



SPECIFICATIONS

SOLICITATION #: 23-58167

BUILDING: U-61,
1920 Research Private,
Ottawa, Ontario

PROJECT: Flight Recorder and Playback Centre
Renovation

PROJECT #: 6018

Date: November 2023

SPECIFICATION

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Construction Tender Form

Project Identification **Flight Recorder and Playback Centre Renovation**

Tender No.: **23-58167**

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

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

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

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

National Research Council Canada	Conseil national de recherches Canada
Finance and Procurement Services Branch	Direction des services financiers et d'approvisionnement

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 services 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 His Majesty to forfeit the security deposit.

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

National Research Council Conseil national de recherches
Canada Canada

Finance and Procurement Direction des services financiers
Services Branch et d'approvisionnement

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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Finance and Procurement Services Branch	Direction des services financiers et d'approvisionnement
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1.10 Execution of Tender

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

1.11 Pricing Table

The Pricing Table must be included with your Tender Form

**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

Flight Recorder and Playback Centre Renovation

You are invited to submit **one** electronic Technical Proposal and **one** electronic Tender Form in two separate attachments to fulfil the following requirement forming part of this Request for Proposal. One attachment **must** be clearly marked 'Technical Proposal' and the other attachment **must** be marked 'Tender Form'. All financial information **must** be fully contained in the Tender Form, and only in the Tender Form. Vendors who provide financial information in the technical proposal will be disqualified. **All proposals should include the front page of this RFP duly completed.**

The National Research Council Canada, 1920 Research Road Ottawa, has a requirement for a project that includes:

The proposed scope of work includes the Flight Recorder and Playback Center located in rooms (151, 151A, 151B, 151C) and the instrumentation shop room 152 in U61 requires upgrades to the walls, floor, lighting and ventilation located at the Upland Campus of the National Research Council of Canada.

Tender Destination

- a) Tenders are to be submitted **by email only**:
National Research Council Canada

NRC.BidReceiving-ReceptiondesSoumissions.CNRC@nrc-cnrc.gc.ca

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.

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

Selection Criteria

Potential bidders will be rated in a combination of technical score and price rating. For this project the total score will be established as follows:

Technical rating 40%	=	Technical Score (Points)
Price rating 60%	=	Price Score (Points)
Total Score	=	Max. 100 points

Mandatory requirements

Failure to meet the mandatory requirement will render the proposal as non-responsive and no further evaluation will be carried out.

Item	Mandatory Requirements	Proposal Page #(s)
1	The Proponent must have a minimum of ten (10) years' experience in the execution and as a contractor providing construction services comparable to this tender. Provide a company profile and relevant history as described in item #1 of the evaluated technical criteria.	
2	The Proponent must supply a CV for the proposed construction site supervisor.	
3	The Proponent must supply a CV for the proposed construction Project Manager.	

Include this table with your proposal and indicate the proposal page where the information can be found.

Any Proposal which fails to meet any of the following mandatory requirements will be considered non-compliant and will not be given further consideration. Each requirement should be addressed separately.

Evaluated Technical Criteria

Item	Evaluated Technical Criteria	Proposal Page # (s)	Max Score
1	<p>Demonstrated experience by the Proponent providing general construction services relevant to this project. Include 2 comparable projects completed by the proponent's firm in the last 10 years with reference names & phone numbers. Maximum 1 page per project. Evaluations will take into account relevance compared to the scope of this tender (up to 3 point for each example project) and whether the reference was satisfied with the work completed (up to 1 point for each example project). It is the responsibility of the bidder to ensure the contact information for the reference is accurate. If the reference cannot be reached or declines to provide input the proponent will received a score of 0/1 for that example.</p>		8
2	<p>Qualifications and overall experience of proposed construction site supervisor and Project Manager. CV will be scored on the basis of related experience (up to 2 points), experience acting as a construction site supervisor on federal government construction projects (up to 2 points) and experience on federal government Project for the Manager (up to 3 points). Include detailed examples of 2 past projects for the construction site supervisor who was in that position for at least 80% of the duration of those projects. CV should be no longer than 3 pages.</p>		7
3	<p>Provide company profile for asbestos abatement sub-contractor. Include 3 comparable projects completed by the proponents firm in the last 5 years that demonstrate experience relevant to the asbestos abatement scope of work for this tender. Evaluation will consist of (1 point) for 10-15 years in business, (2 points) for over 15 years in business and up to 1 point for each comparable project (up to 3 Points).</p>		5
4	<p>The Proponent must provide their construction schedule for this project, from award to final completion, detailing major milestones, critical path elements, and associated timelines. Schedule evaluation will be based on whether it meets the completion date noted in the tender documents (up to 2 points), and if the tasks and associated timelines demonstrate the contractor understands the scope of work (up to 3 points).</p>		5
Total			25

Include this table with your proposal and indicate the proposal page where the information can be found.

Evaluation and Rating

Financial Proposal will remain sealed and only the technical components of the proposals considered responsive will be reviewed, evaluated and rated by a NRC Evaluation Board in accordance with the criteria listed in the evaluated technical criteria table.

No further consideration will be given to proponents not achieving the pass mark of 17.5 out of 25 (70%). The successful Bidder shall be the one who accumulates the highest combined score of the technical assessment (40%) and tendered amount (60%), as shown below:

TABLE A	Bidder #1	Bidder #2	Bidder #3
Technical score	18 out of 25	20 out of 25	23 out of 25
Tendered amount	\$190,000	\$200,000	\$210,000

For information only:

	Technical score (40%)	Tendered amount score (60%)	Final score
Bidder #1	$18/25 \times 40\% = 28.8$	$\frac{190 \text{ k} \times 60\%}{190 \text{ k}} = 60$	= 88.8
Bidder #2	$20/25 \times 40\% = 32$	$\frac{190 \text{ k} \times 60\%}{200 \text{ k}} = 57$	= 89
Bidder #3	$23/25 \times 40\% = 36.8$	$\frac{190 \text{ k} \times 60\%}{210 \text{ k}} = 54.3$	= 91.1 (successful bid)

1. GENERAL

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

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

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

2. MANDATORY SITE VISIT

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

The site visits will be held on November 28th and November 29th 2023 at **9:30am**. Meet Benoit Huot at 1920 Research Road, Building U61, Main Entrance, 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 December 14th, 2023, 14:00

4. TENDER RESULTS

Following the Tender closing, proposals will be evaluated and notice of individual results will be sent by email 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: <https://www.tpsgc-pwgsc.gc.ca/esc-src/msi-ism/index-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. WSIB (WORKPLACE SAFETY AND INSURANCE BOARD)

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

7. 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 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.

