WillsonArt.
 - .5 Provide plastic laminate in colour, pattern and finish selected by NRC Departmental Representative from manufacturer's complete range.
 - .6 Allow for one colour scheme, with each scheme including four (4) colours.
- .2 Plastic laminate for exposed and semi-exposed horizontal flatwork: to NEMA LD3 Grade HGS, 1.2 mm thick.
- .3 Plastic laminate for exposed and semi-exposed vertical flatwork: to NEMA LD3 Grade VGS, 0.7 mm thick.
- .4 Laminated plastic for postforming countertop work: to NEMA LD3 Grade HGP, 1 mm thick.
- .5 Laminated plastic backing sheet: to NEMA LD3 BKL grade, supplied by same manufacturer as facing sheet; white, 0.5 mm thick.
- .6 Laminated plastic cabinet liner sheet: supplied by same manufacturer as facing sheet, not less than 0.5 mm thick, white colour.

- .7 Laminated plastic for toe space below floor mounted cabinets: to CAN3-A172- M79, Grade GP, Type HD, 2.5 mm thick; based on solid colour from manufacturer's standard range with matt finish.
- .8 Adhesives:
 - .1 For shop lamination: urea resin adhesive to CSA 0112.5-M1977.
 - .2 Test for acceptable VOC emissions in accordance with ASTM D2369 and ASTM D2832.
 - .1 Acceptable materials: ECP-44.
- .9 Sealer: Water-resistant sealer or glue acceptable to laminate manufacturer.
- .10 Low Pressure Decorative Laminate (LPDL): thermofused melamine to AWMAC/AWI requirements.
 - .1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).
 - .2 Provide balancing sheet.

2.4 FASTENERS

- .1 Nails and staples: to CSA B111.
- .2 Wood screws: chromium plated steel, type and size to suit application and substrate.
- .3 Splines: as per fabricator recommendation.

2.5 SEALANT

- .1 Sealant: Silicone sanitary sealant in accordance with Section 07 92 00.
 - .1 Casework and countertop perimeter: clear colour.
 - .2 Edges of cutouts: white.

2.6 CASEWORK FABRICATION - GENERAL

- .1 Fabricate casework to AWMAC/AWI Architectural Woodwork Standards Custom Quality Grade requirements and typical details as follows, except where specified or indicated otherwise:
 - .1 Casework construction type A frameless.
 - .2 Interface style 1 flush overlay
 - .3 Provide vertical divider panels to separate cabinet space below sinks from adjacent cabinets.
- .2 For purposes of applied finishes, the exposed, semi-exposed and concealed surfaces and edges in the final assembly shall be as defined in the specified AWMAC/AWI standard, except where specified otherwise.
- .3 Apply balancing finish to concealed surfaces including underside of countertops, drawer bottoms and cabinet backs.

- .4 Provide top and bottom fillers and corner panels where cabinets abut other cabinets and surfaces.

2.7 CASEWORK DETAILS

- .1 Fabricate casework to AWMAC/AWI Architectural Woodwork Standards custom grade quality requirements and typical details, except where specified otherwise.
- .2 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.
 - .1 S2S is acceptable for concealed blocking only.
 - .2 Board sizes: "Standard" or better grade.
 - .3 Dimension sizes: "Standard" light framing or better grade.
- .3 Framing: pine species, NLGA "D" Select or Better grade, para 117d.
- .4 Case bodies (ends, divisions and bottoms): particleboard, thickness as indicated.
 - .1 Provide specified finish on both sides of ends and divisions, except liner may be used for interior of drawer banks and underside of bottoms.
- .5 Backs: Melamine component panel, 6mm thickness, colour white.
- .6 Shelving.
 - .1 Particleboard, square edge, minimum 16 mm thick.
 - .2 Provide shelving 25.4 mm thick for shelves between 36 and 42 inches in length.
- .7 Apply specified surface and finish to surfaces and edges exposed or semi-exposed in final assembly, in accordance with AWMAC/AWI specifications.

2.8 EDGE TREATMENT

- .1 Apply 3 mm PVC edge banding minimum thick to the following edge surfaces:
 - .1 exposed edges of gables;
 - .2 exposed and semi-exposed edges of upper and lower cabinet bottoms;
 - .3 perimeter of doors and drawer fronts;
 - .4 fronts of fixed and adjustable shelves;
 - .5 edges of chemical resistant plastic laminate countertops.
- .2 Apply 0.5 mm PVC edge banding to the following edge surfaces:
 - .1 backs and sides of adjustable shelves;
 - .2 semi-exposed edges of gables.
- .3 Prepare edges and apply PVC edge banding in accordance with manufacturer's instructions.

2.9 DRAWERS

- .1 Fabricate drawers to AWMAC/AWI Custom Grade supplemented as follows.

- .2 Drawer joinery: Box with applied front; lock shoulder, glued and pin nailed; bottoms set into back, both sides and front in 6 mm deep groove with minimum 10 mm standing shoulder.
- .3 Standard duty drawers (drawer front 450 mm or less in width):
 - .1 Box: Canadian softwood plywood (CSP), square edge, 12.7 mm thick.
 - .2 Bottoms: Tempered hardboard, 6 mm thick, colour white.
 - .3 Finish for box and bottom: Laminated plastic liner sheet, white.
- .4 Heavy duty drawers (drawer front greater than 450 mm in width):
 - .1 Sides and Backs: Canadian softwood plywood (CSP), square edge, 3 mm thick.
 - .2 Bottoms: Tempered hardboard, 9.5 mm thick, colour white.
 - .3 Finish: Laminated plastic liner sheet, white.
- .5 Drawer fronts: to match case bodies:
 - .1 Particleboard square edge, 19 mm thick.
 - .2 Laminated plastic: to match case bodies.
 - .3 Hardwood plywood: to match case bodies.

2.10 CASEWORK DOORS

- .1 Fabricate doors of material to match case bodies to AWMAC/AWI Custom Grade supplemented as follows:
 - .1 Particleboard, square edge, 19 mm thick.
 - .2 Laminated plastic: Grade, type, thickness, colour, and finish to match case bodies.
- .2 For casework items with laminated plastic finish, apply fusible PVC 3 mm thick tape to all door edges.
- .3 Fabricate doors and drawer fronts to be full overlay at end gables and half-overlay at intermediate gables.

2.11 CABINET HARDWARE

- .1 Use one manufacturer's product for all similar items.
- .2 Provide hardware of similar quality and finish to match similar existing application.
- .3 Cabinet hardware: to CAN/CGSB-69.25, Grade 1, designated by letter B and numeral identifiers as listed below. Where manufacturer and product specified, provide products as specified.
- .4 Hinges: concealed self closing hinge, type B01601, zinc die cast and steel construction, bright nickel plated finish, 165 degree opening, full overlay and half overlay as necessary.
 - .1 Hinges for 170 degree opening: Richelieu/Blum 91A658-180, complete with mounting plate 193L810-180, and Euro pre-drilled inserts.
 - .2 Hinges for 107 degree opening: to match Richelieu/Blum 91M158-180, complete with mounting plate 193L810-180, and Euro pre-drilled inserts.

- .3 Provide 170 degree opening at all locations, except 107 degree opening when adjacent to wall, full overlay and half overlay as necessary.
- .4 Acceptable manufacturers: Hafele, Blum/Richelieu, Hettich International.
- .5 Hinge installation:
 - .1 Provide two (2) hinges for doors up to 710.
 - .2 Provide three (3) hinges for doors up to 1525mm.
 - .3 Acceptable manufacturers: Hafele, Blum/Richelieu, Hettich International.
- .6 Pulls, "D" design : Richelieu #54000140, chrome finish. 90mm center to center, or approved equal.
 - .1 Install "D" pulls on all casework unless noted otherwise.
- .7 Shelf rests and standards: adjustable shelf standards, type B04071, with open shelf rests, type B04091, finished to bright nickel plated finish.
- .8 Drawer slides: side mounted drawer slides, type B05051, full extension, length suitable to drawer depth.
 - .1 150mm high drawers; Standard duty, to match Hafele Accuride Model 3732B/80.
 - .2 250mm high drawers; Heavy duty: to match Hafele Accuride Model 9301.
 - .3 Acceptable manufacturers: Hafele, Blum/Richelieu, Hettich International.

2.12 HARDWARE FASTENERS

- .1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .2 Exposed fastening devices to match finish of hardware.
- .3 Use fasteners compatible with material through which they pass.
- .4 Fasteners for hinges in particleboard or medium density fibreboard shall consist of a plastic dowel insert and screw assembly designed specifically for the substrate. Fasteners for hinge baseplates shall be the "EuroscREW" type in size recommended by hinge manufacturer.
- .5 Fasteners for all other hardware accessories secured to particleboard core shall be type FHL or other deep thread screw.

2.13 CASEWORK FABRICATION

- .1 Set nails and countersink screws apply plain wood filler to indentations, sand smooth and leave ready to receive finish.
- .2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.
- .3 Shelving to cabinetwork to be adjustable unless otherwise noted.
- .4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

- .5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- .6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.
- .7 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .8 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to [2400] [3000] mm. Keep joints 600 mm from sink cutouts.

2.14 PLASTIC LAMINATE FABRICATION

- .1 Comply with CAN3-A172-M79, Appendix 'A' regarding pre-conditioning, fabricating and installing decorative laminate work.
- .2 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .3 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths to longest possible continuous sheet length.
- .4 Form shaped profiles and bends as indicated, using postforming grade laminate installed in accordance with laminate manufacturer's instructions.
- .5 Offset joints in plastic laminate facing from joints in core.
- .6 Adhere laminated plastic over entire surface. Make corners with hairline joints. Use full sized laminate sheets. Make joints only where approved. Slightly bevel arrises.
- .7 Fill and seal joints in horizontal surfaces to match adjacent plastic laminate.
- .8 Provide plastic laminate liner sheet on concealed side of unrestrained assemblies, including panelling.

Part 3 Execution

3.1 INSTALLATION

- .1 Do architectural woodwork installation to AWI/AWMAC Architectural Woodwork Quality Standards custom grade, except where specified otherwise.
- .2 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.
- .3 Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.

- .4 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .5 Make allowances around perimeter where fixed objects pass through or project into laminated plastic casework to permit normal movement without restriction.
- .6 Provide cutouts for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.
- .7 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant.
- .8 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.
- .9 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

3.2 SEALER FOR CUTOUTS

- .1 Where plumbing fixtures are installed in countertops, provide gasket or sealant between rims or bases of sinks and other fixtures to prevent water penetration between fixture and plastic laminate countertops.
- .2 Apply white silicone sealer to edges of all cutouts in countertops containing plumbing. Sealer shall effectively seal the applied laminates and the core against water penetration.

3.3 CLEANING AND TOUCHUP

- .1 Clean cabinet work, inside cupboards and drawers and outside surfaces.
- .2 Clean casework of soil marks, dust, fingerprints and other surface disfigurements.
- .3 Touch up wood finishes in accordance with finish manufacturer's instructions.
- .4 Fill, finish and touch-up nail and screw holes resulting from installation or field assembly, to match adjacent finish.
- .5 Refinish and touch-up surfaces and edges scratched, abraded, dented, marred or otherwise damaged as a result of delivery, storage, handling or installation.
- .6 Clean all exposed and semi-exposed surfaces prior to final examination.
- .7 Touch up wood finishes in accordance with finish manufacturer's instructions
- .8 Replace items of casework, hardware or solid wood which are scratched, dented or otherwise damaged, to conform to specification.
- .9 Remove excess glue from surfaces.

3.4 PROTECTION

- .1 Protect cabinet work from damage until final inspection.

END OF SECTION

Part 1 GENERAL N/A

Part 2 PRODUCTS

2.1 Insulation

- .1 Sound batt insulation: fabricated from friction fit batts, mineral fibre, thickness as indicated on drawings.

Part 3 EXECUTION

3.1 Workmanship

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of acoustic insulation in wall construction.
- .3 Install insulation on top of ceiling installation at partitions as noted on drawings.
- .4 Fit insulation closely around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Offset both vertical and horizontal joints in multiple layer applications.
- .7 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 84 00 Fire Stopping
- .2 Section 09 11 10 Metal Stud System

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN-ULC-S101-04, Standard Methods of fire Endurance Tests of Building Construction and Materials.
 - .2 CAN-ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

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, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets
- .2 Samples: submit duplicate 300 x 300 mm size sample of exposed fireproofing for approval of texture and colour.
- .3 Quality assurance submittals: submit,
 - .1 Test Reports:
 - .1 Submit product data including certified copies of test reports verifying fireproofing applied to substrate as constructed on project will meet or exceed requirements of Specification.
 - .2 Submit test results in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .3 For assemblies not tested and rated, submit proposals based on related designs using accepted fireproofing design criteria.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.4 QUALITY ASSURANCE

- .1 Qualifications:

- .1 Installer: company specializing in sprayed-on fireproofing approved by manufacturer with 5years documented experience.
- .2 Mock-ups:
 - .1 Apply fireproofing to approximately 10 m² area of surface to be treated.
 - .2 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .3 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with fireproofing work.
 - .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.
- .3 Site Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative.
 - .1 Verify Project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.6 AMBIENT CONDITIONS

- .1 Ensure that 5 degrees C air and substrate temperature is maintained during and for 24 hours after application. Ensure that natural ventilation to properly dry the fireproofing during and subsequent to its application is provided. In enclosed areas lacking openings for natural ventilation, ensure that interior air is circulated and exhausted to the outside.
- .2 Maintain relative humidity within limits recommended fireproofing manufacturer.
- .3 Ensure that natural ventilation to properly dry fireproofing during and subsequent to its application is provided.
- .4 In enclosed areas lacking openings for natural ventilation, provide minimum of 4 air exchanges per hour by forced air circulation.

Part 2 Products

2.1 MATERIALS

- .1 Sprayed fireproofing: ULC certified cementitious fireproofing qualified for use in ULC Designs specified. Acceptable product: AD Fire Protection Systems-Type 5GP.

- .2 Curing compound: type recommended by fireproofing manufacturer, qualified for use in ULC Designs specified.
- .3 Sealer: type recommended by fireproofing manufacturer, qualified for use in ULC Design specified. Acceptable product: AD Fire Protection Systems Type-TC-55 Sealer.
 - .1 Colour: white.

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 datasheets.

3.2 PREPARATION

- .1 Substrate: free of material, which would impair bond.
- .2 Verify that painted substrates are compatible and have suitable bonding characteristics to receive fireproofing.
- .3 Remove incompatible materials.
- .4 Ensure that items required to penetrate fireproofing are placed before installation of fireproofing.
- .5 Ensure that ducts, piping, equipment, or other items which would interfere with application of fireproofing are not positioned until fireproofing work is completed.

3.3 APPLICATION

- .1 Apply bonding adhesive or primer to substrate.
- .2 Apply fireproofing to correspond with tested assemblies, or acceptable calculation procedures to provide following fire resistance ratings;
 - .1 Steel Columns; 2 hrs fire rating – ULC Design No X813
 - .2 Steel floor decks and beams: 2 hrs fire rating – ULC Design No810
- .3 Apply fireproofing over substrate, building up to required thickness to cover substrate with monolithic blanket of uniform density and texture.
- .4 Apply curing compound to surface of cementitious fireproofing as required by manufacturer.
- .5 Apply sealer to surface of fireproofing (fireproofing is to be painted).

3.4 PATCHING

- .1 Patch damage to fireproofing caused by testing or by other trades before fireproofing is concealed, or if exposed, before final inspection.

3.5 CLEANING

- .1 Clean surfaces not indicated to receive fireproofing of sprayed material within 24 hours period after application.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Division 22 – Plumbing.
- .2 Division 23 – Heating, Ventilating and Air Conditioning.
- .3 Division 26 – Electrical.

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-1995, Fire Tests of Fire stop Systems.

1.3 DEFINITIONS

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
- .5 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets.
- .2 Shop Drawings:
 - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.
- .3 Samples:
 - .1 Submit duplicate 300 x 300 mm samples showing actual fire stop material proposed for project.
- .4 Quality assurance submittals:
 - .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
- .7 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company specializing in fire stopping installations, with 5 years experience, approved by manufacturer.
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative.
- .3 Verify project requirements.
- .4 Review installation and substrate conditions.
- .5 Co-ordination with other building subtrades.
- .6 Review manufacturer's installation instructions and warranty requirements.

- .7 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, and ULC markings.
- .2 Storage and Protection:
 - .1 Store materials indoors, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
- .2 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended.
- .3 Fire stop system rating: 2 hours..
- .4 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .5 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .6 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .7 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .8 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .9 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

- .10 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .11 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .12 Sealants for vertical joints: non-sagging.

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 datasheets.

3.2 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
- .2 Ensure that substrates and surfaces are clean, dry and frost free.
- .3 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .4 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .5 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.

- .5 Remove excess compound promptly as work progresses and upon completion.

3.4 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative.
- .2 Install floor fire stopping before interior partition erections.
- .3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
- .4 Mechanical pipe insulation: certified fire stop system component.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

Fire stop and smoke seal at:

- .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
- .2 Edge of floor slabs at curtain wall and precast concrete panels.

- .3 Top of fire-resistance rated masonry and gypsum board partitions.
- .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
- .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
- .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
- .7 Openings and sleeves installed for future use through fire separations.
- .8 Around mechanical and electrical assemblies penetrating fire separations.
- .9 Rigid ducts: greater than 129 cm²: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

Part 1 GENERAL

- .1 One manufacturer's product only to be used throughout.
- .2 Sealant must be approved by Departmental Representative as acceptable product.
- .3 Colours of all sealants to be selected by the Departmental Representative prior to proceeding.

Part 2 PRODUCTS

2.1 Materials

- .1 Type 1-Multi-purpose sealant: Acrylic latex one part: to CAN/CGSB-19.17., approved by Departmental Representative.
- .2 Type 2-Acoustic sealant: Synthetic Rubber Sealant, "Tremco Acoustical Sealant" or equivalent approved by Departmental Representative.
- .3 Type 3-Single Component Silicone: "Tremco Spectrum 1" or equivalent approved by Departmental Representative.
- .4 Preformed compressible and non-compressible back-up materials:
 - .1 Polyethylene, urethane, neoprene or vinyl foam:
 - .1 Extruded: closed cell foam backer rod.
 - .2 Size: oversize to 30%.
 - .2 Bond breaker tape:
 - .1 Polyethylene bond breaker tape that does not bond to sealant.
- .5 Primers: sealant manufacturer's type.
- .6 Cleaners: as recommended by sealant manufacturers.
- .7 Sealant Colour: to Departmental Representatives selection from standard colour range.

2.2 Sealant Selection

- .1 Type-1; Perimeters of interior door frames.
- .2 Type-2; At base along bottom track of partitions.
- .3 Type-3; Perimeter of built-in architectural woodwork.
- .4 Type-3; Junction of plastic laminate kick plate, casework gables and flooring.

Part 3 EXECUTION

3.1 Preparation

- .1 Ensure all materials which will bear sealant on their surfaces are clean and free from foreign material which would affect bonding.
- .2 Permit concrete and mortar to cure fully before sealing.
- .3 Prime joint sides in accordance with manufacturer's directions.
- .4 Mask adjacent surfaces to prevent contamination by sealant. Remove mask immediately after joints completed.
- .5 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .6 Ensure joint surfaces are dry and frost free.

3.2 Backup Material

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30%

3.3 Application

- .1 Sealant:
 - .1 Apply sealant in accordance with manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.
 - .5 Use sufficient pressure to fill voids and joints solid.
 - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
 - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
 - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing:
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.

3.4 Cleaning

- .1 Leave Work area clean at end of each day.
 - .1 Clean adjacent surfaces immediately.

- .2 Remove excess and droppings, using recommended cleaners as work progresses.
- .3 Remove masking tape after initial set of sealant.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 07 90 00 - Sealants: Caulking of joints between frames and other building components.
- .2 Section 08 14 16 - Flush Wood Doors: Wood doors for installation in hollow steel frames.
- .3 Section 08 71 00 - Finish Hardware: General: Supply of finish hardware, including sound-stripping and mounting heights.
- .4 Section 091110 - Metal Studs System: Building frames into steel stud walls
- .5 Section 09 91 00 - Painting: Paint systems for interior hollow metal doors and frames.
- .6 Division 26 - Electrical: Rough-in, wiring, conduit and connection for door operators, walls switches, power supplies and security hardware.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM A924M-14 Standard Specification for General Requirements for Steel Sheet, Metallic Coated by the Hot-Dip Process.
 - .2 ASTM A653/A653M-13 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM B29-03(2009) Standard Specification for Refined Lead.
 - .4 ASTM B749-03(2009) Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2 Canadian Standards Association (CSA International)
 - .1 G40.20-13/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.
 - .2 CSA W5913 Welded Steel Construction (Metal Arc Welding) (Metric Version).
- .3 Canadian Steel Door Manufacturers' Association, (CSDMA).
 - .1 CSDMA Specifications for Commercial Steel Doors and Frames 2009.
 - .2 CSDMA Fire Labelling Guide 2009
 - .3 CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 80-2013, Standard for Fire Doors and Other Opening Protectives
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN4-S104-M80(R1985), Fire Tests of Door Assemblies.
 - .2 CAN4-S105-M85(R1992), Fire Door Frames Meeting the Performance Required by CAN4-S104.

- .6 CAN/ULC-S702-09, Thermal Insulation, Mineral Fibre, for Buildings.

1.3 DEFINITIONS

- .1 Opening sizes shall be defined as follows:
- .1 Width: Widths of openings shall be measured from inside to inside of frame jamb rabbets. (Referred to as "frame rabbet width" or "nominal door width")
 - .2 Height: Heights of openings shall be measured from the finished floor (exclusive of floor coverings) to the head rabbet of the frame. (Referred to as "frame rabbet height" or "nominal door height")
 - .3 Door Sizes: Doors shall be sized so as to fit the above openings and allow a 3 mm (0.125") nominal clearance at jambs and head of frame. A clearance of 19 mm (0.75") maximum shall be allowed between the bottom of the door and the finished floor (exclusive of floor coverings).
 - .4 Tolerances: Doors and frame product shall be manufactured and installed in accordance with the CSDMA's, "Recommended Dimensional Standards for Commercial Steel Doors and Frames".

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with submittal procedures of Section 013300 - Submittal Procedures.
- .2 Indicate each type of door, frame, including CSDMA classification, steel type, fire rating, construction type, finishes and core.
- .3 Indicate material thicknesses, mortises, reinforcements, location of exposed fasteners, openings (glazed, paneled or louvred), arrangement of hardware.
- .4 Indicate each type frame material, CSDMA duty grade classification, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing firerating finishes.
- .5 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.5 SAMPLES

- .1 Submit samples in accordance with submittal procedures of Section 013300 - Submittal Procedures.
- .2 Submit one 300 x 300 mm top butt corner sample of each type door.
- .3 Submit one 300 x 300 mm corner sample of each type of frame.
 - .1 Show butt cutout, glazing stops, 300 mm long removable mullion connection snap-on trim with clips.

1.6 FIRE PROTECTION REQUIREMENTS

- .1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104M for ratings specified or indicated.
- .2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with CAN4-S104 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Handle and store doors in accordance with CSDMA Guide Specification.
- .2 Inspect materials upon receipt and report all discrepancies, deficiencies and damages in writing to the supplier.
- .3 Note all damages incurred during shipping on carrier's Bill of Lading.
- .4 Store frame materials on planks, protected from weather and damage.
- .5 Remove doors from wrappings or coverings upon delivery and store in vertical position, spaced with blocking to permit air circulation between doors.

1.8 WARRANTY

- .1 Provide warranty on materials and workmanship in accordance with the General Conditions of the Contract.
 - .1 Materials warranty form shall be Canadian Steel Door and Frame Manufacturer's Standard Warranty for Steel Doors and Frames.

Part 2 Products

2.1 MATERIALS

- .1 Steel sheet: Commercial grade steel to ASTM A653 CS, Type B, and ASTM A924, hot-dip galvanized, wipe coated, known commercially as "Colourbond", Satincoat", or "Galvaneal".
 - .1 Provide steel sheet thickness for component parts as specified or, in the absence of specification, in accordance with table 1 of CSDFMA specifications for heavy duty doors and medium duty frames.
 - .2 Coating weight for interior doors and frames: ZF75.
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to match door.

2.2 DOOR CORE MATERIALS

- .1 Honey comb construction:

- .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m³ minimum sanded to required thickness
- .2 Fiberglasssemi-rigid type, density 24 kg/m³ minimum, conforming to CAN/ULC-S702.

2.3 ADHESIVES

- .1 Steel components: heat resistant, spray grade, epoxy resin based, low viscosity, contact cement.
- .2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.4 PRIMER

- .1 Touch-up prime CAN/CGSB-1.181.

2.5 PAINT

- .1 Touch up damaged galvanizing with rust-inhibitive primer.
- .2 Field paint steel doors and frames in accordance with Section 09 91 00 Painting.
 - .1 Protect sound strips from paint.
 - .2 Provide final finish free of scratches or other blemishes.

2.6 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Metallic paste filler: to manufacturer's standard.
- .3 Fire labels: metal riveted.
- .4 Sealant: in accordance with Section 07 92 10.
- .5 Glazing: in accordance with Section 08 80 50.

2.7 FRAME FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications for heavy duty grade.
- .2 Provide all frames assembled and welded construction. Slip-on frames only allowed at existing openings to receive new frames.
- .3 Fabricate frames to profiles and maximum face sizes as indicated.
- .4 Interior frames: welded for new partitions, slip-on type construction for existing partitions.
 - .1 Medium duty: 1.6 mm thickness.
- .5 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

- .6 Protect mortised cutouts with steel guard boxes.
- .7 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .8 Manufacturer's nameplates on frames and screens are not permitted.
- .9 Conceal fastenings except where exposed fastenings are indicated.
- .10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

2.8 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm o.c. maximum.

2.9 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.10 FRAMES: SLIP-ON TYPE

- .1 Ship slip-on type frames unassembled.
- .2 Provide frames with mechanical joints which inter-lock securely and provide functionally satisfactory performance when installed in accordance with CSDMA Recommended Installation Guide for Steel Doors and Frames and manufacturers' instructions.
- .3 Provide slip-on frames with manufacturers' proprietary design of wall anchorage comprising single, adjustable tension type per jamb and provision for secure attachment of each jamb base to partition.

2.11 DOOR FABRICATION TYPES

- .1 Doors: swing type, flush, 45 mm thick, with provision for glass and/or louvre openings as indicated.
- .2 Interior door construction shall be laminated insulated core construction.
- .3 Provide all interior hollow steel doors as medium-duty doors fabricated in accordance with CSDFMA Recommended Selection and Usage Guide except as follows:
 - .1 Provide heavy-duty doors in accordance with CSDFMA recommendations at the following locations:
 - .1 New Electrical Room (Door 125a).
- .4 Fabricate doors with longitudinal edges locked seamed only, locked seamed and adhesive assisted, tack- or continuously-welded in accordance with CSDFMA recommendations, except as follows.
 - .1 Seams: visible except seamless as follows:

2.12 DOOR FABRICATION DETAILS

- .1 Doors shall be mortised, blanked, reinforced, drilled and tapped at the factory for templated hardware only, in accordance with the approved hardware schedule and templates provided by the hardware supplier.
- .2 Factory prepare holes 12.7 mm diameter and larger shall be factory prepared, except mounting and through-bolt holes to be drilled on site at time of hardware installation. Factory prepare holes less than 12.7 mm diameter only when required for the function of the device (for knob, lever, cylinder, thumb or turn pieces) or when these holes over-lap function holes.
- .3 Reinforce doors only where required for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware. Drilling and tapping is by others, on site, at time of installation.
- .4 Provide inverted, recessed, welded steel channels at top and bottom of doors.
- .5 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .6 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in strict conformance with CAN4-S104 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .7 Manufacturer's nameplates on doors are not permitted.
- .8 For fire-rated doors, provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.

- .3 Finished floor, top of carpet: 13 mm.

2.13 DOORS: LAMINATED CORE CONSTRUCTION

- .1 Form each face sheet for interior doors from sheet steel of thickness specified with vertical steel stiffeners laminated under pressure to face sheets.
- .1 Vertical steel stiffeners shall be securely laminated to each face sheet at 150 mm on center maximum.
- .2 Voids between vertical stiffeners shall be filled with fiberglass batt type insulation.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

3.2 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm 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.
- .5 Caulk perimeter of frames between frame and adjacent material.

3.3 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 087100 - Finish Hardware.
- .2 Adjust operable parts for correct function.

3.4 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.5 **GLAZING**

- .1 Install glazing for doors and frames in accordance with Section 08 80 50 - Glazing.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 08 11 00 Hollow Steel Doors and Frames: Metal frames to receive wood doors.
- .2 Section 08 71 10 Door Hardware: Hardware for wood doors and frames.
- .3 Section 08 80 50 Glazing : Glass & glazing for wood doors.
- .4 Section 09 91 00 Painting: Paint finish for wood doors.

1.2 REFERENCES

- .1 American National Standards Institute:
 - .1 ANSI/HPVA HP-1-2009 Standard for Hardwood and Decorative Plywood,
 - .2 ANSI/WDMA I.S.1A-13 Interior Architectural Wood Flush Doors
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
 - .1 Architectural Woodwork Standards 2009 (First Edition).
- .3 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable.
 - .2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
- .4 National Fire Protection Association (NFPA).
 - .1 NFPA 80-2013 Standard for Fire Doors and Other Opening Protectives.
 - .2 NFPA 252-2012 Standard Method of Fire Tests of Door Assemblies.
- .5 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN4-S104M-2010, Fire Tests of Door Assemblies.
 - .2 CAN4-S105M-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.
- .6 Window & Door Manufacturers Association.
 - .1 How to Store, Handle, Finish, Install and Maintain Wood Doors

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with submittal procedures of Section 01 00 10.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with submittal procedures of Section 013300 - Submittal Procedures. Indicate VOC's for door materials and adhesives.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 013300 - Submittal Procedures.

- .2 Cross reference door types to door schedule, indicating door and frame number as applicable.
- .3 Indicate door types and cutouts for lights, sizes, core construction, transom panel construction and cutouts.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 SAMPLES

- .1 Submit samples in accordance with Section 013300 - Submittal Procedures.
- .2 Submit one 300 x 300 mm corner sample of each type of wood door.
 - .1 Sample shall represent the upper hinge side corner of the door, showing hardware reinforcement, if applicable.
- .3 Show door construction, core, glazing detail and faces.

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements:
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Section

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle protect and store plastic faced wood doors in accordance with door manufacturer's instructions, WDMA guidelines and as follows.
- .2 Storage and Protection:
 - .1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
 - .2 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.
 - .3 Protect doors from scratches, handling marks and other damage.
 - .4 Store doors away from direct sunlight.
- .3 Remove damaged doors, scratched doors, doors with blemishes from the place of the Work and replace with new doors.

1.7 EXTENDED WARRANTY

- .1 Provide a written warranty executed in favour of the National Research Council of Canada in accordance with the General Conditions of the Contract, but for a warranty period of three (3) years.
- .2 The warranty shall cover the work of this Section and, in particular:
 - .1 labour and materials for removal, repair, refinishing and reinstatement of products provided as part of the Work of this Section, and adjacent parts damaged as a result of such warranty work.
 - .2 warping in excess of 6 mm in any door larger than 1065 mm by 2 130 and 3.2 mm in any direction in smaller doors, any degree of delamination of face or edge laminate, and telegraphing of core construction through the face laminate.

Part 2 Products

2.1 CLEARANCES

- .1 Fabricate all doors, both fire-rated and non-rated, to provide clearances that do not exceed the following maximum NFPA 80 clearances between:
 - .1 Door and Jamb or Head: 2.4 to 3.2 mm.
 - .2 Meeting Edges of Paired Doors: 3.2 mm.
 - .3 Door and Noncombustible Finished Floor: 19.05 mm.
 - .4 Door and Floor Coverings: 12.7 mm.
 - .5 Door and washroom thresholds: 19 mm.
 - .6 Door and Raised Noncombustible Sill or Threshold: 0.5 mm (fire-rated doors only).

2.2 WOOD FLUSH DOORS

- .1 Solid core: to ANSI/WDMA I.S.1A and AWI Quality Standards [Custom] [Premium] grade.
 - .1 Construction: seven ply.
 - .2 Solid particleboard core: 70 mm wide solid wood stiles and rails, bonded to 28 lb per cubic foot particleboard core, sanded after assembly.
 - .3 Provide solid wood lock blocks and wood blocking for hardware as necessary or as indicated.
 - .4 Cross-banding: Three-ply hardwood plywood or edge-glued wood or high performance composite, minimum 0.0625 inch thick.
 - .5 Face Panels for Opaque Finish: Sound close grain hardwood, MDO, MDF or Hardboard at manufacturer's option.
 - .6 Adhesive: Type II (water resistant) for interior doors. Contact cement type adhesives are not acceptable.
 - .7 Edge detail: Vertical edge strips to match face veneer, minimum 12 mm thick.
 - .1 AWI Edge Type F Solid Wood.

2.3 FABRICATION

- .1 Fabricate flush wood doors to AWI Quality Standards Premium Grade requirements and to ANSI/WDMA IS-1A requirements for Heavy Duty Performance Level.
- .2 Coordinate door fabrication with door frames and door hardware to ensure door reinforcement and edge profiles are coordinated with hardware.
- .3 Prepare doors to receive hardware using templates provided by hardware supplier.
- .4 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.
- .5 Radius vertical edges of double acting doors to 60 mm radius.
- .6 Factory seal top and bottom of doors and edges of openings.
- .7 Size doors for specified clearances.

2.4 FINISHING – GENERAL

- .1 Apply specified finish to all surfaces, including faces, top and bottom edges, and hardware preparation areas at hinges and lock edges to be finished.
- .2 Apply equal number of coats of the same material to each side.
- .3 Finish pairs of doors and openings with sidelights and transoms together to ensure maximum uniformity of colour.

2.5 PAINT FINISH

- .1 Provide paint finish in accordance with Section 09 91 00.
- .2 Sand and clean all surfaces prior to commencing finishing operations.
- .3 Sand and clean surfaces as necessary between coatings.
- .4 Finish quality is to meet the following requirements when viewed in the normal light in which the casework is to be used:
 - .1 Orange peel: none visible from 900 mm.
 - .2 Filled nail holes: none visible from 900 mm.
 - .3 No runs, sags, blistering.
 - .4 No glue spots.
 - .5 No checking, crazing or cracking.
 - .6 No finish sanding scratches.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine installed door frames prior to hanging door:

- .1 Verify that frames comply with specified requirements for type, size, location and swing characteristics, and have been installed with plumb jambs and level heads.
- .2 Inspect doors and reject doors with defects.
- .2 Do not proceed with installation until unsatisfactory conditions have been corrected.
- .3 Do not machine or modify doors on site. Return doors to factory for adjustment and refinishing as necessary.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

- .1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.
- .2 Install labelled fire rated doors to NFPA 80.
- .3 Install doors and hardware in accordance with manufacturer's printed instructions ANSI/WDMA IS-1A, and referenced AWI standard.
- .4 Adjust hardware for correct function.
- .5 Install glazing in accordance with Section 08 80 50 – Glazing, complete with stops as specified.
- .6 [Install louvres and stops.]
- .7 Secure transom and side panels by means of [stops] [concealed fasteners or countersunk screws concealed by means of wood plugs matching panel in grain and colour].

3.4 ADJUSTMENT

- .1 Re-hang or replace doors that do not swing or operate freely, or that drift open or closed.
- .2 Refinish or replace doors damaged during installation.
- .3 Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.
- .4 Re-adjust doors and hardware just prior to completion of building to function freely and properly.
- .5 Maximum acceptable warp when measured diagonally across door after installation: 6 mm.

3.5 TOUCH-UP

- .1 Touch up surfaces marred or scratched during delivery, storage, handling, installation or by subsequent construction operations. Where site fitting has resulted in exposure of unfinished wood, re-finish to match original finish.
- .2 Replace doors that in opinion of Consultant cannot be properly re-adjusted or re-finished to meet specifications.

3.6 CLEANING

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking; clean doors and frames.
- .3 Clean glass and glazing materials with approved non-abrasive cleaner.
- .4 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 GENERAL

1.1 Reference Standards

- .1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame manufacturer's Association.

1.2 Hardware List

- .1 Submit hardware schedule for Departmental Representative's approval.
- .2 Indicate hardware proposed, including make, model, material, function, finish and other pertinent information.

1.3 Maintenance

- .1 Provide maintenance data, parts lists, and manufacturer's instruction for each type door closers, locksets, door holders and fire exit hardware for incorporation into maintenance manual.

1.4 Maintenance Materials

- .1 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

1.5 Hardware Requirements

- .1 NRC has a bonded locksmith for our keying system on standing contract. See contract coordinator for information.
- .2 Contractor will be responsible to have all cylinders keyed by NRC bonded locksmith on standing offer contract.
- .3 Contractor will be responsible to carry all associated costs for cylinders and keying of same with N.R.C. bonded standing offer locksmith.

Part 2 PRODUCTS

2.1 Hardware Items

- .1 Only door closers, locksets and latchsets and items listed below.
- .2 Use one manufacturer's products only for all similar items.

2.2 Door Hardware Standards

- .1 Hinges:

- .1 Interior doors: Dorex 114.3mm x 101.6mm x 179 454 NRP X C15.
- .2 Security enabled doors: Von Duprin EPT2 Transfer Hinge.
- .2 Latching devices: ANSI/BHMA Commercial Grade 1 Hardware. Apply to all new doors.
 - .1 Lockset = Yale 5300 Series M-AU-5307LN-380AN-497-1803-47L-1 ¾-626.
 - .2 Passage set = Yale 5300 Series AU-5301LN-380BN-497-1 ¾-626.
 - .3 Lockset (HES) = Yale 5300 Series M-AU-5305LN-380AN-497-1803-47L-1 ¾-626
- .3 Cylinders:
 - .1 Medeco, keyed to NRC key plan M19CA5 by Lister Lock.
 - .2 Contractor to carry all costs associated with keying of doors.
- .4 Electric Strikes:
 - .1 Pre-wired by door supplier.
 - .2 Model: HES 4500.
- .5 Door Closer: Standard duty:
 - .1 "LCN" 4040XP Rw/Pa-AL (regular arm/parallel arm bracket)
 - .1 Include integral overhead stop.
 - .2 Maximum force applied to operate door 22N for barrier free compliance.
- .6 Single Door Exit Devices:
 - .1 Von Duprin Exit Device 98L-NL (includes lever; for electric strike), 3' or 4' length (to be chosen base on door width), 630 finish.
 - .2 Von Duprin Exit Device 98L-NL-F (includes lever; for electric strike), 3' or 4' length (to be chosen base on door width), 630 finish. For fire rated doors. Power Door Operator/Push Button:
 - .1 Standard of acceptance: NABCO GT8710 series or approved equivalent. To have clear anodized aluminum finish, left or right hand operation as required.
- .7 Door Bottom Seal:
 - .1 Heavy duty, door seal of extruded aluminum frame and closed cell neoprene weather seal, closed ends,
 - .2 Adjustable with automatic retract mechanism when door is open.
 - .3 "K.N. Crowder" CT-52 (semi-mortised)
- .8 Perimeter Acoustical Gasket:
 - .1 Head and Jamb Seal:
 - .1 Extruded aluminum frame and hollow closed cell neoprene insert, clear anodized finish.
 - .2 "K.N. Crowder" W15 Heavy Duty.
- .8 Door Holder:
 - .1 "Hager" Kick Down Door Holder 270C. S1-sprayed aluminum finish.

- .9 Kick plates:
 - .1 To be adhered to both sides of door.
 - .2 Thickness: 2.0 mm, 630 stainless steel.
 - .3 Height: 200mm.
 - .4 Width: to suit each door.
 - .5 "Hager", Door Protection Plate 200S.
- .10 Door Stop:
 - .1 Half Dome Floor:
 - .1 "Hagar" 241F, cast brass, rubber bumper X 626
 - .2 Wall Mounted Door Stop:
 - .1 "Hagar" 255S, cast brass, rubber bumper X 626
- .11 Above hardware is standard NRC requirements unless specified or listed on drawings to be otherwise.

2.3 Fastenings

- .1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .2 Exposed fastening devices to match finish of hardware.
- .3 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .4 Use fasteners compatible with material through which they pass.

Part 3 EXECUTION

3.1 Installation

- .1 Furnish door and frame manufacturer with complete instructions and templates for preparation of their work to receive hardware.
- .2 Furnish manufacturer's instructions for proper installation of each hardware component.
- .3 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .4 Sound gasket stripping shall not be installed until final coat of paint has been applied to door and frame and is completely dry
- .5 Only tradesmen competent in the installation of Finish Hardware shall be used for this purpose. The installer shall adjust, clean, and make good all installations of Finish Hardware to the satisfaction of the Engineer.

3.2 Schedule

- .1 Hardware Package #01(Fire Rated 1hr)
 - .1 (3) Hinge
 - .2 (1) Latch Device, Store Room
 - .3 (1) Door Closure
 - .4 (1) Single Door Exit Device
 - .5 (1) Electric Strike
 - .6 (1) Panic Bar/Exist Device
 - .7 (1) Door stop
 - .8 (1) Door Bottom Seal
 - .9 (1) Perimeter Acoustical Gasket
 - .10 (2) Kick plates
- .2 Hardware Package #02
 - .1 (3) Hinge
 - .2 (1) Latch Device, Store Room
 - .3 (1) Door Closure
 - .4 (1) Single Door Exit Device
 - .5 (1) Electric Strike
 - .6 (1) Panic Bar/Exist Device
 - .7 (1) Door stop
 - .8 (1) Door Bottom Seal
 - .9 (1) Perimeter Acoustical Gasket
 - .10 (2) Kick plates
- .3 Hardware Package #03
 - .1 (3) Hinge
 - .2 (1) Latch Device, Store Room
 - .3 (1) Door Closure
 - .4 (1) Single Door Exit Device
 - .5 (1) Electric Strike
 - .6 (1) Door stop
 - .7 (1) Door Bottom Seal
 - .8 (1) Perimeter Acoustical Gasket
- .4 Hardware Package #04
 - .1 (3) Hinge
 - .2 (1) Door Pull: 200mm long, 19mm diameter round, Ives 8102 Bar Pulls,
 - (1) Pull Plate 100mm X 400mm Ives 8300
 - (1) Push Plate 100mm X 400mm Ives 8200
 - .3 (1) Door Closure
 - .4 (1) Door stop

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- .5 (2) Power door operator/push bottom
 - .6 (2) Kick plates
 - .5 Hardware Package #05
 - .1 (3) Hinge
 - .2 (1) Latch Set
 - .3 (1) Door stop
 - .4 (1) Door Bottom Seal
 - .5 (1) Perimeter Acoustical Gasket
 - .6 Hardware Package #07
 - .1 (3) Hinge
 - .2 (1) Lock Set
 - .3 (1) Door stop
 - .4 (1) Door Bottom Seal
 - .5 (1) Perimeter Acoustical Gasket

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Glass and glazing of:
 - .1 Section 081100 - Hollow Steel Doors & Frames
 - .2 Section 081416 - Flush Wood Doors.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass..
- .2 Flat Glass Manufacturers Association (FGMA).
 - .1 FGMA Glazing Manual - 1997.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 013300 - Submittal Procedures.
 - .2 Submit two copies of WHMIS MSDS- Material Safety Data Sheets in accordance with Section 013300 - Submittal Procedures. Indicate VOC's:
 - .1 For glazing materials during application.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with submittal procedures of Section 013300 - Submittal Procedures.
- .3 Samples:
 - .1 Submit samples in accordance with submittal procedures of Section 013300 - Submittal Procedures.
 - .2 Submit duplicate 300 mm square size samples of all glass materials and 300 mm long samples of glazing materials.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 SITE CONDITIONS

- .1 Environmental Requirements:
 - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
 - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

Part 2 **Products**

2.1 **GLASS MATERIALS**

- .1 Clear Safety Glass to CAN/CGSB-12.1, Laminated 6mm overall thickness unless indicated otherwise.