3. 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.

The Departmental Representative or his designate for this project is: Benoit Huot
Benoit.Huot@nrc-cnrc.gc.ca
Telephone: (613) 808-3650

Contracting Authority for this project is: Collin Long
Collin.Long@nrc-cnrc.gc.ca

INSTRUCTIONS TO BIDDERS

Article 1 – Receipt of Tender

- 1a) Tender must be received **by email only** not later than the specified tender closing time. Electronic bids received after the indicated closing time - NRC servers received time - will be irrevocably rejected. Bidders are urged to send their proposal sufficient time in advance of the closing time to prevent any technical issues. NRC will not be held responsible for bids sent before closing time but received by the NRC servers after the 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 **email only** provided that such amendments are received not later than the specified tender closing time.
- 1d) Any amendments to the tender which are transmitted by **email only** must be signed and must clearly identify the tenderer.

All such amendments are to be addressed to:
National Research Council of Canada
Collin Long, Senior Contracting Officer

NRC.BidReceiving-ReceptiondesSoumissions.CNRC@nrc-cnrc.gc.ca

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 colored 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 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.
- 8) The Council does not bind itself to accept the lowest or any tender.

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 **by email only**:
National Research Council Canada

NRC.BidReceiving-ReceptiondesSoumissions.CNRC@nrc-cnrc.gc.ca

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) bonds of the Government of Canada, or bonds unconditionally guaranteed as to principal and interest by the Government of Canada; **OR**
 - ii) 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.
- 1c) 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 bond or E-bond Security must be in the ORIGINAL form. PDF via email is acceptable. **FAILURE TO PROVIDE THE REQUIRED BID SECURITY SHALL INVALIDATE THE TENDER.**
- 1d) 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.
- 1e) 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 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.
- 1) 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.

Article 12 – Harmonized Sales Tax

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

Non-resident contractors

RST guide 804

Published August 2006

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

Publication Archived

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

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

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

Non-Resident Contractor Defined

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

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

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

Registration and Guarantee Deposit

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

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

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

Letter of Compliance

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

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

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

Calculation of RST

Fair Value

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

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

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

Machinery and Equipment - Leased

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

Machinery and Equipment - Owned by Contractor

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

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

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

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

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

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

net book value at date of import x tax rate

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

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

(See Completion of Contract section)

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

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

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

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

(See RST Guide 401 - Manufacturing Contractors)

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

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

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

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

E x e m p t i o n s

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

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

Status Indians, Indian Bands and Band Councils

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

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

Completion of Contract

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

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

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

All returns are subject to audit.

Legislative References

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

For More Information

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

Acceptable Bonding Companies

Published September 2010

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

1. Canadian Companies

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

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

2. Provincial Companies

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

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

3. Foreign Companies

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

Articles of Agreement

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

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

Articles of Agreement

These Articles of Agreement made in duplicate this day of .

Between

His Majesty the King, in right of Canada (referred to in the contract documents as “His 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, His 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 His 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, including addendum(s).

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 His 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 His Majesty by

as Senior Contracting Officer

and _____

as _____

of the **National Research Council Canada**

on the _____

day of _____

Signed, sealed and delivered by

as _____ and
Position

by _____

as _____
Position

of

on the _____

day of _____

Seal

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END OF TABLE

1. SCOPE OF WORK

- .1 Work under this contract covers the interior renovation of room 151 and 152 on the first and second floor in the Council's Building U-61 of the National Research Council.

2. DRAWINGS

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

- | | | |
|-----|----------|--|
| .1 | 6018-CP1 | Cover Page |
| .2 | 6018-S01 | Structural: Plans and Details |
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3. COMPLETION

- .1 Complete all work before March 31st, 2024 for the work related to room 152 and July 15th, 2024 for the work related to room 151.

4. GENERAL

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

5. SPECIFIED ACCEPTABLE & ALTERNATIVE EQUIPMENT & MATERIALS

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

written application to the Departmental Representative during the tender period, not later than ten (10) working days before tender closing.

- .3 Certify in writing that the alternative meets all requirements of the specified material or equipment. In addition, it shall be understood that all costs required by or as a result of acceptance or proposed alternatives, will be borne by the Contractor.
- .4 Approval of alternatives will be signified by issue of an Addendum to the Tender Documents.
- .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, and Canadian Code for Construction Safety and the Provincial Construction Safety Act.
- .2 Work to conform to referenced standards and codes as reaffirmed or revised to date of specification.

7. WORKPLACE HAZARDOUS MATERIAL INFORMATION SYSTEM (WHMIS)

- .1 The General Contractor shall comply with Federal and Provincial legislation regarding the WHMIS. The Contractor's responsibilities include, but are not limited to the following:
 - .1 To ensure that any controlled product brought on site by the Contractor or sub-contractor is labeled;
 - .2 To make available to the workers and the 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 sub-contractor for this project has received a copy of the above list.

9. COST BREAKDOWN

- .1 Submit, for approval by the Departmental Representative, a cost breakdown of tender 72 hours after the contract is awarded.
- .2 Use the approved cost breakdown as the basis for submitting all claims.
- .3 Request Departmental Representative's verbal approval to amount of claim prior to preparing and submitting the claim in its final form.
- .4 Contractor costs associated with compliance with occupational health and safety requirements (Canada Labour Code) related to the Coronavirus/COVID-19 pandemic must be included in the initial bid price. These costs may include, but are not limited to, the provision of additional personal protective equipment (PPE) and social distancing requirements as required to complete the project. Contractor must review and incorporate into initial bid pricing compliance with any Coronavirus/COVID-19 related health and safety guidance issued by the local Medical Officer of Health (applicable in the jurisdiction of the project), the Public Health Agency of Canada, Health Canada and/or the provincial Ministry of Health, as applicable.

10. SUB-TRADES

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

11. PERSONNEL SECURITY AND IDENTIFICATION

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

12. WORKING HOURS AND SECURITY

- .1 Normal working hours on the NRC property are from 8:00 a.m. until 4:30 p.m., Monday to Friday inclusive, except statutory holidays.

- .2 At all other times, special written passes are required for access to the building site.
- ~~.3~~ Before scheduling any work outside normal working hours, obtain permission from the Departmental Representative to perform the specific tasks.
- .4 An escort may be required whenever working outside normal hours. Contractor to bear the associated costs.

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.

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 not later than two weeks after the award of the contract and prior to commencement of any work on site.
- .2 Notify Departmental Representative in writing of any changes in the schedule.
- .3 Ten (10) days 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 assumes responsibility for recording and distributing minutes.

16. SHOP DRAWINGS

- .1 Submit to Departmental Representative for review, shop drawings, product data and samples specified within two (2) weeks after contract award.

- .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 bi-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 one (1) electronic copy of all shop drawings and product data and samples for review, unless otherwise specified.
- .5 Review of shop drawings and product data by the Departmental Representative does not relieve the Contractor of the responsibility for errors and omissions and for the conformity with contract documents.

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.

19. WORK & MATERIALS SUPPLIED BY OWNER

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

21. 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.

22. 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.

23. SITE OFFICE & TELEPHONE

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

24. SANITARY FACILITIES

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

25. TEMPORARY SERVICES

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

26. 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.

27. CO-OPERATION

- .1 Co-operate with NRC staff in order to keep disruption of normal research work to an absolute minimum.
- .2 Work out in advance, a schedule for all work which might disrupt normal work in the building.
- .3 Have schedule approved by the Departmental Representative.
- .4 Notify the Departmental Representative in writing, 72 hours prior to any intended interruption of facilities, areas, corridors, mechanical or electrical services and obtain requisite permission.

28. PROTECTION AND WARNING NOTICES

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

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

29. BILINGUALISM

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

30. 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.

31. 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.

32. 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.

33. 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.
 - .1 Maintain ambient temperature and humidity levels as required for comfort of NRC personnel.
- .5 Prevent hazardous or unhealthy accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction including also, storage areas and sanitary facilities.
 - .1 Dispose of exhaust materials in a manner that will not result in a harmful or unhealthy exposure to persons.
- .6 Maintain strict supervision of operation of temporary heating and ventilating equipment.
 - .1 Enforce conformance with applicable codes and standards.

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

34. CONNECTIONS TO AND INTERRUPTIONS TO EXISTING SERVICES

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

35. CUTTING AND PATCHING

- .1 Cut existing surfaces as required to accommodate new work.
- .2 Remove all items as shown or specified.

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

36. 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.

37. 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.

38. ENCLOSURE OF STRUCTURES

- .1 Maintain in place until all chances of damage are over and proper curing has taken place.
- .2 Provide temporary weather tight enclosures for exterior openings until permanent sash and glazing and exterior doors are installed.
- .3 Provide lockable enclosures as required to maintain the security of NRC facilities and be responsible for the same.
- .4 Provide keys to NRC security personnel when required.
- .5 Lay out the work carefully and accurately and verify all dimensions and be responsible for them. Locate and preserve general reference points.
- .6 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.

- .7 Conceal all services, piping, wiring, ductwork, etc., in floors, walls or ceilings except where indicated otherwise.

39. STORAGE

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

40. GENERAL REVIEW

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

41. INSPECTION OF BURIED OR CONCEALED SERVICES

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

42. TESTING

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

43. PARTIAL OCCUPANCY

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

44. DISPOSAL OF WASTES

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

45. CLEAN-UP DURING CONSTRUCTION

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

46. FINAL CLEAN-UP

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

47. WARRANTY AND RECTIFICATION OF DEFECTS IN WORK

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

48. MAINTENANCE MANUALS

- .1 Provide one (1) bilingual copy of maintenance the manual or one (1) English and one (1) French maintenance manuals in an electronic format (PDF) due immediately upon completion of the work and prior to release of holdbacks.
- .2 Manuals to include operating and maintenance instructions, all guarantees and warranties, shop drawings, technical data, etc., for the material and apparatus supplied under this contract.

END OF SECTION

1. 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. Site Specific Safety Plans must also be robust enough to address any abnormal occurrences, such as, but not limited to: pandemics (COVID-19 or a similar), fire, flooding, incimate weather or other environmental anomalies.
 - .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 sub-contractors 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 sub-contractors 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

3. When reporting a fire by phone, give the location of fire, building number and be prepared to verify location.
4. The person activating fire alarm pull station must remain at a safe distance from the scene of the fire but readily available to provide information and direction to the Fire Department personnel.

.5 Interior and Exterior Fire protection & Alarm Systems

- .1 DO NOT OBSTRUCT OR SHUT OFF FIRE PROTECTION EQUIPMENT OR SYSTEMS, INCLUDING BUT NOT LIMITED TO FIRE ALARM SYSTEMS, SMOKE/HEAT DETECTORS, SPRINKLER SYSTEM, PULL STATIONS, EMERGENCY CALL BUTTONS AND PA SYSTEMS, WITHOUT AUTHORIZATION FROM THE DEPARTMENTAL REPRESENTATIVE.
- .2 WHEN ANY FIRE PROTECTION EQUIPMENT IS TEMPORARILY SHUT DOWN, ALTERNATIVE MEASURES AS PRESCRIBED BY THE DEPARTMENTAL REPRESENTATIVE SHALL BE TAKEN TO ENSURE THAT FIRE PROTECTION IS MAINTAINED.
- .3 DO NOT LEAVE FIRE PROTECTION OR ALARM SYSTEMS INACTIVE AT THE END OF A WORKING DAY WITHOUT NOTIFICATION AND AUTHORISATION FROM THE DEPARTMENTAL REPRESENTATIVE. THE DEPARTMENTAL REPRESENTATIVE WILL ADVISE THE (FPO) OF THE DETAILS OF ANY SUCH EVENT.
- .4 DO NOT USE FIRE HYDRANTS, STANDPIPES AND HOSE SYSTEMS FOR OTHER THAN FIRE FIGHTING PURPOSES UNLESS AUTHORISED BY DEPARTMENTAL REPRESENTATIVE.