2.2 **ACCESSORIES - INTERIOR GLAZING**

- .1 Glazing tape:
 - .1 Preformed butyl compound 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; 3 mm thick x 13 mm wide, black colour.
 - .2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, size to suit application.
- .2 Setting blocks for single glazing: neoprene or EPDM, Shore "A" durometer hardness 80-90, maximum compression set in accordance with ASTM D2240, minimum 100 mm long x width of glazing rabbet minus 1.5 mm, thickness to suit glazing method, glass light weight and area.
- .3 Edge blocks: neoprene, Shore "A" durometer hardness 60-70, maximum compression set in accordance with ASTM D395-C864, 2 inches long x thickness and width to suit glass thickness and application.
- .4 Lateral spacer shims: Neoprene or EPDM, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.
- .5 Glazing clips: manufacturer's standard type.

Part 3 **Execution**

3.1 **MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 **EXAMINATION**

- .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.

3.3 **PREPARATION**

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

- .3 Prime surfaces scheduled to receive sealant.

3.4 INSTALLATION: INTERIOR - DRY METHOD (TAPE AND TAPE)

- .1 Perform work in accordance with FGMA Glazing Manual for glazing installation methods.
- .1 Use butyl tape for glazing steel doors and frames
- .2 Use PVC or neoprene foam self-adhesive tape for wood doors and wood casework.
- .2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
- .3 Place setting blocks at 1/4 or 1/3 points to suit materials and application, with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.
- .5 Place glazing tape on free perimeter of glazing in same manner described.
- .6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- .7 Knife trim protruding tape.

3.5 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking.
- .3 Remove glazing materials from finish surfaces.
- .4 Remove labels after work is complete.
- .5 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacture's instructions.
- .6 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.6 PROTECTION OF FINISHED WORK

- .1 After installation, mark light with an "X" by using removable plastic tape or paste.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 08 80 50 Glazing: Glass surface to receive film application.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM E84-15a Standard Test Method for Surface Burning Characteristics of Building Materials
- .2 International Window Film Association (IWFA)
 - .1 IWFA Visual Quality Standard for Applied Window Film 1999.
- .3 National Fire Protection Association
 - .1 NFPA 101-2015 Life Safety Code

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 013300 - Submittal Procedures
- .2 Product Data: submit WHMIS MSDS - Material Data Sheets in accordance with Section 013300 - Submittal Procedures.
- .3 Submit shop drawings and product data in accordance with Section 013300 - Submittal Procedures.
- .4 Submit samples in accordance with Section 013300 - Submittal Procedures.
 - .1 Submit one 500 x 500mm sample of film installed on 6 mm thick clear plate glass.
- .5 Submit test reports in accordance with Section 013300 - Submittal Procedures.
 - .1 Submit test reports from approved independent testing laboratory, certifying film's compliance with specified requirements.
- .6 Submit closeout submittals in accordance with closeout procedures of Section 013300 - Submittal Procedures.
 - .1 Provide operation and maintenance data for window film.
 - .2 Follow manufacturers written instructions for care and maintenance of decorative film.
 - .3 Use only cleaning solution recommended by manufacturer for regularly scheduled cleaning of decorative film.

1.4 MOCK-UP

- .1 Construct mock-up in accordance with Section 013300 - Submittal Procedures.

- .2 Construct mock-up of one of each typical installation. Mock-up may be part of finished work.
- .3 Allow 24 h for inspection of mock-up by Consultant before proceeding with waterproofing work.

1.5 QUALITY ASSURANCE

- .1 Film applicator: applied by applicator trained and approved by manufacturer for application of its products.
- .2 Applicators: minimum 5 years proven experience.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original sealed packaging with manufacturer's labels legible and seals intact.
- .2 Store materials elevated from contact with the ground, and protected from moisture and direct sunlight. Store materials in accordance with manufacturers written instructions.
- .3 Provide and maintain dry, off-ground weatherproof storage.
- .4 Store rolls of film flat on cross supports. Do not stand rolls of film on end.
- .5 Remove from storage, in quantities required for same day use.

1.7 ENVIRONMENTAL AND SAFETY REQUIREMENTS

- .1 Comply with requirements of Workplace hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Do not apply film until all dust generating operations are completed and the area has been cleaned.

1.8 WARRANTY

- .1 For Work of this Section, the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 10 years.
- .2 Ensure warranty includes items as follows:
 - .1 Maintaining adhesion properties without blistering, bubbling or delaminating from glass surface.

- .2 Maintaining appearance without discolouration.
- .3 Removing, replace and reapply defective materials.
- .4 In event of product failure under warranty terms, remove and re-apply film without glass replacement at no cost to NRC.

Part 2 Products

2.1 PRODUCTS

- .1 Decorative Graphic Window Film: Polyester film, pressure sensitive with visible light transmittance and reflectance of 50% and 20% respectively when measured on 6 mm thick clear glass. Pattern: horizontal bars 60 mm long by 3 mm wide, spaced 1.5 mm vertically and 3 mm horizontally. Fire performance Type A as defined in NFPA 101 when tested to ASTM E84.
 - .1 Acceptable product and manufacturer: Fasara Paracell as manufactured by the 3M Company.

2.2 ON SITE INSTALLATION

- .1 Apply and attach film to glass in accordance with manufacturer's written instructions.
- .2 Use only water and film slip solution on glass to facilitate positioning of film.
- .3 Clean glass before beginning installation using neutral cleaning solution.
- .4 Ensure no deleterious material adheres to glass by scraping surface of glass using industrial razors.
- .5 Ensure dust, grease, and chemical residue are removed from surface of glass before installation of film.
- .6 Lay out film on glass to ensure film edges will be captured behind window stops.
- .7 Cut film edges straight and square to within 3 mm of edge of panel.
- .8 Splicing:
 - .1 Splice film only when glass is greater in width than film.
 - .2 Splice film only after receipt of written approval from Consultant.
 - .3 Use butt factory edges only.
- .9 Install decorative film to glass panels ensuring no blisters, bubbles, scratches, edge defects or distortions.
- .10 Ensure removal of excess water from between film and glass.
- .11 Examine film applied to glass under natural daylight and identify cracks, blisters, bubbles, discolouration, edge defects or other anomalies that may cause film to delaminate, or cause vision transparency or distortion problems.

- .12 Deliver glass panels complete with decorative film installed and labels intact and legible to site in accordance with manufacturer's recommendations for handling, transportation and storage.

Part 3 Execution

3.1 INSTALLATION

- .1 Apply film to glass panels in glazing frames as indicated and in accordance with manufacturer's instructions and requirements of Section 08 80 50.
- .2 Installed glass and film shall have orientation of film level and properly aligned with surrounding frame.

3.2 INSTALLER'S INSPECTION

- .1 Perform visual Inspection at time of installation in accordance with IWFA - Visual Quality Standard for Applied Window Film.
- .2 Return to work place after 30 days but no longer than 40 days for final cleaning and inspection of installed film.
- .3 Remove and replace glass panel or film that continues to show blisters, bubbles, tears, scratches, edge defects or vision distortion in film when viewed under natural daylight from 2.0 m after 30 day period.
 - .1 Replace film that exhibits defects with newly installed film
 - .2 Re-inspect as specified.

3.3 FINAL CLEANING

- .1 Wash both sides of each glass panel and film using cleaning solution recommended by film manufacturer.

END OF SECTION

Part 1 GENERAL

Part 2 PRODUCTS

2.1 Materials

- .1 Non-loadbearing channel stud framing: to ASTM C645-83; 38mm (1-5/8"), 64mm (2-1/2"), 92mm (3-5/8"), 152mm (6") stud sizes as indicated on drawings; roll formed from 1.0mm (20 gauge) electrogalvanized steel sheet; for screw attachment of gypsum board. Knock-out service holes at 460 mm (1'-6") centres.
- .2 Floor and ceiling tracks: to ASTM C645-92b; in widths to suit stud sizes, 32 mm (1-1/4") flange height.
- .3 Metal channel stiffener: 38 x 20mm (1-1/2" x 3/4") size, 1.52 mm (16 gauge) thick cold rolled steel, coated with rust inhibitive coating.
- .4 Acoustical sealant: to CAN/CGSB-19.21-M87.
- .5 Insulating strip: rubberized, moisture resistant 3 mm (1/8") thick cork strip, 12 mm (1/2") wide, with self sticking adhesive on one face, lengths as required.

Part 3 EXECUTION

3.1 Erection

- .1 Align partition tracks at floor and ceiling and secure at 600 mm (2'-0") OC maximum.
- .2 Place studs vertically at 600mm (24") OC, or as indicated on drawings and not more than 50 mm (2") 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.
- .3 Erect metal studding to tolerance of 1:1000.
- .4 Attach studs to bottom using screws.
- .5 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .6 Co-ordinate erection of studs with installation of door frames and special supports or anchorage for work specified in other Sections.
- .7 Provide wood blocking secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, and base and upper cabinets, attached to steel stud partitions.
- .8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, using column clips or other approved means of fastening placed alongside frame anchor clips.
- .9 Erect track at head of door 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.
- .10 Install steel studs or furring channel between studs for attaching electrical and other boxes.
 - .11 Extend partitions to ceiling height except where noted otherwise on drawings.
 - .11 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use slotted deflection track.
 - .12 Install continuous insulating strips to isolate studs from uninsulated surfaces.
 - .13 Install two continuous beads of acoustical sealant behind studs and tracks around perimeter of sound control partitions.

END OF SECTION

Part 1 GENERAL

1.1 Reference Standards

- .1 Do work in accordance with CAN/CSA-A82.31-M91 except where specified otherwise.

Part 2 PRODUCTS

2.1 Gypsum Board

- .1 Regular board: to CAN/CSA A82.27-M91 12.5mm (1/2") x 1200 mm (4'-0") wide x maximum practical length, edges tapered with round edge (at perimeter and non-demountable partition walls).
- .2 Regular board: to CAN/CSA A82.27-M91 12.5mm (1/2") x 1200 mm (4'-0") wide x maximum practical length, square edge (at demountable partition walls).

2.2 Fastenings and Adhesives

- .1 Nails, screws and staples: CAN/CSA- A82.31-M91.
- .2 Laminating compound: to CAN/CSA-A82.31-M91, asbestos-free.
- .3 Stud adhesive: to CAN/CGSB-71.25.

2.3 Accessories

- .1 Casing beads, corner beads: 0.5 mm (0.02") base thickness commercial grade sheet steel with Z275 zinc finish to ASTM A525-91b, perforated flanges; one piece length per location.
- .2 Control Joints Beads, V-configuration, galvanized steel meets or exceeds requirements of ASTM A-653, continuous, to suit gypsum board thickness as indicated on drawings.
- .1 Designed for movement of up to 6mm.
- .3 Acoustic sealant: to CAN/CGSB-19.21-M87.
- .4 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Panel for joint sealants.
- .5 Insulating strip: rubberized, moisture resistant, 3 mm (1/8") thick closed cell neoprene strip, 12 mm (1/2") wide, with self sticking permanent adhesive on one face; lengths as required.
- .6 Joint compound: to CAN/CSA-A82.31-M91, asbestos-free.
- .7 Access doors:

- .1 Non-rated access doors, 16 ga door, 18 ga mounting frame, door flush to frame, rounded safety corners, continuous concealed hinge, screwdriver operated cam latch, paintable steel.
 - .1 Acceptable product and manufacturer MIFAB, Universal Access Door series, or approved equal.
- .2 Fire rated access door, 16 ga steel frame and door. Door flush frame, self-closing. Hinge, concealed pivot pins. Frame, four piece welded frame. Finish, satin coat steel doors, primed white finish. Spring, heavy duty. Latch, flush mount, key operator latch.
 - .1 Acceptable product and manufacturer MIFAB, MFRU2230, or approved equal.

Part 3 EXECUTION

3.1 Gypsum Board Application

- .1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.
- .2 Apply single layer gypsum board as indicated to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm (1'-0") oc.
- .3 Arrange square edge gypsum board symmetrical about openings and wall areas, with butt joints, battens over joints. Utilize concealed installation clips to support boards in field of gypsum board panels and secure panels to back up components with screws that will not be exposed to view when installation is complete.
- .4 Install battens and continuous backing clips at all joints in square edge gypsum board and at vertical edges and top edge of square edge gypsum board installation.

3.2 Sound Attenuation Blanket

- .1 Sound insulation as noted under Section 072000 Insulation.

END OF SECTION

Part 1 GENERAL

1.1 Reference Standards

- .1 Do tile work in accordance with Installation Manual 200-1979, "Ceramic Tile", produced by Terrazzo Tile and Marble Association of Canada (TTMAC), except where specified otherwise.

1.2 Samples

- .1 Submit duplicate 300 x 300 mm (1'-0" x 1'-0") sample panels of each colour, texture, size, and pattern of tile, in accordance with Section 013300 - Submittal Procedures.

1.3 Maintenance Materials

- .1 Provide minimum 5m² of each type and colour of tile required for project for maintenance use.

1.4 Environmental Conditions

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 10°C (50°F) for 24h before, during and 24h after installation.

Part 2 PRODUCTS

2.1 Floor Tile

- .1 Porcelain tile: CAN/CGSB-75.1-M88, cushion edges, unglazed surface.
- .2 **CT-1:** 300mm x 600mm porcelain tile, Creation series, colour: black, finish: matte, from Olympia Tile & Stone, or approved equivalent.

2.2 Wall Tile

- .1 Ceramic Tile: CAN/CGSB-75.1-M88, satin unglazed surface.
- .2 **CT-1:** 100mm x 400mm porcelain tile, Colour & Dimension series, colour: bone, finish: bright, from Olympia Tile & Stone, or approved equivalent.
- .3 **CT-2 accent wall tile:** 16mm x 16mm mounted on 300mm x 300mm backing sheet, Murano series, colour: red pepper, finish: gloss, from Olympia Tile & Stone, or approved equivalent.

2.3 FINISHING AND EDGE-PROTECTION PROFILES FOR WALLS

.1 Wall Base at GB Wall and Ceramic Floor Tile:

.1 Anodized Aluminum Baseboard profile comprised of a symmetrically rounded top, flat exposed face, and 5/16 inch (8 mm) radius lower section.) Profile Height: 2-3/8 inch (60 mm).

.2 Corners:

- .1 Provide with matching inside corners.
- .2 Provide with matching outside corners.
- .3 Provide with matching connectors.
- .4 Provide with matching end caps.
- .5 Provide with matching Sealing Lip.

.3 Material and Finish:

- .1 AE - Satin Anodized Aluminum.

.4 Height: H = as required.

.5 Similar product to:

- .1 Designbase – SL as manufactured by Schluter or approved equal.

.2 Wall Base at Ceramic Wall Tile and Ceramic Floor Tile:

.1 Anodized aluminum profile with integrated trapezoid-perforated anchoring leg, connected at a 90-degree angle by a cove shaped section with 3/8" (10 mm) radius that forms the visible surface.

.2 Corners:

- .1 Provide with matching inside corners
- .2 Provide with matching outside corners.
- .3 Provide with matching end caps
- .4 Provide with matching connectors

.3 Material and Finish:

- .1 AE - Satin Anodized aluminum

.4 Height: H = as required.

.5 Similar product to:

- .1 Schluter –DILEX-AHK as manufactured by Schluter or approved equal.

.3 Termination Between GB and Ceramic Tile and Ceramic Tile Outside Corners (vertical or horizontal):

.1 Anodized aluminum L-shaped profile with 1/8" (3.2) wide top section and vertical wall section that together form the visible surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.

.2 Anchoring Leg:

- .1 Provide with straight anchoring leg

- .2 Provide with special radius anchoring leg for radius applications.
- .3 Material and Finish:
 - .1 EV4A - Stainless Steel Type 316 L = V4A.
- .4 Height: Height = as required.
- .5 Similar product to:
 - .1 Schluter®-SCHIENE as manufactured by Schluter or approved equal.
- .4 Termination Between General Wall Tile and Accent Ceramic Tile:
 - .1 Description: profile with 1/4" (6 mm) wide visible surface and integrated trapezoid-perforated anchoring leg.
 - .2 Anchoring Leg:
 - .1 Provide with straight anchoring leg
 - .2 Provide with special radius anchoring leg for radius applications
 - .3 Material and Finish:
 - .1 E - Stainless Steel Type 304 = V2A b.
 - .4 Height: Height as required.
 - .5 Similar product to:
 - .1 Schluter®-DECO as manufactured by Schluter or approved equal.

2.4 Mortar and Adhesive

- .1 Portland Cement: to CAN3-A5-M1983, Type Materials 10, colour to match tile, to be selected by Departmental Representative from manufacturer's full range of colours.
- .2 Sand: to CSA A82.56-M1976.
- .3 Water: potable and free of minerals which may discolour mortar.
- .4 Mortar additive: liquid polymer.
- .5 Thin-set adhesive: latex modified high bond strength.

2.5 Grout

- .1 Sand and cement grout additive: liquid latex.

2.6 Accessories

- .1 Thresholds: 45 mm (1-3/4") wide marble selected by Departmental Representative, 16 mm (5/8") thick, rounded edges, honed finish to exposed surfaces, size to suit door opening and frame width.

- .2 Sealant: in accordance to manufacturer's specifications. Colour selected by Departmental Representative.

2.7 Mortar and Adhesive Mixes

- .1 Mortar bed for floors: 1 part cement, 2 parts sharp sand, liquid polymer mortar additive mixed in accordance with manufacturer's instructions.
- .2 Floor tile joint: 1 part grey cement, 1 part fine sharp sand, latex polymer additive.
- .3 Mortar bed for walls: latex modified high strength mortar/adhesive, two components mixed in accordance with manufacturer's instructions.
- .4 Wall tile joint: 1 part white cement, 1 part fine sharp sand, latex polymer additive.

Part 3 EXECUTION

3.1 Workmanship

- .1 Apply tile to clean and sound surfaces.
- .2 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even.
- .3 Maximum surface tolerance 1:800 for walls and floors.
- .4 Make joints between tile uniform and approximately 1.5 mm (1/16") wide, plumb, straight, true, even and flush with adjacent tile.
- .5 Lay out tiles so perimeter tiles are minimum ½ size.
- .6 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .7 Make internal angles square, external angles rounded.
- .8 Use round edged tiles at termination of wall tile panels, except where panel butts projecting surface of differing plane.
- .9 Allow minimum 24h after installation of tiles, before grouting.
- .10 Clean installed tile surfaces after installation and grouting cured.

3.2 Wall Tile

- .1 Install tiles on walls in accordance with TTMAC detail 11.

3.3 Floor Tile

- .1 Install tiles on floor substrate in accordance with TTMAC detail 15.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Division 22 Plumbing: Plumbing work above ceilings.
- .2 Division 23 Heating, Ventilating and Air Conditioning: HVAC work above ceilings.
- .3 Division 26 Electrical: Electrical work above ceilings; trim for recessed light fixtures: sound masking system.
- .4 Division 27 Communications: Work above ceilings; trim for recessed fixtures.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C423-09a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - .2 ASTM C635-07, Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 - .3 ASTM C636-08, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
 - .4 ASTM E1264-08, Standard Classification for Acoustical Ceiling Products.
 - .5 ASTM E1414-11a¹ Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
 - .6 ASTM E1477-98a(2008), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-2007, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DESIGN REQUIREMENTS

- .1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.

1.4 SEISMIC DESIGN CRITERIA

- .1 Provide seismic restraint for ceiling suspension systems in accordance with the requirements of the NBC, and in accordance with requirements of ASTM E580 and good engineering practice.
 - .1 Contractor to provide third party seismic design and installation review by a professional Engineer licensed to practice in Ontario.
 - .2 Include provisions for all fixtures incorporated into or suspended from ceiling suspension system.

- .2 Provide ceiling suspension systems capable of withstanding effects of earthquake motions determined in accordance with NBC for site specific conditions.

- .1 Provide connections and bracing as required to satisfy seismic criteria.

1.5 SUBMITTALS

- .1 Provide all listed submittals in accordance with of Section 01 33 00.
- .2 Submit triplicate 150 mm x 150 mm samples of each type of acoustical units, except as follows.
 - .1 Submit triplicate full size samples of acoustical unit type .
- .3 Submit one representative model of each type ceiling suspension system.
- .4 Submit manufacturer's product literature describing specified products, including their technical and physical properties.
 - .1 Include manufacturer's certificate of mix formulation compliance, including certification that products contain no more than 0.5% asbestos.
 - .2 Include WHMIS and Material Safety Data Sheets.

1.6 QUALITY ASSURANCE

- .1 Mock-up:
 - .1 Construct mock-ups in accordance with quality assurance requirements of Section 01 33 00.
 - .2 Construct ceiling suspension system mockup to show basic construction and assembly, treatment at walls, recessed fixtures, sound masking devices, splicing, interlocking, finishes, acoustical unit installation.
 - .3 Submit mock-up of each combination of suspension system and acoustical ceiling panel, in two typical application areas such as offices, meeting rooms, corridors, special areas.
 - .1 Construct mock-up 10 m2 minimum of each type acoustical panel ceiling including one inside corner and one outside corner where applicable.
 - .2 Construct mock-ups where directed.
 - .4 Allow 48 hours for inspection of mock-up by Departmental Representative before proceeding with ceiling work.
 - .5 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of the finished work.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original unopened packaging with labels intact.
- .2 Label cartons and packages indicating contents and locations for which each item is intended.
- .3 Do not deliver panels to job site until shortly before installation.
- .4 Protect on site stored or installed absorptive material from moisture and all other forms of damage.

- .5 Remove damaged or deteriorated materials from the site.
- .6 Store extra materials required for maintenance, where directed by NRC Departmental Representative.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Permit wet work to dry before beginning to install.
- .2 Maintain uniform minimum temperature of 15 degrees C and humidity of 20- 40% before and during installation.
- .3 Store materials in work area 48 hours prior to installation.

1.9 EXTRA MATERIALS

- .1 Provide suspension system components amounting to 2% of gross ceiling area for each type required for project. Extra materials are from same production run as installed materials. Clearly identify each type.
- .2 Provide twenty (20) ceiling tiles for each pattern and type on project. Extra material shall be from the same production run as installed materials, in unopened packages. Clearly identify each type of acoustic unit, including colour and texture.
- .3 Deliver to Departmental Representative, upon completion of the work of this section.

1.10 SEQUENCING AND SCHEDULING

- .1 Do not install acoustical panels and tiles until work above ceiling has been inspected by Departmental Representative.
- .2 Do not commence installation until mechanical and electrical work above ceiling is complete.

1.11 COORDINATION

- .1 Coordinate installation of suspended ceiling system with construction of ceiling bulkheads.
- .2 Coordinate installation of suspended ceiling system with mechanical, electrical and other work so that interference is prevented and items such as diffusers, grilles, lights, fixtures and other items are properly located and supported as indicated or as directed by Departmental Representative.
- .3 Coordinate installation of ceiling suspension system and curved trim with erection of partition framing and installation of wallboard to ensure uniform width of reveal between curved trim and partition.
 - .1 Manufacturer recommends installation of ceiling suspension system and curved trim prior to erection of adjacent partition and bulkhead framing to allow adjustment of curved partition to pre-fabricated curved trim.

Part 2 Products

2.1 SOURCE OF SUPPLY

- .1 Provide all suspension systems and acoustic panels as products of the same single manufacturer.

2.2 ACOUSTICAL SUSPENSION SYSTEM

- .1 Provide intermediate duty system to ASTM C635, as specified for each respective system.
- .2 Basic materials for suspension system: commercial quality cold rolled steel, zinc coated.
- .3 Provide acoustical suspension system specified for each respective acoustical ceiling panel, and as follows.
- .4 Exposed tee bar grid components: Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face, colour white. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.
- .5 Hanger wire: galvanized soft annealed steel wire, 2.6 mm diameter.
- .6 Hanger inserts: purpose made drilled threaded twist-expanded sleeve anchors suitable for rod or hanger wire installation, as applicable. Do not use inserts or anchors requiring powder activated driver.
- .7 Carrying channels: 38 x 12.7 mm channel, of 3 mm thick painted galvanized steel.
- .8 Accessories: splices, clips, wire ties, retainers and wall moulding as indicated complete with pre-fabricated corners, to complement suspension system components, as recommended by system manufacturer.

2.3 ACOUSTIC CEILING PANEL (ACP) AND SUSPENSION

- .1 Acoustic ceiling panel for suspended ceiling system: to CAN2-92.1.
 - .1 Flame spread rating of 25 or less.
 - .2 Noise reduction coefficient (NRC) designation of 0.70 to 0.75.
 - .3 Ceiling Attenuation Class (CAC): minimum 35.
 - .4 Light reflectance range: Actual LR of 0.85.
 - .5 Edge type: square.
 - .6 Colour: white.
 - .7 Standard size: 610 mm x 1 220 mm x 19 mm thick and 610 mm x 610 mm x 19 mm thick, as indicated.
 - .8 Custom size: to be field cut and edge finished as required and as indicated.
 - .9 Shape: flat.
 - .10 Acceptable products and manufacturers:
 - .1 Armstrong Ultima;
 - .2 CGC Mars.

- .3 Certainteed Symphony M.
- .2 Suspension Systems for Use with ACP:
 - .1 Acceptable products and manufacturers:
 - .1 Prelude XL as manufactured by Armstrong.
 - .2 Donn DX/DXL as manufactured by CGC Inc.,
 - .3 Classic Stab as manufactured by Certainteed
 - .2 Colour: flat white

2.4 SEISMIC SUPPORT COMPONENTS

- .1 Provide all necessary seismic components in accordance with approved shop drawings, including but not limited to compression posts, stainless steel aircraft cable, turnbuckles, eyebolts, clips, cross-tee connections and anchors.

Part 3 Execution

3.1 EXAMINATION

- .1 Prior to beginning ceiling installation work, examine the installation areas and identify all areas of potential interference between ceiling components and components of other trades. Report all areas so designated to the Departmental Representative Departmental Representative.
- .2 Do not commence installation work in areas of interference until interference has been resolved or accepted. Commencement of the work in areas of interference signifies acceptance of the conditions.

3.2 SUSPENSION SYSTEM INSTALLATION

- .1 Installation: in accordance with ASTM C636 except where specified otherwise.
- .2 Install suspension system to manufacturer's instructions and Certification Organizations tested design requirements.
- .3 Do not erect ceiling suspension system until work above ceiling has been inspected by Departmental Representative.
- .4 Secure hangers to overhead structure using attachment methods as indicated acceptable to Departmental Representative.
 - .1 Do not use powder actuated fastening devices at any time or place in this Work.
- .5 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.
- .6 Lay out centre line of ceiling both ways, to provide balanced borders at room perimeter with border units not less than 50% of standard unit width system according to reflected ceiling plan.
- .7 Ensure suspension system is co-ordinated with location of related components.

- .8 Install wall moulding to provide correct ceiling height.
- .9 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles and speakers.
- .10 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .11 Interlock cross member to main runner to provide rigid assembly.
- .12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .13 Finished ceiling system to be square with adjoining walls and level within 1:1000.

3.3 EXPANSION JOINTS.

- .1 Erect two main runners parallel, 50 mm apart, on building expansion joint line and where indicated.
- .2 Do not extend ceiling panels across building expansion joints.
- .3 At joint in ceiling suspension system, lay in strip of acoustic panel, 25% narrower than space between two "T" bars.

3.4 INSTALLATION OF TRIM

- .1 Install in accordance with approved shop drawings and manufacturer's instructions.
- .2 Use attachment clips to secure trim to each main tee.
- .3 Use splice plates for joining adjacent trim pieces.
- .4 Use 90 degree corner trim pieces at corners.
- .5 Finished installation to be smoothly curving line to accurate radius, free of distortion and kinks, and shall form a reveal of uniform width at partitions and bulkheads.

3.5 SEISMIC RESTRAINT

- .1 Install seismic restraint for suspended ceiling system and all associated fixtures in accordance with approved shop drawings.
- .2 Minimum seismic tension bracing for ceilings shall be installed as follows:
 - .1 At perimeter of each suspended ceiling and at the end of each grid run, install additional hanger wire splayed upward at 45 degrees and attached to structure.
 - .2 In field of ceiling, install hanger wires at points 12 feet OC in both directions splayed upward 45 degrees from each point in four directions and secured to the underside of the structure.
- .3 Tighten bracing wires without deforming the ceiling grid beyond specified tolerances.

- .4 Seismic tension bracing is not required in areas in which the maximum horizontal dimension is less than or equal to 12 feet and which are bounded on all sides by partitions anchored to floor slab and underside of structural deck with seismic anchorage.
- .5 The professional engineer responsible for the production of the shop drawings setting out the requirements for seismic restraint of the suspension systems shall provide periodic field review during construction and shall submit reports in accordance with quality assurance requirements of this specification. The cost of this field inspection shall be included in the Guaranteed Price.

3.6 ACOUSTICAL PANEL INSTALLATION

- .1 Install acoustical panels in ceiling suspension system, supported on all edges, in accordance with manufacturer's current printed instructions.
- .2 Touch up edges of panels cut to fit site conditions to conceal core and to match face.

3.7 INTERFACE WITH OTHER WORK

- .1 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, to be built into acoustical ceiling components.

3.8 TOUCH-UP AND CLEANING

- .1 Touch up scratches, abrasions, voids and other defects in surfaces.
- .2 Replace damaged units that cannot be touched up to satisfaction of Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 09 25 00 Gypsum Board: Wall repairs at surfaces to receive resilient base.
- .2 Section 09 68 13 Tile Carpeting: Floor finish.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM F1861-08 Specification for Resilient Wall Base.

1.3 PRODUCT DATA

- .1 Submit manufacturer's product literature describing specified products, including their technical and physical properties.
 - .1 Include manufacturer's certificate of mix formulation compliance, including certification that products contain no more than 0.5% asbestos.
 - .2 Include WHMIS and Material Safety Data Sheets.

1.4 SAMPLES

- .1 Submit samples in accordance with Section 013300 - Submittal Procedures.
- .2 Submit duplicate 300 x 300 mm sample pieces of sheet material, 300 mm long base.

1.5 QUALITY ASSURANCE

- .1 Installer shall have five (5) years of documented experience installing resilient base products.
- .2 Provide proof of experience at request of Departmental Representative.

1.6 MOCKUP

- .1 Include resilient base and accessories in mockups specified for each floor covering product specified, in accordance with requirements of Section 013300 - Submittal Procedures.
- .2 Accepted mockup may form part of finished Work.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and store packaged materials in original containers with manufacturer's seals and labels intact.
- .2 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness. Store rolled goods on end.
- .3 Store materials on site for site conditioning at temperatures between 18oC and 24oC for at least 48 hours immediately before installation.
- .4 Protect from intense or direct sunlight until installation is complete and adhesives are fully cured.

1.8 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for resilient base and adhesives for incorporation into manual specified in Section 013300 - Submittal Procedures.

1.9 EXTRA MATERIALS

- .1 Provide 5% of each colour, pattern and type of resilient base material required for project for maintenance use.
- .2 Extra materials to be in one piece and from same production run as installed materials.
- .3 Clearly identify each resilient base product and each container of adhesive.
- .4 Deliver to Departmental Representative, upon completion of the work of this section.
- .5 Store where directed by Departmental Representative.

1.10 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain air temperature and structural base temperature at resilient base installation area above 20oC for 48 hours before, during and 48 hours after installation.
- .2 Protect materials from intense or direct sunlight during storage and until installation is complete and adhesives are fully cured.

Part 2 Products

2.1 RESILIENT WALL BASE

- .1 Resilient base: to ASTM F1861, Type TS or TP, rubber, Style B-cove minimum for resilient floor, Style A-straight toeless for carpeted areas, in maximum practical length, 3 mm thick, 150 mm high, of colour selected by Departmental Representative from manufacturer's standard range.
 - .1 Acceptable products and manufacturers:
 - .1 Pinnacle Rubber Base by Roppe,
 - .2 Traditional Wall Base by Johnsonite.
 - .3 Equivalent products from Amtico, Armstrong.
 - .2 Allow for one colour to be selected by Departmental Representative from manufacturer's full range.

2.2 RESILIENT BASE COLOUR SCHEDULE

- .1 Allow for one colour per functional area for each type of resilient base specified, selected from manufacturer's full range.

2.3 RESILIENT BASE INSTALLATION ACCESSORIES

- .1 Primers and adhesives: of types recommended by resilient products manufacturer for specific material on applicable substrate, above, on or below grade.
- .2 Adhesives for contoured resilient wall base: as recommended by manufacturer.
 - .1 Porous substrate: Johnsonite #960 Acrylic Cove Base Adhesive.
 - .2 Non-porous substrate: Johnsonite #945 Contact Bond Adhesive.
 - .3 Double sided tape adhesive for all substrates: Johnsonite Power Tape.

Part 3 Execution

3.1 SITE VERIFICATION OF CONDITIONS

- .1 Inspect areas and surfaces to receive new resilient base and report conditions detrimental to performance of the Work and satisfactory installation in writing to the Departmental Representative.
- .2 Ensure that surfaces to receive base have been repaired under Section 09 25 00 and are sound, dry, clean and smooth.
- .3 Do not proceed with the work until detrimental conditions have been corrected.

3.2 RESILIENT BASE APPLICATION

- .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.
- .7 Cope internal corners.
- .8 Form external corners from resilient base as follows:
 - .1 Bend the base and flip the toe to stretch it.
 - .2 Reverse the bend and shave a strip 6 mm wide to a depth $\frac{1}{4}$ the thickness of the base from the back of the base at corner location.
 - .3 Apply hot melt or solvent-based adhesive to outside corners, minimum 100 mm back from corner.
 - .4 Install base.
- .9 Use toeless type base where floor finish will be carpet, coved type elsewhere.
- .10 Install toeless type base before installation of carpet on floors.
- .11 Heat weld base joints in accordance with manufacturer's printed instructions.

3.3 APPLICATION – CONTOURED RESILIENT TRIM

- .1 Lay out base to keep number of joints at minimum.
 - .1 Space joints in resilient base at maximum length available.
- .2 Set base in adhesive tightly by using 3 kg hand roller, against wall and floor surfaces.

Apply adhesive uniformly at both top and bottom of base.
- .3 Install straight and level to variation of 1:1000.
- .4 Scribe and fit to door frames and other obstructions.
- .5 Running joints to be diagonal or scarf joints.
- .6 Miter inside and outside corners using compound miter saw.
- .7 Jointing tolerances:
 - .1 AWI Premium grade:

-
- .1 Maximum gap width: 0.65 mm.
 - .2 Maximum gap length: 30% of joint length.

3.4 CLEANING

- .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.

3.5 PROTECTION

- .1 Prohibit traffic on stairs for 24 hours after installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 09 65 13 Resilient Base and Accessories: Resilient base.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM International)
 - .1 ASTM F710-11 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
 - .2 ASTM F1066-13 Standard Specification for Vinyl Composition Floor Tile

1.3 PRODUCT DATA

- .1 Submit manufacturer's product literature describing specified products, including their technical and physical properties.
 - .1 Include manufacturer's certificate of mix formulation compliance, including certification that products contain no more than 0.5% asbestos.
 - .2 Include WHMIS and Material Safety Data Sheets.

1.4 SAMPLES

- .1 Submit samples in accordance with Section 013300 - Submittal Procedures.
- .2 Submit selection and verification samples for range of colours, pattern and textures as requested by Departmental Representative.
- .3 Submit triplicate of each floor covering tile colour selected, pattern and texture specified, in size specified.
- .4 Submit triplicate feature strips, edge strips, transition strips for each typical transition, minimum 300 mm long.

1.5 QUALITY ASSURANCE

- .1 Flooring installer shall have five (5) years of documented experience installing resilient tile flooring.
- .2 Provide proof of experience at request of Departmental Representative.

1.6 SUBFLOOR CONDITIONS

- .1 Prior to commencement of floor installation work, conduct bond tests as follows:
 - .1 Conduct bond tests as recommended by flooring manufacturer to ensure that bond between flooring products and substrate meets manufacturer's requirements.
- .2 Test procedures and results shall be recorded and submitted to Departmental Representative prior to commencement of flooring installation.

- .3 Do not proceed with the work until detrimental conditions have been corrected, test results are consistent with flooring manufacturer's requirements.
- .4 Commencement of the installation shall be deemed to be acceptance of the conditions. After commencement of the work the Contractor shall be fully responsible for its satisfactory performance in accordance with the specifications.

1.7 MOCKUP

- .1 Provide mockup of typical room for each floor covering product specified, in accordance with Section 013300 - Submittal Procedures.
- .2 Include floor pattern as directed by Departmental Representative.
- .3 Allow 48 hours for review of mockup by Departmental Representative.
- .4 Accepted mockup may form part of finished Work.

1.8 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for resilient flooring, base and adhesive for incorporation into manual specified for closeout procedures in Section 011000 - General Instructions.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and store packaged materials in original containers with manufacturer's seals and labels intact. Indicate batch and sequence numbers on labels.
- .2 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness. Do not stack tile boxes more than four high.
- .3 Maintain temperature of store room at a minimum of 20°C for at least 48 hours immediately before installation.

1.10 EXTRA MATERIALS

- .1 Provide one unopened boxes of each colour, pattern and type flooring material required for this project for maintenance use.
- .2 Extra materials to be from same production run as installed materials.
- .3 Clearly identify each container of floor tile and each container of adhesive.
- .4 Deliver to Departmental Representative, upon completion of the work of this section.
- .5 Store where directed by Departmental Representative.

Part 2 Products

2.1 RESILIENT TILE PRODUCTS (RT)

- .1 All resilient tile flooring materials shall be the products of the same single manufacturer.

- .2 Vinyl Composition Tile: 305 mm square x 3.2 mm thick tile to ASTM F1066, class 2 through pattern.
 - .1 Acceptable Product: Excelon as manufactured by Armstrong.
 - .2 Pattern:
 - .1 Choose from manufactures standard range of patterns.

2.2 INSTALLATION ACCESSORIES

- .1 Adhesive: Type as tile recommended by tile manufacturer for substrate condition.
- .2 Primers: waterproof, type recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.
- .3 Sub-floor filler and leveller to ASTM F710, moisture-, mildew-, and alkali-resistant material, with 3000 psi compressive strength when cured:
 - .1 2 part latex-type filler requiring no water and packaged separately in correctly proportioned units as recommended by flooring manufacturer for use with their product.
- .4 Recessed vinyl stair nosing: 76.2mm tread depth with ribbed surface, 50.8 hinged square nose configuration, 7.94mm tread depth, under cut for 3.18 material.
 - .1 Manufactured from a homogeneous polyvinyl chloride composition combined with high quality additives and colorants to meet the performance requirements of ASTM F-2169 Standard Specification for resilient Stair Treads, Type TV, Class 1 and 2, Group 1 and 2.
 - .2 Slip resistant.
 - .3 Colour: Black.
 - .4 Acceptable Product: Vinyl Nosing, RCN-XX-B as manufactured by Tarkett.
- .5 Vinyl Riser: 2mm thick material.
 - .1 Risers are formulated from a homogeneous polyvinyl chloride composition combined with high quality additives and colorants designed specifically to meet the performance and dimensional requirements of ASTM F-1861-98, Type TV, Group 1 (solid) Standard Specification for Resilient Wall Base.
 - .2 Colour : Black
 - .3 Height: to be determined on site
 - .4 Acceptable Product: 2mm vinyl riser as manufactured by Tarkett.
- .6 Reducer and transition strips: resilient wedge profile transition of thermoplastic rubber compound, 457 mm wide from 0 to thickness to suit transition.
 - .1 Acceptable product: Subfloor Leveller as manufactured by Roppe.
- .7 Transition and edge strips: purpose made solid vinyl strip, tapered profile, dimensions to provide flush meeting with adjacent surfaces, color to be selected by Departmental Representative from manufacturer's standard range.
 - .1 Provide "J" or "T" profiles as necessary to protect edges at transitions.
 - .2 Tapered vinyl or rubber edging, profile and thickness to suit flooring condition, with lip to extend under floor finishes, shoulder flush with top of adjacent floor

finish. Colour selected by Departmental Representative from manufacturer's full range.

Part 3 Execution

3.1 SITE VERIFICATION OF CONDITIONS

- .1 Inspect areas and surfaces to receive new resilient tile flooring and report conditions detrimental to performance of the Work and satisfactory installation in writing to the Departmental Representative.
- .2 Ensure that surfaces to receive tile are:
 - .1 Flat within the tolerances of 12 mm in 3 000 mm;
 - .2 dry clean and smooth;
 - .3 free from paint, varnish, existing adhesive residue, wax, oil and other deleterious substances.
- .3 Prior to commencement of floor installation work, conduct bond and moisture emission tests as specified.
- .4 Do not proceed with the work until detrimental conditions have been corrected.
- .5 Commencement of the installation shall be deemed to be acceptance of the conditions. After commencement of the work the Contractor shall be fully responsible for its satisfactory performance in accordance with the specifications.

3.2 SUB-FLOOR TREATMENT

- .1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .3 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.
- .4 Prime and seal concrete sub-floor to flooring manufacturer's printed instructions.

3.3 SUB-FLOOR TRANSITION LEVELLER

- .1 Provide pre-fabricated resilient subfloor leveller at all transitions between resilient tile flooring and adjacent flooring types where elevation difference is 12.7 mm or less.
- .2 Trim width of leveller to suit difference in elevation.

3.4 TILE APPLICATION

- .1 Provide a high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to the outside. Do not let contaminated air recirculate through a zoned or whole building air distribution system.