.6 Fire Extinguishers

- .1 Provide a minimum of 1-20 lb. ABC Dry Chemical Fire Extinguisher at each hot work or open flame location.
- .2 Provide fire extinguishers for hot asphalt and roofing operations as follows:
 1. Kettle area - 1-20 lb. ABC Dry Chemical; and
 2. Roof - 1-20 lb. ABC Dry Chemical at each open flame location.
- .3 Provide fire extinguishers equipped as below:
 1. Pinned and sealed;
 2. With a pressure gauge; and
 3. With an extinguisher tag signed by a fire extinguisher servicing company.

- .4 Carbon Dioxide (CO₂) extinguishers will not be considered as substitutes for the above.

.7 Roofing Operations

- .1 Kettles:
 - .1 Arrange for the location of asphalt kettles and material storage with the Departmental Representative before moving on site. Do not locate kettles on any roof or structure and keep them at least 10m (30 feet) away from a building.
 - .2 Equip kettles with two (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 Fire and Smoke Hazard Management:
 - .1 Contractor shall identify “Designated Roofing Marshall” for duration of construction activities. “Designated Roofing Marshall” shall be responsible for the following:
 - .1 Perform NRC Daily Fire and Smoke Risk Hazard Assessment each day prior to commencement of roofing activities.
 - .2 Provide completed NRC Daily Fire and Smoke Risk Hazard Assessment to Departmental Representative every morning by email prior to commencement of roofing activities.
 - .3 Follow behind any torch activities with a thermal scanner periodically to identify any hot spots and rectify immediately. Interval for periodic thermal scanning to be approved on site with Departmental Representative.
 - .2 Any proposed changes to “Designated Roofing Marshall” must be reviewed and approved by Departmental Representative.

- .5 Store all combustible roofing materials at least 3m (10 feet) away from any structure.
- .6 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 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 RELATED SECTIONS

- .1 Section 01 10 00 - 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.

- .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.

- .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.

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 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by NRC. Do not burn waste materials on site.
- .3 Clear snow and ice from access to building in affected work area.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris. Location of containers to be approved by NRC.
- .6 Provide and use marked separate bins for recycling.
- .7 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .8 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.2 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste materials from site at regularly scheduled times or dispose of as directed by NRC. Do not burn waste materials on site.

- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors and has indicated.
- .8 Clean lighting reflectors, lenses, and other lighting surfaces.
- .9 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .10 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .11 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .12 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .13 Remove dirt and other disfiguration from exterior surfaces.
- .14 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .15 Sweep and wash clean paved areas.
- .16 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .17 Clean roofs, downspouts, and drainage systems.
- .18 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .19 Remove snow and ice from access to building.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance provincial and local regulation.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for management of construction waste and disposal, which forms the Contractor's commitment to reduce and divert waste materials from landfill and includes the following:
 - .1 Preparation of a Draft Construction Waste Management Plan that will be used to track the success of the Construction Waste Management Plan against actual waste diversion from landfill.
 - .2 Preparation of monthly progress reports indicating cumulative totals representing progress towards achieving diversion and reduction goals of waste materials away from landfill and identifying any special programs, landfill options or alternatives to landfill used during construction.
 - .3 Preparation of a Construction Waste Management Report containing detailed information indicating total waste produced by the project, types of waste material and quantity of each material, and total waste diverted and diversion rates indicated as a percentage of the total waste produced.
- .2 Owner has established that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor.

1.2 RELATED REQUIREMENTS

- .1 Section 01 10 00 – General Instructions
- .2 Section 02 41 13 – Selective Interior Demolition
- .3 Section 02 41 19.16 – Selective Interior Demolition
- .4 Section 02 42 00 – Removal and Salvage of Construction Material
- .5 Section 22 05 05 – Selective Demolition for Plumbing
- .6 Section 23 05 05 – Selective Demolition for HVAC-R Equipment
- .7 Section 26 05 05 – Selective Demolition for Electrical

1.3 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM E1609 01, Standard Guide for Development and Implementation of a Pollution Prevention Program
- .2 Recycling Certification Institute (RCI):

.1 RCI Certification Construction and Demolition Materials Recycling

1.4 DEFINITIONS

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re-modeling, repair and demolition operations.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.
- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the project site.
- .11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
 - .1 Solvents in paints and other coatings;
 - .2 Wood preservatives; strippers and household cleaners;

- .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
- .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
- .18 Construction Waste Management Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the Construction Waste Management Plan are followed.
- .2 Preconstruction Meeting: Arrange a pre-construction meeting in accordance with Section 01 10 00 – General Instructions before starting any Work of the Contract attended by the Owner, Contractor, affected Subcontractor's and Departmental Representative to discuss the Contractor's Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide required information in accordance with Section 01 10 00 – General Instructions.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Draft Construction Waste Management Plan (Draft CWM Plan): Submit to Departmental Representative a preliminary analysis of anticipated site generated waste by listing a minimum of five (5) construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies; Departmental Representative will provide commentary before development of Contractor's Construction Waste Management Plan.
 - .2 Construction Waste Management Plan (CWM Plan): Submit a CWM Plan for this project prior to any waste removal from site and that includes the following information:
 - .1 Material Streams: Analysis of the proposed jobsite waste being generated, including material types and quantities forming a part of identified material streams in the Draft CWM Plan; materials removed from site destined for alternative daily cover at landfill sites and land clearing debris cannot be considered as contributing to waste diversion and will be included as a component of the total waste generated for the site.
 - .2 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.