- .2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .3 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.
- .4 Lay tiles with bottom surface securely bonded to substrate and top surface left smooth, clean and free from imperfections. Fit tiles so each unit is in contact with contiguous tiles and joints are in proper alignment. Make neat tight joints where exposed edges about other surfaces.
- .5 Install flooring as indicated on Floor Pattern Drawing and to match accepted mockup.
- .6 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.
- .7 As installation progresses, and after installation, roll flooring in 2 directions including resilient tile with 45 kg minimum roller to ensure full adhesion.
- .8 Cut tile and fit neatly around fixed objects.
- .9 Cut feature strips and floor markings to shapes, sizes and profiles as shown on drawings. Carefully scribe into positions in field. Fit joints tightly.
- .10 Install feature strips at door jambs between rooms with different colours or patterns, as directed by Departmental Representative. Provide in full depth of jamb unless indicated otherwise.
- .11 Install flooring in pan type floor access covers. Maintain floor pattern.
- .12 Continue flooring through areas to receive movable type partitions and demountable partitions without interrupting floor pattern.
- .13 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.
- .14 Install edge reducer strips at unprotected or exposed edges where flooring terminates. Securely bond to subfloor in straight true line.
- .15 Install reducer and transition strips between floor areas which do not meet flush with each other. Securely bond to subfloor in straight true line.
- .16 Continue flooring over areas which will be under built-in furniture, wood and metal casework and equipment.

3.5 **CLEANING**

- .1 **Cleaning:** Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.

- .1 Remove visible adhesive and other surface blemishes using cleaning methods recommended by floor manufacturer.
- .2 Sweep and vacuum floor after installation.
- .3 Do not wash floor until after time period recommended by flooring manufacturer.
- .4 Damp mop flooring to remove black marks and soil.

3.6 INITIAL MAINTENANCE

- .1 Do not wax or seal floor. NRC will wax floor.

3.7 PROTECTION OF FINISHED WORK

- .1 Protect new floors from traffic, deterioration and damage at all times until final inspection.
- .2 Prohibit traffic on floor for 48 hours after installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 09 65 13 Resilient Base and Accessories: Resilient base for carpeted areas.
- .2 Section 09 65 19 Resilient Tile Flooring: Floor reducer and transition strips.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No.27.6-M91(R2013), Textile Test Methods - Flame Resistance - Methemine Tablet Test for Textile Floor Coverings.
 - .2 CAN/CGSB-4.129-93, Carpet for Commercial Use.
- .2 Carpet and Rug Institute (CRI)
 - .1 CRI-104-96, Standard Installation of Commercial Carpet.
 - .2 IAQ Carpet Testing Program.
- .3 National Floor Covering Association (NFCA)
 - .1 Floor Covering Specification Manual.
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102.2-10, Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.3 SUBMITTALS

- .1 Submit the following in accordance with submittal procedures of Div. 01.
- .2 Submit verification to demonstrate compliance with CAN/ULCS102.2 for floor covering.
- .3 Submit proof that carpet has been tested and passed the Indoor Air Quality (IAQ) Carpet Testing Program requirements of the Carpet and Rug Institute (CRI) and the Canadian Carpet Institute (CCI).
- .4 Submit carpet schedule using same room designations indicated on drawings.
- .5 Submit carpet manufacturer's installation instructions: Indicate special procedures and perimeter conditions requiring special attention.
- .6 Submit certification and description of carpet reclamation and/or recycling process.

1.4 PRODUCT DATA

- .1 Submit product data in accordance with submittal procedures of Div. 01.
- .2 Submit product data sheet for each carpet, undercushion, adhesive, carpet protection and subfloor patching compound.

- .3 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada and Health Canada for carpet adhesive and seam adhesive. Indicate VOC content.
- .4 Submit data on specified products, describing physical and performance characteristics, sizes, patterns, colours, and methods of installation.

1.5 SAMPLES

- .1 Submit samples in accordance with submittal procedures of Section 01 10 00 – General Instructions.
- .2 Submit duplicate pieces of each type, size and colour of carpet tile specified.

1.6 CLOSEOUT SUBMITTALS

- .1 Submit operation and maintenance data for incorporation into manual specified in Section 01 10 00 – General Instructions.
- .2 Submit maintenance data: Include maintenance procedures, recommendations for maintenance materials and equipment, and suggested schedule for cleaning.

1.7 QUALIFICATIONS

- .1 Installer Qualifications:
 - .1 Flooring contractor requirements.
 - .1 Specialty contractor normally engaged in this type of work, with prior experience in installation of these types of materials.
 - .2 Certified by carpet manufacturer prior to bid submission.
 - .3 Must not sub-contract labour without written approval of Departmental Representative.
 - .2 Be responsible for proper product installation, including floor testing and preparation as specified and in accordance with carpet manufacturers written instructions.

1.8 REGULATORY REQUIREMENTS

- .1 Carpet tile shall be tested to CAN/ULC-S102.2 and have a maximum flame spread rating of 300 and maximum smoke developed rating of 450 in accordance with NBC requirements
- .2 Indoor Air Quality: compliance with CRI/CCI Green Label Indoor Air Quality Program, CRI/CCI-IAQ requirements for maximum total volatile chemicals released into air. Label each carpet product with CRI/CCI-IAQ label.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Label packaged materials.
- .2 Store packaged materials in original containers or wrapping with manufacturer's seals and labels intact.

- .3 Store carpeting and accessories in location as directed by Departmental Representative. Store carpet and adhesive at minimum temperature of 18°C and relative humidity of maximum 65% for minimum of 48 hours before installation.
- .4 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.
- .5 Store materials in area of installation for minimum period of 48 hours prior to installation.
- .6 Modular carpet: store on pallet form as supplied by Manufacturer. Do not stack pallets.

1.10 ENVIRONMENTAL REQUIREMENTS

- .1 Moisture: Ensure substrate is within moisture limits and alkalinity limits prescribed by manufacturer. Prepare moisture testing and provide report to Departmental Representative.
- .2 Temperature: Maintain ambient temperature of not less than 18°C from 48 hours before installation to at least 48 hours after completion of work.
- .3 Relative humidity: Maintain relative humidity between 10 and 65% RH for 48 hours before, during and 48 hours after installation.
- .4 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .5 Ventilation:
 - .1 Arrange with Departmental Representative to operate existing building ventilation system to provide continuous ventilation during and after carpet application. 24 hours per day during installation and for 7 days after completion of carpet installation.

1.11 EXTRA MATERIALS

- .1 Provide modular tile maintenance material in quantity equivalent to minimum 5% of each colour, pattern and type of carpeting installed. Minimum one full box of each.
- .2 Extra materials to be from same production run as installed materials.
- .3 Identify each package of carpet and each container of adhesive.
- .4 Deliver to site and store where directed by Departmental Representative.

Part 2 Products

2.1 MANUFACTURERS

- .1 Specification is based on products of Shaw Contract Group. Products of other modular carpet manufacturers may be acceptable subject to review and acceptance by the Departmental Representative for conformance to design concept and specifications.
- .2 Certified to Carpet and Rug Institute's and the Canadian Carpet Institute IAQ requirements.

2.2 MODULAR CARPET (CPT)

- .1 Provide carpet tile in dimensions, patterns and colours as specified.
- .2 Construction: tufted.
- .3 Pile Surface Appearance:
 - .1 Multi-level pattern loop.
- .4 Pile fibre: to CAN/CGSB-4.129.
 - .1 Nylon.
- .5 Gauge: 1/12.
- .6 Stitch Rate: 10 per inch.
- .7 Tuft Density: 6,511 ounces per square yard.
- .8 Finished Pile Thickness: 0.094 inch.
- .9 Yarn Dye Method: 100% solution dyed.
- .10 Colourization: multiple colour tones.
- .11 Colourfastness to light: to CAN/CGSB-4.2No.18.3.
- .12 Primary Backing: woven.
- .13 Secondary Backing: synthetic.
- .14 Soil protection: manufacturer's protective treatment.

2.3 INSTALLATION ACCESSORIES

- .1 Adhesive:
 - .1 Pressure sensitive type: recommended by carpet manufacturer for direct glue down installation of modular carpet or speciality backed carpets.
- .2 Primers: waterproof, type recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.
- .3 Sub-floor filler and leveller to ASTM F710, moisture-, mildew-, and alkali-resistant material, with 3000 psi compressive strength when cured:
 - .1 2 part latex-type filler requiring no water and packaged separately in correctly proportioned units as recommended by flooring manufacturer for use with their product.
- .4 Reducer and transition strips: resilient wedge profile transition of thermoplastic rubber compound, width to site conditions from 0 to thickness to suit transition.
 - .1 Acceptable product: Subfloor Leveller as manufactured by Roppe.

- .5 Transition and edge strips: purpose made solid vinyl strip, tapered profile, dimensions to provide flush meeting with adjacent surfaces, color to be selected by Departmental Representative from manufacturer's standard range.
 - .1 Provide "J" or "T" profiles as necessary to protect edges at transitions.
 - .2 Tapered vinyl or rubber edging, profile and thickness to suit flooring condition, with lip to extend under floor finishes, shoulder flush with top of adjacent floor finish. Colour selected by Departmental Representative from manufacturer's full range.
- .6 Carpet protection: non-staining heavy duty kraft paper.
- .7 Subfloor patching compound: Portland cement base filler, mix with latex and water to form a cementitious paste.

2.4 CARPET TILE SCHEDULE

- .1 **CPT-1:** Ignite Tile, Colour: Oxidize 48531, Size: 460mm x 915mm, as manufactured by Shaw Contract Group.
- .2 **CPT-2:** Colour: glowing 81211 (yellow), Size: as per the drawings, as manufactured by Shaw Contract Group.
- .3 **CPT-3:** Colour: puzzle 81991 (purple), Size: as per the drawings, as manufactured by Shaw Contract Group.
- .4 **CPT-4:** Colour: hyper green 81326 (green), Size: as per the drawings, as manufactured by Shaw Contract Group.
- .5 **CPT-5:** Colour: hyper blue 81436 (blue), Size: as per the drawings, as manufactured by Shaw Contract Group.

Part 3 Execution

3.1 SUB-FLOOR TREATMENT

- .1 Concrete shall be inspected to determine special care required to make it a suitable foundation for carpet. Fill cracks 3 mm wide and level protrusions over 0.8 mm with appropriate and compatible latex or polymer fortified patching compound.
- .2 Do not exceed manufacturer's recommendations for patch thickness.
- .3 Large patch areas are to be primed with a compatible primer.
- .4 Concrete substrates shall be cured, clean and dry.
- .5 Concrete substrates shall be free of paint, dirt, grease, oil, curing or parting agents, and other contaminants, including sealers, that may interfere with the bonding of the adhesive.
- .6 Wherever a powdery or porous concrete surface is encountered, a primer compatible with the adhesive shall be used to provide a suitable surface for glue-down installation.

3.2 PREPARATION

- .1 Prepare floor surfaces in accordance with CRI 104 Standard for Installation of Commercial Carpet.
- .2 Pre-condition carpeting following manufacturer's printed instructions.

3.3 SUB-FLOOR TRANSITION LEVELLER

- .1 Provide pre-fabricated resilient subfloor leveller at all transitions between resilient tile flooring and adjacent flooring types where elevation difference is 12.7 mm or less.
- .2 Trim width of leveller to suit difference in elevation.

3.4 INSTALLATION OF ADHESIVE

- .1 Review substrate and environmental conditions to ensure they are in accordance with adhesive manufacturer's written requirements.
- .2 Mix and apply adhesives in strict accordance with manufacturer's written instructions, observing recommended application techniques and spread rates, open times and safety precautions.
- .3 Apply adhesive to fully cover substrate using appropriate notched trowel. Use new trowels when existing trowels become worn. Self-adhesive carpet tile installation shall be in accordance with manufacturer's recommendations.

3.5 INSTALLATION OF CARPET TILE

- .1 Install modular carpet in accordance with manufacturer's printed instructions and in accordance with NFCA guidelines using tools, materials, methods and sequence of work as recommended
- .2 Install carpet tile as indicated in areas and patterns detailed on drawings and/or indicated on the project Finish Schedule.
- .3 Install carpet tile adhered to substrate in accordance with NFCA requirements and carpet tile manufacturer's recommendations.
- .4 Install carpet tile starting in the centre of the room and working outwards towards perimeter walls. Other acceptable commercial practices can be substituted as the starting point to provide a border width equal to at least half a tile.
- .5 Install carpet tile with butted joints straight, in true plane with carpet nap in pattern indicated. Ensure dye lot, pattern, and texture match within any one area. All patterns shall be pre-approved by Departmental Representative.
- .6 Border tiles shall be scribed to vertical surfaces and around architectural, mechanical, electrical and furniture fixtures, fitments and floor projections, and cut and fitted into place after the field tile has been laid and before wall base has been installed.
- .7 Install carpet tile into recesses and closets adjacent to carpeted areas and continuous through doorways and other openings for a uniform appearance.

- .8 Do not bridge building expansion joints with carpet tile; provide for movement.
- .9 Tiles should be carefully rolled in each direction with a roller of size and weight as recommended by carpet tile manufacturer to ensure full adhesion of tile to the substrate and again when entire room is complete to ensure uniform adhesion.
- .10 Clean excess adhesive off of tiles after installation using methods and materials recommended by flooring and adhesive manufacturer.

3.6 COMPLETION

- .1 On completion of work, trim all loose pieces of face yarn with scissors, remove all carpet tile scraps and other refuse from areas and rooms worked in and from job site, and inspect and correct other apparent defects.
- .2 Vacuum carpet tile with a beater type vacuum to remove dirt. Remove any soiled spots with proper cleaner recommended by carpet tile manufacturer for each type of carpet tile installed.

3.7 PROTECTION OF FINISHED WORK

- .1 Prohibit traffic on carpet for a period of 24 hours until adhesive is cured.
- .2 Install carpet protection to satisfaction of Departmental Representative.

END OF SECTION

Part 1 GENERAL

1.1 Related Sections

- .1 Section 01 10 00-General Instructions
- .2 Section 01 33 00- Submittal Procedures

1.2 Summary

- .1 This Section includes the Acoustic Finishes as shown and specified in the described system(s): Adjust list below to suit Project
 - .1 Wall Acoustic Panels.

1.3 Submittals

- .1 General: Submit the following in accordance with conditions of contract and specification section 01 33 00 - Submittal Procedures.
- .2 Product Data: Submit manufacturer's product data; include product description, fabrication information, and compliance with specified performance requirements.
- .3 Submit product test reports from a qualified independent 3rd party testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.
- .4 Test reports required are:
 - .1 Steiner Tunnel Surface Burning Rate Test (ASTM E 84)
 - .2 ASTM C423
 - .3 Dynamic environmental testing (ASTM standards D 5116 and D 6670)
- .5 Shop Drawings: Include plans, elevations, sections, panel dimensions, details, and attachments to other work.
- .6 Samples for Initial Selection:
 - .1 Submit minimum 50mm by 50mm samples. Indicate full color and pattern.
- .7 Samples for Verification:
- .8 Submit minimum 100mm by 10mm sample for each color
- .9 Mockups:
 - .1 Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects.
 - .2 Build mockup of each Acoustic Finish.

- .3 Retain subparagraph below if mockups are erected as part of building rather than separately
- .4 Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- .10 Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions. Include in Project closeout documents.

1.4 Quality Assurance

- .1 Manufacturers Qualifications
 - .1 Materials and systems shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least two (2) consecutive years and which can show evidence of those materials being satisfactorily used on at least three (3) projects of similar size, scope and location. At least three (2) of the projects shall have been successful for use two (2) years or longer.
 - .2 Manufactured panels must be produced from a minimum of 50% post-industrial recycle content.
 - .3 Manufacturer must offer a documented reclaim process that will take back, at the manufacturers cost, panels that are at their end-of life cycle. Return process is preceded by following requirements highlighted in Section 02 42 00 Removal and Salvage of Construction Materials.

1.5 Delivery, Storage, and Handling

- .1 Deliver Acoustic Finishes and specified items in manufacturer's standard protective packaging.
- .2 Do not deliver Acoustic Finishes, components and accessories to Project site until areas are ready for installation.
- .3 Store materials in a flat orientation in a dry place that is not exposed to exterior elements.
- .4 Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation for duration of project.
- .5 Before installing Acoustic Finishes, permit them to reach room temperature.

1.6 Project Conditions

- .1 Environmental Limitations: Do not install Acoustic Finishes until spaces are enclosed and weatherproof, and ambient temperatures and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 Warranty

- .1 Manufacturer's Special Warranty on polymer panel system: Manufacturer's standard form agreeing to repair or replace units that fail in material or workmanship within the specified warranty period.
- .2 Warranty Period: 1 year after the date of substantial completion.

- .3 The warranty shall not deprive the owner of other rights or remedies the Owner may have under other provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

Part 2 PRODUCTS

2.1 ACCEPTABLE PRODUCTS AND MANUFACTURERS

- .1 Specification is based on Hush Blocks as manufactured by 3Form. Equivalent products with similar design and function must be submitted to the Departmental Representative for review, conformance to design concept and accommodation requirements.

2.2 Manufacturer

- .1 Manufacturer: 3form, LLC., Salt Lake City, Utah, USA / Telephone 801-649-2500

2.3 Materials

- .1 Hush Clad produced from Sola Felt
 - .1 Recycled Rigid PET Felt
 - .2 Size: Various
 - .3 Thickness: Sola Felt 3/8"
- .2 Sheet minimum performance attributes:
 - .1 Noise Reduction Coefficient (ASTM C423) – 0.35
 - .2 Dynamic environmental testing (ASTM standards D 5116 and D 6670). Panels must not have detectable VOC off-gassing agents and must be have Greenguard™ Indoor Air Quality certified.
 - .3 Panels must be produced from a minimum of 50% post-industrial recycle content.

2.4 Miscellaneous Materials

- .1 General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- .2 Cleaner: Type recommended by manufacturer.

Part 3 EXECUTION

- .1 Examine substrates, areas, and conditions where installation of Acoustic Finishes will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.
- .2 Installation

- .1 General: Comply with manufacturer's written instructions for the installation of Acoustic Finishes.
 - .2 Utilize fasteners provided by manufacturer.
 - .3 Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
- .3 Cleaning and Protection
- .1 Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to NRC Departmental Representative's satisfaction.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Work of this Section includes surface preparation and paint finishes for all new and previously painted exposed and semi-concealed surfaces within the area under contract for which a paint formula is specified.
 - .1 Semi-concealed areas include inside of light troughs and valences, behind grilles, and projecting edges above and below sight lines.
 - .2 Moisture testing of substrates.
 - .3 Provision of safe and adequate ventilation as required where toxic and/or volatile/flammable materials are being used over and above temporary ventilation supplied by others.
- .2 Re-painting previously painted surfaces also includes:
 - .1 Material and installation of site applied paint finishes painting pre-existing painted surfaces.
 - .2 Surface preparation of substrates as required for acceptance of paint, including cleaning, small crack repair, patching, caulking, and making good surfaces and areas to limits defined under MPI Repainting Maintenance Manual requirements.
 - .3 Specific pre-treatments noted herein or specified in the MPI Repainting Maintenance Manual.
 - .4 Sealing/touch-up, spot priming, and/or full priming surfaces for repainting in accordance with MPI Repainting Maintenance Manual requirements.

1.2 REFERENCES

- .1 Environmental Protection Agency (EPA)
 - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).
- .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual, 2005.
 - .2 MPI Maintenance Repainting Manual 2004
- .4 Current National Fire Code of Canada

1.3 PERFORMANCE REQUIREMENTS

- .1 Unless specified otherwise, provide materials and perform the work in accordance with the MPI Premium grade requirements for each system specified.

1.4 QUALITY ASSURANCE

- .1 Qualifications and Experience:

- .1 Painting Subcontractor shall have a minimum of five years proven satisfactory experience. Submit list of last three comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Journeymen shall be qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.
- .3 Apprentices shall work under direct supervision of qualified trades person in accordance with trade regulations.
- .2 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .3 Retain purchase orders, invoices and other documents to prove conformance with specification requirements when requested by Departmental Representative.

1.5 SCHEDULING

- .1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 10 Working Days in advance of proposed operations.
- .2 Paint occupied facilities in accordance with approved schedule.
- .3 Obtain written authorization from Departmental Representative for changes in work schedule.
- .4 Schedule painting operations to prevent disruption of occupants.

1.6 SUBMITTALS

- .1 Submittals in accordance with submittal procedures of Section 01 10 00.
- .2 Product Data:
 - .1 Submit product data and instructions for each paint and coating product to be used prior to ordering materials. Do not order materials until list has been accepted.
 - .2 Submit product data for the use and application of paint thinner.
 - .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 10 00 – General Instructions. Indicate VOCs during application and curing.
- .3 Samples:
 - .1 Submit full range colour sample chips for review and selection. Indicate where colour availability is restricted.

- .2 Prepare samples with stepped application of finish system showing each separate coat, including primers and block fillers.
- .3 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
 - .1 3 mm plate steel for finishes over primed ferrous metal surfaces.
 - .2 3 mm wipe-coat galvanized plate steel for finishes over wipe-coated galvanized metal surfaces such as hollow metal doors and frames.
 - .3 3 mm galvanized plate steel for finishes over galvanized metal surfaces other than hollow metal doors and frames.
 - .4 13 mm birch plywood for finishes over wood surfaces.
 - .5 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
 - .6 13 mm gypsum board of each type specified for finishes over each type of gypsum board specified and other smooth surfaces.
- .4 Include list of material and application for each coat of each sample. Label each sample as to location and application.
- .5 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- .4 Test reports and Certificates:
 - .1 Submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .1 Lead, cadmium and chromium: presence of and amounts.
 - .2 Mercury: presence of and amounts.
 - .3 Organochlorines and PCBs: presence of and amounts.
 - .2 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manual specified in Section 01 10 00 - General Instructions include following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.

1.7

MOCK-UPS:

- .1 Construct mock-ups in accordance with quality assurance requirements of Section 013300 - Submittal Procedures.
 - .1 Provide 3 000 mm x 3 000 mm mock-up.
 - .2 Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements of each interior finish system listed, with specified paint or coating showing selected colours, gloss/sheen, textures.

- .3 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.
- .4 Locate where directed where indicated.
- .5 Allow 24 hours for inspection of mock-up before proceeding with work.
- .6 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may not remain as part of finished work. Remove mock-up and dispose of materials when no longer required and when directed by Departmental Representative.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Pack, ship, handle and unload materials in accordance with manufacturer's written instructions.
- .2 Acceptance at Site:
 - .1 Identify products and materials with labels indicating:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Storage and Protection:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
- .5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- .7 Remove paint materials from storage only in quantities required for same day use.
- .8 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to each 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 National Fire Code of Canada requirements.

1.9 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Provide continuous ventilation for seven days after completion of application of paint.
 - .2 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .3 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
 - .4 Provide minimum lighting level of 323 Lux (30 foot candles) on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Perform painting work when maximum moisture content of the substrate is below:
 - .1 12% for concrete, concrete masonry, clay masonry.
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .2 Test for moisture using calibrated electronic Tramex type moisture meter. Test concrete floors for moisture using "cover patch test".
 - .3 Allow new concrete and masonry to cure minimum of 28 days.
 - .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.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.

1.10 WARNING:

- .1 **DO NOT USE SPRAY EQUIPMENT:** Only paint brush and roller will be accepted on this project.

Part 2 Products

2.1 MATERIALS

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Acceptable Paint: Sherwin Williams or approved equal.

2.2 COLOURS

- .1 Submit proposed Colour Schedule to Departmental Representative for review..
- .2 Colour schedule:
 - .1 P1: Sherwin Williams, Elder White, SW 7014.
 - .2 P2: Sherwin Williams, Dynamic Blue, SW 6958.
 - .3 P3: Sherwin Williams, Gauntlet Grey, SW 7019.
 - .4 P4: Sherwin Williams, Overt Green, SW 6718.
 - .5 P5: Sherwin Williams, Bee, SW 6683.
 - .6 P6: Sherwin Williams, Verve Violet, SW 6975.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Departmental Representative for tinting of painting materials on site.
 - .1 For re-painting, the first coat in a two coat (Premium) repaint system shall be tinted slightly lighter colour than top coat to show visible difference between coats.
 - .2 For painting new surfaces, the second coat in three coat system shall be tinted slightly lighter colour than top coat to show visible difference between coats.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.
- .5 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 is defined as sheen rating of applied paint, in accordance with following values:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 - Matte Finish (flat)	Max. 5	Max. 10
Gloss Level 2 - Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - Satin-Like Finish	20 to 35	min. 35
Gloss Level 5 - Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 - Traditional Gloss	70 to 85	
Gloss Level 7 - High Gloss Finish	More than 85	

- .2 Gloss level ratings of painted surfaces as indicated and as noted on Finish Schedule.

2.5 INTERIOR PAINTING AND RE-PAINTING SYSTEMS

- .1 Electrical backer boards.
 - .1 INT 6.4P – Intumescent fire retardant alkyd coating, gloss level 1 (flat) finish, ULC listed.
- .2 Plaster and gypsum board walls: gypsum wallboard and textured finishes:
 - .1 INT 9.2B - High performance architectural latex, gloss level 4.
- .3 Plaster and gypsum board ceilings, soffits and bulkheads:
 - .1 INT 9.2B - High performance architectural latex, gloss level 1.
- .4 Doors and Frames surface apply:
 - .1 INT 9.2B - High performance architectural latex, gloss level 5 (semi-gloss) finish.
- .5 Concrete horizontal surfaces: Mechanical room floor and housekeeping pads:
 - .1 One coat primer-sealer
 - .2 Two finish coats latex floor enamel, gloss level 5.

2.6 EXISTING PAINTED STEEL SURFACES

- .1 Paint system applicable to:
 - .1 Existing painted steel windows.
 - .2 Existing steel door frames to remain.
- .2 Provide specified paint system products or approved equal:
 - .1 De-greaser: non-flammable, biodegradable synthetic safety solvent based on N-methyl 2-pyrrolidone containing no methylene chloride, methanol or benzenes, in gel and liquid form.
 - .1 Acceptable product and manufacturer: Green Solve as manufactured by Cyndan Chemicals.
 - .2 Primer: Pro-Cryl Universal Primer B66W00310 Off-White as manufactured by Sherwin Williams.
 - .3 Top coat: Water Based Catalyzed Epoxy Part A B73-300 Series (Gloss) with Part B B73V300 Hardener as manufactured by Sherwin Williams.
 - .4 Colour: as indicated on drawings.
 - .1 Tint first coat lighter than top finish coat.

Part 3 Execution

3.1 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Perform preparation and operations for interior re-painting of existing surfaces in accordance with MPI Maintenance Repainting Manual requirements except where otherwise specified.

- .3 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
 - .1 Stucco, plaster and gypsum board: 12%.
 - .2 Concrete: 12%.
 - .3 Clay and Concrete Block/Brick: 12 %.
 - .4 Wood: 15%.

3.3 INSPECTION REQUIREMENTS FOR RE-PAINTING WORK

- .1 Inspect existing interior surfaces requiring repainting and notify Departmental Representative in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.
- .2 Assume responsibility for preparation of surfaces with assessed degree of surface degradation up to and including DSD-2 as defined in MPI Maintenance Repainting Manual.
- .3 Where an assessed degree of surface degradation of DSD-0 to DSD-2 before preparation of surfaces for repainting is revealed to be DSD-3 or DSD-4 after preparation, notify Departmental Representative Do not begin repainting until Departmental Representative issues instruction.

3.4 PREPARATION

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by 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 passing pedestrians, building occupants and general public in and about the building.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to

- undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
- .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
- .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .5 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.
- .6 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes blowing with clean dry compressed air or vacuum cleaning.
- .7 Touch up of shop primers with primer as specified.
- .8 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 APPLICATION

- .1 Apply paint by brush, roller, air sprayer, or airless sprayer. Conform to manufacturer's application instructions, including spreading rates, unless specified otherwise. Method of application shall be approved by Departmental Representative prior to commencement of work.
- .2 Brush and Roller Application:

- .1 Apply paint in uniform layer using brush and/or roller type 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 free of roller tracking and heavy stipple.
- .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray application is not permitted for standard paint products.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .5 Apply each coat of paint in a 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 surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .9 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .10 Finish closets and alcoves as specified for adjoining rooms.
- .11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 EXISTING PAINTED STEEL SURFACES

- .1 In addition to the requirements specified, prepare and apply coatings to the following surfaces:
 - .1 Stair railings, guardrails, stringers, risers and nosings.
 - .2 Hollow steel doors and frames to remain.
 - .3 Existing heat register louvered covers.
 - .1 At option of Contractor, register covers may be removed from site to paint shop for surface preparation and finish painting.
 - .2 For materials taken off site:
 - .1 Prepare inventory of items removed and submit to Departmental Representative.
 - .2 Transport, store and handled all items taken off site protected from all loss, deterioration and damage.
 - .3 Re-finish as specified, including testing.
 - .4 Transport to site and re-install.
- .2 Testing Requirements:

- .1 Prior to complete application, prepare surfaces and apply coatings as specified, for three test areas.
- .2 Allow paint to dry one week and test for adhesion in presence of Departmental Representative.
- .3 If adhesion is poor, perform additional abrasion and re-test.
- .4 Repeat until adhesion is acceptable.
- .3 Abrade existing painted metal surfaces to provide required surface texture.
- .4 Grind all weld burn marks down to smooth, clean, bare metal.
- .5 Clean all particulate matter from surface.
- .6 De-grease existing painted and new bare metal surfaces with specified de-greaser in liquid and/or gel form to suit surface.
- .7 Apply specified primer to all painted and bare metal surfaces in strict accordance with manufacturer's instructions.
- .8 Apply two coats of specified top coat to primed surfaces in strict accordance with manufacturer's instructions.

3.7 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .5 Do not paint over nameplates.
- .6 Keep sprinkler heads free of paint.
- .7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .8 Paint fire protection piping red.
- .9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .10 Paint natural gas piping yellow.
- .11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

- .12 Do not paint interior transformers and substation equipment.

3.8 SITE TOLERANCES

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface when viewed using final lighting source.
- .2 Floors and ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat shall exhibit uniformity of colour and uniformity of sheen across full surface area.

3.9 FIELD QUALITY CONTROL

- .1 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .2 Cooperate with inspection and provide access to areas of work.
- .3 Retain purchase orders, invoices and other documents to prove conformance with specified requirements when requested by Departmental Representative.

3.10 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 splashings 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 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 Departmental Representative.

END OF SECTION

Part 1 GENERAL

1.1 Shop Drawings

- .1 Submit shop drawings in accordance with Section 013300 - Submittal Procedures.
- .2 Clearly indicate fabrication details, plans, elevations, hardware, and installation details.

Part 2 PRODUCTS

2.1 Materials

- .1 Sheet steel: commercial grade, stretcher levelled sheet steel to ASTM A526/A526M-90 with Z275 zinc coating to ASTM A525M-91b.
- .2 Minimum base steel thickness:
 - .1 Panels and doors: 0.8 mm (20 gau.).
 - .2 Pilasters: 1.0 mm (18 gau.).
 - .3 Reinforcement: 3.0 mm (1/8").
- .3 Stainless steel sheet: to ASTM A666-92 type 304 with No. 4 finish.
- .4 Pilaster shoe: 0.8 mm (20 gau.) stainless steel, 75mm (3") high.
- .5 Attachment: stainless steel tamperproof type screws and bolts.
- .6 Hardware:
 - .1 Hinges: concealed heavy duty chrome plated non-ferrous casting, adjustable door-open angle.
 - .2 Latch set: built-in, combination latch, door stop, keeper and bumper chrome plated non-ferrous casting or extrusion.
 - .3 Wall and connecting brackets: anodized aluminum extrusion or casting.
 - .4 Coat hook: combination hook and door bumper, chrome plated non-ferrous casting. Vinyl reinforced tarps.

2.2 Fabrication

- .1 Doors and panels: 25 mm (1") thick, two sheet steel faces pressure bonded to honeycomb core, 600 mm wide x 1473 mm (2'-0" x 4'-10") high.
- .2 Pilasters: 32 mm (1-1/4") thick, constructed same as door, to sizes indicated.
- .3 Headrails: 25 x 40 mm (1" x 1-1/2").
- .4 Pilaster shoes: 75 mm (3") high, die formed stainless steel.
- .5 Provide formed and closed edges for doors, panels and pilasters. Mitre and weld corners and grind smooth.
- .6 Provide internal reinforcement at areas of attached hardware and fittings. Temporarily mark location of reinforcement for tissue holders.
- .7 Provide 0.8 mm (20 gau.) thick type 316 stainless steel protective shields on urinal side of toilet partition panels next to urinals. Make protective shields 600 mm wide x 800 mm high (2'-0" x 2'-8") with top of shield 1200 mm (4'-0") above finished floor. Fasten with stainless steel screws.

2.3 Shop Finishing

- .1 Clean, degrease and neutralize steel components with phosphate or chromate treatment.
- .2 Spray apply primer to CAN/CGSB-1.81-M90, 1 coat.
- .3 Spray apply finish enamel to CAN/CGSB-1.88-92, type 2 gloss, 1 coat and bake to smooth, hard finish.
- .4 Finish: doors and pilaster/panels same colour as selected from manufacturer's standard colour by the Departmental Representative.

Part 3 EXECUTION

3.1 Partition Erection

- .1 Install partitions secure, plumb and square.
- .2 Leave 12 mm (1/2") space between wall and panel or end pilaster.
- .3 Attach fixing brackets securely to masonry/ concrete surfaces using screws and shields: to hollow walls using bolts and toggle type anchors.
- .4 Attach panel and pilaster to brackets with through type sleeve bolt and nut.

- .5 Provide for adjustment of floor variations with screw jack through steel saddles made integral with pilaster. Conceal floor fixings with stainless steel shoes.
- .6 Equip each door with hinges, latch set, and coat hook. Adjust and align hardware for easy, proper function. Set door open position at 30° to front, opening inward.
- .7 Make good baked enamel surfaces damaged during shipment or installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 09 22 16 Non-Structural Metal Framing: Sheet metal support for wall and corner guards.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM B456-11, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 - .3 ASTM A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .4 ASTM A924/A924M-10a, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.5-M86, Mirrors, Silvered.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-B651-12 Accessible Design for the Built Environment.
 - .2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 013300 - Submittal Procedures.
- .2 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars, shower seats.

1.4 SAMPLES

- .1 Submit samples in accordance with Section 013300 - Submittal Procedures.
- .2 Samples will be returned for inclusion into work.

1.5 PRODUCTS INSTALLED BUT NOT SUPPLIED BY THIS SECTION

- .1 Soap dispenser (SD): Supplied by Owner with installation by Contractor.
- .2 Toilet tissue dispenser (TTD): Supplied by Owner with installation by Contractor.
- .3 Paper towel dispenser (PTD): Supplied by Owner with installation by Contractor.
- .4 Sanitary napkin disposal (SND): Supplied by Owner with installation by Contractor.

1.6 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in closeout submittal requirements of Division 01.
- .2 Include three (3) copies of list of accessories requiring particular supply, including the names and addresses of local distributors of required supplies.
- .3 Submit three sets of the following items of manufacturer's literature:
 - .1 Technical data sheets for each item used for the project.
 - .2 Service and parts manuals and schedules.
 - .3 Name of local representative to be contacted in the event of need of field service or consultation.

1.7 EXTRA MATERIALS

- .1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with closeout procedures of Division 01.
- .2 Deliver special tools to Owner.

1.8 WARRANTY

- .1 Provide a warranty for mirrors in accordance with General Conditions of the Contract, but for five (5) years.

Part 2 Products

2.1 GENERAL

- .1 Provide accessories as indicated, and including options specified. Model numbers may not reflect all options required.
- .2 Provide stainless steel collars to accommodate semi-recessed mounting of units whose depth exceeds the wall cavity depth.

2.2 ACCEPTABLE PRODUCTS AND MANUFACTURERS

- .1 Products are listed in specification with named manufacturer as basis of design. Corresponding equal products from other manufacturers are acceptable, subject to the review and acceptance by Consultant for conformity with requirements.
- .2 In the event of dispute provide specified products.
- .3 Provide products for the Work of this Section from a single manufacturer and keyed alike.

2.3 MATERIALS

- .1 Galvanized sheet steel: commercial quality to ASTM A526M with ZF001 designation zinc coating, minimum thickness 22 gauge.

- .2 Stainless steel sheet metal: to ASTM A167, Type 304, No. 4 satin finish, minimum thickness 18 gauge, unless specified otherwise.
 - .1 Arrange stainless steel sheet so that grain of finish runs vertically in the finished installation.
- .3 Stainless steel tubing: Type 304, commercial grade, seamless welded, No. 4 satin finish, except where specified otherwise.
- .4 Chrome and nickel plating: to ASTM B456, polished finish except where specified otherwise.
- .5 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.
- .6 Lettering for identification of washroom accessories and operation instructions: silk-screened using international symbols unless otherwise specified.
- .7 Manufacturer's or brand names on face of units not acceptable.
- .8 Sheet steel: to ASTM A653/A653M with ZF001 designation zinc coating.

2.4 ACCESSORIES AND FIXTURES

- .1 Mirror:
 - .1 Tilt Mirror (TM):
 - .1 Mirror Frame: 18-8, type 304, heavy-gauge stainless steel, 19 x 19mm angle with vertical-grain satin finish. One piece, rollformed construction forms continuous integral stiffener on all sides. Bevel design on front of angle holds frame tightly against mirror. Corners of mirror frame are heliarc welded, ground and polish smooth. Galvanized steel back is fastened to frame with concealed screws and equipped with integral horizontal hanging brackets near the top and bottom of the mirror for hanging the mirror and to prevent the mirror from pulling away from the wall frame.
 - .2 Wall Frame: 18-8, type 304, heavy-gauge stainless steel with satin finish. Tapers from 111mm depth at top to 33mm depth at bottom. Wall Frame furnished with tumbler lock to secure mirror to wall frame.
 - .3 Mirror: No. 1 quality, 6mm select float glass, selected for silvering; electrolytically copper-plated by the galvanic process, guaranteed for 15 years against silver spoilage. All edges are polished and protected by plastic filler strips; back is protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3mm thick polystyrene padding.
 - .4 Size: 610mm (W) X 920mm (h)
 - .5 Acceptable product and manufacturer Bobrick B-293-2436, or approved equal.
 - .2 Fixed Mirror (FM):
 - .1 Frame: 18-8, heavy-gauge stainless steel, 19 x 19mm angle with satin finish. One-piece, roll-formed construction forms continuous integral stiffener on all sides. Bevel design on front of angle holds frame tightly

against mirror. Corners of mirror frame are heliarc welded, ground and polish smooth. Galvanized steel back is fastened to frame with concealed screws and equipped with integral horizontal hanging brackets near the top and bottom of the mirror for hanging the mirror and to prevent the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger.

- .2 Mirror: No. 1 quality, 1/4" (6mm) select float glass (standard glass): selected for silvering, electrolytically copper-plated by the galvanic process, and guaranteed for 15 years against silver spoilage. All edges protected by plastic filler strips; back is protected by full-size, shock-absorbing, water-resistant, nonabrasive, 5mm thick polyethylene padding.
 - .3 Concealed Wall Hanger: Galvanized steel construction. Incorporates upper and lower support members, which engage lower backplate louvers to keep bottom of mirror against wall.
 - .4 Size: 610mm (W) X 915mm (H).
 - .5 Acceptable product and manufacturer Bobrick B-290-2436, or approved equal.
- .2 Back rest (BR): Solid plastic laminate back rest 254 mm wide x 102 mm high x 16 mm thick, white finish, with 32 mm stainless steel tubing 1.6 mm wall thickness, concealed fastener mounting.
- .1 Acceptable product and manufacturer: Toilet Backrest Code 1028 as manufactured by Frost, or approved equal.
- .3 Grab bars (GB): 38 mm diameter stainless steel tubing with 1.6 mm wall thickness, 76 mm diameter wall flanges welded to tube, concealed mounting, peened gripping surface. Include steel backplates and all accessories necessary for installation. Installed grab bar shall withstand downward force of 2.2 kN.
- .1 Acceptable product: Bobrick B-5806.99 series, length and configuration as indicated.
- .4 Coat hook (CH): Satin finish stainless steel. Flange 50 x 50mm; hook is 40 mm high x 20 mm high. Projects 40 mm from wall.
- .1 Acceptable product: Bobrick model B-76717, or approved equal.
- .5 Semi-recessed waste receptacle (WR): Type 304 Stainless steel all welded construction, satin finish, curved front and radiused corners on formed one-piece seamless removable front panel; waste receptacle liner with bag holder.
- .1 Acceptable product: Bobrick model B-43644, or approved equal.
- .6 Shelf (SF):
- .1 18-gauge (1.2mm), type 304 stainless steel, satin finish.
 - .2 405mm long x 125mm wide, 19mm return edge; front edge is hemmed for safety.
 - .3 Brackets are 16-gauge.
 - .4 Acceptable product: Bobrick model B-295 x 16, or approved equal.

2.5 FABRICATION

- .1 Fabricate accessories true, square, rigid, free from distortion and defects detrimental to appearance and performance.

- .2 Visible joints, where permitted, shall be straight, accurate, hairline butt joints. Corner joints shall be mitred.
- .3 Weld and grind joints of fabricated components flush and smooth. Exposed welded joints shall not be visible to the unassisted eye. Use mechanical fasteners only where approved.
- .4 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .5 Brake form sheet metal work with 1/16 inch radius bends.
- .6 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .7 Back paint components where contact is made with building finishes, cementitious materials and dissimilar metals to prevent electrolysis.
- .8 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164-M1981.
- .9 Shop assemble components and package complete with anchors and fittings.
- .10 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .11 Provide steel anchor plates and components for installation on studding and building framing.
- .12 Provide stainless steel collars as required where fixture depths is greater than the allowable recess depth of the wall.
- .13 Bar diameter shall be uniform around curves without distortions. Grab bar joints and supports shall be contour cut and heliarc welded.
- .14 Except where specified otherwise, assembly fastenings, hardware fixings, and mounting or installation devices shall be concealed in the finished work.
- .15 Where items are specified as frameless, fronts shall be formed in one piece with 90 degree formed returns continuously welded and ground smooth at the corners. Form doors with 90 degree returns, welded and ground.
- .16 Hinges shall be concealed stainless steel piano hinges and shall extend full length of hinged element. Provide hinges with concealed, mechanically retained rubber bumpers for silent closing, Hinged elements shall close flush with faces of fronts or frames.
- .17 Unless otherwise specified exposed portions of sheet metal work shall be stainless steel. Concealed sheet metal parts shall be galvanized or stainless steel.
- .18 Changes in plane shall be formed or continuously welded and ground smooth.
- .19 All edges of metal that are accessible by users or maintenance personnel shall hemmed for safety.

2.6 FASTENERS

- .1 Provide all anchors and fasteners necessary for complete installation of each item.
- .2 Provide fasteners of non-corrosive metal, compatible with adjacent materials as follows:
 - .1 Chemical anchor bolts in hollow masonry.
 - .2 Expansion shields in solid masonry or concrete.
 - .3 Toggle bolts in hollow construction.
- .3 Provide exposed fasteners, where permitted, finished to match adjacent surface finish and countersunk flush with surrounding surface.
- .4 Where accessories are to be mounted to sheet metal, provide minimum 1/8 inch thick full size metal back-up plate drilled and tapped to receive machine screws
 - .1 Exposed plate shall be finished to match adjacent sheet metal surface.

Part 3 Execution

3.1 INSTALLATION

- .1 Install fixtures, accessories and other components in accordance with manufacturer's instructions and as specified.
- .2 Coordinate installation with adjacent construction to achieve required edge conditions. Install fully-recessed, frameless accessories flush with finished wall surface.
- .3 Install and secure accessories rigidly in place as follows:
 - .1 Stud walls: install steel back-plate to stud framing prior to plaster or drywall finish.
 - .1 Where specified, provide plate with threaded studs or plugs.
 - .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
 - .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
 - .4 Toilet/shower compartments: use male/female through bolts.
- .4 Install grab bars on built-in anchors or proprietary anchors provided by bar manufacturer.
- .5 Install shower seats with solid wood blocking and additional stud framing and bridging as necessary for loading.
- .6 Use tamper proof screws/bolts for fasteners.
- .7 Fill units with necessary supplies shortly before final acceptance of building.
- .8 Install mirrors in accordance with Section 08 80 50 - Glazing.

3.2 LOCATION AND QUANTITY

- .1 Determine quantities from drawings.

- .2 Locate accessories as indicated. Exact locations will be determined on site.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI).
 - .1 ANSI A208.1-2009, Standard for Particleboard.
- .2 American National Standards Institute / Business & Institutional Furniture Manufacturers Association
 - .1 ANSI/BIFMA X5.5-2014 Desk Products
- .3 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-44.227-2008 Free-Standing Office Desks and Components
 - .2 CAN/CGSB-44.232-2002, Task Chairs for Office Work with Visual Display Terminals.
- .4 Underwriters' Laboratories Canada (ULC).
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surfaces Burning Characteristics of Building Materials and Assemblies.
- .5 Underwriters' Laboratories (UL).
 - .1 UL 1286 2008, Standard for Office Furnishings.

1.2 SUBMITTALS

- .1 Submit product data in accordance with submittal procedures of Section 013300 - Submittal Procedures. Indicate conformance to specified reference standards and specifications.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with submittal procedures of Section 013300 - Submittal Procedures. WHMIS MSDS acceptable to Health Canada.
- .3 Supply part numbers of furniture to allow for replacement of worn or damaged furniture parts.
- .4 Supply instructions detailing procedures for repairing or replacing worn furniture parts.

1.3 DELIVERY, HANDLING AND STORAGE

- .1 Deliver, store and handle furniture in accordance with manufacturer's recommendations, using means and methods as necessary to prevent all damage, deterioration and loss.
- .2 Schedule delivery to minimize time of storage at site and to prevent overcrowding of construction areas. Do not deliver furniture until all painting, flooring and overhead work is complete and products are required for installation.
- .3 Deliver products in manufacturer's original sealed containers or wrappings, complete with labels and instructions for handling, storing, unpacking, protecting and installing.
- .4 Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are free from damage and deterioration and are properly protected.

1.4 WARRANTY

- .1 Provide written assurance that replacement parts will be available for minimum of 5years following discontinuation of product manufacture.
- .2 Ensure warranties provide for repair rather than replacement.

Part 2 Products

2.1 FURNITURE PRODUCTS

- .1 Specification is based on products as listed by a stated manufacture. Equivalent products with similar design and function must be submitted to the Departmental Representative for review, conformance to design concept and accommodation requirements.
- .2 Provide all finished products specified in this section as the products of a single manufacturer with a minimum of ten (10) years experience in the manufacturing of office furniture.
- .3 Products shall conform to applicable requirements of CAN/CGSB-44.227, CAN/CGSB-44.232, and UL 1286.
- .4 Surface burning characteristics shall conform to requirements of National Building Code of Canada when tested in accordance with CAN/ULC-S102.

2.2 GUEST CHAIR – Manager’s Stations: 113G, 132A & 132B, Quiet Rooms 120, 128.

- .1 Dimensions:
 - .1 Seat height: 445 mm.
 - .2 Overall height: 812 mm.
 - .3 Overall depth: 610 mm.
 - .4 Overall width: 457 mm.
- .2 Features:
 - .1 Upholstered Seat GR 2.
 - .1 Seat foam, cut foam standard.
 - .2 Woven+ mesh back.
 - .3 Color selected by Departmental Representative from manufacturer’s full range.
 - .4 Ganging brackets with arms.
 - .5 Carpet casters
 - .6 Tubular steel frame, silver finish.
- .3 Similar product to:
 - .1 Inertia Mesh Side Chair as manufactured by Allseating, or approved equal.

2.3 MEETING ROOM CHAIRS – Meeting Rooms 112, 114, 131 and 133

- .1 Dimensions:
 - .1 Seat height: 417 - 533 mm.

- .2 Overall height: 991 - 1118 mm.
- .3 Overall depth: 686 mm.
- .4 Overall width: 711 mm.
- .5 Seat width: 470 mm.
- .6 Seat depth: 457 mm.
- .2 Features:
 - .1 Frame: 22 mm solid steel frame, constructed for strength and durability.
 - .2 Seat: Upholstered with foam pad.
 - .1 Color selected by Departmental Representative from manufacturer's full range.
 - .2 Upholstery: Grade 2
 - .3 Back: Midback, mesh.
 - .1 Color selected by Departmental Representative from manufacturer's full range.
 - .2 Lumbar support with 89mm adjustment.
 - .4 Control Mechanism: Synchro tilt.
 - .5 Height Adjustment: Standard pneumatic.
 - .6 Casters: 65mm carpet Casters Standard.
 - .7 Chair Style:
 - .1 Arms: Conference Arm.
 - .2 Base: 5 prong base with casters.
 - .3 Arms: Fixed conference arms.
- .3 Similar product to:
 - .1 Soji task chair with fixed arms (back lock & forward tilt w/seat depth adjustment) as manufactured by Haworth, or approved equal.

2.4 MEETING ROOM STACKING CHAIRS – Meeting Rooms 112, 114.

- .1 Dimensions
 - .1 Seat height: 457 mm.
 - .2 Overall height: 813 mm.
 - .3 Overall depth: 546 mm.
 - .4 Overall width: 599 mm.
 - .5 Seat width: 483 mm.
 - .6 Seat depth: 4457 mm.
- .2 Features:
 - .1 Stacking chair, stacks 10 high with dolly
 - .2 Arms and molded floor glides to match frame colour.
 - .3 Tablet arm:
 - .1 Right 80%
 - .2 Left 20%
 - .4 Upholstered polypropylene back shell and upholstered seat.

- .1 Color selected by Departmental Representative from manufacturer's full range.
- .3 Frame colour: metallic black..
- .4 Similar product to:
 - .1 Improv Stacking Chair as manufactured by Haworth Seating, or approved equal.

2.5 MEETING ROOM STACKING CHAIR DOLLY - Meeting Rooms 112, 114.

- .1 Dimensions:
 - .1 Height: 381mm
 - .2 Width: 616mm
 - .3 Depth: 711mm
- .2 Features:
 - .1 76mm hard rubber casters
 - .2 Colour: black.
- .3 Special Notes: Supply 1 dolly for every 10 stacking chairs.
- .4 Similar product to:
 - .1 Improv Series, MPRV-CART as manufactured by Haworth Seating, or approved equal.

2.6 TASK CHAIR – Hoteling Workstations

- .1 Dimensions:
 - .1 Seat height: 419 - 527 mm.
 - .2 Overall height: 1016 - 1124 mm.
 - .3 Overall depth: 711 mm.
 - .4 Overall width: 711 mm.
 - .5 Seat width: 470 mm.
 - .6 Seat depth: 470 mm.
 - .7 Back height: 597 mm.
 - .8 Back width: 482 mm.
- .2 Features
 - .1 Frame: 22 mm solid steel frame, constructed for strength and durability.
 - .2 Seat: Upholstered with foam pad.
 - .1 Color selected by Departmental Representative from manufacturer's full range.
 - .2 Upholstery: Grade 2
 - .3 Back: Highback, mesh.
 - .1 Color selected by Departmental Representative from manufacturer's full range.
 - .4 Control Mechanism: Synchro tilt.

- .5 Casters: 65mm carpet Casters Standard.
- .6 Frame finish: Polished Aluminum
- .7 Chair Style:
 - .1 Arms: Conference Arm.
 - .2 Base: 5 prong base with casters, chrome finish.
 - .3 Arms: Fixed conference arms.
- .3 Similar product to:
 - .1 Inertia Conference Highback Chair as manufactured by Allseating, or approved equal.

2.7 TABLET CHAIR – Quiet Room 130

- .1 Dimensions:
 - .1 Seat height: 440 – 550 mm.
 - .2 Overall height: 765 – 870 mm.
 - .3 Overall depth: 795 mm.
 - .4 Overall width: 630 mm.
- .2 Features:
 - .1 Base and yolk, polished aluminum
 - .2 Five star base, polished aluminum.
 - .3 Fully upholstered, GR 2.
 - .1 Color selected by Departmental Representative from manufacturer’s full range.
 - .4 Moulded foam construction.
 - .5 Tablet arm.
 - .6 Cup holder.
- .3 Similar product to:
 - .1 Sholes Lounge Arm Chair (SHLED03) as manufactured by Allermuir Sholes, or approved equal.

2.8 STACKING CHAIR – Open Collaboration Area (OCA) 119 & Kitchenette 121

- .1 Dimensions
 - .1 Seat height: 457 mm.
 - .2 Overall height: 862 mm.
 - .3 Overall depth: 584 mm.
 - .4 Overall width: 546 mm.
 - .5 Seat width: 438 mm.
 - .6 Seat depth: 457 mm.
 - .7 Back height: 362 mm
 - .8 Back width: 470 mm
- .2 Features:

- .1 Stacking chair, stacks 12 high.
- .2 Sled base,
- .3 Polypropylene seat and back.
 - .1 Color selected by Departmental Representative from manufacturer's full range.
- .3 Frames finish chrome.
- .4 Similar product to:
 - .1 Tuck Stacking Chair as manufactured by Allseating Seating, or approved equal.

2.9 STACKING STOOL - Open Collaboration Area (OCA) 119

- .1 Dimensions:
 - .1 Seat height: 787 mm.
 - .2 Overall height: 1162 mm.
 - .3 Overall depth: 699 mm.
 - .4 Overall width: 622 mm.
 - .5 Seat width: 438 mm.
 - .6 Seat depth: 483 mm.
 - .7 Back height: 362 mm
 - .8 Back width: 470 mm
- .2 Features:
 - .1 Stacking barstool, stacks 5 high.
 - .2 Sled base,
 - .3 Polypropylene seat and back.
 - .1 Color selected by Departmental Representative from manufacturer's full range.
- .3 Frames finish chrome. Similar product to:
 - .1 Tuck Bar Stool as manufactured by Allseating Seating, or approved equal.

2.10 MOBILE LOUNGE CHAIR Open Collaboration Area (OCA) 113A

- .1 Dimensions
 - .1 Seat height: 438 mm.
 - .2 Overall height: 883 mm.
 - .3 Overall depth: 660 mm.
 - .4 Overall width: 781 mm.
 - .5 Arm height: 241 mm.
 - .6 Seat width: 476 mm.
 - .7 Seat depth: 495 mm.
- .2 Features

- .1 Upholstered back/seat.
 - .2 Passive lumbar back support.
 - .3 360° swivel base.
 - .4 Casters: Standard with two-tone hard casters.
 - .5 Fabric: Different fabrics for each of seat and back as selected by Departmental Representative from manufacturer's full range.
 - .6 Grommets to accommodate cup holder and tablet arm non- handed (reversible)
 - .7 Tablet and cup holder: Standard Laminate finish
 - .8 Swivel base, back support uprights and grommets: metal construction finished in metallic silver.
- .3 Acceptable product and manufacturer:
- .1 Hello Mobile as manufactured by Haworth Inc, or approved equal.

2.11 SIT TABLE – Quiet Rooms: 120, 130 & Open Collaboration Area (OCA) 119 & Kitchenette 121

- .1 Table Top Finish: HPDL wood grain laminate.
- .2 Tables tops
 - .1 Thickness: 30 mm thick.
 - .2 Table edge: PVC edgeband
 - .3 Table Shape: Round
 - .4 Table size:
 - .1 Quiet Rooms: 120, 130 & Open Collaboration Area 119: 915 mm diameter by 724 mm high.
 - .2 Kitchenette 121: 1524mm Diameter by 724mm high.
- .3 Table Base: Single Column X-Base with glides.
- .4 Similar product to:
 - .1 Everywhere Table as manufactured by Herman Miller, or approved equal.

2.12 BAR HEIGHT TABLE - Open Collaboration Area (OCA) 119

- .1 Dimensions:
 - .1 Overall Height: 1067 mm.
 - .2 Length: 2438 mm.
 - .3 Width: 610 mm.
- .2 Tables top:
 - .1 Table Top Finish: Laminate.
 - .1 Color selected by Departmental Representative from manufacturer's full range.
 - .2 Thickness: 30 mm thick.
 - .3 Table edge: 2mm.

- .4 Table Shape: Rectangular,
- .3 Gable Ends: 50 mm End Panels.
 - .1 Gable Finish: Laminate.
 - .1 Color selected by Departmental Representative from manufacturer's full range.
- .4 Similar product to:
 - .1 Endzone 50 mm End Panel as manufactured by Spec Furniture Inc, or approved equal.

2.13 MEETING ROOM TABLE – Meeting Room 131 and 133

- .1 Table top construction: manufacturer's standard core with HPDL wood grain laminate finish, rectangular shape.
 - .1 Meeting rooms 131 and 133: 1067 mm x 2440 mm, 50 mm thick tabletop, with column base.
 - .2 Column base: dimensions to suit table size, MDF core with HPDL wood grain laminate, 1 mm thick edgebanding, heavy duty steel frame built with brackets for cable management, cable access panels and cutouts, leveling glides with 12 mm adjustment.
 - .3 Power and data module: clear anodized aluminum sliding module with two power and two data/communications outlets each.
- .2 Similar product to:
 - .1 Planes collection as manufactured by Haworth Inc. or approved equal.

2.14 MEETING ROOM TABLE – Meeting Room 112, 131 and 133

- .1 Dimensions:
 - .1 Table Top:
 - .1 Thickness: 30mm
 - .2 Width: 762mm
 - .3 Length: 1524mm
 - .2 Table Height: 737mm.
- .2 Base: Flip top table.
 - .1 Painted aluminum C-leg, glide stem and stretcher.
 - .2 Casters, locking
- .3 Table Top: Flip Top Table:
 - .1 Table top flips from horizontal to vertical position via pneumatic assist mechanism Activated by two finger pulls.
 - .2 Table nest when flipped to vertical position.
 - .2 Table top construction: manufacturer's standard core with HPDL wood grain laminate finish, rectangular shape.
- .3 Flip Top Unit Electrical Module:
 - .1 3 power, 1 dual USB-A,
 - .2 3048mm cord.
 - .3 Adjustable top mounted bracket.

Similar product to:

- .1 Planes collection as manufactured by Haworth Inc. or approved equal.

2.15 DUAL MONITOR ARM – All Workstations and Manager’s Stations

.1 Features:

- .1 Supports two monitors 2.3kg to 6.8
- .2 Maximum monitor height: 500mm (full range of motion)
- .3 Articulation range: 330mm.
- .4 Forward reach: 390mm.
- .5 Monitor: Tilt: +90°/-45°; Pivot: +/-90°; Rotation: +/-90° Grommet bolt through mount.
- .6 Standard VESA (75mm & 100mm).
- .7 Silver with black accents.

.2 Similar product to:

- .1 Workrite Conform Dual Articulating Dual Monitor Arm as manufactured by Workrite, or approved equal.

Part 3

3.1 FABRICATION

- .1 Manufacture furniture to allow for dismantling and replacing of worn or defective components and recycling options following first use.
 - .1 Fabricate furniture to allow for remanufacturing or refurbishing of furniture following first use.
 - .2 Seal exposed surfaces of particleboard constructed with urea formaldehyde adhesives to contain formaldehyde emissions.
- .2 Chair Marking and labelling: to CAN/CGSB-44.232.

Part 4 Execution

4.1 EXAMINATION

- .1 Examine Project site 24 hours before first delivery, including loading dock area, elevators and staging areas to ensure conditions are satisfactory for proper performance of the Work.
- .2 Note existing damage to building or debris that hinders performance and report to Departmental Representative.
- .3 Examine products immediately upon delivery and again prior to installation. Reject damaged or defective items and remove from site.
- .4 Do not proceed until unsatisfactory conditions have been corrected.

4.2 INSTALLATION OF FURNITURE

- .1 Comply with manufacturer's installation instructions and recommendations.
- .2 Provide connection devices, hardware, and accessories required for complete installation.

4.3 CLEANING AND ADJUSTMENT

- .1 Remove and replace products that are chipped, scratched, delaminated, or otherwise defective and do not match adjoining Work or do not operate properly. Provide new matching units, installed as specified and without evidence of replacement.
- .2 Adjust to provide smooth operation of moving parts without binding or racking, levelled to prevent rocking.
- .3 Clean furniture of all soil marks, dust, fingerprints and loose threads.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Division 26 Electrical: Electrical services for work stations.
- .2 Division 27 Communications: Communications cabling and connections for work stations.

1.2 REFERENCES

- .1 American National Standards Institute / Business & Institutional Furniture Manufacturers Association
 - .1 ANSI/BIFMA X5.5-2014 Desk Products
 - .2 ANSI/BIFMA X5.6-2010 Panel Systems
 - .3 ANSI/BIFMA X5.9-2012 Storage Units
 - .4 ANSI/BIFMA X7.1-2011 Standard for Formaldehyde & TVOC Emissions.
- .2 Canadian General Standards Board
 - .1 CAN/CGSB-44.227-2008 Free-Standing Office Desks and Components
 - .2 CAN/CGSB-44.229-2008 Inter-connecting Panel Systems and Supported Components.
- .3 Underwriters Laboratories
 - .1 UL 1286 Standard for Office Furnishings

1.3 SCOPE OF WORK

- .1 Include all panels and furniture components as indicated on the drawings.
- .2 Panel systems to include base and/or stackable units, separate and/or in combination to provide an architectural look and function as specified and as indicated.
- .3 Panels to be wired by installers for hook-up by others. Panels are to have desk height or base accessible data, telephone and power, as outlined on drawings. The raceway to be accessible from one or both sides.

1.4 MANUFACTURERS & PRODUCTS

- .1 The standard of performance for manufacturer's products and panels are as specified herein and as generally described by the latest edition of CAN/CGSB-44.229 for Inter-connecting Panel Systems and Supported Components. Free-Standing Components to meet CAN/CGSB-44.227.
- .2 Local representation with a local sales office and locally available factory trained and certified installers is a requirement.
- .3 Submit all design and associated design material including shop drawings for review in accordance with submittal requirements of Section 013300 - Submittal Procedures.

- .4 Manufacturers are to demonstrate by mock-ups the ability to meet the technical specifications, stability without the support of furniture components and load bearing ability with stacking components without changing base units. Mock-up should also show a typical side by side workstation with and without work surfaces and accessories.
- .5 Demonstrations and mock-ups of product shall be carried out locally at supplier showroom, on site or other local installation.

1.5 SUBMITTALS

- .1 Submit all necessary test reports, samples and other information required to demonstrate that the products to be installed meet all performance criteria specified herein. Systems certification to CAN/CGSB-44.229 Standard. Assembled panels to meet Flame Spread and Smoked Developed Index of the National Building Code of Canada.
- .2 Provide test reports from a recognized testing laboratory or agency.
- .3 Show complete plans of the work at 1:100 or a scale sufficient to indicate:
 - .1 Widths and heights of all panels.
 - .2 Locations of panel joins, vertical and horizontal.
 - .3 Finish of each side of each panel,
 - .4 Locations of all components,
 - .5 Heights of work surfaces and accessories indicated.
 - .6 Points of connection of powered panels to hard-wired circuits,
 - .7 Locations of all electrical and telephone and data outlets
- .4 Update shop drawings upon completion of installation to show completed (as-built) layout in AutoCAD format, as requested by Departmental Representative and in accordance with Department CAD Standards.

1.6 WARRANTY

- .1 Provide a written warranty, signed and issued in the name of National Research Council of Canada by the manufacturer stating that the post and panel demountable partitions system is guaranteed against defects in materials and workmanship of the systems as a whole or of any component for a period of five (5) years and against obsolescence for a period of ten (10) years from the date of Substantial Completion.
- .2 Replacement of defective material to be provided at no cost for parts, labourer, and transportation for first five (5) years.
- .3 Provide replacement parts, including transportation, for five (5) years after initial five (5) years from date of Substantial Completion at no cost to the National Research Council of Canada.

1.7 MAINTENANCE DATA

- .1 Provide two (2) sets of Maintenance and Operations Manuals in accordance with closeout procedures of Section 011000 - General Instructions, including assembly, disassembly, refinishing and reupholstering and maintenance data.

1.8 DIMENSIONS

- .1 Provide panels as dimensioned on drawings.
- .2 Panel heights shall consist of a base panel with or without added stacking panels to achieve panel division heights as indicated on drawings.
- .3 Dimensions noted on the drawings are critical minimums required to accommodate specific furniture and provide adequate corridor and exit widths that meet NBCC, latest edition, Exit Requirements.
- .4 Dimensions of workstations shall not be scaled from the drawings. Workstations are to be constructed using the minimum number of standard panels yielding the total length of the dimension provided such that specified and future components or furniture can be installed in the indicated location. Layouts to accommodate future or specified furniture layouts as shown by combination panel hung and floor supports without having to be reconfigured.
- .5 Panels and workstation components to the manufacturer's nearest standard size to the metric dimensions indicated.
- .6 Panels and panel ends delineating corridors to fall on straight lines.

1.9 SCHEDULING

- .1 Departmental Representative to approve installation schedule. Schedule time for inspections and training.

1.10 MAINTENANCE MATERIALS

- .1 Provide 150 ml quantity of touch-up fluid for the repair of paint-type surfaces. Supply touch-up fluid in small containers.
- .2 Maintenance materials to be of the same production run, and dye lot as the installed materials.

PART 2 PRODUCTS

2.1 ACCEPTABLE PRODUCTS AND MANUFACTURERS

- .1 Specification is based on Compose as manufactured by Haworth. Equivalent products with similar design and function must be submitted to the Departmental Representative for review, conformance to design concept and accommodation requirements.
- .2 The following products and manufacturers are acceptable, subject to conformance with the specification and drawings:
 - .1 Compose as manufactured by Haworth.
 - .2 Answer as manufactured by Steelcase.
 - .3 Leverage as manufactured by Teknion
 - .4 Cosmopolitan as manufactured by Tayco.

- .3 Provide all primary products specified in this section as the products of a single manufacturer with a minimum of ten (10) years experience.

2.2 PANELS

- .1 Panel Types:
 - .1 Panel thickness: 75 mm +/- 5 mm.
 - .2 Standard panel width +/- 25mm:
 - .1 915 mm
 - .2 610 mm
 - .3 1219 mm
 - .4 1524 mm
 - .5 Other panel sizes for closure panels may be required.
 - .3 Standard panel heights:
 - .1 1270 mm +/- 25 mm
 - .2 1676 +/- 25 mm
 - .4 Use combinations of panel widths and heights listed above to achieve workstation layouts indicated on drawings..
- .2 Architectural glazed elements: single pane 6.0 mm clear tempered glass, frameless, for panels as indicated.
 - .1 Glass panel-topper height:
 - .1 200 mm.
- .3 Panel construction: Panels to be capable of providing telephone, data and power as indicated. Manufacturer to provide power from building connection to receptacle locations. Cover panels with the specified fabric, attached to allow field re-upholstery without removing the panel. Trim panels with durable top and side rail. If caps are required by manufacturer to provide trim look, caps are to be metal or PVC unless noted otherwise. Trim to be finished with the manufacturer's standard powder coated finish, colour to be selected by Departmental Representative. Panels to be load bearing up to 1700 mm.
- .4 Panel frames:
 - .1 Frames shall consist of four roll-formed cold rolled steel tubes welded together at the corners into a rectangular frame and finished using an e-coating process. Frames shall be load bearing.
 - .2 Panels shall be reinforced to accommodate cantilevered work surfaces, shelves and storage units.
- .5 Panel core: no-added formaldehyde molded fiber-pad insert.
- .6 Panel joints: Panels shall be jointed with manufacturer's standard closure providing a sight and sound seal as tight as possible (maximum allowable gap of 3 mm). Provide equal sight and sound, seal at existing construction, where wall mounts are used.
 - .1 Panels shall have the capability to stack up to 90" and be connect to one another via a bolted connection.

- .2 Panel connectors must be universal for use in all 90 degree conditions (2-,3- and 4-way conditions shall be orderable as a single line item).
- .7 Support: Manufacturer's standard, to permit up to 38 mm +/- 5 mm adjustment. Provide two (2) corrosion resistant supports per panel and provide grippers for each support leg for the finished floor. Provide extended leg support to meet site conditions at no extra cost. Provide support for panels independent of work surfaces. Provide stabilizing panels as required, where wall attachment is not possible.
- .8 Fabric: Fabric pattern/style as selected by Departmental Representative from manufacturers full range, meeting this specification. Several colors or patterns may be used throughout, limited to three (3) different colors or patterns. Fabric to meet the following minimum requirements:
 - .1 Content: 100% polyester (may contain recycled material)
 - .2 Weight: Between 275 and 400 g per linear m
 - .3 Width: min 1675 mm
 - .4 Directional: Non-directional
 - .5 Fabric to meet the Association of Contract Textiles (ACT), Fabric Performance Guidelines.
- .9 Adjustment: Panels to allow for work surface components and accessories to be adjusted in height in 25 mm increments.

2.3 FURNITURE COMPONENTS

- .1 Manufacturer's standard systems furniture as shown on the drawings.
- .2 Provide standard supports and accessories required for proper installation and functioning of the furniture components. Provide accessories for optimum rigidity of work surfaces and other items without attaching panel bottoms or legs to building structure. Where support legs are necessary provide corrosion resistant supports and two (2) per panel.
- .3 Colours as selected by the Departmental Representative from the manufacturer's full range.
- .4 Provide numbers and types of units indicated:
- .5 Work Surfaces:
 - .1 Straight and corner styles, depths and lengths as shown.
 - .1 Fixed height work surface with panel mounted bracket supports.
 - .2 Freestanding electric height adjustable (simple up down) work table with 558 mm to 1270 mm range on L-shaped legs.
 - .1 Typical Workstation – Surface Size:
 - .1 762 mm X 1220 mm.
 - .2 Manager's Station – Surface Size.
 - .1 762 mm X 1524 mm with modesty panel.
 - .3 Similar product to:
 - .1 Renew Sit-To-Stand Tables as manufactured by Herman Miller.

- .2 Manufacturers standard, constructed of high pressure plastic laminate bonded to high pressure particle board, with a high pressure laminate backer sheet on the underside work surfaces and pre-drilled for support devices.
 - .1 Thickness: 25 mm to 30 mm.
- .3 Edges to be rounded and trimmed with a PVC T-moulding in a colour to be selected by Departmental Representative.
- .4 Support brackets to be self-locking where mounted to panels. Colour and finish to match the panel trim.
- .5 Each work surface may be supported using pedestals, panels, brackets or cantilever brackets or a combination thereof.
- .6 Work surfaces may be hung from panels in an off modular manner.
- .7 Design work surfaces to support up to 200 kg as per ANSI-BIFMA 5.5, 1998, Functional Load Test, tested for 60 minutes fully loaded with less than 1/180 of span deflection.
- .8 Extra support to be provided for work surfaces 1500 mm and over in length.
- .9 Provide a clearance envelope under work surfaces 610 mm in depth or greater, to meet CSA Z412 Guidelines for Office Ergonomics.
- .10 Colour to be selected by the Departmental Representative from manufacturer's full range.
- .11 Floor supports to have adjustable capability for levelling with a vertical adjustment of 65 mm.
- .12 Horizontal Wire Management. Manages and stores wires or cables under horizontal surfaces.
 - .1 Length: 381mm
 - .2 Depth: 51mm
 - .3 Install two (2) per work surfaces, equally spaced c/w mounting hardware.
 - .4 Similar to product:
 - .1 Horizontal Wire Management, WUAW-1500-PNH as manufactured by Haworth, or approved equal.
- .6 Open Shelves:
 - .1 Construction and finish: to match work surfaces.
 - .2 Shelf depth: 337 mm.
 - .3 Shelf end height: 204 mm.
 - .4 Shelf length 1220mm
 - .5 With 1220 mm LED task light below.
 - .1 Built-in On/Off Occupancy Sensor Preset with 30 minute delay,
 - .2 997 Lumen, 14 Watt, 9' ground cord,
 - .3 Kelvin Color Temperature 4100K Light colour, Neutral White
 - .4 Certification ETL.
- .7 Storage tower:
 - .1 Typical Workstation:
 - .1 Dimensions:
 - .1 Width: 610 mm.
 - .2 Depth: 610 mm.

- .3 Height: 1727 mm.
- .2 Drawer configuration: Drawers in box/box/file.
 - .1 Legal filing.
- .3 Open bookcase with and two adjustable shelves.
- .4 Colours as selected by Departmental Representative from manufacturer's full range.
- .2 Private Offices – W225A, W226 & Supervisor station (W229-21)
 - .1 Dimensions:
 - .1 Width: 914 mm
 - .2 Depth: 610 mm
 - .3 Height: 1650 mm
 - .2 Full Coat storage with bar.
 - .3 Drawer configuration: Drawers in box/box/file.
 - .1 Legal filing.
 - .4 Closed bookcase with hinged door and two adjustable shelves.
 - .5 Colours as selected by Departmental Representative from manufacturer's full range
- .8 User Adjustable Tool Bar: Provide one option per workstation,
 - .1 Option#1 Panel Integrated User Adjustable Tool Bar
 - .1 Manufacturer's standard sizes to match panel width.
 - .2 Qty two X 610 mm user adjustable tool bar.
 - .3 Constructed from heavy duty extruded aluminium, Colour finish to match panel trim.
 - .4 Provide all necessary accessories for proper attachment to building components to provide support for panel.
 - .2 Option #2 Panel integrated slat tile:
 - .1 Manufacturer's standard sizes to match panel height and width.
 - .2 Constructed from heavy duty extruded aluminum, Colour finish to match panel trim.
 - .3 Tracks to be 12 mm slotted on 25 mm centers to match panel side rails.
 - .4 Provide all necessary accessories for proper attachment to building components to provide support for panel.
- .9 Electrical Feed modules:
 - .1 Provide for routing of communications and data cables, and access to power receptacles.
 - .2 Manufacturers standard sizes as indicated. Modules to provide power to the panel's raceway from wall or ceiling connections.
 - .1 Panel base raceway covers shall have factory installed knockouts (4 per panel, 2 each side).
 - .2 External base in feed modules shall be capable of mounting into every base receptacle outlet location.
 - .3 Provide leads length as required for connection to the building electrical system.
 - .4 Leads to be in CSA protective covering, as per the Canadian Electrical Code.

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- .10 Ceiling Feeds:
- .1 Provide ceiling poles when required and where indicated. Finish to match metal finish on exposed panel trim.
 - .1 Five station or less clusters require one ceiling pole, with power and a minimum data capacity of 24 CAT6.
 - .1 With metal separation between power and data.
 - .2 Five to eight station clusters require two ceiling poles. One power ceiling feed pole and one data pole with minimum of 24 CAT6 capacity.
 - .2 Power pole widths shall be equal to the thickness of the panels.
 - .3 Power pole shall be capable of being opened along the length of the vertical of the pole to permit lay-in of wiring.
- .11 Wiring:
- .1 Wiring for panel systems shall have preconnectorized cable assemblies for connection of duplex receptacles and meet the following requirements:
 - .1 Voltage: 120/208 VAC
 - .2 Circuit capacity: three circuits with not less than six wires providing one circuit having the common ground and having its own neutral.
 - .3 One circuit for dedicated/isolated use of the computer
 - .4 Tamper proof connectors.
 - .5 Flexible cable to the Canadian Electrical Code, approved for use in systems furniture. The complete electrical system in the panels and the components to meet CSA-C22.2, No. 23.
- .12 Receptacles:
- .1 Manufacturer's standard single sided duplex style, 15 Amp CSA configuration 5-15R configuration.
 - .2 Coordinate actual locations in the panels on site by the Departmental Representative's Representative.
 - .1 Panel Base Mounted:
 - .1 Provide two duplex receptacles for general use and one isolated/dedicated duplex per workstation, receptacles may be a combination of duplex or simplex providing six (6) plug-in locations.
 - .2 One general use duplex outlet along spine.
 - .3 One general use duplex outlet and one isolated/dedicated duplex outlet under the electric height adjustable table.
 - .2 Desk Top – Adjustable:
 - .1 Provide 4 port power module.
 - .1 Three (3) power receptacles configured with simplex outlets (NEMA-5-15R),
 - .2 One (1) USB charging port with two USB outlets.
 - .1 USB Charging Port consists of two USB 2.0 style A outlets. 4 Amp (shared) charging capacity

- .3 Spiral Cord includes 15 amp plug (NEMA 5-15P) and expands to 3658mm when stretched.
- .4 Auxiliary 610mm power cord includes IEC connector (IEC C13) for motor controller.
- .5 Module Colour: White.
- .6 Surface mounted adjustable bracket.
- .2 Similar to product:
 - .1 Enhanced Power Module as manufactured by Haworth or approved equal.
- .13 Raceway systems:
 - .1 Manufacturer's standard raceway to accommodate both electrical, telephone/data distribution, be an integral part of the base panel and ULC approved.
 - .2 Panels without power shall be capable of field installation without changing or removing panel raceways and carry up to three separate 120 volt A.C. 15 amp circuits.
 - .3 Location of duplexes as shown on drawings. Wiring shall move easily through raceways and around corners in both vertical and horizontal directions.
 - .4 Raceways to be accessible from at least one side, located at desk or base height.
- .14 Cutouts:
 - .1 Provide factory cut-outs as required for all outlets and replacement cover plates.
- .15 Miscellaneous: In addition to the products specified and listed herein, provide all additional products, hardware, trims and accessories needed for a proper, operable and complete installation.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install panels, componentry, accessories and systems furniture in accordance with the manufacturers' instructions and reviewed shop drawings and adjust for proper performance.
- .2 Install panels over finished floor.
- .3 Adjust panel heights as necessary to suit unevenness of floors and ensure horizontal lines of panels are level and continuous.
- .4 Install and adjust seals between panels and existing construction for proper performance.
- .5 Supply maintenance inventory parts list.
- .6 Replace all damaged panels, componentry, accessories and systems furniture or repair to the approval of the Departmental Representative. Obtain approval to repair in each instance before beginning repair work, and at completion of repair work.

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- .7 Provide Departmental Representative with maintenance material at the time of Certificate of Final Completion.

3.2 ELECTRICAL

- .1 Install all panel electrical work to meet the requirements of the Canadian Electrical Code Latest Edition and to the approval of authorities having jurisdiction.
- .2 Co-ordinate connection of panel electrical system with the building electrical system installers.
- .3 Co-ordinate with the work of the data cable installers and telephone installers.

3.3 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean surfaces after installation using manufacturer's recommended cleaning procedures.
- .3 Upon completion of installation remove surplus materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 10 00 – General Instructions.
- .2 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .3 Shop drawings and product data 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 current model production.
 - .5 Certification of compliance to applicable codes.
- .4 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 00 10 00 – General Instructions.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .3 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .4 Maintenance data to 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 datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .6 Approvals:

- .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
- .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
 - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

1.2 DEFINITIONS

- .1 For purposes of this the Mechanical Division the following:
 - .1 "Concealed" - mechanical services and equipment in suspended ceilings and in chases and furred spaces.
 - .2 "Exposed" - will mean not concealed as defined above.

1.3 EXAMINATION OF THE SITE

- .1 Carefully examine conditions at the site which the site will or may affect your work, and become familiar with both the new and existing construction, finishes, and other work associated with your work in order that your tender price includes for everything necessary for completion of your work within the proposed project schedule

1.4 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 10 00 – General Instructions.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 10 00 – General Instructions and 00 15 45 – General Safety Section and Fire Instructions.

1.5 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 10 00 – General Instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 00 10 00 – General Instructions and Section 00 15 45 – General Safety Section and Fire Instructions.

1.7 COORDINATION & COOPERATION WITH OTHER TRADES

- .1 Co-ordinate your work with the work of all trades to ensure a proper and complete installation. Notify all trades concerned of the requirement for openings, sleeves, inserts and other hardware necessary in their work for the installation of your work.
- .2 The exact locations and routing of mechanical and electrical services must be properly planned, coordinated and established with all affected trades prior to installation such that they will clear each other as well as any obstructions. Generally, piping requiring uniform pitch shall be given the right of way, with other services located and arranged to suit.

1.8 PERMITS, CERTIFICATES & FEES

- .1 Display all required permits on worksite and include copies of inspection certificates in operating and maintenance instruction manuals.
- .2 Obtain "Hot Work Permit" from the Engineer prior to commencement of soldering, welding or other high temperature work.
- .3 Comply with all requirements of Section 01 10 00 – General Instructions.

1.9 FEDERAL HALOCARBON REGULATION

- .1 Generate halocarbon records for work on equipment (cooling equipment with CFC's, HCFC's and HFC refrigerants; fire suppression systems; solvent cleaning systems) that may result in the release of a halocarbon.
- .2 Tag equipment with duplicate of halocarbon record.
- .3 Provide additional copy of halocarbon record to NRC for inclusion in the Zone Halocarbon Service File.

1.10 CLEANING & FINAL ADJUSTMENT

- .1 During construction, keep the site reasonably clear of rubbish and waste material resulting from your work on a daily basis to the satisfaction of the Engineer. Notify the general contractor of any requirements for a waste receptacle for disposal of waste materials.
- .2 Clean interior and exterior of all systems including strainers, and vacuum interior of air handling units.
- .3 Clean and refurbish all equipment and leave in first class operating condition including replacement of all filters in all air and piping systems.
- .4 Balance and adjust all systems and each piece of equipment to operate as designed.

1.11 PROTECTION OF EQUIPMENT & MATERIALS Properly protect all of your equipment and materials on site from damage due to the elements, your work and the work of other trades, to the approval of the Engineer.

- .2 Wherever possible, coordinate equipment deliveries with the manufacturers and/or suppliers such that equipment is delivered to the site when it is required, or so that it can be suitably stored within the building and protected from the elements.

1.12 STORAGE OF EQUIPMENT & MATERIALS

- .1 Arrange for sufficient storage facilities off the premises for the storage of equipment and materials which will not be allowed to stand in the open, nor to interfere with normal operations in the building.
- .2 Bring prefabricated materials on the job site as and when required to be installed.

1.13 HOISTING & SCAFFOLDING

- .1 Provide all necessary hoists and scaffolds required for your work.
- .2 Design and construction of scaffolding to be in accordance with CSA S269.2

Part 2 Products

2.1 MATERIALS

- .1 Materials and products in accordance with Section 01 10 00 – General Instructions.

Part 3 Execution

3.1 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 00 10 00 – General Instructions and submit report as described in PART 1 - SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 DEMONSTRATION (If Required)

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 Fume hood and associated services.
- .3 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.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Determination of whether or not demonstration is required will be decided by Departmental Representative in consultation with end user (client).

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 10 00 – General Instructions.
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- .1 Quality Assurance: in accordance with Section 01 10 00 – General Instructions.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 10 00 – General Instructions and 00 15 45 – General Safety Section and Fire Instructions.

1.5 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 10 00 – General Instructions.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 00 10 00 – General Instructions and Section 00 15 45 – General Safety Section and Fire Instructions.

1.7 COORDINATION & COOPERATION WITH OTHER TRADES

- .1 Co-ordinate your work with the work of all trades to ensure a proper and complete installation. Notify all trades concerned of the requirement for openings, sleeves, inserts and other hardware necessary in their work for the installation of your work.
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- .2 Tag equipment with duplicate of halocarbon record.
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- .3 Clean and refurbish all equipment and leave in first class operating condition including replacement of all filters in all air and piping systems.
- .4 Balance and adjust all systems and each piece of equipment to operate as designed.

1.11 PROTECTION OF EQUIPMENT & MATERIALS Properly protect all of your equipment and materials on site from damage due to the elements, your work and the work of other trades, to the approval of the Engineer.

- .2 Wherever possible, coordinate equipment deliveries with the manufacturers and/or suppliers such that equipment is delivered to the site when it is required, or so that it can be suitably stored within the building and protected from the elements.

1.12 STORAGE OF EQUIPMENT & MATERIALS

- .1 Arrange for sufficient storage facilities off the premises for the storage of equipment and materials which will not be allowed to stand in the open, nor to interfere with normal operations in the building.
- .2 Bring prefabricated materials on the job site as and when required to be installed.

1.13 HOISTING & SCAFFOLDING

- .1 Provide all necessary hoists and scaffolds required for your work.
- .2 Design and construction of scaffolding to be in accordance with CSA S269.2

Part 2 Products

2.1 MATERIALS

- .1 Materials and products in accordance with Section 01 10 00 – General Instructions.

Part 3 Execution

3.1 PAINTING REPAIRS AND RESTORATION

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

3.2 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 00 10 00 – General Instructions and submit report as described in PART 1 - SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 DEMONSTRATION (If Required)

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 Fume hood and associated services.
- .3 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.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Determination of whether or not demonstration is required will be decided by Departmental Representative in consultation with end user (client).

3.5 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED

- .1 Section 01 10 00 – General Instructions
- .2 Section 01 33 30 – General and Fire Safety Requirements
- .3 Section 21 05 01 – Common Work Results- Mechanical

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.
 - .2 CAN/CGSB-24.3, Identification of Piping Systems.
- .2 National Fire Protection Association
 - .1 NFPA 13-1989, Installation of Sprinkler Systems.
 - .2 NFPA 14-1986, Standpipe and Systems.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with Section 00 10 00 – General Instructions.
- .3 Product data to include paint colour chips, all other products specified in this section.

1.4 SAMPLES

- .1 Submit samples in accordance with Section 00 10 00 – General Instructions.
- .2 Samples to include nameplates, labels, tags, lists of proposed legends.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers to be raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: Manufacturer's name, model, size, serial number, capacity.
 - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 EXISTING IDENTIFICATION SYSTEMS

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section.
- .3 Before starting work, obtain written approval of identification system from NRC representative.

2.3 PIPING SYSTEMS GOVERNED BY CODES

- .1 Identification:
 - .3 Sprinklers: To NFPA 13.
 - .4 Standpipe and hose systems: To NFPA 14.