- .3 Alternative Waste Disposal: Prepare a listing of each material proposed to be salvaged, reused, recycled or composted during the course of the project, and the proposed local market for each material.
- .4 Landfill Materials: Identify materials that cannot be recycled, reused or composted and provide explanation or justification; energy will be considered as a viable alternative diversion strategy for these materials where facilities exist and are operated in accordance with LEED Construction and Demolition Waste Management requirements.
- .5 Landfill Options: The name of the landfill where trash will be disposed of; landfill materials will form a part of the total waste generated by the project.
- .6 Materials Handling Procedures: A description of the means by which any recycled waste materials will be protected from contamination, and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
- .7 Transportation: A description of the means of transportation of the recyclable materials, whether materials will be site separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site, and destination of materials.

1.7 PROJECT CLOSEOUT SUBMISSIONS

- .1 Record Documentation: Submit as constructed information in accordance with Section 01 10 00 – General Instructions as follows:
 - .1 Construction Waste Management Report (CWM Report): Submit a CWM Report for this project in a format that includes the following information:
 - .1 Accounting: Submit information indicating total waste produced by the project.
 - .2 Composition: Submit information indicating types of waste material and quantity of each material.
 - .3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the project.
 - .4 Transportation Documentation and Diversion Documentation: Submit copies of transportation documents or shipping manifests indicating weights of materials, and other evidence of disposal indicating final location of waste diverted from landfill and waste sent to landfill.
 - .5 Multiple Waste Hauling: Compile all information into a single CWM Report where multiple waste hauling and diversion strategies were used for the project.

1.8 QUALITY ASSURANCE

- .1 Resources for Development of Construction Waste Management Report (CWM Report): The following sources may be useful in developing the Draft Construction Waste Management Plan:
 - .1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.
 - .2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.
 - .3 Municipal Garbage & Recycling Waste Websites:
 - .1 Ontario Region
 - .1 London
[EnviroDepots | City of London](#)
 - .2 Mississauga
[How to sort your waste - Region of Peel \(peelregion.ca\)](#)
 - .3 National Capital Region (City of Ottawa)
[Garbage and recycling | City of Ottawa](#)
 - .2 Quebec Region
 - .1 Boucherville
[Accueil | Ville de Longueuil](#)
 - .2 Montreal
[Get details about bulky items and construction debris collections | Ville de Montréal \(montreal.ca\)](#)
 - .3 Saguenay
[Demolition Waste Management | Demex-Centrem group \(groupedemexcentrem.com\)](#)

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.
- .2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
 - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
 - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.
- .3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 OBJECTIVE

- .1 The Federal Sustainable Development Strategy (FSDS) presents the Government of Canada's sustainable development goals and targets, as required by the *Federal Sustainable Development Act*. In keeping with the purpose of this Act – to provide the legal framework for developing and implementing a Federal Sustainable Development Strategy that will make environmental decision-making more transparent and accountable to Parliament – National Research Council (NRC) supports the goals laid out in the FSDS through the activities described in our Departmental Sustainable Development Strategy (DSDS). NRC's DSDS waste management target is as follows:

.1 Divert at least 90% (by weight) of all construction and demolition waste from landfills (striving to achieve 100% by 2030).

- .2 Project Waste Diversion Target: 90%.

3.2 (CWM PLAN) IMPLEMENTATION

- .1 Manager: Contractor is responsible for designating an on-site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the project.

- .2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor, the Owner, the Departmental Representative and other site personnel as required to maintain CWM Plan.

- .3 Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the project to Subcontractor's at appropriate stages of the project.

- .4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:

.1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

.2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.

- .5 Progressive Documentation: Submit a monthly summary of waste generated by the project to ensure that waste diversion goals are on track with project requirements:

.1 Submission of waste summary can coincide with application for progress payment, or similar milestone event as agreed upon between the Contractor and Departmental Representative.

- .2 Monthly waste summary shall contain the following information:
 - .1 The amount in tonnes or m3 and location of material landfilled;
 - .2 The amount in tonnes or m3 and location of materials diverted from landfill;
and
 - .3 Indication of progress based on total waste generated by the project with materials diverted from landfill as a percentage.

3.3 SUBCONTRACTOR'S RESPONSIBILITY

- .1 Subcontractor's shall cooperate fully with the Contractor to implement the CWM Plan.
- .2 Failure to cooperate may result in the Owner not achieving their environmental goals, and may result in penalties being assessed by the Contractor to the responsible Subcontractor's.

3.4 CONSTRUCTION WASTE MANAGEMENT FORMS

- .1 Departmental Representative will provide Contractor will NRC Waste Management and Disposal Tracking Forms (sample provided below) for recording management of construction waste.
- .2 Contractor shall utilize these forms for all waste management and disposal tracking for the duration of the project, and is responsible for maintaining current up to date records at all times during construction.
- .3 Contractor is responsible to ensure all waste management tracking forms, weigh-bills, donation receipts, and summary information are incorporated into Operational and Maintenance Manuals upon construction completion in accordance with 01 10 00 – General Instructions.

[INSERT WASTE MANAGEMENT FORMS]

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 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.
- .4 AFD managed projects the term NRC Representative in Cx specifications to be interpreted as AFD Service Provider.

1.3 COMMISSIONING OVERVIEW

- .1 Section 01 91 31 - Commissioning (Cx) Plan.

- .2 For Cx responsibilities refer to Section 01 91 31 - Commissioning (Cx) Plan.
- .3 Cx to be a line item of Contractor's cost breakdown.
- .4 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .5 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.
- .6 NRC Representative will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by NRC Representative.
 - .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 un-functional system, including related systems as deemed required by NRC 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 NRC 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 and primary 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 NRC 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 NRC Representative for review and approval.
 - .10 Ensure "As-Built" system schematics are available.
- .4 Inform NRC Representative in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

- .1 Report conflicts between requirements of this section and other sections to NRC Representative 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 00 10 00 – General Instructions.
 - .1 Submit no later than 2 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 NRC Representative for changes to submittals and obtain written approval at least 2 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to NRC Representative where not specified and obtain written approval at least 2 weeks prior to start of Cx.
 - .4 Provide additional documentation relating to Cx process required by NRC Representative.

1.8 COMMISSIONING DOCUMENTATION

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms for requirements and instructions for use.
- .2 NRC Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to NRC Representative.

1.9 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule.
- .2 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 Convene Cx meetings following project meetings.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage NRC Representative to 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.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by NRC Representative, who will record and distribute minutes.
- .7 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 5 days notice prior to commencement.
- .2 NRC 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 NRC Representative.
 - .3 Arrange for NRC Representative to witness tests.
 - .4 Obtain written approval of test results and documentation from NRC Representative before delivery to site.

- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with NRC Representative.
 - .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 NRC 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 NRC Representative. 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 NRC Representative.
 - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by NRC Representative.
 - .3 If evaluation report concludes that major damage has occurred, NRC 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 NRC 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 NRC 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 NRC 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 Notify NRC Representative at least 5 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

- .1 Submit to NRC 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 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 NRC 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 NRC Representative within 5 days of test and with Cx report.

1.23 COMMISSIONING CONSTRAINTS

- .1 None expected.

1.24 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 NRC Representative Consultant in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

1.25 EXTENT OF VERIFICATION

- .1 Everywhere:
 - .1 Provide manpower and instrumentation to verify 30 % of reported results, unless specified otherwise in other sections.
- .2 Number and location to be at discretion of NRC 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. Repeat verifications shall be performed in accordance to the following unless otherwise specified.
 - .1 Everywhere:
 - .1 Second verification:
 - .1 Provide manpower and instrumentation to verify 100 % of all failed tests results.
 - .2 Provide manpower and instrumentation to verify an additional 20% of reported results, locations to be at the discretion of the NRC Representative.
 - .2 Third and subsequent verifications:
 - .1 Provide manpower and instrumentation to verify 100 % of reported results.
- .5 Perform additional commissioning until results are acceptable to NRC Representative.

1.26 REPEAT VERIFICATIONS

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

1.27 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.

1.28 DEFICIENCIES, FAULTS, DEFECTS

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

1.29 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 NRC Representative.

1.30 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.

1.31 TRAINING

- .1 In accordance with Section 01 91 41 - Commissioning (Cx) - Training.

1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

1.33 OCCUPANCY

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

1.34 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 NRC Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

1.35 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 +/- 10] % 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 +/- 10% of recorded values.

1.36 OWNER'S PERFORMANCE TESTING

- .1 Performance testing of equipment or system by NRC Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

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 SUMMARY

- .1 Section Includes:
 - .1 Description of overall structure of Cx Plan and roles and responsibilities of Cx team.
- .2 Related Sections:
 - .1 Section [___].

1.2 REFERENCES

- .1 American Water Works Association (AWWA)
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA-13, Installation of Sprinkler Systems Handbook.
 - .2 NFPA-14, Automatic Sprinkler Systems Handbook.
- .3 Underwriters' Laboratories of Canada (ULC)

1.3 GENERAL

- .1 Provide a fully functional facility:
 - .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.

1.4 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 16 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 NRC Representative and obtain written approval.

1.5 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 2 weeks during construction phase. At each revision, indicate revision number and date.
- .3 Submit each revised Cx Plan to NRC Representative for review and obtain written approval.
- .4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF CX TEAM

- .1 NRC 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 PWGSC Design Quality Review Team: during construction, will conduct periodic site reviews to observe general progress.
 - .2 PWGSC 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 NRC 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.
 - .6 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:
 - .1 Receiving facility.

- .2 Day-To-Day operation and maintenance of facility.

1.7 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 NRC Representative and details of instruments and procedures to be followed for Cx 2 weeks prior to starting date of Cx for review and approval.

1.8 EXTENT OF CX

- .1 Cx Structural and Architectural Systems:
 - .1 Structural:
 - .1 Beam and slab deflection:
 - .1 First floor slab
 - .2 Structural walls:
 - .1 Wall opening
 - .2 Wall infill

- .3 Doors, windows, related hardware:
 - .1 Steel sound control door and frame complete with accessories and hardware.
 - .2 Acoustic steel window
- .4 Interior Partitions:
 - .1 Steel framing and resilient channels
 - .2 Insulation
 - .3 Gypsum board
 - .4 Sealant
- .2 Commission mechanical systems and associated equipment:
 - .1 Plumbing systems:
 - .1 Domestic CWS and HWS.
 - .2 Condensate and under-sink pumps.
 - .2 HVAC and exhaust systems:
 - .1 HVAC systems.
 - .2 General exhaust systems.
 - .3 Fire and life safety systems:
 - .1 Wet pipe sprinkler systems.
- .3 Commission electrical systems and equipment:
 - .1 Low voltage below 750 V:
 - .1 Low voltage equipment.
 - .2 Low voltage distribution systems.
 - .3 Electronic data and communications information systems.
 - .2 Lighting systems:
 - .1 Lighting equipment.
 - .2 Distribution systems.
 - .3 Emergency lighting systems, including battery packs.
 - .4 Fire exit emergency signage.
 - .3 Fire alarm systems, equipment:
 - .1 Annunciators.
 - .2 Control panels.
 - .3 Fire alarm battery banks.
 - .4 Other systems and equipment:
 - .1 Access security and safety systems

1.9 DELIVERABLES RELATING TO O&M PERSPECTIVES

- .1 General requirements:
 - .1 Compile English and French documentation.
 - .2 Documentation to be computer-compatible format ready for inputting for data management.

- .2 Provide deliverables:
 - .1 Warranties.
 - .2 Project record documentation.
 - .3 Inventory of spare parts, special tools and maintenance materials.
 - .4 Maintenance Management System (MMS) identification system used.
 - .5 WHMIS information.
 - .6 MSDS data sheets.
 - .7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board. Duplicate of inventory inside each panel.

1.10 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 NRC Representative to witness and certify tests and reports of results provided to NRC Representative.

1.11 PRE-CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 Items listed in this Cx Plan include the following:
 - .1 Pre-Start-Up inspections: by Contractor and NRC Representative prior to permission to start up and rectification of deficiencies to NRC Representative's satisfaction.
 - .2 Contractor to use approved check lists.