2.4 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour, marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms:
 - .1 Where required, to Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.
- .4 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
 - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
 - .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 All other pipes: Pressure sensitive vinyl with protective over coating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C and intermittent temperature of 200°C.
- .7 Colours and Legends:
 - .1 Where not listed, obtain direction from Departmental Representative.
 - .2 Colours for legends, arrows: To following table:
 Background colour: Yellow Legend, arrows: BLACK
 Green WHITE
 Red WHITE
 - .3 Background colour marking and legends for piping systems:

Contents	Background Colour	Legend
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT

2.5 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

- .2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.

2.6 VALVES, CONTROLLERS

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.7 CONTROLS COMPONENTS IDENTIFICATION

- .1 Shall be performed by controls contractor.

2.8 LANGUAGE

- .1 Identification to be in English and French

PART 3 - EXECUTION

3.1 TIMING

- .1 Provide identification only after all painting has been completed.

3.2 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.

3.3 NAMEPLATES

- .1 Locations:
 - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection
 - .1 Do not paint, insulate or cover in any way.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels:
At not more than 9 m 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 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.

-
- .9 Identification to be easily and accurately readable from usual operating areas and from access points.
 - .1 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.

3.5 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by NRC representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 **Number valves in each system consecutively.**

END OF SECTION

Part 1

General

1.1

SUMMARY

- .1 Section Includes:
 - .1 Thermal insulation for piping and piping accessories.

1.2

REFERENCES

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).

1.3

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 specified.

1.4

SUBMITTALS

- .1 Submittals: in accordance with Section 00 10 00 – General Instructions.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 00 10 00 – General Instructions.
 - .1 Shop drawings: submit drawings stamped for review by NRC.
- .4 Samples:
 - .1 Samples: Not required.

1.5

QUALITY ASSURANCE

- .1 Qualifications:
- .2 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, member of TIAC.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 33 30 – General and Fire Safety Requirements.

1.6

DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:

- .1 Protect from weather, theft, construction traffic.
- .2 Protect against damage.
- .3 Store at temperatures and conditions required by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Remove all material from NRC property and dispose, reuse and recycle excel material as per local good waste management practices.
 - .2 Place excess or unused insulation and insulation accessory materials in designated containers.

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

INSULATION

- .1 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
 - .1 Vapor retarder jacket includes a continuous longitudinal self-sealing closure lap.
 - .2 Jacket shall be suitable to be painted with future latex paint.
 - .3 Mineral fibre: CAN/ULC S102-M88
 - .4 Jacket: to CGSB 51-GP-9M, self-sealing lap.
 - .5 Temperature Range: 0 to 538 °C
 - .6 Maximum "k" factor: 0.033 W/m°C at 24°C to ASTM C 335.

2.3

INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum 50 mm wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.
- .4 Single/double bands: stainless steel, 19 mm wide, 0.5 mm thick.
- .5 Wire mesh: 25 mm hexagonal type 304 stainless steel wire mesh, tightly laced together at horizontal and circumferential mesh joints.

2.4

VAPOUR RETARDER LAP ADHESIVE

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

2.5

INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.6

OUTDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: fibrous glass, untreated 305 g/m².

2.7

JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Colours: As indicated
 - .3 Minimum service temperatures: -20 °C
 - .4 Maximum service temperature: 65 °C
 - .5 Moisture vapour transmission: 0.02 perm.

- .6 Thickness: 0.3 mm.
- .7 Fastenings:
- .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
- .2 Pressure sensitive vinyl tape of matching colour.
- .8 Special requirements:
 - .1 Indoor: As indicated.
 - .2 Outdoor: UV rated material at least 0.5 mm thick.
- .2 Canvas:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
 - .2 Lagging adhesive: compatible with insulation.
- .3 Aluminum:
 - .1 To ASTM B209.
 - .2 Thickness: 0.40 mm sheet.
 - .3 Finish: smooth.
 - .4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
 - .5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.
- .4 Interior / Exterior acoustic lagging
 - .1 Barrier shall be constructed of a 3-mm thick mass loaded, limp vinyl sheet bonded to a thin layer of reinforced aluminum foil on one side. The barrier shall have a nominal density of 4.9-kg/m² and shall have a minimum STC rating of 28. The barrier shall exhibit minimum flammability ratings of 0.0-seconds for flame-out and after-glow, and 5-mm for char length when tested in accordance with Federal Test Std. No. 191-5903. The barrier shall have a minimum thermal conductivity (K) value of 0.29 and a rated service temperature range of -40°C to 105°C. When tested for Surface Burning Characteristics per ASTM E84, the barrier will have a Flame Spread Index of no more than 10 and a Smoke Development Index of no more than 40.
 - .2 The decoupling layer shall be a combination of 25-mm fiber glass batting, non-woven porous scrim-coated glass cloth, quilted together in a matrix of 100-mm diamond stitch pattern which encapsulates the glass fibers.
 - .3 The composite material shall be fabricated to include a nominal 152-mm wide barrier overlap tab extending beyond the quilted fiber glass to facilitate a leak-tight seal around field joints. Nominal barrier width 1372-mm, nominal fiber glass batt decoupler width 1219-mm.
 - .4 Insertion Loss when tested to ASTM E1222-90:

Frequency, Hz	125	250	500	1000	2000	4000	STC
Loss	3	6	7	18	24	27	28

- .5 Finish: stucco embossed
- .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

- .5 Prefabricated, Self-Adhering, Sheet-Type Waterproofing Membrane:
 - .1 Description: Top Layer: Stucco-embossed, UV-resistant aluminum weathering surface. Middle Layer: Double layer of high-density polyethylene reinforcement. Bottom Layer: Uniform layer of rubberized asphalt adhesive, protected by disposable silicone release paper.
 - .2 Color: Aluminum
- .6 Stainless steel:
 - .1 Type: 304.
 - .2 Thickness: 0.25 mm.
 - .3 Finish: smooth [corrugated] [stucco embossed].
 - .4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
 - .5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5mm thick at 300 mm spacing.

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 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified by NRC.
- .2 Piping to be inspected and approved by NRC.
- .3 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and this specification.
- .3 Use two layers with staggered joints (minimal 400 mm) when required nominal wall thickness exceeds 50 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high temperature and compressive strength insulation between all hangers and piping where temperature of pipe exceeds 230 °C. Insulation to be sized to suit compressive loads at hanger. Where pipe surface temperature is less than 230°C, wood blocking may be used between pipe support hangers.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

- .1 Application: at expansion joints, valves, primary flow measuring elements, flanges, unions, equipment and where indicated.
- .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: aluminum, SS, PVC

3.5 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-3.
 - .1 Securements: SS bands at 300 mm on centre.
 - .2 Seals: VR lap seal adhesive, VR lagging adhesive.
 - .3 Installation: TIAC Code: 1501-C.
- .3 Thickness of insulation as listed in following table.
 - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
 - .2 Do not insulate exposed run outs to plumbing fixtures, chrome plated piping, valves and fittings.

Application	MAX TEMP. °C	TIAC CODE	Pipe sizes (NPS) and insulation thickness (mm)				
			< 1	1 to <1-1/2	1-1/2 to < 4	4 to < 8	8 & over
Heating Water/Glycol	100	A-3	25	25	25	38	38
Domestic hot water		A-3	25	25	25	25	25
Chilled Water or Glycol		A-3	25	25	25	25	38
Domestic cold water		A-3	25	25	25	25	25
Storm water		A-3	25	25	25	25	25
Cooling Condensate drain		A-3	25	25	25	25	25

- .4 Finishes:
 - .1 Exposed indoors: aluminum jacket.
 - .2 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 10 00 – General Instructions.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1

General

1.1

SUMMARY

- .1 Section Includes:
 - .1 Selection of piping valves in domestic water system.

1.2

RELATED SECTIONS

- .1 Section 01 10 00 – General Instructions
- .2 Section 01 33 30 – General and Fire Safety Requirements
- .3 Section 23 05 23.01 Valves – Bronze.
- .4 Section 23 05 01 - Installation of Pipework

1.3

REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150.
- .2 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
 - .1 ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.
- .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67, Butterfly Valves.
 - .2 MSS-SP-70, Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
- .7 National Research Council (NRC)/Institute for Research in Construction

- .1 NRCC 38728, National Plumbing Code of Canada (NPC).
- .8 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide manufacturer shop drawings for all valves, piping, fittings and as specified on drawings and in Section 01 10 00 – General Instructions
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 See section 01 10 00 – General Instructions

Part 2 Products

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
 - .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M. No buried joints.

2.2 FITTINGS

- .1 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22. NPS 2 and larger: roll grooved to CSA B242.
- .3 Cast bronze threaded fittings, Class 150: to ANSI/ASME B16.15.
- .4 Cast copper, solder type: to ANSI/ASME B16.18.
- .5 Bronze pipe flanges and flanged fittings, Class 150 to ANSI/ASME B16.24.

2.3 JOINTS

- .1 Solder: 95% tin / 5% copper alloy.
- .2 Teflon tape: for threaded joints.
- .3 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.4 GLOBE VALVES

- .1 NPS 2 and under, screwed

.1 NPS 2 and under: screwed ends, OS&Y, class 150, see section 23 05 23 01
Valves – Bronze

.2 See Section 23 05 23.01 Valves – Bronze

2.5 SWING CHECK VALVES

.1 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 150, bronze body, bronze swing disc, screw in cap, see
Section 23 05 23.01 - Valves - Bronze.

2.6 BALL VALVES

.1 NPS 2 and under, screwed:

.1 Threaded, 2-Piece, Std. Port, Bronze Ball Valve, 600 CWP, with extension, see
Section 23 05 23.01 - Valves - Bronze

.2 NPS 2 and under, soldered:

.1 Solder, 2-Piece, Std. Port, Bronze Ball Valve, 600 CWP, with extension, see
Section 23 05 23.01 - Valves - Bronze.

Part 3 Execution

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations,
including product technical bulletins, handling, storage and installation instructions, and
datasheets.

3.2 INSTALLATION

.1 Install in accordance with Ontario Plumbing Code.

.2 Install pipe work in accordance with Section 23 05 01 - Installation of Pipework,
supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Install CWS piping below and away from HWS and HWC and other hot piping so as to
maintain temperature of cold water as low as possible.

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

.6 Buried tubing:

.1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.

.2 Bend tubing without crimping or constriction. Minimize use of fittings.

.7 Install valves with unions at each piece of equipment arranged to allow servicing,
maintenance and equipment removal.

3.3 VALVES

- .1 Isolate equipment with unions, fixtures and branches with gate valves.
- .2 Provide valves as indicated on drawing and in specifications.
- .3 Balance recirculation system using balancing valve. Mark settings and record on as-built drawings on completion.
- .4 Provide line size check valve on discharge of all pumps.

3.4 PRESSURE TESTS

- .1 Test pressure: Hydrostatic test pressure (1.5 times maximum working pressure), Pneumatic test pressure (1.2 maximum working pressure pending NRC approval) for a minimum of 15 minutes. All tests must be witnessed and approved by NRC.
- .2 Provide NRC with a minimum of 48 hours notice in writing before all pressure tests.

3.5 FLUSHING AND CLEANING

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean copper to Provincial potable water guidelines.

3.6 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.
- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

3.7 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.
 - .4 Water treatment systems operational.
- .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 Bring HWS storage tank up to design temperature slowly.

- .4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
- .5 Check control, limit, safety devices for normal and safe operation.

3.8 PERFORMANCE VERIFICATION

- .1 Scheduling:
 - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.
 - .2 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .3 Sterilize HWS and HWC systems for Legionella control.
 - .4 Verify performance of temperature controls.
 - .5 Verify compliance with safety and health requirements.
 - .6 Check for proper operation of water hammer arrestors. Run [one][two...] outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
 - .7 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 10 00 – General Instructions.
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 33 30 – General and Fire Safety Requirements.
- .4 Section 21 05 01 – Common Work Results – Mechanical
- .5 Section 21 05 02 – Mechanical Identification
- .6 Section 23 05 05 – Installation of Pipework

1.2 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM B32, Standard Specification for Solder Metal.
 - .2 ASTM B306, Standard Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA International).
 - .1 CSA B67, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
 - .2 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .3 CAN/CSA-B125.3, Plumbing Fittings.
- .3 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36, Commercial Adhesives.

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 and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 10 00 – General Instructions and 01 33 30 - General and Fire Safety Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

- .3 Packaging Waste Management: in accordance with Section 01 10 00 – General Instructions.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary and vent Type DWV to: ASTM B306.
- .1 Fittings.
- .1 Cast brass: to CAN/CSA-B125.3.
- .2 Wrought copper: to CAN/CSA-B125.3.
- .2 Solder: lead free, tin-antimony 95:5, to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Above ground sanitary, storm and vent: to CAN/CSA-B70.
- .1 Joints:
- .1 Hub and spigot:
- .1 Caulking lead: to CSA B67.
- .2 Mechanical joints:
- .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 In accordance with Section 23 05 05 – Installation of Pipework.
- .2 Install in accordance with National Plumbing Code, supplemented as per Provincial Plumbing Code.

3.3 TESTING

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

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 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Ensure weirs are correctly sized and installed correctly.
 - .3 Verify provisions for movement of roof system.
- .4 Ensure that fixtures are properly anchored, connected to system and effectively vented.
- .5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 LABELLING

- .1 Label all above ground sanitary, storm, vent piping as per section 21 05 02 – Mechanical Identification

3.6 CLEANING

- .1 Clean in accordance with Section 01 10 00 – General Instructions.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

- .1 Materials and installation for plumbing specialties and accessories.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM).

- .1 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA).

- .1 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.
- .2 AWWA C701, Cold Water Meters-Turbine Type for Customer Service.
- .3 AWWA C702-1, Cold Water Meters-Compound Type.

.3 Canadian Standards Association (CSA International).

- .1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.
- .2 CSA-B79, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
- .3 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).

- .1 Material Safety Data Sheets (MSDS).

.5 Plumbing and Drainage Institute (PDI).

- .1 PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
- .2 PDI-WH201, Water Hammer Arresters Standard.

1.3 SUBMITTALS

.1 Product Data:

- .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
- .2 Indicate dimensions, construction details and materials for specified items.

.2 Shop Drawings:

- .1 Submit shop drawings to indicate, materials, finishes, method of anchorage, number of anchors, dimensions, color, construction and assembly details.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

- .4 Instructions: submit manufacturer's installation instructions.
- .5 Manufacturers' Field Reports: manufacturers' field reports specified.

Part 2 Products

2.1 FLOOR DRAINS

- .1 Type 1, General purpose: all duco coated cast iron body, reversible flashing clamp with seepage openings and adjustable 5" diameter nickel bronze 1/2" thick strainer, secured with S.S. screws, 4" throat on strainer. In quarry or mosaic tiled areas, provide 'BHD' - 5" x 5" square nickel bronze strainer. Provide trap primer connection 'P'.

2.2 CLEANOUTS

- .1 Line cleanout: in cast iron pipe with bolted neoprene gasketed cover secured to body with brass bolts, with full size pipe opening. Access shall be made by round stainless steel plate and slotted flat head stainless steel screws. Acceptable Material: Jay R Smith Series 4420 or approved equal.
- .2 Floor cleanout in unfinished areas: Duco coated cast iron body with flashing flange, and removable positive gasket seal closure plug and heavy duty 6" diameter adjustable cast iron cover secured with stainless steel screws, C.O. cast in cover. For water-proofed areas provide 'FC' flange with flashing clamp. Acceptable Material: Jay R Smith 4220 or approved equal
- .3 In tiled areas: Duco coated cast iron body with flashing flange, and removable positive gasket seal closure plug and square nickel bronze cover and frame with 1/8" tile recess. Acceptable Material: Jay R Smith Series 4140 or approved equal

2.3 WATER HAMMER ARRESTORS

- .1 Stainless steel construction, piston type: Normal operating pressure 35 to 250 PSIG. Spike pressure 1,500 PSIG. Acceptable Material: PPP Inc. Model SS-750304 or approved equal.
- .2 Copper construction, piston type, working pressure, 150 psig from 33 to 180 deg F PDI-WH201. Acceptable Material: Watts Model LF15 or approved equal

2.4 ACCESS DOORS

- .1 General : 14 GA. (1.7mm) steel, rust resistant, continuous concealed hinge, with positive and self-opening screwdriver operated lock. Doors in tile walls shall be stainless steel and shall suit tile pattern. All other panels shall be prime painted steel. Unless otherwise stated all panel to be 16"x16". Acceptable Material: Acudor Series UF-5000 or approved equal.
- .2 Fire rated: for walls and ceiling UL/ULC 1-1/2 hour 'B' label with maximum temperature rise of 250 degrees after 30 minutes. Door with 2" (50mm) insulation, steel, 20 GA. (1mm) with 16 GA. (1.6mm) frame, concealed hinge, self latching ring pull and grey baked enamel finish. See as required. Acceptable Material: Acudor Series FW 5050 or approved equal.

2.1 WATER COOLER FILTER

- .1 Minimum filter capacity : 5600 L

- .2 Minimum flow rate 2.8 L/min at 34 kPa pressure drop
- .3 Maximum line pressure: 724 kPa
- .4 Maximum water temperature: 49 C
- .5 Inlet/outlet connection: 9.5 mm/6.4mm O.D tube
- .6 ¼ turn installation c/w automatic inlet shutoff valve when filter is removed.
- .7 Touch less filter media
- .8 Dimensions: 83mm x318 mm
- .9 All filters to be c/w isolation valve and union no water inlet. Acceptable Material: Elkay model WaterSentry VII- EWF172

2.2 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 Series, vacuum breaker hose connection.
- .2 Hose Connection Vacuum Breakers: chrome finish stainless steel working parts, a rubber diaphragm and disc, and a draining stem. Maximum Pressure:125psi. Acceptable Material: Watts Model NF8C or approved equal.

2.3 FLOOR DRAIN TRAP SEAL PRIMERS

- .1 1/2" NPT connections with strainer and integral back flow preventer & vacuum breaker. Acceptable Material: PPP Inc. Model P0-500 or approved alternate

2.4 STRAINERS

- .1 NPS 2 and under
 - .1 Body: Bronze , ASTM B 62
 - .2 Strainer: stainless steel type 304
 - .3 Screen perforation: 1/16"
 - .4 Removable cap c/w removable threaded cap for blow off connection
 - .5 Connection: screwed [soldered]
 - .6 Minimum saturated steam pressure rating: 200 psig Acceptable Material: Spirax Sarco Model BT or approved alternate.

2.5 PIPE ESCUTCHEON

- .1 Chrome plated brass solid type with set screws.
- .2 Outside diameter shall cover opening or sleeve

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 data sheet.

3.2 INSTALLATION

- .1 Install in accordance with latest version of Ontario Building Code.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.3 ACCESS DOORS

- .1 Supply access doors to give access to all valves, cleanouts, strainers, duct access doors, and other similar mechanical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on the drawings.
- .2 Locate access doors in walls and partitions to the Engineer's approval, and arrange mechanical work to suit.
- .3 Group piping and ductwork to ensure the minimum number of access doors is required. Access doors will be installed by the trades responsible for the particular type of construction in which the doors are required.
- .4 Access doors shall be, wherever possible, of a standard size for all applications. Confirm exact dimensions prior to ordering.

3.4 CLEANOUTS

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.5 STRAINERS

- .1 Provide strainers in piping where shown on the drawings and where specified herein.
- .2 Locate strainers so they are easily accessible for service.
- .3 Install ahead of each automatic control valve and radiation and as indicated on drawing.

3.6 WATER HAMMER ARRESTORS

- .1 Install on branch supplies to fixtures or group of fixtures and where indicated.
- .2 All arrestors shall be accessible. Provide access panels has required.

- .3 Provide isolation ball valve.

3.7 INSTALLATION OF PIPE ESCUTCHEON

- .1 On pipes passing through walls, partitions, floors and ceilings in finished areas.
- .2 Install the plates so that they are tight against the building surface concerned, and ensure that the plates completely cover pipe sleeves and/or openings.
- .3 Where sleeve extends above finished floor, escutcheons or plates shall cover sleeve extension

3.8 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.9 TRAP SEAL PRIMERS

- .1 Install for floor drains and elsewhere, as indicated.
- .2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of NRC. Where located in wall unit shall be c/w access panel sized to suit proper access to primer.
- .3 Install soft copper tubing to floor drain.

3.10 START-UP

- .1 General:
- .1 In accordance with Section 01 10 00 – General Instructions and Section 01 91 13 – Commissioning (CX) Plan supplemented as specified herein.
- .2 Timing: start-up only after:
- .1 Pressure tests have been completed.
- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.
- .4 Water treatment systems operational.
- .3 Provide continuous supervision during start-up of all equipment.

3.11 TESTING AND ADJUSTING

- .1 General:
- .1 Contractor shall be responsible to verify that all equipment operates as per manufacturer specification to the satisfaction of NRC.
- .2 Contractor shall be responsible to train NRC staff in the use of all equipment. Exact training schedule to be coordinated with NRC.
- .2 Timing:

- .1 After start-up deficiencies rectified.
- .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
 - .1 Pressure at fixtures: +/- 20 kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- .4 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.
- .5 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removeability of strainer.
 - .5 Clean out baskets.
- .6 Vacuum breakers, backflow preventers, backwater valves:
 - .1 Test tightness, accessibility for O&M of cover and of valve.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
 - .3 Verify visibility of discharge from open ports.
- .7 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .8 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .9 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 10 00 – General Instructions.
- .2 Section 01 33 00 – Submittal Procedures
- .3 Section 01 33 30 – General and Fire Safety Requirements.
- .4 Section 01 91 31 – Commissioning (CX) Plan
- .5 Section 21 05 01 – Common Work Results- Mechanical
- .6 Section 21 07 19 – Thermal Insulation for Piping
- .7 Section 22 11 16 – Domestic Water Piping
- .8 Section 22 42 01 – Plumbing Specialties and Accessories
- .9 Section 23 05 05 – Installation of Pipework

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45 Series, Plumbing Fixtures.
 - .2 CAN/CSA-B125.3, Plumbing Fittings.
 - .3 CAN/CSA-B651, Accessible Design for the Built Environment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 00 10 00 – General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for washroom fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Indicate fixtures and trim:
 - .1 Dimensions, construction details, roughing-in dimensions.
 - .2 Factory-set water consumption per flush at recommended pressure.
 - .3 (For water closets, urinals): minimum pressure required for flushing.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for washroom fixtures, for incorporation into manual specified in Section 00 10 00 – General Instructions.
- .2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 00 10 00 – General Instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 MANUFACTURED UNITS

- .1 BASIS OF DESIGN IS SHOWN ON FIXTURE SCHEDULE, ANY ALTERNATES MUST BE SUBMITTED DURING TENDERING PROCESS BY DATE SPECIFIED IN CONTRACT DOCUMENTS.
- .2 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .3 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.
- .4 Exposed plumbing brass to be chrome plated.
- .5 Type, number, locations: as indicated on drawing 5604-M07.
- .6 Fixtures in any one location to be product of one manufacturer and of same type.
- .7 Trim in any one location to be product of one manufacturer and of same type.
- .8 Water closets:

WC type	Mounting		Bowl		Flush valve		Flush tank	Handicapped
	Wall	Floor	Elong	Reg	Exp'd	Conc'd		
WC1		X	X		X			X

- .1 WC1 : floor-mounted, exposed flush valve, top spud, ultra-low flush, maximum 6 litres/flush.
 - .1 Bowl: vitreous china, syphon jet, elongated rim.
 - .2 Acceptable Material: American Standard, Kholer, Crane or approved equal.
- .2 Water Closet Flush Valves:
 - .1 Flush valve: exposed, polished chrome, externally adjustable, diaphragm type with NPS 1 screwdriver angle stop, oscillating handle, wall and spud escutcheons and vacuum breaker. Ultra low flush cycle: adjustable from 3.8 - 17 litres/ flush, set to 5.7 litres/flush.
 - .2 Acceptable Material: American Standard, Sloan, Zurn, Moen, TAC or approved equal
- .3 Water Closet Seats.
 - .1 Seat: white, elongated, open front, moulded solid plastic, less cover, stainless steel check hinges, stainless steel **or** solid brass insert post.
 - .2 Acceptable Material: American Standard, Enpoco or approved equal
- .9 Urinals:
 - .1 UR1 : wall mounted, ultra-low flush, exposed flush valve, top spud.
 - .1 Urinal: vitreous china, washout type, integral flushing rim, extended shields, integral trap, removable stainless steel strainer, back outlet.
 - .2 Acceptable Material: American Standard, Kholer, Crane or approved equal.
 - .2 Urinal Electronic Flush Valves:

- .1 Top Mounted, Exposed, controlled by infra-red occupancy detector.
 - .1 Complete with removable filter, 9 second time delay, flush time adjustable from 0-8 seconds, factory set at 4.5 seconds, 4.5 L flush/cycle maximum.
 - .2 Sensor adjustable from 50-1220 mm, factory set to 860 mm.
 - .3 Solenoid valve: low voltage, slow-closing type for 60 kPa (minimum), 1000 kPa (maximum), 85 degrees C with manual over-ride, adjustable flow control.
 - .4 Battery: battery life 100,000 flushes (3 years) with type "c" alkaline batteries.
 - .2 Acceptable Material: American Standard, Sloan, Zurn, TAC or approved equal.
- .10 Washroom Lavatories:
- .1 LAV1 & LAV2: counter-top:
 - .1 Porcelain-on-steel, self-rimming, with front overflow, soap depressions, gasket, swivel clamps, semi-oval, supply openings on 100 mm centres. Sizes: 549x457 mm outside, 441x279 mm nominal inside.
 - .2 Acceptable Material: American Standard, Kohler, Crane or approved equal.
- .11 Washroom Lavatory Trim (for LAV2's):
- .1 Wheelchair supply fitting with gooseneck spout, aerator, 150 mm blade handles with indexed buttons, bent tailpiece.
 - .1 Provide accessories to limit maximum flow rate to 8.35 l/minute at 413 kPa.
 - .2 Waste fitting: none
 - .3 All exposed piping under counter shall be insulated as per CAN/CSA standards.
 - .4 Acceptable Material: American Standard, Delta, Moen, Chicago Faucets, or approved equal.
- .12 Washroom Lavatory Electronic Trim (for LAV1's):
- .1 Barrier-free electronic faucet:
 - .1 Infra-red motion sensor activated by hand motion in lavatory.
 - .2 Sensor: waterproof, incorporated in body of unit, with impact-resistant plastic lens and anti-scratch coating, sensitivity adjustable from 75 mm to 450 mm.
 - .3 Water conservation: Set to 60 second run time, 180 second maximum run time.
 - .4 Controls: vandal-proof, interchangeable receptacles for stainless steel sheathed sensor and modular plug-type solenoid connections, battery operated slow-closing commercial solenoid for 860 kPa, 85 degrees C.
 - .5 Spout: Chrome plated, with integral flow control aerator rated at 1.9 l/minute at 413 kPa maximum.

- .6 Temperature controls separate from unit.
- .7 Acceptable Material: American Standard, Delta, Moen, Chicago Faucets, or approved equal.
- .13 Fixture piping:
 - .1 Hot and cold water supplies to fixtures:
 - .1 Chrome plated flexible supply pipes with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with clean out on fixtures not having integral trap.
 - .2 Chrome plated in exposed places.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to manufacturer's recommendations, measured from finished floor].
 - .2 Wall-hung fixtures: as indicated on drawing 5604-A06, measured from finished floor.
 - .3 Barrier free: to most stringent CAN/CSA B651.

3.3 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
 - .3 Adjust flush valves to suit actual site conditions.
 - .4 Adjust urinal flush timing mechanisms.
 - .5 Set controls of automatic flush valves for WCs and urinals to prevent unnecessary flush cycles.
- .3 Checks:
 - .1 Water closets, urinals: flushing action.
 - .2 Aerators: operation, cleanliness.
 - .3 Vacuum breakers, backflow preventers: operation under all conditions.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 10 00 – General Instructions.

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: in accordance with Section 01 10 00 – General Instructions.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 10 00 – General Instructions
- .2 Section 01 30 00 – Submittal Procedures
- .3 Section 01 33 30 – General and Fire Safety Instructions.

1.2 REFERENCES

- .1 Air-Conditioning and Refrigeration Institute (ARI)
 - .1 ARI 1010, Self-Contained, Mechanically Refrigerated Drinking-Water Coolers.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-B45, CSA Standards on Plumbing Fixtures.
 - .2 CAN/CSA-B125.3, Plumbing Fittings.
 - .3 CAN/CSA-B651, Accessible Design for the Built Environment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 00 10 00 – General Instructions.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for fountains and coolers, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate, for all fixtures:
 - .1 Dimensions, construction details, roughing-in dimensions.
 - .2 Electrical requirements
 - .3 Refrigerant Used.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data including monitoring requirements for incorporation into manuals specified in Section 01 10 00 – General Instructions.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 10 00 – General Instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 MATERIAL

2.2 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Refrigerated water coolers with bottle fillers:
 - .1 DF1 : Wall mounted.
 - .1 Refrigeration system: packaged hermetic R134A unit with pre-cooler, insulated double wall chiller, storage tank, air-cooled condenser, thermostatically controlled.
 - .2 Filter: 3000 gallon plus capacity certified to NSF/ANSI 42 & 53 with visual fill monitor to indicate when replacement is required
 - .3 Capacity: 30 L/h from 27 degrees C to 10 degrees C, with 32 degrees C ambient air. In accordance with ARI 1010.
 - .4 Stainless Steel basin with integral drain, galvanized structural steel cooler chassis, stainless steel bottle filler wrapper with ABS plastic alcove, cooler cabinet shall be vinyl clad, grey in colour
 - .5 Bubbler: push button operated, polyester elastomer construction, self-regulating, angle stream, squirt-proof, with nozzle and guard.
 - .6 Touch-less activation bottle filler with auto 20 second shut-off
 - .7 Electrical: grounded electrical cord with plug: 120 V, 60 Hz. CSA certified.
 - .8 Basis of Design Elkay EZH2O Bottle filling station with filtered single LZ cooler or approved equivalent.
- .6 Fixture piping:
 - .1 Cold water supplies to each fixture:
 - .1 Chrome plated flexible supply pipes each with handwheel stop, reducers, escutcheon.
 - .2 Waste:
 - .1 Brass P trap with cleanout on each fixture not having integral trap.
 - .2 Chrome plated in all exposed places.
- .7 Chair carriers:
 - .1 Factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
 - .2 Wall-hung fixtures: as per manufacturer's specifications, architectural drawings, measured from finished floor.
 - .3 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA B651.
- .2 Water coolers:
 - .1 In accordance with ARI 1010.

3.3 ADJUSTING

- .1 Conform to water conservation requirements specified this Section.
- .2 Adjustments:
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust water cooler, drinking fountain flow stream to ensure no spillage.
- .3 Checks:
 - .1 Refrigerated water coolers: operation, temperature settings.
- .4 Thermostatic controls:
 - .1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

- .1 Clean in accordance with Section 01 10 00 – General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 The contractor is responsibility to coordinate and dispose of all waste material to local provincial and municipality requirements.
 - .2 It is the full responsibility of the contractor to insure that all construction material, equipment, tools, etc. are stored and used in a safe and reasonable manor as per good industry standards.
 - .3 The contractor is responsible for all damaged and stolen material, tools or equipment on site.
 - .4 The contractor is responsible for the delivery of all material, tools or equipment.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 APPLICATION

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

3.2 CONNECTIONS TO EQUIPMENT

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges 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 and when penetrating ceiling/roof and has indicated..

3.3 CLEARANCES

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, testing (x-ray, 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 and components.

3.4 DRAINS

- .1 Install piping with grade in direction of flow except as indicated.
- .2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
- .3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.
- .4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 AIR VENTS

- .1 Install air vents at high points in piping systems.
- .2 Install isolating valve at each air valve.
- .3 Install drain piping to approved location and terminate where discharge is visible.

3.6 DIELECTRIC COUPLINGS

- .1 General: compatible with system, to suit pressure rating of system.
- .2 Locations: where dissimilar metals are joined.
- .3 NPS 2 and under: isolating unions or bronze valves.
- .4 Over NPS 2: isolating flanges.

3.7 PIPEWORK INSTALLATION

- .1 Screwed fittings jointed with Teflon tape.
- .2 Protect openings against entry of foreign material.
- .3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .4 Assemble piping using fittings manufactured to ANSI standards.

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- .5 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
 - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
 - .6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
 - .7 Install concealed pipework to minimize furring space, maximize headroom and conserve space.
 - .8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
 - .9 Install, except where indicated, to permit separate thermal insulation of each pipe.
 - .10 Group piping wherever possible.
 - .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.
 - .14 Valves:
 - .1 Install in accessible locations.
 - .2 Remove interior parts before soldering.
 - .3 Install with stems above horizontal position unless otherwise indicated.
 - .4 Valves accessible for maintenance without removing adjacent piping.
 - .5 Install globe valves in bypass around control valves.
 - .6 Use valves at branch take-offs for isolating purposes except where otherwise specified.
 - .7 Install butterfly valves between weld neck flanges to ensure full compression of liner.
 - .8 Install ball valves for glycol service and where indicated.
 - .9 Use chain operators on valves NPS 2 1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.
 - .15 Check Valves:
 - .1 Install silent check valves on discharge of pumps in vertical pipes with downward flow and elsewhere as indicated.
 - .2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

3.8 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: foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.
- .4 Sizes: 6 mm minimum clearance 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 25 mm 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 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
 - .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
 - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
 - .4 Ensure no contact between copper pipe or tube and sleeve.

3.9 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.

3.10 PREPARATION FOR FIRE STOPPING

- .1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 - Fire Stopping.
- .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 fires topping material or installation.
- .4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.11 FLUSHING OUT OF PIPING SYSTEMS

- .1 Flush system in accordance with good industry standards and as indicated.

3.12 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

- .1 Advise NRC with 48 hours minimum prior to performance of pressure tests.
- .2 Pipework: test as specified in relevant sections.
- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
- .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 and has indicated in relevant mechanical sections.
- .6 Pay all costs for repairs or replacement, retesting, and making good. NRC to determine whether repair or replacement is appropriate.
- .7 Insulate or conceal work only after approval and certification of tests and approved by NRC.

3.13 EXISTING SYSTEMS

- .1 Connect into existing piping systems at times approved by NRC.
- .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.

3.14 CLEANING

- .1 Clean in accordance with Section 01 10 00 – General Instructions.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Electrical motors, drives and guards for mechanical equipment and systems.
 - .2 Supplier and installer responsibility indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
 - .3 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 22 and 23. Refer to Division 26 for quality of materials and workmanship.
- .2 Related Sections:
 - .1 Section 01 10 00 – General Instructions.
 - .2 Section 01 33 00 – Submittal Procedures
 - .3 Section 01 33 30 – General and Fire Safety Requirements.
 - .4 Section 01 91 31 – Commissioning (CX) Plan
 - .5 Section 21 05 01 – Common Work Results- Mechanical

1.2 REFERENCES

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA cosponsored; ANSI approved; Continuous Maintenance Standard).
- .2 Electrical Equipment Manufacturers' Association Council (EEMAC)
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, and limitations.
- .3 Quality Control: in accordance with Section 01 10 00 – General Instructions.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Closeout Submittals

- .1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 00 10 00 – General Instructions.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements: work to be performed in compliance with CEPA, and applicable Provincial /Territorial regulations.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 00 15 45 - General Safety Section and Fire Instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 10 00 – General Instructions.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 01 10 00 – General Instructions.

Part 2 Products

2.1 GENERAL

- .1 Motors: high efficiency, in accordance with local Hydro company standards and to ASHRAE 90.1.

2.2 MOTORS

- .1 Provide motors for mechanical equipment as specified.
- .2 Motors under 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 1/2 HP and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40 degrees C, 3 phase, 575 V, unless otherwise indicated.

2.3 TEMPORARY MOTORS

- .1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Departmental Representative for temporary use. Work will only be accepted when specified motor is installed.

2.4 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 7.5 kW (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 7.5 kW (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.

2.5 DRIVE GUARDS

- .1 Provide guards for unprotected drives.
- .2 Guards for belt drives;
 - .1 Expanded metal screen welded to steel frame.
 - .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
 - .3 38 mm dia holes on both shaft centres for insertion of tachometer.
 - .4 Removable for servicing.
- .3 Provide means to permit lubrication and use of test instruments with guards in place.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.-
- .5 Guard for flexible coupling:
 - .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
 - .2 Securely fasten in place.
 - .3 Removable for servicing.
- .6 Unprotected fan inlets or outlets:
 - .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
 - .2 Net free area of guard: not less than 80% of fan openings.
 - .3 Securely fasten in place.
 - .4 Removable for servicing.

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 Fasten securely in place.
- .2 Make removable for servicing, easily returned into, and positively in position.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 91 31 – Commissioning (CX) Plan.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 CLEANING

- .1 Proceed in accordance with Section 01 10 00 – General Instructions.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes: Bronze valves that may be used for the following systems unless otherwise stated.
 - .1 Pressure less than 100 psig : domestic water, chilled water, heating water, glycol piping and compressed air piping
 - .2 Pressure less than 15 psig: saturated steam

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).
 - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A276, Specification for Stainless Steel Bars and Shapes.
 - .2 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B283, Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
 - .4 ASTM B505/B505M, Specification for Copper-Base Alloy Continuous Castings.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 MSS-SP-25, Standard Marking System for Valves, Fittings, Flanges and Unions.
 - .2 MSS-SP-80, Bronze Gate Globe, Angle and Check Valves.
 - .3 MSS-SP-110, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 SUBMITTALS

- .1 Contractor shall submit detailed shop drawings for all valves for NRC review.
- .2 Shop drawings shall include but not limited to the following:
 - .1 Fitting type
 - .2 Material for valve body and internals
 - .3 ASME Class
- .3 Valve shall not be purchased until shop drawing has been approved by NRC.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 See Section 01 33 00 – General and Fire Safety Requirements.

1.5 DELIVERY STORAGE AND DISPOSAL

- .1 See Section 01 10 00 – General Instructions

1.6 MAINTENANCE

- .1 Furnish following spares

- .1 Valves: supply NRC with one spare valve for every 10 valves provided

Part 2

Products

2.1

MATERIALS

- .1 Valves:
- .1 Except for specialty valves, to be single manufacturer.
- .2 All valves on steam and compressed air above at or above 15 psig shall have Canadian Registration Number (CRN#)
- .2 End Connections:
- .1 Connection into adjacent piping/tubing:
- .1 Steel pipe systems: Screwed ends to ANSI/ASME B1.20.1.
- .2 Copper tube systems: Solder ends to ANSI/ASME B16.18.
- .3 Lockshield Keys:
- .1 Where lockshield valves are specified, provide 2 keys of each size: malleable iron cadmium plated.
- .4 Globe Valves:
- .1 Requirements common to globe valves, unless specified otherwise:
- .1 Standard specification: MSS SP-80.
- .2 Bonnet: union with hexagonal shoulders.
- .3 Connections: screwed with hexagonal shoulders.
- .4 Stuffing box: threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing.
- .5 Handwheel: non-ferrous.
- .6 Handwheel Nut: bronze to ASTM B62.
- .2 NPS 2 and under, plug disc, Class 150, screwed:
- .1 Body and bonnet: union bonnet.
- .2 Inside screw and rising stem
- .3 Disc and seat ring: tapered plug type with disc stem ring.
- .4 Operator: Handwheel.
- .5 Standard of acceptance: KITZ #09
- .5 Swing Check Valves:
- .1 NPS 2 and under, Class 150, screwed
- .1 To MSS SP-80 and ANSI B1.20.1.
- .2 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
- .3 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: Standard of acceptance: KITZ #29NPS 2 and under, Class 150, soldered

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- .1 To MSS SP-80 and ANSI B16.18.
 - .2 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
 - .3 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: Standard of acceptance: KITZ #30 Silent Check Valves:
 - .1 NPS 2 and under, screwed ends:
 - .1 Body: cast high tensile bronze to ASTM B62 with integral seat.
 - .2 Minimum pressure rating: Class 150.
 - .3 Connections: screwed ends to ANSI B1.20.1 and with hex. shoulders.
 - .4 Disc and seat: renewable rotating disc.
 - .5 Stainless steel spring, heavy duty.
 - .6 Seat: re-grindable.
 - .7 Standard of acceptance: KITZ #26
 - .7 Ball Valves:
 - .1 NPS 2 and under, threaded ends:
 - .1 Body and cap: cast high tensile bronze
 - .2 Chrome plated brass ball, RPTFE seat.
 - .3 Minimum pressure rating: 1000 kPa saturated steam, 4130 kPa WOG
 - .4 Valves to be complete with minimal 31 mm stem extension for all insulated pipes, see section 21 07 19 THERMAL INSULATION FOR PIPING
 - .5 Operator: steel lever handle with securely attached vinyl grip
 - .6 Connections: Screwed ends to ANSI B1.20.1 and with hexagonal shoulders
 - .7
 - .2 NPS 2 and under, soldered ends:
 - .1 Body and cap: cast high tensile bronze
 - .2 Chrome plated brass ball, RPTFE seat.
 - .3 Minimum pressure rating: 1000 kPa saturated steam, 4130 kPa WOG
 - .4 Valves to be complete with minimal 31 mm stem extension for all insulated pipes, see section 21 07 19 THERMAL INSULATION FOR PIPING
 - .5 Operator: steel lever handle with securely attached vinyl grip
 - .6 All internals to be removed prior to soldering.
 - .7 Connections: solder ends to ANSI. Soldered ends to ANSI B16.18, solder ends to ANSI.
 - .8 Standard of acceptance: Apollo #70-200 Series or approved equivalent

- .8 Circuit Balancing Valves:
 - .1 NPS 2 and under, screwed ends:
 - .1 Y-pattern, bronze body c/w two brass metering ports, memory feature and capable of precise flow measurement, flow balancing and drip tight shut-off. Standard of acceptance Armstrong CBV-T and Tour & Andersson STASA

Part 3 Execution

3.1 INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Where soldered valves are used contractor shall remove internal parts before soldering. Before soldering, installation shall be inspected by NRC.
- .3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance and equipment removal.
- .4 No valve shall be insulated until all pressure tests relating to valve are completed and approved by NRC.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Cast Iron valves may be used for the following systems where indicated: Steam, condensate, compressed air, glycol, chilled water and heating water.
- .2 Related Sections:
 - .1 Section 01 10 00 – General Instructions
 - .2 Section 01 33 00 – Submittal Procedures
 - .3 Section 01 33 30 – General and Fire Safety Requirements

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
- .2 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A49, Specification for Heat-Treated Carbon Steel Joint Bars.
 - .2 ASTM A126, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
 - .3 ASTM B61, Specification for Steam or Valve Bronze Castings.
 - .4 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 MSS SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
 - .2 MSS SP-71, Grey Iron Swing Check Valves, Flanged and Threaded Ends.
 - .3 MSS SP-82, Valve Pressure Testing Methods.
 - .4 MSS SP-85, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

- .1 Contractor shall submit detailed shop drawings for all valves for NRC review.
- .2 Shop drawings shall include but not limited to the following:
 - .1 Fitting type
 - .2 Material for valve body and internals
 - .3 ASME Class
- .3 Valve shall not be purchased until shop drawing has been approved by NRC.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 See Section 01 33 30 – General and Fire Safety Requirements.