- .3 NRC Representative will monitor some of these pre-start-up inspections.
- .4 Include completed documentation with Cx report.
- .5 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 NRC Representative and does not form part of Cx specifications.
- .6 NRC Representative will monitor some of these inspections and tests.
- .7 Include completed documentation in Cx report.
- .2 Pre-Cx activities - ARCHITECTURAL AND STRUCTURAL:
 - .1 Slab and beam deflection test: test after removal of portion of existing slab.
 - .2 Structural walls: test after removal of existing structural walls.
 - .1 Doors, windows, related hardware: test sound performance
 - .1 Steel sound control door and frame complete with accessories and hardware
 - .2 Acoustic steel window
 - .2 Interior Partitions:
 - .1 Steel framing and resilient channels
 - .2 Insulation
 - .3 Gypsum board
 - .4 Sealant
- .3 Pre-Cx activities - MECHANICAL:
 - .1 Plumbing systems:
 - .1 "Bump" each item of equipment in its "stand-alone" mode.
 - .2 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.
 - .2 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] [Engineer] [Consultant] [____].
 - .3 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 Only additional testing after foregoing have been successfully completed to be "Off-Season Tests".
- .4 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.
- .5 Pre-Cx activities - ELECTRICAL:
 - .1 Low voltage distribution systems under 750 V:
 - .1 Requires independent testing agency to perform pre- energization and post-energization tests.
 - .2 Lighting systems:
 - .1 Emergency lighting systems:
 - .1 Tests to include verification of lighting levels and coverage, initially by disrupting normal power.
 - .3 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 to Departmental Representative.
 - .4 Low voltage systems: these include:
 - .1 Communications, low voltage lighting control systems and data communications systems.
 - .5 Security, surveillance and intrusion alarm systems: to include verification by Departmental Representative.

1.12 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:
 - .1 Make-Up air Unit.
 - .2 Fan Coil Units.
 - .3 DX Split System.
 - .4 Under-sink Pump
- .3 NRC Representative to monitor some of these start-up activities.
 - .1 Rectify start-up deficiencies to satisfaction of NRC Representative.
- .4 Performance Verification (PV):
 - .1 Approved Cx Agent to perform.
 - .1 Repeat when necessary until results are acceptable to NRC Representative.
 - .2 Use procedures modified generic procedures to suit project requirements.
 - .3 NRC Representative to witness and certify reported results using approved PI and PV forms.
 - .4 NRC Representative reserves right to verify up to 50% 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.

1.13 CX ACTIVITIES AND RELATED DOCUMENTATION

- .1 NRC Representative to monitor Cx activities.
- .2 Upon satisfactory completion, Cx agency performing tests to prepare Cx Report using approved PV forms.
- .3 NRC Representative to witness, certify reported results of, Cx activities.
- .4 NRC Representative reserves right to verify a percentage of reported results at no cost to contract.

1.14 CX OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

- .1 Tests to be witnessed by NRC Representative and documented on approved report forms.
- .2 NRC Representative reserves right to verify percentage of reported results.
- .3 Integrated systems to include:
 - .1 HVAC and associated systems forming part of integrated HVAC systems.
 - .2 Fire alarm systems.
 - .3 Emergency lighting systems.
- .4 Identification:
 - .1 In later stages of Cx, before hand-over and acceptance NRC Representative and Contractor to co-operate to complete inventory data sheets and provide assistance to PWGSC in full implementation of MMS identification system of components, equipment, sub-systems, systems.

1.15 INSTALLATION CHECK LISTS (ICL)

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.16 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.17 PERFORMANCE VERIFICATION (PV) REPORT

- .1 Refer to Section 01 91 33 - Commissioning (Cx) Forms: Installation Check Lists and Product Information (PI) / Performance Verification (PV) Forms.

1.18 DELIVERABLES RELATING TO ADMINISTRATION OF CX

- .1 General:
 - .1 Because of risk assessment, complete Cx of occupancy, weather and seasonal-sensitive equipment and systems in these areas before building is occupied.

1.19 CX SCHEDULES

- .1 Prepare Cx Schedule and submit to NRC 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 Submission of list of instrumentation with relevant certificates: 14 days before start of Cx.
 - .3 Notification of intention to start TAB: 7 days before start of TAB.
 - .4 TAB: after successful start-up, correction of deficiencies and verification of normal and safe operation.
 - .5 Notification of intention to start Cx: 14 days before start of Cx.
 - .6 Identification of deferred Cx.
 - .7 Implementation of training plans.
 - .8 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 NRC Representative.
 - .3 6 months in Cx schedule for verification of performance in all seasons and wear conditions.
- .2 After approval, incorporate Cx Schedule into Construction Schedule.
- .3 Contractor's Cx agent, and NRC Representative will monitor progress of Cx against this schedule.

1.20 CX REPORTS

- .1 Submit reports of tests, witnessed and certified by Contractor to NRC 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 NRC Representative.

1.21 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.

1.22 TESTS TO BE PERFORMED BY OWNER/USER

- .1 None is anticipated on this project.

1.23 TRAINING PLANS

- .1 Refer to Section 01 91 41 - Commissioning (Cx) - Training.

1.24 FINAL SETTINGS

- .1 Upon completion of Cx to satisfaction of NRC 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 SUMMARY

- .1 Section Includes:
 - .1 Commissioning forms to be completed for equipment, system and integrated system.

1.2 INSTALLATION/START-UP CHECK LISTS

- .1 Include the following data:
 - .1 Product manufacturer's installation instructions and recommended checks.
 - .2 Special procedures as specified in relevant technical sections.
 - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by NRC Representative supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in O&M Manual at completion of project.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

1.3 PRODUCT INFORMATION (PI) REPORT FORMS

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain NRC Representative's approval.

1.4 PERFORMANCE VERIFICATION (PV) FORMS

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

- .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.
- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain NRC Representative's approval.

1.5 SAMPLES OF COMMISSIONING FORMS

- .1 NRC Representative will provide to Contractor required project-specific Commissioning forms in electronic format complete with specification data.
- .2 Revise items on Commissioning forms to suit project requirements.
- .3 Samples of Commissioning forms and a complete index of produced to date will be attached to this section.

1.6 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

- .1 When additional forms are required, but are not available from NRC Representative develop appropriate verification forms and submit to NRC Representative for approval prior to use.
 - .1 Additional commissioning forms to be in same format as provided by NRC Representative.