1.5 DELIVERY STORAGE AND DISPOSAL

- .1 See Section 01 10 00 – General Instructions

1.6 MAINTENANCE

- .1 Extra Materials:
- .2 Furnish following spares:
 - .1 Valves: supply NRC with one spare valve for every 10 valves provided

Part 2 Products

2.1 MATERIAL

- .1 Requirements:
 - .1 All valves in steam or compressed air system at 103 kPa or more shall be complete with a Canadian Registration Number (CRN).
 - .2 Standard specifications:
 - .1 Gate valves: MSS SP-70.
 - .2 Globe valves: MSS SP-85.
 - .3 Check valves: MSS SP-71.
 - .3 Requirements common to valves, unless specified otherwise:
 - .1 Body, bonnet: cast iron to ASTM B209 Class B.
 - .2 Connections: flanged ends plain face with 2 mm raised face with serrated finish to ANSI B16.1.
 - .3 Inspection and pressure testing: to MSS SP-82.
 - .4 Bonnet gasket: non-asbestos.
 - .5 Stem: to have precision-machined Acme or 60 degrees V threads, top screwed for hand wheel nut.
 - .6 Stuffing box: non-galling two-piece ball-jointed packing gland, gland bolts and nuts.
 - .7 Gland packing: non-asbestos.
 - .8 Handwheel: Die-cast aluminum alloy to ASTM B85 or malleable iron to ASTM A49. Nut of bronze to ASTM B62.
 - .9 Identification tag: with catalogue number, size, other pertinent data.

2.2 GATE VALVES

- .1 NPS 2-1/2 to 14, outside screw and yoke (OS&Y), class 125, solid wedge disc, flanged:
 - .1 Body and multiple-bolted bonnet: taps and drains, full length disc guides designed to ensure correct re-assembly, yoke, yoke hub, yoke sleeve and nut.
 - .2 Disc: cast iron
 - .3 Disc/body seat rings: cast bronze B62
 - .4 Stem: Forged Brass
 - .5 Gasket: NON-ASBESTOS

.6 Operator: Handwheel cast iron/ductile iron

2.3 **GLOBE VALVES**

.1 NPS 2 1/2 to 8, OS&Y, class 125, flanged:

.1 Body: cast iron A126 Class B with multiple-bolted bonnet.

.2 Bonnet-yoke gasket: non-asbestos.

.3 Disc: cast iron A126 Class B

.4 Seat ring: cast bronze

.5 Stem: forged bronze to ASTM B124.

.6 Operator: Handwheel cast iron/ductile iron

2.4 **SWING CHECK VALVES**

.1 NPS 2-1/2 to 24, Class 125, flanged:

.1 Bolted on cover, ductile iron hinges, replaceable 13% chromium stainless steel hinge pins, replaceable hinge bushings, sold iron disc with integral seat face. ASME B 161, ASME B 16.10, MSS SP-71 Type 1 and MSS SP-25.

2.5 **CIRCUIT BALANCING VALVES:**

.1 NPS 2-1/2 and over, flanged:

.1 Y-pattern, cast iron body with industry standard grooved ends and flanged adaptor or flanged ends c/w two metering ports, memory feature and capable of precise flow measurement, flow balancing and drip tight shut-off.

2.6 **VALVE OPERATORS**

.1 Install valve operators as follows: as specified herein

.1 Handwheel: on valves except as specified.

Part 3 **Execution**

3.1 **INSTALLATION**

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance and equipment removal.

.3 All valves to be installed as per manufacturer recommendation and has per good industry standard.

.4 No valve shall be insulated until all pressure tests relating to valve are completed and approved by NRC.

.5 Where pressure for testing of piping system exceeds valve limits contractor shall include for the removal of specific valve and blanking off of piping system to allow for testing. Once test has been completed contractor shall reinstate valve.

3.2 **VERIFICATION**

.1 Verification requirements in accordance with Section 01 10 00 – General Instructions, drawings and as follows:

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

- .1 Concrete housekeeping pads, hangers and supports for mechanical piping, ducting and equipment.

1.2 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)

- .1 ANSI/ASME B31.1 / B31.3

.2 American Society for Testing and Materials International (ASTM)

- .1 ASTM A125, Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A563, Specification for Carbon and Alloy Steel Nuts.

.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

- .1 MSS SP58, Pipe Hangers and Supports - Materials, Design and Manufacture.
- .2 ANSI/MSS SP69, Pipe Hangers and Supports - Selection and Application.
- .3 MSS SP89, Pipe Hangers and Supports - Fabrication and Installation Practices.

1.3 SYSTEM DESCRIPTION

.1 Design 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 MSS SP58.ASME B31.1 or B31.3 as indicated.
- .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. Amount of adjustment in accordance with MSS SP58.

.2 Performance Requirements:

- .1 Design supports, platforms, catwalks, hangers, to withstand seismic where indicated.

1.4 SUBMITTALS

- .1 Submit shop drawings and product data for following items:
 - .1 Bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.
 - .4 Installation instructions
- .2 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
 - .1 The contractor is responsibility to coordinate and dispose of all waste material to local provincial and municipality requirements.
- .2 It is the full responsibility of the contractor to insure that all construction material, equipment, tools, etc. are stored and used in a safe and reasonable manor as per good industry standards.
- .3 The contractor is responsible for all damaged and stolen material, tools or equipment on site.
- .4 The contractor is responsible for the delivery of all material, tools or equipment.

Part 2 Products

2.1 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.

2.2 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: galvanized-exterior and painted with zinc-rich paint – interior after manufacture.
 - .2 Use hot dipped galvanizing process.
 - .3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.
- .2 Upper attachment structural: suspension from lower flange of I-Beam:

- .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
 - .1 Rod: 9 mm UL listed
- .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed to MSS-SP58 and MSS-SP69.
- .3 Upper attachment structural: suspension from upper flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed to MSS SP69.
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.
- .4 Upper attachment to concrete:
 - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed to MSS SP69.
- .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. Pipe attachments: material to MSS SP58:
 - .1 Attachments for steel piping: carbon steel [black][galvanized].
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.
- .7 Adjustable clevis: material to MSS SP69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for rivetting to insulation shields
- .8 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
- .9 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
 - .1 Finishes for steel pipework: galvanized.
 - .2 Finishes for copper, glass, brass or aluminum pipework: black with formed portion plastic coated or epoxy coated.
- .10 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69. Shop and field-fabricated assemblies.
 - .1 Trapeze hanger assemblies: MSS SP-89.
 - .2 Steel brackets: MSS SP-89.

- .3 Sway braces for seismic restraint systems: to MSS SP-89.

2.3 RISER CLAMPS

- .1 Steel or cast iron pipe: galvanized steel to MSS SP58, type 42, UL listed.
- .2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
- .3 Bolts: to ASTM A307.
- .4 Nuts: to ASTM A563.

2.4 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
- .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
- .2 Insulated hot piping:
- .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

2.5 CONSTANT SUPPORT SPRING HANGERS

- .1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
- .2 Load adjustability: 10 % minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.
- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 VARIABLE SUPPORT SPRING HANGERS

- .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

- .3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.
- .4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- .1 Provide templates to ensure accurate location of anchor bolts.

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:
 - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 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 industry standards.
 - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: install below joint.
- .4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .6 Use approved constant support type hangers where:
 - .1 vertical movement of pipework is 13 mm or more,
 - .2 transfer of load to adjacent hangers or connected equipment is not permitted.
- .7 Use variable support spring hangers where:

- .1 transfer of load to adjacent piping or to connected equipment is not critical.
- .2 variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

- .1 Plumbing piping: to Canadian Plumbing Code or authority having jurisdiction.
- .2 Fire protection: to applicable fire code.
- .3 Copper piping: up to NPS 1/2: every 1.5 m.
- .4 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.
- .5 Within 300 mm of each elbow.
- .6 Hydronic, steam, steam condensate, compressed air, rigid, and flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

MAXIMUM HANGER SPACING AND MINIMUM ROD SIZE

O.D		STEEL PIPE				COPPER TUBE		ROD SIZE	
INCHES	mm	WATER		STEAM / AIR		FT	METER	INCH	mm
		FT	METER	FT	METER				
<= 1/2	12.7	7	2.13	8	2.44	5	1.52	1/4'	6.4
3/4'	19.1	7	2.13	9	2.74	5	1.52	1/4'	6.4
1	25.4	7	2.13	9	2.74	6	1.83	1/4'	6.4
1-1/4'	31.7	8	2.44	10	3.05	7	2.13	1/4'	6.4
1-1/2'	38.1	9	2.74	12	3.66	8	2.44	3/8'	9.5
2	50.8	10	3.05	13	3.96	8	2.44	3/8'	9.5
2-1/2'	63.5	11	3.35	14	4.27	9	2.74	3/8'	9.5
3	76.2	12	3.66	15	4.57	10	3.05	3/8'	9.5
4	101.6	14	4.27	17	5.18	12	3.66	1/2'	12.7
6	152.4	17	5.18	21	6.40	14	4.27	1/2'	12.7
8	203.2	19	5.79	24	7.31	16	4.88	5/8'	15.8
10	254.0	20	6.10	26	7.92	18	5.49	3/4'	19.0
12	304.8	23	7.01	30	9.14	19	5.79	7/8'	22.2
14	355.6	25	7.62	32	9.75			1	25.4
16	406.4	27	8.23	35	10.67			1	25.4
18	457.2	28	8.53	37	11.28			1-1/4'	31.7
20	508.0	30	9.14	39	11.89			1-1/4'	31.7

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 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, 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 SUMMARY

- .1 Section Includes:
 - .1 Vibration isolation materials and components, seismic control measures and their installation.
- .2 Related Sections:
 - .1 Section 01 10 00 – General Instructions.
 - .2 Section 01 33 00 – Submittal Procedures.
 - .3 Section 01 33 30 – General and Fire Safety Requirements

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.
- .3 National Building Code of Canada (NBC) - 1995

1.3 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Provide system shop drawings complete with performance and product data.
 - .3 Provide detailed drawings of seismic control measures for equipment and piping.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 33 00 – General and Fire Safety Requirements

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:

- .1 Deliver, store and handle in accordance with Section 01 10 00 – General Instructions
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 01 10 00 – General Instructions

Part 2 Products

2.1 GENERAL

- .1 Size and shape of bases type and performance of vibration isolation as indicated.

2.2 ELASTOMERIC PADS

- .1 Type EP1 - neoprene waffle or ribbed; 9 mm minimum thick; 50 durometer; maximum loading 350 kPa.
- .2 Type EP2 - rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.
- .3 Type EP3 - neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.
- .4 Type EP4 - rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

2.3 ELASTOMERIC MOUNTS

- .1 Type M1 - colour coded; neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

2.4 SPRINGS

- .1 Design stable springs: ratio of lateral to axial stiffness is equal to or greater than 1.2 times ratio of static deflection to working height. Select for 50% travel beyond rated load. Units complete with levelling devices.
- .2 Ratio of height when loaded to diameter of spring between 0.8 to 1.0.
- .3 Colour code springs.

2.5 SPRING MOUNT

- .1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.
- .2 Type M2 - stable open spring: support on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad.

- .3 Type M3 - stable open spring: 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; levelling bolt for rigidly mounting to equipment.
- .4 Type M4 - restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.

2.6 HANGERS

- .1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30 degrees arc without metal to metal contact.
- .2 Type H1 - neoprene - in-shear, moulded with rod isolation bushing which passes through hanger box.
- .3 Type H2 - stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.
- .4 Type H3 - stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.
- .5 Type H4 - stable spring, elastomeric element with precompression washer and nut with deflection indicator.

2.7 HORIZONTAL THRUST RESTRAINT

- .1 Spring and elastomeric element housed in box frame; assembly complete with rods and angle brackets for equipment and ductwork attachment; provision for adjustment to limit maximum start and stop movement.
- .2 Arrange restraints symmetrically on either side of unit and attach at centerline of thrust.

2.8 SEISMIC CONTROL MEASURES

- .1 General:
 - .1 Seismic control systems to work in every direction.
 - .2 Fasteners and attachment points to resist same maximum load as seismic restraint.
 - .3 Drilled or power driven anchors and fasteners not permitted.
 - .4 No equipment, equipment supports or mounts to fail before failure of structure.
 - .5 Supports of cast iron or threaded pipe not permitted.
 - .6 Seismic control measures not to interfere with integrity of firestopping.
- .2 Static equipment:
 - .1 Anchor equipment to equipment supports. Anchor equipment supports to structure.
 - .2 Suspended equipment:
 - .1 Use one or more of following methods depending upon site conditions or as indicated:
 - .1 Install tight to structure.

- .2 Cross brace in every direction.
- .3 Brace back to structure.
- .4 Cable restraint system.
- .3 Seismic restraints:
 - .1 Cushioning action gentle and steady.
 - .2 Never reach metal-like stiffness.
- .3 Vibration isolated equipment:
 - .1 Seismic control measures not to jeopardize noise and vibration isolation systems. Provide 6 to 9 mm clearance during normal operation of equipment and systems between seismic restraint and equipment.
 - .2 Incorporate seismic restraints into vibration isolation system to resist complete isolator unloading.
 - .3 As indicated.
- .4 Piping systems:
 - .1 Fire protection systems: to NFPA 13.
 - .2 Piping systems: hangers longer than 300 mm; brace at each hanger.
 - .3 Compatible with requirements for anchoring and guiding of piping systems.
- .5 Bracing methods:
 - .1 Approved by NRC Representative
 - .2 Structural angles or channels.
 - .3 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

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 Seismic control measures to meet requirements of NBC and OBC
- .2 Install vibration isolation equipment in accordance with manufacturer's instructions and adjust mountings to level equipment.
- .3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.
- .4 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:

- .1 Up to NPS4: first 3 points of support. NPS5 to NPS8: first 4 points of support. NPS10 and Over: first 6 points of support.
- .2 First point of support: static deflection of twice deflection of isolated equipment, but not more than 50 mm.
- .5 Where isolation is bolted to floor use vibration isolation rubber washers.
- .6 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.3 **FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
 - .1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.
 - .2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:
 - .1 After delivery and storage of Products.
 - .2 After preparatory work is complete but before installation commences.
 - .3 Twice during the installation, at 25% and 80% completion stages.
 - .4 Upon completion of installation.
 - .3 Submit manufacturer's reports to NRC Representative within 5 days of manufacturer representative's review.
 - .4 Make adjustments and corrections in accordance with written report.
- .2 Inspection and Certification:
 - .1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC system[s] after start up and TAB of systems to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .2 Provide NRC Representative with notice 48 h in advance of commencement of tests.
 - .3 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations (including sound curves).
- .3 Proceed in accordance with Section 01 10 00 – General Instructions.
- .4 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.
- .2 All TAB work shall be performed in conjunction with controls contractor (Ainsworth Controls).

1.2 QUALIFICATIONS OF TAB PERSONNEL

- .1 Submit names of personnel to perform TAB to NRC Representative within 14 days of award of contract.
- .2 Provide documentation confirming qualifications, successful experience.
- .3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
 - .1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1.
 - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
 - .3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.
- .4 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
 - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
 - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

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 to meet specified performance requirements and to achieve specified interaction with other related systems under 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 satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule 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 and confirm in writing to NRC Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to NRC Representative in writing proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of 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 NRC Representative for verification of TAB reports.

1.9 START OF TAB

- .1 Notify NRC Representative and Controls Contractor 7 days prior to start of TAB to confirm proposed dates are acceptable to all parties.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weather-stripping, sealing, and caulking.
- .5 Pressure, leakage, other tests specified elsewhere Division 23.
- .6 Provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of 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:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire, smoke, volume control dampers installed and open.
 - .6 Coil fins combed, clean.
 - .7 Access doors, installed, closed.
 - .8 Outlets installed, volume control dampers open.
 - .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.

1.10 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 5 %, minus 5 %.
 - .2 Hydronic systems: plus or minus 5 %.

1.11 ACCURACY TOLERANCES

- .1 Measured values accurate to within plus or minus 2% of actual values.

1.12 INSTRUMENTS

- .1 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .2 Calibrate within 3 months of TAB. Provide certificate of calibration to NRC Representative.

1.13 SUBMITTALS

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

- .1 Submit for checking and approval of NRC 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 in accordance with AABC or NEBB standards
- .2 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .3 Submit PDF copy of balancing report for review.

1.16 VERIFICATION

- .1 Reported results subject to verification by NRC Representative.
- .2 Provide personnel and instrumentation to verify up to 30% of reported results.
- .3 Number and location of verified results as directed by NRC Representative
- .4 Pay costs to repeat TAB as required to satisfaction of NRC Representative.

1.17 SETTINGS

- .1 After TAB is completed to satisfaction of NRC Representative, replace drive guards, close access doors, lock devices in set positions and ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.18 COMPLETION OF TAB

- .1 TAB considered complete when final TAB Report received and approved by NRC Representative.

1.19 AIR SYSTEMS

- .1 Standard: TAB to most stringent of TAB standards of AABC, NEBB and ASHRAE.
- .2 Complete the Fan Coil Unit Commissioning Checklist for each unit. Checklist provided as part of tender documents (Microsoft Excel version can be provided upon request).
- .3 Do TAB of systems, equipment, components, controls specified Division 23 and the following systems, equipment, components, controls:]
 - .1 Diffusers and exhaust grilles.
 - .2 Fan Coil Units.
 - .3 Air Handling Unit.
 - .4 Exhaust Fan.
- .4 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB.
- .5 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC or NEBB.
- .6 Measurements: to include 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, voltage, noise, vibration.
- .7 Locations of equipment measurements: to include as appropriate:
 - .1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
 - .2 At controllers, controlled device.
- .8 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.20 POST-OCCUPANCY TAB

- .1 Measure DBT, WBT (or %RH), and NC levels, in occupied zone of following areas: Meeting Rooms and quiet rooms.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 **Execution**

3.1 **NOT USED**

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 10 00 – General Instructions.
- .2 Section 01 33 00 – Submittal Procedures.
- .3 Section 01 33 30 – General and Fire Safety Requirements

1.2 REFERENCES

- .1 Definitions:
 - .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - means "not concealed" as previously defined.
 - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
 - .2 TIAC Codes:
 - .1 CRD: Code Round Ductwork,
 - .2 CRF: Code Rectangular Finish.
- .2 Reference Standards:
 - .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IESNA 90.1-[04], SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
 - .2 ASTM International Inc.
 - .1 ASTM B209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C547, Standard Specification for Mineral Fiber Pipe Insulation.
 - .6 ASTM C553, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .7 ASTM C612, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
 - .8 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .9 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36, Commercial Adhesives.
- .5 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .6 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

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 and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Manufacturers' Instructions:
 - .1 Provide manufacture's written duct insulation jointing recommendations. and special handling criteria, installation sequence and cleaning procedures.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: specialist in performing work of this section, and have at least 5 years successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 10 00 – General Instructions and Manufacturer's instructions.

Part 2 Products

2.1 FIRE AND SMOKE RATING

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

2.2 INSULATION

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

- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C553.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C553.

2.3 JACKETS

- .1 Canvas:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.
 - .1 Maximum VOC limit 200 g/L.

2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
 - .1 Maximum VOC limit 200 g/L.
- .2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 ULC Listed Canvas Jacket:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .4 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.
- .5 Contact adhesive: quick-setting
 - .1 Maximum VOC limit 200 g/L.
- .6 Canvas adhesive: washable.
 - .1 Maximum VOC limit 200 g/L.
- .7 Tie wire: 1.5 mm stainless steel.
- .8 Banding: 19 mm wide, 0.5 mm thick stainless steel.
- .9 Facing: 25 mm galvanized steel hexagonal wire mesh stitched on one face of insulation with expanded metal lath on other face.

- .10 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

Part 3 Execution

3.1 APPLICATION

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

3.2 PRE-INSTALLATION REQUIREMENTS

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry and free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and as indicated.
- .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.4 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	[yes]	50
Round cold and dual temperature supply air ducts	C-2	[yes]	50
Rectangular warm air ducts	C-1	[no]	25
Round warm air ducts	C-1	[no]	25
Supply, return and exhaust ducts exposed			[none]

	TIAC Code	Vapour Retarder	Thickness (mm)
in space being served			
Mixing plenums	C-1	[yes]	25
Exhaust duct between dampers and louvres	C-1	[no]	25
Acoustically lined ducts	[none]		25

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

	TIAC Code	Round
Indoor, concealed	Rectangular none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

3.5 CLEANING

.1 Clean in accordance with Section 01 10 00 – General Instructions.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Reheat Coil for in duct reheat
 - .2 Copper piping valves and fittings for hydronic systems.
- .2 Related Sections:
 - .1 Section 01 10 00 – General Instructions.
 - .2 Section 01 33 00 – Submittal Procedures
 - .3 Section 01 33 30 – General and Fire Safety Requirements

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/American Welding Society (AWS)
 - .1 ANSI/AWS A5.8/A5.8M-[04], Specification Filler Metals for Brazing and Bronze Welding.
- .2 American Society of Mechanical Engineers (ASME)
 - .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings.
 - .2 ANSI B16.18, Cast Copper Alloy, Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22, Wrought Copper and Copper-Alloy Solder Joint Pressure Fittings.
- .3 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B32, Standard Specification for Solder Metal.
 - .2 ASTM B61, Standard Specification for Steam or Valve Bronze Castings.
 - .3 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .4 ASTM B88M, Standard Specification for Seamless Copper Water Tube [Metric].
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Manufacturers Standardization Society (MSS)
 - .1 MSS SP80-2003, Bronze Gate, Globe, Angle and Check Valves.
 - .2 MSS SP85-2002, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.

- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Quality assurance submittals: submit following in accordance with Section 01 10 00 – General Instructions.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 10 00 – General Instructions.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial /Territorial regulations and to the satisfaction of the NRC Representative.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 33 30 – General and Fire Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 10 00 – General Instructions
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 01 10 00 – General Instructions.

Part 2 Products

2.1 IN DUCT REHEAT COIL

- .1 Acceptable Manufacturers: Engineered Air, Madoc, Coilmaster or approved equivalent
- .2 Capacity as per schedule on drawing M07
- .3 Frame shall be galvanized steel and installation shall allow for full coil removal for replacement or cleaning.
- .4 Connections shall be sweat type, standard MPT type connections, all connections between dissimilar metals shall have di-electric couplings.
- .5 Coil shall be capable of being fully drained by drain valve located at lowest point.
- .6 Heating Coils: Heating Water: 2 row copper tubes and aluminium fins mechanically bonded, complying with ASTM B-75, 12 fins per inch.

- .7 Drain Pan: Double sloped 20 gauge type 304 Stainless Steel with antimicrobial spray and constructed to ASTM B117

2.2 TUBING

- .1 Type L, Hard drawn copper tubing: to ASTM B88M.

2.3 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 copper alloy solder joint pressure fittings: to ANSI B16.18.

2.4 FLANGES

- .1 Brass or bronze: threaded.

2.5 JOINTS

- .1 Solder, tin-antimony, 95:5: to ASTM B32.
- .2 Silver solder BCUP: to ANSI/AWS A5.8.
- .3 Brazing: as indicated.

2.6 VALVES

- .1 Connections:
 - .1 NPS 2 and smaller: ends for soldering.
- .2 Balancing, for TAB:
 - .1 Sizes: calibrated balancing valves, as specified.
- .3 Drain valves: gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves – Bronze c/w end cap.
- .4 Swing check valves:
 - .1 NPS 2 and under:
 - .1 Class 125, swing, with composition disc, as specified Section 23 05 23.01 - Valves - Bronze.
- .5 Ball valves:
 - .1 NPS 2 and under: as specified Section 23 05 23.01 - Valves - Bronze.

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 PIPING INSTALLATION

- .1 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.
- .2 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 where ever practical.
- .3 Slope piping in direction of drainage and for positive venting.
- .4 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.
- .5 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.
- .6 Assemble piping using fittings manufactured to ANSI standards.

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.

3.4 CIRCUIT BALANCING VALVES

- .1 Install flow balancing valves as indicated.

3.5 FLUSHING AND CLEANING

- .1 Flush and clean in presence of NRC Representative.
- .2 Flush after pressure test for a minimum of 4h.
- .3 Fill with solution of water and non-foaming, phosphate-free detergent 3% solution by weight. Circulate for minimum of 8h.
- .4 Refill system with clean water. Circulate for at least 2h. Clean out strainer screens/baskets regularly. Then drain.
- .5 Drainage to include drain valves, dirt pockets, strainers, low points in system.
- .6 Re-install strainer screens/baskets only after obtaining NRC Representative's approval.

3.6 FILLING OF SYSTEM

- .1 Refill system with clean water adding water treatment as specified.

3.7 FIELD QUALITY CONTROL

- .1 Testing:
 - .1 Test system in accordance with Section 21 05 01 - Common Work Results for Mechanical.
- .2 Balancing:
 - .1 Balance water systems to within plus or minus 5% of design output.

3.8 CLEANING

- .1 Proceed in accordance with Section 01 10 00 – General Instructions.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 10 00 – General Instructions.
- .2 Section 01 33 00 – Submittal Procedures.
- .3 Section 01 33 30 – General and Fire Safety Procedures
- .4 Section 21 05 01 – Common Work Results – Mechanical
- .5 Section 21 05 23.01 – Valves - Bronze

1.2 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME, Boiler and Pressure Vessel Code.
- .2 ASTM International Inc.
 - .1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A278/A278M, Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F (350 degrees C).
 - .3 ASTM A516/A516M, Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.
 - .4 ASTM A536, Standard Specification for Ductile Iron Castings.
 - .5 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
 - .2 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code, Supplement #1.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Contractor shall submit detailed shop drawings for all valves for NRC review.
- .2 Shop drawings shall include but not limited to the following:
 - .1 Fitting type
 - .2 Material for valve body and internals
 - .3 ASME Class
- .3 Equipment shall not be purchased until shop drawings have been approved by NRC.

1.4 CLOSEOUT SUBMITTALS

- .1 See Section 01 10 00 – General Instructions **DELIVERY, STORAGE AND HANDLING**
- .1 See Section 01 10 00 – General Instructions

Part 2 Products

2.1 PIPE ESCUTCHEON

- .1 Chrome plated brass solid type with set screws.
- .2 Outside diameter shall cover opening or sleeve

2.2 AUTOMATIC AIR VENT

- .1 NPS 1/2 pipe size: cast brass body, 150 psig working pressure at 270 deg F, viton seal, stainless steel linkage, brass spring, screwed connection.
- .2 To be installed at all high points of system and where indicated.
- .3 Provide isolation valve to all each vent, See Section 23 05 23.01 Valves Bronze Standard of acceptance: Spirotherm model Spirotop

2.3 PIPE LINE STRAINER

- .1 NPS 2 and under
 - .1 Body: Bronze , ASTM B 62
 - .2 Strainer: stainless steel type 304
 - .3 Screen perforation: 1/16"
 - .4 Removable cap c/w removable threaded cap for blow off connection
 - .5 Connection: screwed [soldered]
 - .6 Minimum saturated steam pressure rating: 200 psig Standard of acceptance: Spiro Sarco Model BT

2.4 ACCESS DOORS

- .1 General : 14 GA. (1.7mm) steel, rust resistant, continuous concealed hinge, with positive and self-opening screwdriver operated lock. Doors in tile walls shall be stainless steel and shall suit tile pattern. All other panels shall be prime painted steel. Unless otherwise stated all panel to be 16"x16". Standard of Acceptance Acudor Series UF-5000 or approved equivalent.
- .2 Fire rated: for walls and ceiling UL/ULC 1-1/2 hour 'B' label with maximum temperature rise of 250 degrees after 30 minutes. Door with 2" (50mm) insulation, steel, 20 GA. (1mm) with 16 GA. (1.6mm) frame, concealed hinge, self latching ring pull and grey baked enamel finish. See as required. Standard of acceptance: Acudor Series FW-5050 or approved equal.

2.5 PIPE ESCUTCHEON

- .1 Chrome plated brass solid type with set screws
- .2 Outside diameter shall cover opening or sleeve.

Part 3 Execution

3.1 APPLICATION

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

3.2 GENERAL

- .1 Run drain lines [and blow off connections] to terminate above nearest drain.
- .2 Maintain adequate clearance to permit service and maintenance.
- .3 Should deviations beyond allowable clearances arise, request and follow NRC directive.
- .4 Check shop drawings for conformance of tappings for ancillaries and for equipment operating weights.

3.3 INSTALLATION OF PIPE ESCUTCHEON

- .1 On pipes passing through walls, partitions, floors and ceilings in finished areas.
- .2 Install the plates so that they are tight against the building surface concerned, and ensure that the plates completely cover pipe sleeves and/or openings.
- .3 Where sleeve extends above finished floor, escutcheons or plates shall cover sleeve extension

3.4 ACCESS DOORS

- .1 Supply access doors to give access to all valves, cleanouts, strainers, duct access doors, and other similar mechanical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on the drawings.
- .2 Locate access doors in walls and partitions to the Engineer's approval, and arrange mechanical work to suit.
- .3 Group piping and ductwork to ensure the minimum number of access doors is required. Access doors will be installed by the trades responsible for the particular type of construction in which the doors are required.
- .4 Access doors shall be, wherever possible, of a standard size for all applications. Confirm exact dimensions prior to ordering.

3.5 STRAINERS

- .1 Provide strainers in piping where shown on the drawings and where specified herein.

3.6 AIR VENTS

- .1 Install at high points of systems and where indicated on drawing.
- .2 Install ball valve on automatic air vent inlet.

3.7 PRESSURE SAFETY RELIEF VALVES

- .1 Install at discharge of pump or as indicated on drawing. Exact location to be coordinated on site with NRC.
- .2 Run discharge pipe to terminate above nearest drain. Exact routing to be coordinated and approved on site by NRC.

3.8 PERFORMANCE VERIFICATION

- .1 See Section 01 10 00 – General Instructions

3.9 CLEANING

- .1 See Section 01 10 00 – General Instructions

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for copper tubing and fittings for refrigerant.

.2 Related Sections:

.1 Section 01 10 00 – General Instructions

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 33 30 – General and Fire Safety Requirements

.4 Section 23 05 01 - Installation of Pipework.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B16.22, Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.

.2 ASME B16.24, Cast Copper Pipe Flanges and Flanged Fittings: Class 150.

.3 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes. American Society for Testing and Materials International (ASTM)

.1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM B280, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning work. All work and scheduling to be coordinated and approved by NRC.
 - .1 Verify project requirements.
 - .2 Review installation conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review installation instructions and warranty requirements.
- .2 Health and Safety:
 - .1 Comply with all provincial construction occupational health and safety requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 The contractor is responsibility to coordinate and dispose of all waste material and unused material to local provincial and municipality requirements.
- .2 It is the full responsibility of the contractor to insure that all construction material, equipment, tools, etc. are stored and used in a safe and reasonable manor as per good industry standards.
- .3 The contractor is responsible for all damaged and stolen material, tools or equipment on site.
- .4 The contractor is responsible for all delivery of material, tools or equipment.

Part 2 Products

2.1 TUBING

- .1 -40 to 60 °C, up to 1035 kPa
- .2 Copper tubing: ASTM B88 Drawn, Type L

2.2 FITTINGS

- .1 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22. Cast bronze threaded fittings, Class 150: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Bronze pipe flanges and flanged fittings, Class 150 to ANSI/ASME B16.24.

2.3 SOLDERED AND BRAZED JOINTS

- .1 Soldered

- .1 Solder: Alloy Sb5 95-5 Tin-Antimony Solder. Teflon tape: for threaded joints
Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner
- .2 Brazed
 - .1 Fittings: wrought copper to ASME B16.22.
 - .2 Joints: silver solder, 15% Ag-80% Cu-5%P or copper - phosphorous 95% Cu-5%P and non-corrosive flux.

2.4 PIPE SLEEVES

- .1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.5 BRONZE BALL VALVES

- .1 NPS 2 and under, threaded ends:
 - .1 Body and cap: cast high tensile bronze
 - .2 Chrome plated brass ball, RPTFE seat.
 - .3 Minimum pressure rating: 1000 kPa saturated steam, 4130 kPa WOG
 - .4 **Valves to be complete with minimal 31 mm stem extension for all insulated pipes, see section 21 07 19 THERMAL INSULATION FOR PIPING**
 - .5 Operator: steel lever handle with securely attached vinyl grip
 - .6 Connections: Screwed ends to ANSI B1.20.1 and with hexagonal shoulders

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 VALVES:

- .1 Install where indicated on drawing and in specifications
- .2 Install at all low points when piping is tested with water.
- .3 Install as per manufacturer's recommendations.

3.3 BRAZING PROCEDURES

- .1 Bleed inert gas (nitrogen) into pipe during brazing.
- .2 Valves are not to be brazed.

- .3 Do not apply heat near expansion valve and bulb.
- .4 Remove valve internal parts, solenoid valve coils, sight glass.

3.4 PIPING INSTALLATION

- .1 General:
 - .1 Hard drawn copper tubing: do not bend. Minimize use of fittings.
 - .2 Contractor shall provide test ports for pressure testing as required.

3.5 PRESSURE AND LEAK TESTING

- .1 Close valves and other equipment not designed for test pressures.
- 2. Provide mill test report for all piping.
- 3. The contractor is responsible to organize and arrange for all license and welding procedure and welders qualification verification.
- 5. Contractor shall be responsible for provision of all labour and material necessary to blank off tested section, and remove items which cannot sustain test pressure. All test procedures to be by ASME 31.1.
- 6. After hydrostatic test at a minimum pressure of 1.5 times design pressure for 30 minutes, contractor shall ensure that all new piping sections are thoroughly dried off and cleaned from any debris before being put in service.
- 7. Contractor may perform a pneumatic test at a minimum pressure of 1.2 times design pressure for 30 minutes instead of hydrostatic pending NRC approval.
- 8. NRC shall be given a minimum of 48 hour notice of all tests.
- 9. Contractor shall provide records of the tests, data on instrumentation used and calibration of gauges shall be made available to NRC. Range on pressure gauge used for testing shall not exceed 1.25 times test pressure.
- 10. All piping components provided must have a valid Canadian Registration Number (CRN) recognized by the TSSA. All CRN(s) to be supplied and approved by NRC prior to installation.

3.6 CLEANING

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for duct accessories including flexible connections, access doors, vanes and collars.
- .2 Related Sections:
 - .1 Section 01 10 00 – General Instructions.
 - .2 Section 01 33 00 – Submittal Procedures
 - .3 Section 01 33 30 – General and Fire Safety Requirements
 - .4 Section 21 05 01 – Common Work Results - Mechanical

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, [95].

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:
 - .1 Flexible connections.
 - .2 Flexible ductwork.
 - .3 Fire dampers.
 - .4 Balancing dampers.
 - .5 Back draft dampers.
 - .6 Duct access doors.
 - .7 Turning vanes.
 - .8 Instrument test ports.
 - .2 Submit WHMIS MSDS in accordance with Section 01 10 00 – General Instructions and Section 01 33 30 – General and Fire Safety Requirements. Indicate VOC's for adhesive and solvents during application and curing.
- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

- .1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturer's Field Reports: manufacturer's field reports specified.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 10 00 – General Instructions.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section.
 - .1 Verify project requirements.
 - .2 Review installation [and substrate] conditions.
 - .3 Co-ordination with other building sub-trades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
 - .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 33 30 – General and Fire Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 The contractor is responsible to coordinate and dispose of all waste material to local provincial and municipality requirements. Refer to section 01 10 00 – General Instructions.
 - .2 It is the full responsibility of the contractor to insure that all construction material, equipment, tools, etc. are stored and used in a safe and reasonable manner as per good industry standards.
 - .3 The contractor is responsible for all damaged and stolen material, tools or equipment on site.
 - .4 The contractor is responsible for all delivery of material, tools or equipment

Part 2 Products

2.1 GENERAL

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 STEEL DUCTWORK

- .1 Prime quality galvanized sheet steel with metal gauges in accordance with SMACNA standards to suit the duct configuration and classification.

2.3 FLEXIBLE DUCTWORK – INSULATED

- .1 Flexmaster Triple Lock Type V U.L.C. listed flexible ductwork c/w a core of standard triple lock metal flexible ducting, factory supplied glass or mineral wool insulating blanket and an outer jacket of flexible PVC sheet.
- .2 Acceptable manufacturers are Flexmaster Ltd., Trans Continental Equipment Ltd., "Al-U-Flex", and Alpha Sheet Metal Co.

2.4 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, airtight and moisture proof material, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m².
- .3 Acceptable manufacturers are Duro-Dyne Ltd., "Durolon" as above, Ventfabrics "Ventglas" and Elgen Engineering Ltd. "Neoprene".

2.5 FIRE DAMPERS

- .1 Nailor-Hart Industries Inc. U.L.C. 1-1/2 hour rated, listed and labelled galvanized steel folding blade fire dampers as follows:
 - .1 Model No. 0120 in rectangular ductwork less than 350 mm (14") maximum dimension;
 - .2 Model No. 0110 in rectangular ductwork 350 mm (14") and larger maximum dimension;
 - .3 Model No. 0130 in round ductwork.
- .2 Each fire damper shall be complete with a replaceable 71 degrees C (160 degrees F) fusible link, and a suitable galvanized steel sleeve.
- .3 Horizontally mounted fire dampers shall be complete with stainless steel closure springs and positive blade locking devices.
- .4 Acceptable manufacturers are Nailor-Hart Industries, Controlled Air Manufacturing, Canada Advanced Air Ltd. and Ruskin (Kerr-Hunt).

2.6 ROUND TO RECTANGULAR DUCT CONNECTIONS

- .1 Nailor-Hart Industries Inc. "Spin-In" galvanized steel round to rectangular duct take-off connection collars, Model #1801 where dampers are not required, Model #1802 with integral damper where dampers are required.
- .2 Acceptable manufacturers are Nailor-Hart Industries Inc., Controlled Air Manufacturing and Flexmaster Canada Ltd.

2.7 SPIN-IN COLLARS

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to co-responding round duct standards.

2.8 BALANCING DAMPERS

- .1 Nailor-Hart Industries Inc. opposed blade galvanized steel control damper, Model No. 1020 for rectangular ductwork, Model No. 1021 for round ductwork, each complete with No. 16 U.S.S. gauge frame, No. 18 U.S.S. gauge blades, nylon blade shaft bearings, linkage shaft extension, and a suitable and secure damper operator with locking device and visual indication of damper position from the duct exterior.
- .2 Acceptable manufacturers are Nailor-Hart Industries Inc., Controlled Air Manufacturing Ltd., Ruskin Ltd., and Air Specialties Manufacturing Ltd.

2.9 BACK DRAFT DAMPERS

- .1 Nailor-Hart Industries Inc. 1300 Series gravity type dampers each complete with a galvanized steel frame, aluminum damper blades with felt edges, and lifetime lubricated bearings.
- .2 Acceptable manufacturers are Nailor-Hart Industries Inc., Controlled Air Manufacturing Ltd., Ruskin Ltd., and Air Specialties Manufacturing Ltd.

2.10 DUCT ACCESS DOORS

.1 General:

- .1 Non-insulated sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.7 mm thick (No. 24 gauge) complete with sheet metal angle frame.
- .2 Insulated sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.7 mm thick No. 24 gauge) complete with sheet metal angle frame and 25mm (1") thick rigid glass fibre insulation.
- .2 Gaskets: neoprene or foam rubber.

.3 Hardware:

- .1 Up to 300 x 300 mm (12" x 12"): 2 sash locks.
- .2 301 to 450 mm (12" x 18"): 4 sash locks [complete with safety chain].
- .3 451 to 1000 mm (18" x 40"): piano hinge and minimum 2 sash locks complete with safety chain.
- .4 Doors over 1000 mm (40"): piano hinge and 2 handles operable from both sides.

2.11 BIRD SCREEN

- .1 Heavy gauge galvanized steel or aluminum mesh 12 mm x 12 mm (1/2" x 1/2") sized as indicated on the drawings.

2.12 ACOUSTIC DUCT LINER

.1 General:

- .1 Fibrous glass duct liner 25 mm (1") thick: air side coated with black neoprene.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50.

- .3 Fibrous glass rigid board for rectangular surfaces, fibrous glass blanket for round surfaces.
- .2 **Fasteners:**
 - .1 Duro-Dyne clip pins for installation through the insulation, length to suit the insulation thickness.
- .3 Acceptable manufacturers of acoustic duct liner are Fiberglass Canada Ltd., Manville Canada Inc. and Atlas Asbestos Co. Ltd.

2.13 GRILLES, REGISTERS & DIFFUSERS

- .1 Grilles, registers and diffusers of the type, size and arrangement as specified on the drawings.
- .2 Grilles, registers and diffusers shall be product of one manufacturer.
- .3 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.
- .4 Acceptable manufacturers are E.H. Price Ltd., Titus Ltd., Air Vector Ltd., Nailor Industries Inc., Krueger Manufacturing Co. and Carnes.

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 data sheet.

3.2 INSTALLATION

.1 DUCT, DAMPER & SIMILAR FORMED OPENINGS

- .1 Duct openings, air inlet and outlet openings, fire damper openings, etc. will be provided in poured concrete work, masonry, drywall surfaces, etc., by the trade responsible for the particular construction in which the opening is required.
- .2 Ensure that openings for fire dampers to 350 mm (14") high are sized to suit the damper arrangement with folding blade out of the air stream.

.2 FABRICATION & INSTALLATION OF STEEL DUCTWORK

- .1 Provide all required steel ductwork. Unless otherwise noted, all ductwork shall be constructed of galvanized steel.
- .2 Unless specifically noted otherwise, all duct, bends, elbows, transformations, branch fittings, etc. shall be fabricated, sealed and installed in accordance with the 1" water gauge (0.25 kPa) pressure class of the latest edition of SMACNA Hvac Duct Construction Standards, except for duct upstream of VAV boxes, which shall comply with the requirements of the 2" water gauge (0.50 kPa) pressure class.
- .3 Automatic control dampers and similar duct mounted control components supplied by controls contractor (Ainsworth).

.3 FLEXIBLE DUCTWORK

- .1 Install flexible ductwork where indicated.
- .2 At connections between sheet metal ducts and flexible ducts, provide galvanized steel round to rectangular duct connections as specified hereinbefore.
- .3 Install flexible ducts as straight as possible, secure at each end with steel gear type clamps, and seal joints. Where bends are required, they shall be long radius.
- .4 Maximum length of flexible duct to be 3m (10').

.4 FLEXIBLE CONNECTIONS

- .1 Provide flexible connection in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.
- .2 Length of connection: 150 mm (6").
- .3 Install in accordance with recommendations of SMACNA.
- .4 Minimum distance between metal parts when system in operation: [75] mm (3").
- .5 When fan is running:
 - .1 Ducting on sides of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.

.5 FIRE DAMPERS

- .1 Provide fusible link fire dampers where shown on the drawings.
- .2 Supply dampers which are factory secured with a galvanized steel sleeve, or supply the sleeves at the site. Install the dampers by means of No. 4 gauge 20mm (3/4") sheet metal screws at 150 mm (6") O.C.
- .3 Secure 12mm x 12mm x 3mm (1/2" x 1/2" x 1/8") steel angles by means of tack welding or bolts to the perimeter of one (1) side of the damper sleeves. Install the sleeves in the opening, then secure angles to the perimeter of the other side of the sleeve at the side of the barrier penetrated by the duct.
- .4 Provide expansion clearances between the damper sleeve and the opening in which the damper is required. Ensure that the openings are properly sized and located, and that all voids between the damper sleeve and the opening are properly sealed to maintain the rating of the fire barrier.
- .5 Connect and secure ductwork to fire dampers in accordance with the damper manufacturer's recommendations and to NFPA requirements.

.6 BALANCING DAMPERS

- .1 Provide volume type dampers in all open end ductwork and wherever else shown.
- .2 Install the dampers such that the operating mechanism is positioned for easy operation, and such that the dampers cannot move or rattle.

.7 BACK-DRAFT DAMPERS

- .1 Provide back-draft dampers in the ductwork where shown.
- .2 Install and secure such that the dampers cannot move or rattle.

.8 DUCT ACCESS DOORS

- .1 Provide access doors in ductwork for access to all duct system components which will or may need maintenance and/or repair.
- .2 Size:
 - .1 600 x 600 mm for servicing entry.
 - .2 As indicated.
- .3 Locations:
 - .1 Fire and smoke dampers.
 - .2 Control dampers.
 - .3 Devices requiring maintenance.
 - .4 Required by code.
 - .5 Reheat coils.
 - .6 Elsewhere as indicated.
- .4 Identify access doors provided for fusible link fire damper maintenance as such.
- .5 Access doors in insulated ductwork shall be sandwich construction type with insulation between the inner and outer panels.

.9 BIRD SCREEN

- .1 Provide galvanized steel or aluminum bird screen over air intake and exhaust air openings in walls where indicated.

.10 ACOUSTIC DUCT LINER

- .1 Provide acoustic lining for interior surfaces of ducts where indicated.
- .2 Fasten lining to interior sheet metal surfaces with 100% coverage of adhesive.
- .3 Install weld pins at 400 mm (16") centres on top and side surfaces and seal all joints, exposed edges, weld pin and clip penetrations and all damaged areas of liners. Cover lining joints with tape secured with 2 coats of sealer.
- .4 During installation, take particular care to ensure that the lining coating is not damaged and that exposed lining edges are protected properly such that the lining does not erode when subjected to the velocity in the particular system. Badly damaged areas of lining to be replaced at discretion of the Engineer.
- .5 Increase the size of all lined ducts such that interior duct dimensions with lining in place are the dimensions shown and/or specified on the drawings.
- .6 Where turning vanes, dampers, etc., occur in lined duct, they must be installed in a manner such that the liner surface is not damaged, the damper operation is not restricted, and friction loss within the duct is not increased.

.11 GRILLES, REGISTERS & DIFFUSERS

- .1 Provide grilles and diffusers of the type, size and arrangement specified and shown on the drawings.
- .2 Exactly locate grilles and diffusers to conform to the final architectural reflected ceiling plans and detailed wall elevations, and to conform to the final lighting, ceiling layout, ornamental and other wall treatment.
- .3 Equip supply diffusers having a basic four-way or all round air pattern for operation in one (1), two (2) or three (3) way pattern where so directed on the drawings.
- .4 Confirm finish of grilles, registers and diffusers prior to ordering.

3.3 CLEANING

- .1 Perform cleaning operations as specified in **Section 01 10 00 – General Instructions** and in accordance with manufacturer's recommendations.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1- GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 01 10 00 – General Instructions.
- .2 Section 01 33 00 – Submittal Procedures.
- .3 Section 01 33 30 – General and Fire Safety Requirements.
- .4 Section 21 05 01 – Common Work Results – Mechanical.

1.2 REFERENCES

- .1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
 - .1 ANSI/AMCA Standard 99, Standards Handbook.
 - .2 ANSI/AMCA Standard 210/(ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
 - .3 ANSI/AMCA Standard 300, Reverberant Room Method for Sound Testing of Fans.
 - .4 ANSI/AMCA Standard 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for HVAC fans and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide:
 - .1 Fan performance curves showing point of operation, bhp and efficiency.
 - .2 Sound rating data at point of operation.
 - .2 Indicate:
 - .1 Motors, sheaves, bearings, shaft details.
 - .2 Minimum performance achievable with variable speed controllers.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 10 00 – General Instructions.
 - .1 Provide:
 - .1 Matched sets of belts.
 - .2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
 - .1 Bearings and seals.
 - .2 Addresses of suppliers.
 - .3 List of specialized tools necessary for adjusting, repairing or replacing.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 10 00 – General Instructions and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect HVAC fans from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
 - .2 Capacity: flow rate, total pressure, bhp, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
 - .3 Fans: statically and dynamically balanced, constructed in conformity with ANSI/AMCA Standard 99.
 - .4 Sound ratings: comply with ANSI/AMCA Standard 301, tested to ANSI/AMCA Standard 300. Supply unit with ANSI/AMCA certified sound rating seal.
 - .5 Performance ratings: based on tests performed in accordance with ANSI/AMCA Standard 210. Supply unit with ANSI/AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

2.2 FANS GENERAL

- .1 ANY PROPOSED ALTERNATES FROM THE BASIS OF DESIGN SHALL BE SUBMITTED BY THE DATE OUTLINED IN THE TENDER DOCUMENTS
- .2 Refer to schedule on drawings for basis of design.
- .3 Motors:
 - .1 In accordance with Section 23 05 13 - Common Motors Requirements for HVAC Equipment supplemented as specified herein.
 - .2 For use with variable speed controllers.
 - .3 Sizes as indicated in fan schedule.
 - .4 Fan Motors shall be variable subject
- .4 Accessories and hardware: matched sets of V-belt drives, adjustable motor bases, belt guards, coupling guards fan inlet or outlet safety screens as indicated and as specified in Section 23 05 13 - Common Motor Requirements for HVAC Equipment and as indicated.

- .5 Factory primed before assembly in colour standard to manufacturer.
- .6 Scroll casing drains: as indicated.
- .7 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.
- .8 Vibration isolation: to Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.
- .9 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

2.3 CENTRIFUGAL FANS

- .1 Fan wheels:
 - .1 Welded steel construction.
 - .2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.
 - .3 Forward curved blades.
 - .4 Statically dynamically balanced in accordance with AMCA Standard 204
- .2 Bearings: heavy duty grease lubricated ball or roller self aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 80,000 hours.
- .3 Housings:
 - .1 Volute with inlet cones: fabricated steel for wheels 300 mm or greater, steel or aluminum for smaller wheels, braced, and with welded supports.
- .4 Variable volume control devices:
 - .1 Externally mounted speed controller by fan manufacturer.
 - .2 ECM motor: provided by fan manufacturer.

2.4 CABINET FANS - GENERAL PURPOSE

- .1 Fan characteristics and construction: as centrifugal fans.
- .2 Cabinet hung single or multiple wheel with DWDI centrifugal fans in factory fabricated casing complete with vibration isolators and seismic control measures, motor, variable speed controller outside casing.
- .3 Fabricate casing of zinc coated or phosphate treated steel reinforced and braced for rigidity. Provide removable panels for access to interior. Paint uncoated, steel parts with corrosion resistant paint to MPI #18. Finish inside and out, over prime coat, with rust resistant enamel. Internally line cabinet with 13 mm thick rigid acoustic insulation
- .4 Basis of Design as per schedule on drawing

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 FAN INSTALLATION

- .1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment, flexible electrical leads and flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.
- .2 Provide sheaves and belts required for final air balance.
- .3 Bearings and extension tubes to be easily accessible.
- .4 Access doors and access panels to be easily accessible.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 10 00 – General Instructions.
- .1 Leave Work area clean at end of each day.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Supply, return and exhaust grilles and registers, diffusers and linear grilles, for commercial and residential use.
- .2 Related Sections:
 - .1 Section 01 10 00 – General Instructions.
 - .2 Section 01 33 00 – Submittal Procedure
 - .3 Section 01 33 30 – General and Fire Safety Requirements
 - .4 Section 21 05 01 – Common Work Results- Mechanical
 - .5 Section 21 05 02 – Mechanical Identification
 - .6 Section 23 05 13 – Common Motor Requirements for HVAC
 - .7 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC

1.2 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedure. Include product characteristics, performance criteria, and limitations.
 - .2 Indicate following:
 - .1 Capacity.
 - .2 Throw and terminal velocity.
 - .3 Noise criteria.
 - .4 Pressure drop.
 - .5 Neck velocity.
- .2 Quality assurance submittals: submit following in accordance with Section 01 10 00 – General Instructions.

1.4 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 33 30 – General and Fire Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 10 00 – General Instructions.

- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 01 10 00 – General Instructions.

Part 2 Products

2.1 GENERAL

- .1 NOTE: ALL PROPOSED ALTERNATES ARE TO BE SUBMITTED BEFORE THE DATE SPECIFIED IN TENDER DOCUMENTS.
- .2 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity.
- .3 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board.
 - .3 Concealed fasteners.
- .4 Concealed manual volume control damper operators.
- .5 Colour: White unless directed by Departmental Representative.
- .6 All new and existing diffusers, grilles and registers as well as any associated ductwork is to be cleaned and vacuumed (within vacuum hose length)
- .7 Refer to drawing 5604-M07 for diffuser and grille schedule(s), basis of design and acceptable material

2.2 MANUFACTURED UNITS

- .1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

2.3 SUPPLY DIFFUSERS, GRILLES AND REGISTERS

- .1 General: with opposed blade balancing dampers.
- .2 Type SD1: Square, steel and aluminum construction, perforated face, 4 way air diffusion, suitable for T-bar mounting. Finish: white. Acceptable Material: EH Price, Titus, Nailor, Metal Aire or approved equal.
- .3 Type SD2: Linear 2 slot diffuser, 13mm wide slots c/w adjustable air pattern controllers suitable for plaster frame or T-bar mounting (refer to locations and architectural drawings), for flush plaster application the mounting shall be concealed. Aluminium construction, with insulated sloped shoulder plenum constructed of galvanized steel and internally lined with 7mm of fibre free insulation. Acceptable Material: EH Price, Titus, Nailor or approved equal.
- .4 Type SD3: Linear 3 slot diffuser, 13mm wide slots c/w adjustable air pattern controllers suitable for plaster frame or T-bar mounting (refer to locations and architectural drawings), for flush plaster application the mounting shall be concealed. Aluminium construction, with insulated sloped shoulder plenum constructed of galvanized steel and internally lined with 7mm of fibre free insulation. Acceptable Material: EH Price, Titus, Nailor or approved equal.

2.4 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 General: with opposed bladed balancing dampers except for grilled type RG1.
- .2 Type RG1: Square, steel and aluminum construction, perforated face, suitable for T-bar mounting. Finish: white. Acceptable Material: EH Price, Titus, Nailor, Metal Aire or approved equal.
- .3 Type RG2: Square, steel and aluminum construction, perforated face, suitable for T-bar mounting. Finish: white. Acceptable Material: EH Price, Titus, Nailor, Metal Aire or approved equal
- .4 Type EG1: Square, steel and aluminum construction, perforated face, suitable for T-Bar mounting. Finish: white. Acceptable Material: EH Price, Titus, Nailor, Metal Aire or approved equal
- .5 Type EG2: Rectangular 300x200, steel and aluminum construction, perforated face, suitable for T-bar mounting. Finish: white. Acceptable Material: EH Price, Titus, Nailor, Metal Aire or approved equal
- .6 Type EG3: Rectangular, 600x300 steel and aluminum construction, perforated face, suitable for T-bar mounting. Finish: white. Acceptable Material: EH Price, Titus, Nailor, Metal Aire or approved equal

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 manufacturer's instructions.
- .2 Install with flat head stainless steel screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 10 00 – General Instructions
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Mechanical louvers; intakes; vents; and reinforcement and bracing for air vents, intakes and gooseneck hoods.
- .2 Related Sections:
 - .1 Section 01 10 00 – General Instructions.
 - .2 Section 01 33 00 – Submittal Procedures
 - .3 Section 01 33 30 – General and Fire Safety Requirements.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/ National Fire Protection Association (NFPA)
 - .1 ANSI/NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- .5 Society of Automotive Engineers (SAE)

1.3 SYSTEM DESCRIPTION

- .1 Performance Requirements:
 - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

1.4 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .2 Indicate following:
 - .1 Pressure drop.
 - .2 Face area.

- .3 Free area..
- .2 Quality assurance submittals: submit following in accordance with Section 00 10 00 – General Instructions.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
- .3 Test Reports:
 - .1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

1.5 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 33 30 – General and Fire Safety Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with Section 01 10 00 – General Instructions.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 01 10 00 – General Instructions.

Part 2 Products

2.1 FIXED LOUVRES - ALUMINUM

- .1 Refer to drawings and schedules for basis of design and dimensions
- .2 Construction: welded with exposed joints ground flush and smooth.
- .3 Material: extruded aluminum alloy 6063-T5.
- .4 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm.
- .5 Frame, head, sill and jamb: 100 mm deep one piece extruded aluminum, minimum 3 mm thick.
- .6 Mullions: at 1500 mm maximum centres.
- .7 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

- .8 Screen: 12mm mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvers in formed U-frame.
- .9 Finish: anodized. Colour: to NRC Representative's approval.

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 In accordance with manufacturer's and SMACNA recommendations.
- .2 Reinforce and brace as indicated.
- .3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 10 00 – General Instructions.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for fan coil units.
- .2 Related Sections:
 - .1 Section 01 10 00 – General Instructions.
 - .2 Section 01 33 00 – Submittal Procedures.
 - .3 Section 01 33 30 – General and Fire Safety Requirements.

1.2 REFERENCES

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

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 30 – General and Fire Safety Requirements.
 - .2 Product data to include:
 - .1 Filters, fan accessibility.
 - .2 Suspension of cabinet.
 - .3 Physical size.
 - .4 Thermostat, transformer, controls where integral.
 - .5 Finish.
 - .6 kW rating, voltage, phase.
 - .7 Cabinet material thicknesses.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Quality assurance submittals: submit following in accordance with Section 01 10 00 – General Instructions.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:

- .1 Do construction occupational health and safety in accordance with Section 01 33 30 – General and Fire Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 ALL FAN COILS SHALL BE PRICED AND ORDERED USING QUICK SHIP OPTION.

- .2 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 10 00 – General Instructions.
- .3 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 01 10 00 – General Instructions.

Part 2 Products

2.1 FAN COIL UNITS

- .1 Cabinet: steel, 19 gauge thick, ceiling mounting, lined with 25mm of fiberglass insulation (0.68 kg density). Back inlet/ front outlet.
- .2 Cooling Coils: Chilled Water, 4 row copper tubes and aluminium fins mechanically bonded, complying with ASTM B-75, 12 fins per inch.
- .3 Heating Coils: Heating Water: 2 row copper tubes and aluminium fins mechanically bonded, complying with ASTM B-75, 12 fins per inch.
- .4 Drain Pan: Double sloped 20 gauge type 304 Stainless Steel with antimicrobial spray and constructed to ASTM B117.
- .5 Blower motors: variable speed, single phase. Refer to drawings for voltages and amperages.
- .6 Fans: direct driven double width fan wheel with forward curved blades, statically and dynamically balanced. Heavy gauge galvanized steel construction with die-formed inlet cones. Fan wheels constructed of galvanized steel.
- .7 Wall mounted thermostats: Provided by Controls Contractor (Ainsworth)
- .8 Filter: 25mm replaceable.
- .9 Finish: powder coated, baked finished colour as per manufacturer's basic colour.
- .10 Assembly fully wired to one outlet location.
- .11 Multiple knockouts for up to 38 mm diameter conduit.
- .12 Basis of Design: Magic Aire HCA units. Refer to schedules on drawings for capacities and additional information

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 Hang units with manufacturer's specified and/or supplied vibration isolators and seismic supports.
- .2 Make power and control connections.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 10 00 – General Instructions.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Base board and finned tube radiation, and cabinet convectors including installation.
- .2 Related Sections:
 - .1 Section 01 10 00 – General Instructions
 - .2 Section 01 33 00 – Submittal Procedures
 - .3 Section 01 33 30 – General and Fire Safety Requirements.
 - .4 Section 21 05 01 – Common Work Results - Mechanical.

1.2 REFERENCES

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Hydronic Institute of Boiler and Radiator Manufacturers (IBR)

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
 - .2 Indicate:
 - .1 Equipment, capacity, piping, and connections.
 - .2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.
 - .3 Special enclosures.
- .3 Quality assurance submittals: submit following in accordance with Section 01 10 00 – General Instructions
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
- .4 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manual specified in Section 01 10 00 – General Instructions.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 33 30 – General and Fire Safety Requirements

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 10 00 – General Instructions.
- .2 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: in accordance with Section 01 10 00 – General Instructions

Part 2 Products

2.1 DAMPERS

- .1 Factory built, internal damper, at enclosure air outlet grille for each convection type heating unit not thermostatically controlled. Refer to schedules on drawings.

2.2 CAPACITY

- .1 As indicated, based on 93 degrees C average water temperature, 11 degrees C temperature drop and 12.7 degrees C at entering air temperature.

2.3 FINNED TUBE RADIATION

- .1 Heating elements: NPS 1/2 seamless copper tubing, 1.2 mm minimum wall thickness, mechanically expanded into flanged collars of evenly spaced aluminum fins, 100 x 100 mm nominal, 130 fins per metre suitable for sweat fittings.
- .2 Heating elements: NPS 1/2 steel tube 3.1 mm minimum wall thickness, mechanically expanded into flanged collars of evenly spaced steel fins 100 x 100 mm nominal fins, 105 fins per metre.
- .3 Element hangers: plastic lined cradle type providing unrestricted longitudinal movement on enclosure brackets. Space brackets 900 mm centres maximum and each elbow.
- .4 Special enclosures: Use undamaged existing radiant heater cover as a template for new covers, delete damper on new covers. Submit proposed copy and selection of enclosure to NRC representative for review before commencing manufacture. Do not install modified covers in open office areas.
- .5 Dimensions for enclosures: measure site conditions. Do not scale from drawing.
- .6 Provide for noiseless expansion of components.

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 manufacturer's instructions.
- .2 Install in accordance with piping layout and reviewed shop drawings.
- .3 Provide for pipe movement during normal operation.
- .4 Maintain sufficient clearance to permit performance of service maintenance.
- .5 Check final location with NRC Representative if different from that indicated prior to installation. Should deviations beyond allowable clearances arise, request and follow NRC Representative's directive.
- .6 Valves:
 - .1 Install valves with stems upright or horizontal unless approved otherwise.
 - .2 Install isolating ball valves on inlet and balancing valves on outlet of each unit.
- .7 Venting:
 - .1 Install automatic air vent c/w 1/4 turn isolation valve on continuous finned tube radiation.
- .8 Clean finned tubes and comb straight.
- .9 Install flexible expansion compensators as indicated.

3.3 CLEANING

- .1 Proceed in accordance with **Section 01 10 00 – General Instructions.**
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.
- .2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

Part 2 Products

2.1 BUILDING WIRES AND GENERAL REQUIREMENTS

- .1 Conductor material for branch circuit wiring and grounding:
 - .1 Stranded copper.
 - .2 Neutral wire: continuous throughout its length without breaks.
 - .3 Separate insulated green grounding conductors in all electrical conduits.
 - .4 All wire and cable insulation shall meet the C.S.A. Standards for the types and services hereinafter specified. Colours as per section 4-036 of Electrical Code.
 - .5 Where otherwise specified, use wire and cable types as follows:
 - .1 Type R90 XLPE cross-link polyethylene stranded for applications using wires sized No. 8 and larger.
 - .2 Type T90 stranded for applications using wires sized No. 10 and smaller.
 - .3 For fire alarm wiring refer to Section 283100.
 - .4 Approved heat resistant wire for wiring through and at lighting and heating fixtures. Where insulation types are shown on the drawings other types shall not be used unless the specification is more restrictive.
 - .6 Use AC90 (BX) cable **only** under the following conditions:
 - .1 Wiring from a junction box to a recessed lighting fixture in suspended ceilings. Cable length not to exceed 1.5 m (5'), or
 - .2 Wiring switches or receptacles in existing or new hollow gypsum partitions, vertical runs only with cable length not to exceed 3.5m (12'), or
 - .3 When specifically called for on drawings or approved in writing by departmental representative.
 - .4 AC90 shall not be used in insulated walls or masonry walls.
 - .5 Only AC90 cable of No. 12 AWG will be accepted.
 - .7 Use stranded wire no smaller than No. 12 AWG for lighting and power and no smaller than No. 16 AWG for control wiring.

- .8 Conductors shall be soft copper properly refined and tinned having a minimum conductivity of 98%.

Part 3 Execution

3.1 BUILDING WIRES

- .1 Install building wires as follows:
- .1 Make joints, taps and splices in approved boxes with solderless connectors. Joints and/or splices are not acceptable inside a panelboard.
 - .2 Ensure the lugs accommodate all the strands of the conductor.
 - .3 Replace any wire or cable showing evidence of mechanical injury.
 - .4 Use No. 10 AWG for branch circuit wiring extending more than 30 m (100 ft.) to farthest outlet from panel.
 - .5 Circuit numbers indicated on the drawing are intended as a guide for the proper connection of multi-wire circuits at the panel.
 - .6 Take care to keep the conductors free from twisting.
 - .7 Use an approved lubricant for pulling in conduit.
 - .8 Leave sufficient slack on all runs to permit proper splicing and connection of electrical devices.
 - .9 Branch circuit wiring of 120 volt applications to be multi-wire utilizing common neutrals. Under no condition shall any switch break a neutral conductor.
 - .10 Provide and install an approved fire- retardant wrap or coating for PVC jacketed cables installed in a grouped configuration of two or more.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.
- .2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

Part 2 Products

2.1 WIRE AND BOX CONNECTORS

- .1 Pressure type wire connectors sized to fit conductors.

2.2 WIRING TERMINATIONS

- .1 Provide first grade wire and cable connectors suitable for the service on which they are used and install them in accordance with the latest trade practice.
- .2 Provide high quality extruded copper-free aluminium (0.4% or less) connectors for single and multi conductor cable. Steel and then zinc plated connectors for multi conductor cables.
- .3 When used in hazardous area, connectors should be certified for such location in Class, Division and Group.
- .4 For large conductor sizes, use bolted or compression solderless type connectors.
- .5 Use high temperature connectors and insulation on all connections of high temperature conductors.
- .6 Where connector types are called for on the drawings or in the specification, do not use other types.
- .7 Lugs, terminals, screws used for termination of wiring to be suitable for copper conductors.
- .8 For fire alarm wiring refer to Section 28 31 00.

Part 3 Execution

3.1 INSTALLATION

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

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.
- .2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

Part 2 Products

2.1 FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Steel coupling for EMT.
- .3 Fittings for liquid-tight flexible conduits shall be liquid-tight connectors.
- .4 Provide expansion couplings for all conduits running in slabs through expansion joints. These shall be the type approved for use in concrete with a bonding conductor.
- .5 Factory bends are not permitted to be modified. Ensure conduit bends other than factory bends are made with an approved bender. Making offsets and other bends by cutting and rejoining factory bends are not permitted.

2.2 OUTLET BOXES

- .1 Size boxes in accordance with CSA-C22.
- .2 Unless otherwise specified, provide galvanized steel outlet boxes at least 40mm (1-1/2") deep, single or ganged style, of proper size to accommodate devices used and shall be equipped with covers as necessary of the type designed for the specified fittings. Pull boxes shall be steel and shall be galvanized or painted to prevent rusting. For lighting fixture outlets, use 100mm (4") octagon boxes.
- .3 Equip with plaster rings for flush mounting devices in finished walls.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Equip with centre fixture studs for light fixtures.
- .6 Use cast boxes where indicated and for surface mounted wiring. In areas above hung ceilings where appearance is not significant, pressed steel surface boxes may be used.

- .7 Supply all outlet boxes and pull boxes sized according to code requirements unless specified otherwise on the drawings.

2.3 SUPPORT HARDWARE

- .1 Use 10mm (3/8") threaded rod for suspended unistrut and conduit.
- .2 Unless otherwise specified, use 41mm x 41mm (1-5/8" x 1-5/8") galvanized steel unistrut for conduit support systems.

Part 3 Execution

3.1 INSTALLATION

- .1 Install outlet boxes as follows:
- .1 Support boxes independently of connecting conduits.
 - .2 Make necessary mounting adjustments to the outlet to match interior finish.
 - .3 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of construction material.
 - .4 Where more than one conduit enters a switch or receptacle box on the same side, provide a 100mm (4") minimum square box with a suitable plaster ring.
 - .5 Location and appearance to be to the NRC Departmental Representative's approval.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.
- .2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

Part 2 Products

2.1 RACEWAYS

- .1 Conduit:
 - .1 Each length of conduit to be new and bear the CSA Stamp of Approval.
 - .2 Conduit, unless otherwise noted, to be EMT, no smaller than 16mm (1/2").
 - .3 Conduit to be coloured as required for systems described in section 260500.9.
- .2 Bushings and Connectors:
 - .1 Insulated type, with the insulation an integral part of the fitting.
- .3 Conduit Fastening:
 - .1 One hole malleable iron straps to secure surface conduits. Two hole straps for conduits larger than 50mm (2").
 - .2 Beam clamps to secure conduits to exposed steel work.
 - .3 Channel type supports for two or more conduits.
- .4 Pull Cord:
 - .1 Polypropylene cord in empty conduit.
- .5 Unless specifically called for on the drawings, do not use flexible conduits but it is recognized that there may be applications where this material will be useful, such as equipment connections, etc. In such cases, obtain permission for its use from the NRC Departmental Representative. For tender purposes, assume that flexible conduits will not be permitted unless specifically called for on the drawings or equipment specifications. All flexible conduits for vapour-tight applications shall be liquid-tight flexible conduits (seal-tight).
- .6 Provide expansion couplings for all conduits running in slabs through expansion joints. These shall be the type approved for use in concrete with a bonding conductor.

2.2 SUPPORT HARDWARE

- .1 Use 10mm (3/8") threaded rod for suspended unistrut and conduit.
- .2 Unless otherwise specified, use 41mm x 41mm (1-5/8" x 1-5/8") galvanized steel unistrut for conduit support systems.

Part 3 Execution

3.1 RACEWAYS

- .1 Install raceways as follows:
 - .1 Rigidly supported.
 - .2 Workmanlike manner.
 - .3 Maintain maximum headroom.
 - .4 Concealed in finished area.
 - .5 Surface-mounted in open area.
 - .6 Do not pass conduits through structural members except as indicated.
 - .7 Parallel to or at right angles to the building lines.
 - .8 Thoroughly ream all conduits at ends and terminate with appropriate locknuts and bushings.
 - .9 Cause minimum interference in spaces through which they pass.
 - .10 Plug or cap conduit during construction to protect from dust, dirt or water.
 - .11 Unless specifically indicated on drawings or with the permission of the NRC Departmental Representative, do not cast conduits in concrete.
 - .12 Dry conduits out before installing wire.
 - .13 Mechanically bend conduit of any size. Bend conduit cold.
 - .14 Do not cut or modify prefabricated bends.
 - .15 PVC conduit as indicated.
 - .16 Function and appearance to be to the NRC Departmental Representative's approval.
 - .17 Seal conduit and cable openings in fire- rated walls and floors with an approved fire stop material.
 - .18 Seal conduit and cable openings in exterior walls with a weatherproof silicone sealant.
 - .19 Paint exposed conduits and boxes to match existing wall / ceiling except the colored EMT specified in 260500.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00.

1.2

IDENTIFICATION

- .1 Identification as per Section 26 05 00.

Part 2 Product

2.1 DISCONNECT SWITCHES, FUSED AND NON-FUSED

- .1 Fusible and non-fusible disconnect switches in EEMAC Enclosure as indicated.
- .2 Provision for padlocking in "OFF" switch position.
- .3 Mechanical voidable door interlock in "ON" position.
- .4 Fuses: size and type as indicated.
- .5 Fuseholders in each switch to be 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 Standard of acceptance: Square D.

2.2 GROUNDING

- .1 Insulated grounding conductors in accordance with Section 26 05 00.
- .2 Compression connectors for grounding to equipment provided with lugs.

2.3 DRY TYPE TRANSFORMER

- .1 Type ANN, C802.2.
- .2 Single or three phase, KVA rating, input and output voltage as indicated.
- .3 Class 200, 130°C temperature rise insulation rating for 15kva and 30kva transformer.
Class 220, 150°C temperature rise insulation system for other sizes.
- .4 Copper windings.
- .5 Four 2.5% taps, 2-FCAN and 2-FCBN.

- .6 EEMAC 1 enclosure with lifting lugs, removable metal front and side panels.
- .7 Drip shield.
- .8 Meet latest efficiency regulation: DOE 2016/ NRCAN 2018/ONTARIO GREEN ENERGY ACT 2018.
- .9 Standard of acceptance: Hammond.

2.4 PANELBOARDS

- .1 600 volt rated power panelboards: bus and breakers rated for 25,000 amp r.m.s. symmetrical interrupting capacity at 600V or as indicated.
- .2 250 volt lighting panelboards to have minimum interrupting capacity of 10,000 amp r.m.s. symmetrical.
- .3 Panelboards that have a main breaker indicated in plan shall be service entranced approved (i.e. barrier to separate main breaker from remainder of panels).
- .4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .5 Panelboards: mains, number of circuits, number and size of branch circuit breakers as indicated.
- .6 Two keys for each panelboard and all panelboards to be keyed alike.
- .7 Copper bus, neutral and ground bar with neutral of same ampere rating as mains.
- .8 Suitable for: plug-in breaker for molded case circuit breaker, bolt-on breakers for miniature circuit breaker
- .9 Hinged door, trim finish: baked grey enamel.
- .10 Drip shield.
- .11 Surface mount with hinge door, unless otherwise indicated on drawing.
- .12 Complete circuit directory with typewritten legend showing description of each circuit.
- .13 3 Phase panel shall be equipped with 100% neutral unless otherwise indicated on the drawing.
- .14 Manufacturer: Square D.

2.5 MOLDED CASE CIRCUIT BREAKER

- .1 Thermal-magnetic moulded case circuit breakers, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .2 Common-trip breakers with single handle for multiple applications.

- .3 All new 120V to 600V circuit breakers installed on this project are to include the handle accessory, "Handle Padlock Attachment", which locks breakers on or off.
- .4 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches 10 times their setting.
- .5 Circuit breaker and panel to be of same manufacturer.
Circuit breakers minimum interrupt rating: 25KA for 600/347V or greater if indicated.
- .6 Self-powered Electronic trip unit as indicated by drawing.
LI: long time and instantaneous
LSI: long time, short time and instantaneous
LSIG: long time, short time, instantaneous and grounding
A: with Ammeter
E: with energy meter
- .7 On board control power for trip unit unless otherwise indicated on drawing
- .8 Standard of acceptance: Square D or approved equal.

2.6 FUSES

- .1 250V and 600V time delay, Class J unless otherwise indicated.

Part 3 Execution

3.1 DISCONNECT SWITCHES

- .1 Install disconnect switches complete with fuses as indicated.

3.2 GROUNDING

- .1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including, conductors, compression connectors, accessories, as indicated, to conform to requirements of Engineer, and local authority having jurisdiction over installation. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Soldered joints not permitted.

3.3 DRY TYPE TRANSFORMER

- .1 Transformers above 75 kVA mount on floor.

- .2 Provide adequate clearance around transformer for ventilation.
- .3 Install transformers in level upright position.
- .4 Remove shipping supports only after transformer is installed and just before putting into service.
- .5 Loosen isolation pad bolts until no compression is visible.
- .6 Make primary and secondary connections shown on wiring diagram.
- .7 Energize transformers immediately after installation is completed, where practicable.
- .8 Provide equipment identification in accordance with Section 26 05 00.
- .9 Connect transformer through side of housing.

3.4 PANELBOARDS

- .1 Locate panelboards as indicated and mount securely, plumb, and square, to adjoining surfaces.
- .2 Mount panels to height specified in section 26 27 26 or as indicated.
- .3 Connect loads to circuits as indicated.
- .4 Connect neutral conductors to common neutral bus.

3.5 MOLDED CASE CIRCUIT BREAKERS

- .1 Install circuit breakers as indicated.

3.6 FUSES

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Install fuses correctly sized to assigned electrical circuits.
- .3 Provide 3 spare fuses for each rating supplied.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Motors and controls to Sections 26 29 10.

1.2 MATERIALS

- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.
- .2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00.

1.4 IDENTIFICATION

- .1 Identification as per Section 26 05 00.

Part 2 Products

2.1 WIRING DEVICES

- .1 Toggle Switch:
 - .1 Specification grade, shallow body, designed to withstand high inductive fluorescent loads CSA C22.2 No. 55.
 - .2 Number of poles as indicated.
 - .3 Captive mounting screws, quiet safe mechanical action with rust-proofed mounting strap and silver alloy contact points.
 - .4 Toggle actuated, colour white unless otherwise indicated.
 - .5 Brass screw terminals rated 20 AMP at 125 volt.
 - .6 Standard of acceptance: Hubbell, Leviton.
- .2 Wireless Dimming Switch (At each workstation):
 - .1 Provides control to fixture wireless dimming load module.
 - .2 RF Frequency: 434 MHz
 - .3 4 buttons: On, Off, Raise, Lower and Preset.
 - .4 Battery operated with 10 year battery life.
 - .5 Pedestal mounted on desk to control light fixture overhead. Provide one per workstation and two spares.
 - .6 Standard of acceptance: Lutron Pico PJ2-3BRL-GWH-L01. Pedestal: L-PED1-WH

- .3 Wireless Master Zone Switch:
 - .1 Provides zone manual override.
 - .2 RF Frequency: 434 MHz
 - .3 2 buttons: On, Off.
 - .4 Battery operated with 10 year battery life.
 - .5 Wall plate.
 - .6 Standard of acceptance: Lutron Pico PJ2-2B-GWH-L01. Wall plate: CW-X-WH (Group switches into on multi-gang wallplate).
- .4 Wireless Occupancy Sensor (Washrooms, Corridors, Print Room, Kitchenette, etc.):
 - .1 Compatible wireless communication with fixture wireless dimming or switching devices.
 - .2 RF Frequency: 434 MHz
 - .3 Battery operated with 10 year battery life minimum.
 - .4 360° coverage pattern, 324ft² to 676ft².
 - .5 Selectable Auto-On/Auto-Off, Auto-On LowLight/Auto-Off, and Manual-On/Auto-Off
 - .6 Adjustable time out.
 - .7 Standard of acceptance: Lutron LRF2-OCR2B-P-WH.
- .5 Wired RF Switch (Washrooms):
 - .1 On/Off operation with wireless connection to Occupancy/Vacancy sensor
 - .2 RF Frequency: 434 MHz
 - .3 6A Lighting/3A Fan
 - .4 120V.
 - .5 5 year warranty.
 - .6 Standard of acceptance: Lutron MRF2S-6ANS-WH.
- .6 Wired RF Occupancy/Dimming Switch (Kitchenette, Print Room):
 - .1 On/Off/ Dimming with wireless connection to Occupancy/Vacancy sensor
 - .2 RF Frequency: 434 MHz
 - .3 0-10V Dimming
 - .4 6A Lighting/3A Fan
 - .5 120V.
 - .6 5 year warranty.
 - .7 Standard of acceptance: Lutron MRF2S-8DS010-WH.
- .7 Wired Occupancy/Dimming Switch (Meeting Rooms and Quiet Rooms):
 - .1 Dimmer with passive infrared sensors to control LED fixtures.
 - .2 180° sensor field-of-view.
 - .3 Up to 30'x30' major motion coverage and 20'x20' minor motion coverage.
 - .4 Occupancy sensor can be set too auto-on/auto-off or manual-on/auto-off.
 - .5 Adjustable timeout and high/low sensitivity adjustment.

- .6 Adjustable settings for auto-on light level: 100%, 50%, last light level, or locked pre-set light level.
 - .7 Off warning fades lights to off over a period of 10 seconds.
 - .8 0-10V.
 - .9 120V.
 - .10 5 year warranty.
 - .11 Standard of acceptance: Lutron MS-Z101-WH.
- .8 Wireless Dimming Load Control Module:
- .1 All non-emergency luminaires within Zones 1 to 7 shall be equipped with a wireless dimming load module. This module shall be installed on site by the electrical contractor. In Zone 8 all non-emergency luminaires shall be controlled by one wireless dimming load module.
 - .2 RF Frequency: 434 MHz
 - .3 0-10V Dimming.
 - .4 Compatible with wireless lighting control hub capable of wireless communication with occupancy sensors.
 - .5 Rated 8A, 120V
 - .6 5 year warranty
 - .7 Standard of acceptance: Lutron RMJS-8T-DV-B
- .9 Wireless Lighting Control Hub:
- .1 Provides a connection point to fixture Power Packs wireless dimming and switching modules, wireless switches and sensors
 - .2 RF Frequency: 434 MHz
 - .3 Can be programmed with any WI-FI enabled IOS of Android compatible devices
 - .4 Distributed system architecture
 - .5 Supports timeclock events based on both sunrise and sunset or fixed time of day
 - .6 Connection to BACnet via Ethernet
 - .7 Capable of firmware upgrade and password protected
 - .8 365-day scheduling timeclock with exceptions of holidays with 10 year scheduling
 - .9 Flush mounted
 - .10 Standard of acceptance: Lutron Vive HJS-2-FM
- .10 Receptacles:
- .1 Duplex type, CSA type 5-15R, 125 volt, 15A, U ground, specification grade with the following features:
 - .1 Flush type with parallel blade slots.
 - .2 Double-wiping contacts.
 - .3 Double-grounding terminals.
 - .4 Break-off feature for separate feeds.

- .5 One piece body, colour white unless otherwise indicated.
- .2 Special receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout the project.
- .11 Cover Plates:
 - .1 Cover plates for wiring devices.
 - .2 Smooth white plastic for wiring devices mounted in flush-mounted outlet box.
 - .3 Sheet metal cover plates for wiring devices mounted in surface-mounted outlet box.
 - .4 Multi-outlet covers as indicated.
- .12 Splitters, Junction Boxes & Cabinets:
 - .1 Sheet metal enclosure, welded corners and formed cover, provided as required.
 - .2 Splitter to be 3 phase, 4 wires, minimum 225A, voltage as indicated. Refer to drawing for quantity of the lugs. Allow minimum two extra lugs for future use, size to match the maximum rating of the existing wire.

Part 3 Execution

3.1 LOCATION OF OUTLETS

- .1 The number and general location of outlets for lighting, power, telephones, etc., are to be as shown on the drawings. Install all outlets accurately and uniformly with respect to building details. When centering outlets, make allowance for overhead pipes, ducts, etc. and for variations in wall or ceiling finish, window trim, etc. Reinstall incorrectly installed outlets at no cost to the Owner. Make field power and control connections as indicated.
- .2 The location of all outlets as shown on the plans are approximate and are subject to change, up to 3m (10') without extra cost or credit provided the information is given prior to the installation of the outlet.
- .3 Unless otherwise specified, locate light switches on latch side of doors. Determine the direction of all door swings from the architectural drawings or on site, not from the electrical drawings.
- .4 Locate roof top maintenance receptacle within 7.5m of the rooftop electrical equipment.

3.2 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 indicated verify before proceeding with installation.
- .3 Generally, locate outlets as follows: (except those otherwise shown on the drawings):
 - .1 Local switches 1.2m (3'-11") to centreline.

- .2 Wall receptacles 400mm (1'-4") to centreline.
- .3 Clock receptacles 2.4m (8'-0") to centreline.
- .4 Lighting panels 1.8m (6'-0") to top.
- .5 Telephone and data communications outlet 400mm (1'-4") to centreline.
- .6 Fan coil speed control switch 1.2m (3'-11") to centreline.
- .7 Roof top maintenance receptacle: 750mm above the finished roof.

3.3 WIRING DEVICES

- .1 Install wiring devices as follows:
 - .1 Where more than one local device is shown at one location, they are to be set under one cover plate.
 - .2 Install single throw switches with handle in "up" position when switch closed.
 - .3 Devices in gang type outlet box when more than one device is required in one location.
 - .4 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .5 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.
 - .6 Install metal barriers where required.
 - .7 Remove insulation carefully from ends of conductors and connect wiring as required.
 - .8 Bond and ground as required.

3.4 SPLITTERS AND DEVICES

- .1 Installation of splitters, junction boxes, pull boxes & cabinets as follows:
 - .1 Mount plumb, true and square to the building lines.
 - .2 Install in inconspicuous but accessible locations.
 - .3 Install pull boxes so as not to exceed 30 m (100') of conduit run between boxes or as indicated.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00.
- .2 Include schematic, wiring, interconnection diagrams.
- .3 Indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout of identified internal and front panel components.
 - .4 Enclosure types.
 - .5 Wiring diagram for each type of starter.
 - .6 Interconnection diagrams.
- .4 Motors specified and supplied with mechanical equipment. Refer to Division 23.

1.3 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 00 10 00.
- .2 Include operation and maintenance data for each type and style of starter.

Part 2 Products

2.1 MATERIALS

- .1 Starters:
 - .1 IEC rated starters not acceptable.
- .2 Standard of acceptance: Square D, Class 2510 or approved equal.

2.2 FULL VOLTAGE MAGNETIC STARTERS

- .1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
 - .1 Contactor solenoid operated, rapid action type.
 - .2 Solid state overload protective device in each phase, class 10/20 selectable, manually reset from outside enclosure. Provide protective functions: thermal overload, phase loss/imbalance, selectable trip class, voltage/current unbalance, long start/jam, phase reversal, ground fault.
 - .3 Power and control terminals.

- .4 Wiring and schematic diagram inside starter enclosure in visible location.
- .5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
- .2 Combination type starters to include motor circuit interrupter or circuit breaker with adjustable protective setting, operating lever on outside of enclosure to control motor circuit interrupter or circuit breaker and provision for:
 - .1 Locking in "OFF" position with up to 3 padlocks.
 - .2 Locking in "ON" position.
 - .3 Independent locking of enclosure door.
 - .4 Provision for preventing switching to "ON" position while enclosure door open.
- .3 Accessories:
 - .1 Pushbuttons and selector switches: type and labelled as indicated.
 - .2 Indicating lights: PUSH TO TEST type and color as indicated.
 - .3 2-N/O and 2-N/C spare auxiliary contacts unless otherwise indicated.
- .4 Standard of acceptance: Square D, Class 8539 or approved equal.

2.3 FINISHES

- .1 Apply finishes to enclosure in accordance with Section 26 05 00.

2.4 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 260500.

Part 3 Execution

3.1 INSTALLATION

- .1 Install starters, connect power and control as indicated.
- .2 Install control devices and relay panels and interconnect as indicated.
- .3 Install correct fuses and overload device elements.
- .4 Megger all motors. Dry out motor if dampness is present in accordance with manufacturer's recommendations.
- .5 For installation of motor with mechanical equipment refer to Division 23.
- .6 Make connection to motor as indicated. Use liquid-tight PVC jacketed flexible conduit between rigid conduit and motor.
- .7 Make flexible conduit long enough to permit movement of motor.

3.2 TESTS

- .1 Perform tests in accordance with Section 26 05 00 and Manufacturer's instructions.

- .2 Operate switches, contactors to verify correct functioning.
- .3 Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.
- .2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00.

Part 2 Products

2.1 SYSTEM PERFORMANCE

- .1 Networked decentralized system with addressable masking devices.
- .2 System shall be arranged into zones that will allow the system to be find tuned. Each zone shall be individually addressable and controllable for both volume and spectrum for fine tuning.
- .3 Control unit with generators, equalizers and amplifiers.
- .4 Equalization in narrow bands (more precise than 1/3 octave equalization).
- .5 Graphical software interface integrates the design, setup and calibration stages directly on the office layout plan.
- .6 Speakers with individual volume adjustment. Maximum six speakers per zone to give an optimum adjustment and flexibility.
- .7 Optional paging and music function.
- .8 Configuration software.
- .9 Programmable ramp-up function.
- .10 Include a calendar-based programmable timer function to engage energy saving.
- .11 Automatic calibration process.
- .12 Real-time adaptive volume control of the masking level. The system needs to measure the ambient noise and adjusts the masking sound accordingly. When the distracting noise increases, the masking sound also increases, and vice versa.
- .13 Standard of acceptance: Soft dB.

2.2 CONTROLLOR

- .1 Each unit has 8 individual channels, each with a white noise generator and random octave equalizers.

- .2 Individual calibration and configuration for each channel.
- .3 One to eight input active controls for automatic adjustment area to maximize occupant comfort.
- .4 Two auxiliary inputs for playing music or for call system.
- .5 The unit is fully controllable via a wireless interface or a USB connection from a computer.

2.3 SOFTWARE

- .1 Graphical interface for viewing, access and control of each speaker unit or project area directly on the plan of the premises.
- .2 Visualization on the map of control units, speakers, sensors and wiring.
- .3 Modification with a single click for any parameter.
- .4 Setup and calibration of sound masking system for each project unit or combination unit.
- .5 Equalize system of the masking spectrum for each channel system.
- .6 Equalization in thin strips for accuracy.
- .7 Volume adjustment function by area, in increments of 0.5dB.
- .8 Octave spectrum analyzer integrated to measure and verify the masking spectrum generated in the room.
- .9 NRC has full access to the software for configuration.

2.4 SPEAKER

- .1 High-fidelity broad band speaker.
- .2 Each speaker is tested to ensure a flat frequency response.
- .3 Local adjustment level of masking at each speaker.
- .4 25V, 10W.
- .5 Sensitivity: 91dB.
- .6 Material: metal
- .7 Frequency response: 100-8000Hz.

2.5 SENSOR

- .1 Measure the ambient noise in a zone. So the controller can adjust masking sound level based on this measurement.

- .2 Installed through a 9.5mm hole in acoustic tile.
- .3 Back electret type designed for high resistance to vibrations, high signal-to-noise ratio.
- .4 High sensitivity type. -35 ± 4 dB.
- .5 Directivity: Omnidirectional.
- .6 Frequency range: 20-20000Hz.
- .7 Size: 3/8"Dx2-3/4"L.
- .8 3V, 0.5mA.
- .9 S/N ratio: more than 62dB.
- .10 Measurement range: 35 to 95 dB at 17mV/Pa.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Ensure that plenum heights meet the minimum recommended by the manufacturer for the loudspeakers.
- .2 Ensure that the distance between the top of the loudspeaker and the deck meets manufacture's minimum specifications.
- .3 Ensure that loudspeakers are suspended in a level manner.
- .4 Minimize obstructions to loudspeakers to the extent possible.
- .5 Ensure cables are properly supported in the ceiling.
- .6 Ensure cables are securely terminated.

3.2 INSTALLATION

- .1 Supply and install all devices, cabling and necessary accessories to provide a complete working sound masking system.
- .2 Provide calibration and programming upon job completion.
- .3 Provide a report of the sound masking system acoustical performance upon job completion.
- .4 Provide training/demonstration upon job completion.

3.3 Warranty

- .1 5 year warranty for the whole system.

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SOUND MASKING SYSTEM

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END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.
- .2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 10 00.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by NRC Departmental Representative.

Part 2 Products

2.1 FINISHES

- .1 White polyester powder painted finish.

2.2 METAL SURFACES

- .1 Metal surfaces to be minimum 20 gauge steel.

2.3 LIGHT CONTROL DEVICES

- .1 Refer to Section 26 27 26 – Wiring Devices for details.

2.4 LUMINAIRES

- .1 Refer to luminaire schedule on drawing E01 for details.

Part 3 Execution

3.1 INSTALLATION

- .1 Supply and install all lighting fixtures complete with, switches, supports, etc., to provide a complete working lighting system.
- .2 Locate and install luminaires as indicated.

3.2 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support each luminaire, including exit lights and pot lights, independently of the ceiling support system with separate chains at each end. No. 80 steel sash chain minimum.
- .2 Unless otherwise specified support fluorescent luminaires mounted in continuous rows once every 3.6 m (12').

3.3 LUMINAIRE ALIGNMENT

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

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 REFERENCES

- .1 Telecommunications Industry Association (TIA)
 - .1 ANSI/TIA/EIA 569-D, Commercial Building Standard for Telecommunications Pathways and Spaces.

1.3 MATERIALS

- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Raceways: Minimum 19mm (3/4") EMT larger sizes as indicated on drawing. Factory painted blue as per section 26 05 00.
- .2 Tele-Power poles/Jiffy poles: type as indicated on drawings.
- .3 Floor mounted outlets: type as indicated on drawings.

Part 3 Execution

3.1 CONDUIT SYSTEM

- .1 Conduit and cable pathways installation shall comply with ANSI/TIA/EIA 569-D.
- .2 Run conduit from wall outlets to the closest pull box or cable basket.
- .3 Install a steel pull box after every two 90° bends, or equivalent; or where there is a (U-shaped) bend in the run.
- .4 Install additional steel pull boxes where necessary so that throughout the entire system, wires may be pulled in or withdrawn with reasonable ease. No section of conduit shall be longer than 30m (100ft) between pull points.
- .5 Pull boxes shall be placed in a straight section of conduit and shall not be used in lieu of a bend. The corresponding conduit ends shall be aligned with each other.

- .6 Where a pull box is required with conduits equal or smaller than 27mm (1”), an outlet box may be used as a pull box. For conduits above 27mm (1”), the pull box shall be size as per ANSI/TIA/EIA 569-D or as noted on the drawings.
- .7 Bending radius for conduits equal or less than 50mm (2”) shall be no less than 6 times the internal diameter of the conduit. Bending radius for conduits more than 50mm (2”) shall be no less 10 times the internal diameter.
- .8 No conduit body (Condulet), LB type or other, shall be used unless otherwise indicated on the drawings or pre-approved by the departmental representative.
- .9 Conduits shall be reamed to eliminate sharp edges and terminated with insulating nylon bushings.
- .10 Install nylon pull-cords in all empty conduits.
- .11 Clearly identify conduits at each end.
- .12 Paint all elbows and pull box covers blue. (This identifies the conduit as conduit dedicated to voice/data wiring.)
- .13 Do not run communications cables in the same raceway as power and lighting conductors.
- .14 Grounding and bonding to the Canadian Electrical Code (CEC).

3.2 MOUNTING

- .1 Recess mount wall outlets unless otherwise indicated. Mount wall outlets to height specified in section 26 27 26 or as indicated.

3.3 WORK BY OTHERS

- .1 Cables and terminations.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

- .1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.
- .2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 10 00.
- .2 Shop drawing to contain
 - .1 Coversheet with project name, address and drawing index.
 - .2 General notes drawing with peripheral device backbox size information, part numbers, and device mounting height information.
 - .3 Device riser diagram, which individually depicts all control panels, annunciators, addressable devices, and notification appliances. Shall include a specific, proposed point descriptor above each addressable device. Shall include a specific, discrete point address that shall correspond to addresses depicted on the device layout floor plans. Drawing shall provide wire specifications, and wire tags shown on all conductors depicted on the riser diagram. All circuits shall have designations that shall correspond with those require on the control panel and floor plan drawings. End-of-line resistors (and values) shall be depicted.
 - .4 Control panel termination drawing(s). Shall depict internal component placement and all internal and field termination points. Drawing shall provide a detail indicating where conduit penetrations shall be made, so as to avoid conflicts with internally mounted batteries. End-of-line resistors (and values) shall be depicted.
 - .5 Device typical wiring diagram drawing(s) shall be provided which depict all system components, and their respective field wiring termination points. Wire type, gauge, and jacket shall also be indicated. When an addressable module is used in multiple configurations for monitoring or controlling various types of equipment, different device typical diagrams shall be provided. End-of-line resistors (and values) shall be depicted.
 - .6 Device layout floor plans shall be created for every area served by the fire alarm system. Floor plans shall indicate accurate locations for all control and peripheral

devices. Drawings shall be NO LESS THAN 1/8-INCH SCALE. All addressable devices shall be depicted with a discrete address that corresponds with that indicated on the Riser Diagram. All notification appliances shall also be provided with a circuit address that corresponds to that depicted on the Riser Diagram. If individual floors need to be segmented to accommodate the 1/8" scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner. End-of-line resistors (and values) shall be depicted.

- .7 Contained in the title block of each drawing shall be symbol legends with device counts, wire tag legends, circuit schedules for all addressable and notification appliance circuits, the project name/address, and a drawing description which corresponds to that indicated in the drawing index on the coversheet drawing. A section of each drawing title block shall be reserved for revision numbers and notes. The initial submission shall be Revision 0, with Revision A, B, or C as project modifications require.
- .8 Battery calculations shall be provided on a per power supply/charger basis. These calculations shall clearly indicated the quantity of devices, the device part numbers, the supervisory current draw, the alarm current draw, totals for all categories, and the calculated battery requirements (which reflect a 20% DEGRADE, for 24 Hour supervisory, 5 minute alarm operation). Battery calculations shall also reflect all control panel component, remote annunciator, and auxiliary relay current draws. Failure to provide these calculations shall be grounds for the complete rejection of the submittal package.

1.4 SCOPE OF WORK

- .1 Supply and install all required material, equipment and labour to provide the fire alarm changes and additions as shown on the drawings and indicated by this section of the specification.

1.5 CONTRACTOR QULIFICATION

- .1 The contractor must ensure the supervisor, site foreman and electrician working on site hold valid fire alarm certificate.

1.6 REFERENCES

- .1 Government of Canada
 - .1 TB OSH Chapter 3-03, [latest edition], Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.
 - .2 TB OSH Chapter 3-04, [latest edition], Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.
- .2 Treasury Board: Fire Protection Standard effective April 1, 2010
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 Underwriter's Laboratories of Canada (ULC)

- .1 CAN/ULC-S524-[latest edition], Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525-[latest edition], Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526-[latest edition], Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S527-[latest edition], Control Units.
 - .5 CAN/ULC-S528-[latest edition], Manual Pull Stations for Fire Alarm Systems.
 - .6 CAN/ULC-S529-[latest edition], Smoke Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S530-[latest edition], Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .8 CAN/ULC-S531-[latest edition], Standard for Smoke Alarms.
 - .9 CAN/ULC-S536-S537-[latest edition], Burglar and Fire Alarm Systems and Components.
- .5 National Fire Protection Agency
- .1 NFPA 72-[latest edition], National Fire Alarm Code.
 - .2 NFPA 90A-[latest edition], Installation of Air Conditioning and Ventilating Systems.

Part 2 Products

2.1 AUTOMATIC ALARM INITIATING DEVICES

- .1 Intelligent heat detector. Rate-of-rise rated at 8.3°C (15°F)/min. Optional carbon monoxide sensor. Automatic device mapping, self-diagnostic. Stand-alone operation. Edwards model No. SIGA2-HRS.
- .2 Intelligent photoelectric smoke detector. Self-diagnostics and history mapping. Automatic device mapping. Stand-alone operation. Edwards model No. SIGA2-PS.
- .3 Intelligent duct smoke detector. Can be installed in ducts up to 10ft. remote LED and test station accessories. Edwards model No. SIGA-DH.

2.2 MANUAL ALARM STATIONS

- .1 Pull lever, breakglass, wall mounted, red, bilingual and with electronic addressing. Edwards model No. SIGC-270B.

2.3 AUDIBLE, VISUAL DEVICES

- .1 Combination horn/strobe device:
 - .1 Fire alarm Horn/strobe combination device, red in colour.
 - .2 Adjustable cd output of 15, 20, 75 & 110. Selectable hi/low dB output.
 - .3 Red with red trim ring.
 - .4 Include Synchronization module to synchronize strobes.
 - .5 Standard of acceptance: Chubb Edwards G1R-HDVM.

2.4 MODULES

- .1 Single Input Module:
 - .1 For Waterflow Detectors, Tamper Switches, etc. the Single Input Module shall provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" (64mm) deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers. The single input module shall support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching (Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).
 - .2 Model: Chubb Edwards SIGA-CT1
- .2 Dual Input Module:
 - .1 The Dual Input Module shall provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation. The module shall be suitable for mounting on North American 2 ½" deep 1-gang boxes and 1 ½" (38mm) deep 4" square boxes with 1-gang covers.
 - .2 The dual input module shall support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching (Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).
 - .3 Model: Chubb Edwards SIGA-CT2
- .3 Isolator Detector Mounting Bases:
 - .1 The respective detector processor shall control the operation of the isolator base. Isolators that are not controlled by a detector processor shall not be accepted. Following a short circuit condition, each isolator/detector shall be capable of performing an internal self-test procedure to re-establish normal operation. Isolator/detectors not capable of performing independent self-tests shall not be acceptable. The isolator base shall support all proposed detector types and have the following minimum requirements:
 - .2 The isolator shall operate within a minimum of 23 msec. of a short circuit condition on the communication line.
 - .3 When connected in Class A configuration the Signature Loop Controller shall identify an isolated circuit condition and provide communications to all non isolated analog devices.
 - .4 Terminal connections shall be made on the room side of the base. Bases that must be removed to gain access to the terminals shall not be acceptable.
 - .5 Model: Chubb Edwards SIGA-IB.
- .4 Intelligent Duct Smoke Detector:
 - .1 Low profile intelligent addressable DUCT smoke detector.
 - .2 Provide for variations in duct air velocity between 100 and 4,000 feet per minute and include a wide sensitivity range of .79 to 2.46%/ft. Obscuration.

- .3 Include one Form-C shut down relay rated 2.0 amps @ 30 Vdc and also include slave high contact relays if required.
- .4 Provide an air exhaust tube and an air sampling inlet tube that extends into the duct air stream up to ten feet.
- .5 The addressable DUCT housing shall be suitable for extreme environments, including a temperature range of -20 to 158 degrees F (-29 to 70 degrees Celsius) and offer a harsh environment gasket option.
- .6 Provide Remote Alarm LED Indicators SIGA-LED and/or remote test station model SD-TRK.
- .7 Model: Chubb Edwards SIGA-SD.
- .5 Isolator module:
 - .1 The isolator shall operate within 23 msec. of a short circuit condition on the line.
 - .2 At 10 msec. Intervals, beginning on one side of the Class A circuit nearest the loop controller, the isolators close to provide the next isolator down the line with power.
 - .3 Self-restoring.
 - .4 Self-diagnostics and history log.
 - .5 Electronic addressing and automatic device mapping.
 - .6 Model: Chubb Edwards SIGA-IM.

2.5 CONDUIT AND WIRING

- .1 Raceway to be 21mm EMT unless indicated otherwise on the drawings. Wiring between junction box on underside of slab and heat detector junction box in T-bar ceiling to be 21mm flexible conduit.
- .2 All wiring is to be colour coded to match existing system and is to be of stranded copper.
- .3 Zone wiring is to be #16 TEW colour coded stranded copper.
- .4 Signal wiring to be sized to take into account voltage drop and is not to be smaller than #12 TW colour coded stranded copper.
- .5 All fire alarm initiating device circuits wiring to be class "A" using #18 minimum FAS-105 red jacketed twisted shielded pairs cable, and in accordance with manufacturer's requirements. Run each pair of wire in separate conduit to make it true class 'A'.
- .6 All fire alarm signal circuits wiring to be R90/ T90 #16 minimum, and in accordance with manufacturer's requirements.
- .7

Part 3 Execution

3.1 MOUNTING OF EQUIPMENT

- .1 Recess mount equipment in all areas except where specified in unfinished areas.

- .1 Fire alarm stations 1.2m (3'-11") to centreline.
- .2 Fire alarm bells 2.1m (7'-0") to centreline.
- .2 Mounting heights from floor level to centerline of equipment are as follows:
 - .1 Fire alarm stations 1.2m (3'-11") to centreline.
 - .2 Fire alarm bells, horns, strobes 2.1m (7'-0") to centreline.

3.2 CONDUIT AND WIRING

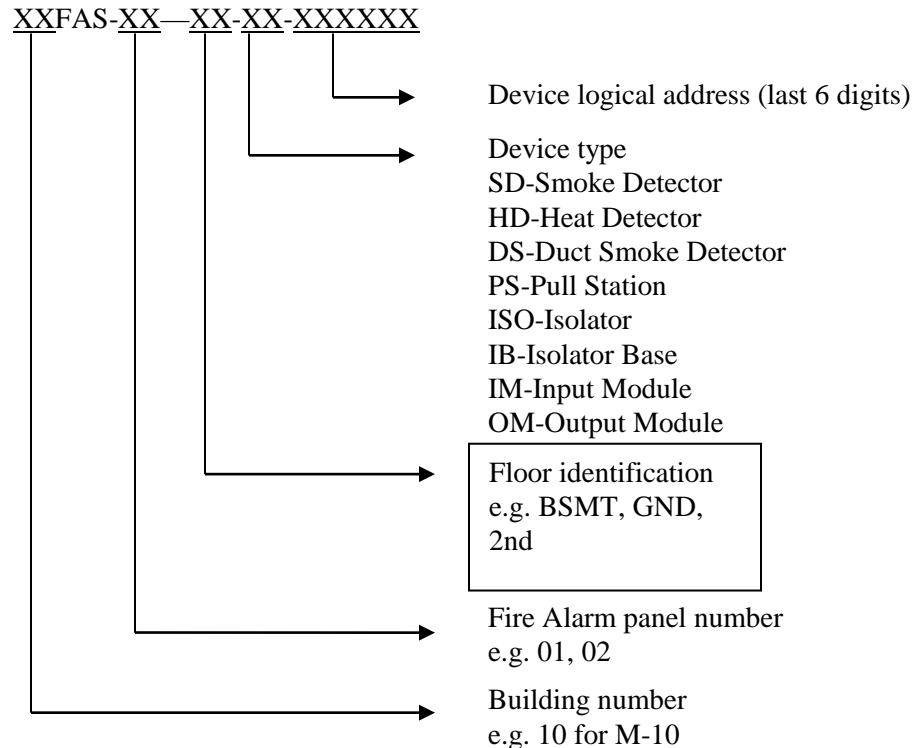
- .1 All conduit to include a #16 TW stranded copper green ground wire.
- .2 Use only uninsulated ring-type STA-KON lugs on screw connections.
- .3 Run conduit tight along underside of ceiling slab or roof deck, unless noted otherwise on drawings.
- .4 In rooms having false ceilings, each fire detection device is to have one junction box secured to the underside of the ceiling slab or roof deck and another firmly supported to the false ceiling tile. The junction box connected to the fire alarm device is not to be used as a raceway for connection to other devices. All splices and routing to other fire alarm devices is to be from the junction box mounted on the underside of the ceiling slab or roof deck.
- .5 Use Tee bar electrical box hangers (Caddy #51224 for 610mm T-bar spacing) to mount heat detectors on T-bar ceiling tiles.
- .6 Install a maximum of 1.5 m (5'-0") 3/4" (21mm) flexible conduit where a heat detector is installed on T-bar ceiling tiles. This is to allow the ceiling tile, having the device, to be shifted two feet either direction for access above the ceiling.
- .7 Leave 6 inch loops of wire in all junction boxes.
- .8 For new installations, no splicing of wires is to be made.
- .9 For renovations, splices may be made in junction boxes other than those at heat detectors after receiving approval of the NRC Departmental Representative. All splices must be soldered and taped.
- .10 Upon awarding of the contract, the NRC Departmental Representative shall provide the contractor with the standard wiring diagram for detection devices, A-7481.
- .11 Prior to installing raceways, submit to the NRC Departmental Representative a proposed method and layout of conduit for approval.

3.3 EQUIPMENT IDENTIFICATION

- .1 Label each manual alarm station and each audible signal device with its unique identification number as per drawings. Use lamicaid nameplates as per Section 26 05 00.
- .2 Label each initiating device use P-Touch type as per Section 26 05 00. Devices are to be numbered per the format shown below.

Example M-10 fire alarm #1 Heat detector 000001

10FAS-01-GND-HD-000001



- .3 Refer to 26 05 00 for fire alarm conduit color coding.
- .4 Label wires as per drawing and as per Section. 26 05 00.
- .5 Update remote annunciator panels and fire alarm panel zone directories if new zones are added to the system.

3.4 SCHEDULING OF SHUTDOWNS

- .1 Make written shutdown request to the NRC Departmental Representative at least 48 hours in advance. Acceptance of shutdown request will be determined by the NRC Departmental Representative based on building user needs. Fire alarm systems are to be shut down by NRC staff only. **Contractor is not to shutdown system on their own.**

3.5 INTEGRATION INTO SYSTEM MONITORING AT BUILDING M-1

Presently all NRC buildings in Ottawa report back their fire alarm status to the M1 building central monitoring station. The monitoring station consists of a computer

graphics terminal showing building layouts of each building, and is linked on an internal NRC network. The new fire alarm system under this contract must communicate all addressable input points to the existing computer graphics monitoring station, Fireworks by Chubb Edwards. All required modifications to the existing Fireworks station are to be included in this tender.

- .1 Addressable devices:
 - .1 Integrate any new addressable devices installed as part of this project into the monitoring system at building M-1.
 - .2 Remove from the monitoring system at building M-1 any addressable devices removed as part of this project.
 - .3 Make appropriate changes to the monitoring system at building M-1 to reflect any relocated addressable devices.
 - .4 All work on the monitoring system at building M-1 is to be done by factory trained technician.

3.6 ACCEPTANCE TEST

- .1 Perform tests in accordance with the latest regulations and in the presence of the NRC Departmental Representative and the representative of the regulating authority.
- .2 Test each device and alarm circuit to ensure manual alarm stations, thermal and smoke detectors transmit alarms to control panel and actuate alarm.
- .3 Check annunciator panels to ensure that the correct zones are activated.
- .4 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of trouble signals.
- .5 Record amperage drawn by audible signal device circuits if new audible signal devices have been added to the circuit.
- .6 Give the NRC Departmental Representative one set of marked in red prints labelled "As Built".
- .7 Provide the NRC Departmental Representative with a letter of verification from the manufacturer of the equipment stating that the equipment supplied under this contract has been installed as per the latest CAN/ULC S537 and CAN/ULC-S524 standards and as per the latest edition of the Ontario Building Code.
- .8 For new fire alarm systems provide the NRC Departmental Representative with a certificate of verification stating that the equipment has been installed as per the latest CAN/ULC-S537 and CAN/ULC-S524 standards and as per the latest edition of the National Building Code.

3.7 SUPPORT FOR INSTALLER AND OWNER MAINTENANCE

- .1 Provide a coded one-man walk test feature. Allow audible or silent testing. Signal alarms and troubles during test. Allow receipt of alarms and programmed operations for alarms from areas not under test.

- .2 Provide internal system diagnostics and maintenance user interface controls to display/report the power, communication, and general status of specific panel components, detectors, and modules.
- .3 Provide loop controller diagnostics to identify common alarm, trouble, ground fault, Class A fault, and map faults. Map faults include wire changes, device type changes by location, device additions/deletions and conventional open, short, and ground conditions. Ground faults on the circuit wiring of remote module shall be identified by device address.
- .4 Allow the user to display/report the condition of addressable analog detectors. Include device address, device type, percent obscuration, and maintenance indicator. The maintenance indicator shall provide the user with a measure of contamination of a device upon which cleaning decisions can confidently be made.
- .5 Allow the user to report history for alarm, supervisory, monitor, trouble, smoke verification, watchdog, and restore activity. Include Facility Name, Licensee, Project Program Compilation date, Compiler Version, Project Revision Number, and the time and date of the History Report.
- .6 Allow the user to disable/enable devices, zones, actions, timers and sequences. Protect the disable function with a password.
- .7 Allow the user to activate/restore outputs, actions, sequences, and simulate detector smoke levels.
- .8 Allow the service user to enter time and date, reconfigure an external port for download programming, initiate auto programming and change passwords. Protect these functions with a password.

3.8 TRAINING SESSION

- .1 Provide training of the newly installed fire alarm system to NRC staff upon job completion.

3.9 WARRANTY

- .1 All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance or approval by AHJ. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

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 constitute a waiver of the right to do so, or an admission of lack of entitlement to do so in any subsequent payment to the Contractor.

TP4 Time of Payment

4.1 In these Terms of Payment

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

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

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

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

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



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



work under the contract have been fully discharged.

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



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

TP5 Progress Report and Payment Thereunder Not Binding on Her Majesty

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

TP6 Delay in Making Payment

- 6.1 Notwithstanding GC7 any delay by Her Majesty in making any payment when it is due pursuant to these Terms of Payment shall not be a breach of the contract by Her Majesty.

- 6.2 Her Majesty shall pay, without demand from the Contractor, simple interest at the Bank Rate plus 1 -1/4 per centum on any amount which is overdue pursuant to TP4.1.3, and the interest shall apply from and include the day such amount became overdue until the day prior to the date of payment except that

- 6.2.1 interest shall not be payable or paid unless the amount referred to in TP6.2 has been overdue for more than 15 days following

6.2.1.1 the date the said amount became due and payable, or

6.2.1.2 the receipt by the Departmental Representative of the Statutory Declaration referred to in TP4.5, TP4.8 or TP4.11,

whichever is the later, and

- 6.6.2 interest shall not be payable or paid on overdue advance payments if any.

TP7 Right of Set-off

- 7.1 Without limiting any right of set-off or deduction given or implied by law or elsewhere in the contract, Her Majesty may set off any amount payable to Her Majesty by the Contractor under this contract or under any current contract against any amount payable to the Contractor under this contract.

- 7.2 For the purposes of TP7.1, "current contract" means a contract between Her Majesty and the Contractor

7.2.1 under which the Contractor has an undischarged obligation to perform or supply work, labour or material, or

7.2.2 in respect of which Her Majesty has, since the date of which the Articles of Agreement were made, exercised any right to take the work that is the subject of the contract out of the Contractor's hands.



TP8 Payment in Event of Termination

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

TP9 Interest on Settled Claims

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



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GC1 Interpretation

1.1 In the contract

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

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

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



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

GC2 Successors and Assigns

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

GC3 Assignment of Contract

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

GC4 Subcontracting by Contractor

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

GC5 Amendments



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

GC6 No Implied Obligations

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

GC7 Time of Essence

- 7.1 Time is of the essence of the contract.

GC8 Indemnification by Contractor

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

GC9 Indemnification by Her Majesty

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

GC10 Members of House of Commons Not to Benefit



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

GC11 Notices

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

GC12 Material, Plant and Real Property Supplied by Her Majesty

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



the purpose of performing this contract.

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

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

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

GC14 Permits and Taxes Payable

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



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

GC15 Performance of Work under Direction of Departmental Representative

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

CG16 Cooperation with Other Contractors

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



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

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

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

GC17 Examination of Work

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

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

GC18 Clearing of Site

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

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

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

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

GC19 Contractor's Superintendent

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

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



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

GC20 National Security

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

GC21 Unsuitable Workers

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

GC22 Increased or Decreased Costs



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

GC23 Canadian Labour and Material

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

GC24 Protection of Work and Documents

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



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

GC25 Public Ceremonies and Signs

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

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

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



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

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

GC27 Insurance

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

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

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

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

GC28 Insurance Proceeds

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

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

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

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

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

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

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

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



creditor.

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

GC29 Contract Security

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

GC30 Changes in the Work

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



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

GC31 Interpretation of Contract by Departmental Representative

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



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

GC32 Warranty and Rectification of Defects in Work

- 32.1 Without restricting any warranty or guarantee implied or imposed by law or contained in the contract documents, the Contractor shall, at his own expense,
- 32.1.1 rectify and make good any defect or fault that appears in the work or comes to the attention of the Minister with respect to those parts of the work accepted in connection with the Interim Certificate of Completion referred to GC44.2 within 12 months from the date of the Interim Certificate of Completion;
- 32.1.2 rectify and make good any defect or fault that appears in or comes to the attention of the Minister in connection with those parts of the work described in the Interim Certificate of Completion referred to in GC44.2 within 12 months from the date of the Final Certificate of Completion referred to in GC44.1.
- 32.2 The Departmental Representative may direct the Contractor to rectify and make good any defect or fault referred to in GC32.1 or covered by any other expressed or implied warranty or guarantee.
- 32.3 A direction referred to in GC32.2 shall be in writing, may include a stipulation in respect of the time within which a defect or fault is required to be rectified and made good by the Contractor, and shall be given to the Contractor in accordance with GC11.
- 32.4 The Contractor shall rectify and make good any defect or fault described in a direction given pursuant to GC32.2 within the time stipulated therein.

GC33 Non-Compliance by Contractor

- 33.1 If the Contractor fails to comply with any decision or direction given by the Departmental Representative pursuant to GC18, GC24, GC26, GC31 or GC32, the Departmental Representative may employ such methods as he deems advisable to do that which the Contractor failed to do.
- 33.2 The Contractor shall, on demand, pay Her Majesty an amount that is equal to the aggregate of all cost, expenses and damage incurred or sustained by Her Majesty by reason of the Contractor's failure to comply with any decision or direction referred to in GC33.1, including the cost of any methods employed by the Departmental Representative pursuant to GC33.1.

GC34 Protesting Departmental Representative's Decisions

- 34.1 The Contractor may, within ten days after the communication to him of any decision or direction referred to in GC30.3 or GC33.1, protest that decision or direction.
- 34.2 A protest referred to in GC34.1 shall be in writing, contain full reasons for the protest, be signed



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

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

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

35.1 Subject to GC35.2 no payment, other than a payment that is expressly stipulated in the contract, shall be made by Her Majesty to the Contractor for any extra expense or any loss or damage incurred or sustained by the Contractor.

35.2 If the Contractor incurs or sustains any extra expense or any loss or damage that is directly attributable to

35.2.1 a substantial difference between the information relating to soil conditions at the work site that is contained in the Plans and Specifications or other documents supplied to the Contractor for his use in preparing his tender or a reasonable assumption of fact based thereon made by the Contractor, and the actual soil conditions encountered by the Contractor at the work site during the performance of the contract, or

35.2.2 any neglect or delay that occurs after the date of the contract on the part of Her Majesty in providing any information or in doing any act that the contract either expressly requires Her Majesty to do or that would ordinarily be done by an owner in accordance with the usage of the trade,

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

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



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

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

GC36 Extension of Time

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

GC37 Assessments and Damages for Late Completion

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



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

GC38 Taking the Work Out of the Contractor's Hands

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



Contractor's failure to complete the work.

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

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

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

G40 Suspension of Work by Minister

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



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

GC41 Termination of Contract

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

GC42 Claims Against and Obligations of the Contractor or Subcontractor

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



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

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

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

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

42.2.3 the consent of the Contractor authorizing a payment.

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

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

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

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

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



Majesty to pay the Contractor.

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

GC43 Security Deposit – Forfeiture or Return

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



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

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

GC44 Departmental Representative's Certificates

44.1 On the date that

44.1.1 the work has been completed, and

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

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

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

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

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

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

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

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

44.2.1.2.3 -1% of the balance

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

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



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

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

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

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

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

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

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

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

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

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

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

GC45 Return of Security Deposit

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

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



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

GC46 Clarification of Terms in GC47 to GC50

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

GC47 Additions or Amendments to Unit Price Table

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

GC48 Determination of Cost – Unit Price Table



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

GC49 Determination of Cost – Negotiation

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

GC50 Determination of Cost – Failing Negotiation

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

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

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



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

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

GC51 Records to be kept by Contractor

51.1 The Contractor shall

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

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



Minister may direct.

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

GC52 Conflict of Interest

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

GC53 Contractor Status

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



GENERAL CONDITONS

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

GENERAL INSUANCE COVERAGES

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

COMMERCIAL GENERAL LIABILITY

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

BUILDER'S RISK – INSTALLATION FLOATER – ALL RISKS

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

INSURER'S CERTIFICATE OF INSURANCE



General Conditions

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

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

IC 2 Risk Management (01/10/94)

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

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

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

IC 4 Insurance Coverage (02/12/03)

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



INSURANCE COVERAGE REQUIREMENTS

PART I GENERAL INSURANCE COVERAGES (GIC)

GCI 1 Insured (02/12/03)

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

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

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

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

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

GIC 4 Notification (01/10/94)

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

PART II COMMERCIAL GENERAL LIABILITY

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

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

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



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

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

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

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

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

CGL 3 Additional Exposures (02/12/03)

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

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



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

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

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

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

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

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

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

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

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

The property insured shall include:

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

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

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



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

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

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

BR 5 Deductible
(02/12/03)

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

BR 6 Subrogation
(01/10/94)

The following Clause shall be included in the policy:

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

BR 7 Exclusion Qualifications
(01/10/94)

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

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



INSURER'S CERTIFICATE OF INSURANCE

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

CONTRACT

DESCRIPTION OF WORK	CONTRACT NUMBER	AWARD DATE
LOCATION		

INSURER

NAME
ADDRESS

BROKER

NAME
ADDRESS

INSURED

NAME OF CONTRACTOR
ADDRESS

ADDITIONAL INSURED

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

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

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

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

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

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



CS1 Obligation to provide Contract Security

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

CS2 Prescribed Types and Amounts of Contract Security

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



of, the Receiver General for Canada, and

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



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

PART A - CONTRACT INFORMATION / PARTIE A - INFORMATION CONTRACTUELLE		
1. Originating Government Department or Organization / Ministère ou organisme gouvernemental d'origine		2. Branch or Directorate / Direction générale ou Direction
M20 1st Floor Accommodations		ASPM
3. a) Subcontract Number / Numéro du contrat de sous-traitance	3. b) Name and Address of Subcontractor / Nom et adresse du sous-traitant	
Tender		
4. Brief Description of Work / Brève description du travail		
M20 1st Floor Accommodations		
5. a) Will the supplier require access to Controlled Goods? Le fournisseur aura-t-il accès à des marchandises contrôlées?		<input checked="" type="checkbox"/> No / Non <input type="checkbox"/> Yes / Oui
5. b) Will the supplier require access to unclassified military technical data subject to the provisions of the Technical Data Control Regulations? Le fournisseur aura-t-il accès à des données techniques militaires non classifiées qui sont assujetties aux dispositions du Règlement sur le contrôle des données techniques?		<input checked="" type="checkbox"/> No / Non <input type="checkbox"/> Yes / Oui
6. Indicate the type of access required / Indiquer le type d'accès requis		
6. a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets? Le fournisseur ainsi que les employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS? (Specify the level of access using the chart in Question 7. c) (Préciser le niveau d'accès en utilisant le tableau qui se trouve à la question 7. c)		<input checked="" type="checkbox"/> No / Non <input type="checkbox"/> Yes / Oui
6. b) Will the supplier and its employees (e.g. cleaners, maintenance personnel) require access to restricted access areas? No access to PROTECTED and/or CLASSIFIED information or assets is permitted. Le fournisseur et ses employés (p. ex. nettoyeurs, personnel d'entretien) auront-ils accès à des zones d'accès restreintes? L'accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS n'est pas autorisé.		<input type="checkbox"/> No / Non <input checked="" type="checkbox"/> Yes / Oui
6. c) Is this a commercial courier or delivery requirement with no overnight storage? S'agit-il d'un contrat de messagerie ou de livraison commerciale sans entreposage de nuit?		<input checked="" type="checkbox"/> No / Non <input type="checkbox"/> Yes / Oui
7. a) Indicate the type of information that the supplier will be required to access / Indiquer le type d'information auquel le fournisseur devra avoir accès		
Canada <input checked="" type="checkbox"/>	NATO / OTAN <input type="checkbox"/>	Foreign / Étranger <input type="checkbox"/>
7. b) Release restrictions / Restrictions relatives à la diffusion		
No release restrictions Aucune restriction relative à la diffusion <input checked="" type="checkbox"/>	All NATO countries Tous les pays de l'OTAN <input type="checkbox"/>	No release restrictions Aucune restriction relative à la diffusion <input type="checkbox"/>
Not releasable À ne pas diffuser <input type="checkbox"/>		
Restricted to: / Limité à: <input type="checkbox"/>	Restricted to: / Limité à: <input type="checkbox"/>	Restricted to: / Limité à: <input type="checkbox"/>
Specify country(ies): / Préciser le(s) pays:	Specify country(ies): / Préciser le(s) pays:	Specify country(ies): / Préciser le(s) pays:
7. c) Level of information / Niveau d'information		
PROTECTED A PROTÉGÉ A <input type="checkbox"/>	NATO UNCLASSIFIED NATO NON CLASSIFIÉ <input type="checkbox"/>	PROTECTED A PROTÉGÉ A <input type="checkbox"/>
PROTECTED B PROTÉGÉ B <input type="checkbox"/>	NATO RESTRICTED NATO DIFFUSION RESTREINTE <input type="checkbox"/>	PROTECTED B PROTÉGÉ B <input type="checkbox"/>
PROTECTED C PROTÉGÉ C <input type="checkbox"/>	NATO CONFIDENTIAL NATO CONFIDENTIEL <input type="checkbox"/>	PROTECTED C PROTÉGÉ C <input type="checkbox"/>
CONFIDENTIAL CONFIDENTIEL <input type="checkbox"/>	NATO SECRET NATO SECRET <input type="checkbox"/>	CONFIDENTIAL CONFIDENTIEL <input type="checkbox"/>
SECRET SECRET <input type="checkbox"/>	COSMIC TOP SECRET COSMIC TRÈS SECRET <input type="checkbox"/>	SECRET SECRET <input type="checkbox"/>
TOP SECRET TRÈS SECRET <input type="checkbox"/>		TOP SECRET TRÈS SECRET <input type="checkbox"/>
TOP SECRET (SIGINT) TRÈS SECRET (SIGINT) <input type="checkbox"/>		TOP SECRET (SIGINT) TRÈS SECRET (SIGINT) <input type="checkbox"/>



PART A (continued) / PARTIE A (suite)

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets?
Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS? No / Non Yes / Oui
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?
Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate? No / Non Yes / Oui

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

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

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

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

Special comments:
Commentaires spéciaux : _____

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

10. b) May unscreened personnel be used for portions of the work?
Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail? No / Non Yes / Oui
If Yes, will unscreened personnel be escorted?
Dans l'affirmative, le personnel en question sera-t-il escorté? No / Non Yes / Oui

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

INFORMATION / ASSETS / RENSEIGNEMENTS / BIENS

11. a) Will the supplier be required to receive and store PROTECTED and/or CLASSIFIED information or assets on its site or premises?
Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS? No / Non Yes / Oui

11. b) Will the supplier be required to safeguard COMSEC information or assets?
Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC? No / Non Yes / Oui

PRODUCTION

11. c) Will the production (manufacture, and/or repair and/or modification) of PROTECTED and/or CLASSIFIED material or equipment occur at the supplier's site or premises?
Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ? No / Non Yes / Oui

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

11. d) Will the supplier be required to use its IT systems to electronically process, produce or store PROTECTED and/or CLASSIFIED information or data?
Le fournisseur sera-t-il tenu d'utiliser ses propres systèmes informatiques pour traiter, produire ou stocker électroniquement des renseignements ou des données PROTÉGÉS et/ou CLASSIFIÉS? No / Non Yes / Oui

11. e) Will there be an electronic link between the supplier's IT systems and the government department or agency?
Disposera-t-on d'un lien électronique entre le système informatique du fournisseur et celui du ministère ou de l'agence gouvernementale? No / Non Yes / Oui



Contract Number / Numéro du contrat PR841772
Security Classification / Classification de sécurité 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			CONFIDENTIAL / CONFIDENTIEL	SECRET	TOP SECRET / TRÈS SECRET
											A	B	C			
Information / Assets / Renseignements / Biens / Production																
IT Media / Support TI																
IT Link / Lien électronique																

12. a) Is the description of the work contained within this SRCL PROTECTED and/or CLASSIFIED?
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, classifiez le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire.

12. b) Will the documentation attached to this SRCL be PROTECTED and/or CLASSIFIED?
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, classifiez le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire et indiquer qu'il y a des pièces jointes (p. ex. SECRET avec des pièces jointes).



Contract Number / Numéro du contrat PR841772
Security Classification / Classification de sécurité UNCLASSIFIED

PART D - AUTHORIZATION / PARTIE D - AUTORISATION

13. Organization Project Authority / Chargé de projet de l'organisme			
Name (print) - Nom (en lettres moulées) Mark O'Connor	Title - Titre Project Manager	Signature 	
Telephone No. - N° de téléphone 991-9873	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel mark.o'connor@nrc.ca	Date 10 Dec 2019
14. Organization Security Authority / Responsable de la sécurité de l'organisme			
Name (print) - Nom (en lettres moulées) Tori Pelletier	Title - Titre Analyst, Security in Contracting	Signature 	
Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel Tori.Pelletier@nrc-cnrc.gc.ca	Date 12/12/2019
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?			<input checked="" type="checkbox"/> No / Non <input type="checkbox"/> Yes / Oui
16. Procurement Officer / Agent d'approvisionnement			
Name (print) - Nom (en lettres moulées) 	Title - Titre Senior Proc Officer	Signature 	
Telephone No. - N° de téléphone 613 991-9984	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date 13-12-2019
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