1.7 COMMISSIONING FORMS

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
 - .1 NRC Representative provides Contractor project-specific Commissioning forms with Specification data included.
 - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
 - .3 Confirm operation as per design criteria and intent.
 - .4 Identify variances between design and operation and reasons for variances.
 - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
 - .6 Record analytical and substantiating data.
 - .7 Verify reported results.
 - .8 Form to bear signatures of recording technician and reviewed and signed off by NRC Representative.
 - .9 Submit immediately after tests are performed.
 - .10 Reported results in true measured SI unit values.
 - .11 Provide NRC Representative with originals of completed forms.
 - .12 Maintain copy on site during start-up, testing and commissioning period.
 - .13 Forms to be both hard copy and electronic format with typed written results in O&M Manual.

1.8 LANGUAGE

- .1 To suit the language profile of the awarded contract.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

WASTE AUDIT worksheet for NRC Construction, Renovation and Demolition Projects

Worksheet for: Total Inventory Specific Stage Individual Floor

Create one worksheet for the entire project or multiple worksheets for each stage of the project, or per floor (where needed). Mark each worksheet accordingly

Project Name	
Project Type (Construction, Renovation or Demolition)	
Area (sq. m)	
Site Address	
Contact Person & Telephone	
Date	

For Project Planning Purposes (i.e. number of bins required)

* Add or delete materials as project requires

WASTE CATEGORY AND MATERIAL TYPE	Units	Total Units	Weight (kg) per unit of measurement	Estimated Weight (Metric Tonnes)	Potential Reuse (Metric Tonnes)	Potential Recycle (Metric Tonnes)	Potential Landfill (Metric Tonnes)	Volume (cubic yards)
Masonry and Pavement								
Asphalt (cu. m.)	cu. m.		2400.00	0.00				
Concrete (walls, floors, stairs)	cu. m.		2400.00	0.00				
Brick block, etc.	cu. m.		1840.00	0.00				
Stone (foundation)	cu. m.		1473.80	0.00				
Glass masonry	cu. m.			0.00				
Marble	cu. m.		2563.00	0.00				
Granite	cu. m.		2750.00	0.00				
Clay tile	cu. m.			0.00				
Other	cu. m.			0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Walls and Ceilings								
Drywall (12.5 mm)	sq. m.		9.74	0.00				
Drywall (19 mm)	sq. m.		12.25	0.00				
Cellulose insulation	sq. m.		6.41	0.00				
Fiberglass insulation	sq. m.		6.41	0.00				
Solid SM insulation	sq. m.		11.54	0.00				
Ceiling tile (19 mm standard)	sq. m.		6.82	0.00				
Glass (5 - 6 mm)	sq. m.			0.00				
Acoustic composite (ceilings, walls)	sq. m.		0.30	0.00				
Other	sq. m.			0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Metal								
Steel (structural, stairs, fabrications, joists, deck, siding)	weight		600.00	0.00				
Aluminum (structural, siding)			2700.00	0.00				
Light Metal								
Studs	lm. of wall			0.00				
Ceiling grid	sq. m.		1.41	0.00				
Steel mesh				0.00				
Miscellaneous				0.00				
Other				0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Mechanical								
HVAC								
Solid ducts	weight		26238.00	0.00				
Flex ducts	weight		5180.00	0.00				
Metal diffuser (600 X600)	each			0.00				
Light diffuser (boot only)	each			0.00				
Plastic grilles (600 X 600)	each			0.00				
VAV boxes	weight			0.00				
Heat coils	weight			0.00				
A/C units	weight		90.00	0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Plumbing								
Copper piping (12.5 to 19mm)	lin. m.		1833.30	0.00				
Steel piping (38 to 50mm)	lin. m.		220.00	0.00				
Plastic piping (38 to 50mm)	lin. m.			0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Fixtures								
Sinks (ceramic/porcelain)	each		10.00	0.00				
Sinks (metal)	each		10.00	0.00				
Faucets	each			0.00				
Water Closet	each		46.00	0.00				
Urinals (wall hung)	each		29.00	0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Other								
			TOTAL	0.00	0.00	0.00	0.00	0
Windows and Doors								
Doors								
Wood (solid or hollow core)	each		20.00	0.00				
Metal (hollow metal)	each		30.00	0.00				
Garage	each		135.00	0.00				
Frame (wood)	each		23.33	0.00				
Frame (metal)	each		2.33	0.00				
Windows								
Wood frame	each		216.36	0.00				
Plastic frame	each		125.10	0.00				
Aluminum frame	each		216.67	0.00				
Door Hardware								
Locksets	each		2.50	0.00				
Hinges, plates, stops, etc.	each		2.50	0.00				
Other (closers, operators, etc.)	each		2.50	0.00				
Other				0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Wood								
Rough (crating, timber, etc.)	weight			0.00				
Dimension (3 m studs)	each		2.83	0.00				
Plywood (17mm)	sq. m.		0.08	0.00				
Hardwood (floor)	sq. m.		0.02	0.00				
Other				0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Millwork and Finish Carpentry								
Baseboards and casing (50 mm ht.)	each			0.00				
Lower cabinets (c/w doors)	each		44.10	0.00				
Upper cabinets (c/w doors)	each			0.00				
Counters (9' sections)	each		45.65	0.00				
Other				0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Flooring								
Carpet (roll)	sq. m.		2.44	0.00				
Carpet tile	sq. m.		2.98	0.00				
Sheet vinyl and linoleum	sq. m.		2.98	0.00				
Rubber cove or carpet base	lin. m.		0.52	0.00				
Terrazzo - 25 mm	sq. m.		0.02	0.00				
Ceramic Tiles	sq. m.		0.21	0.00				
Other				0.00				
			TOTAL	0.00	0.00	0.00	0.00	0
Electrical								
Wiring								
Data	weight			0.00				
Electrical (aluminum, copper, iron, etc)	weight			0.00				
Junction and outlet boxes (standard)	each		3800.00	0.00				
Cover plates	each			0.00				
Electrical panels	weight			0.00				

Conduit (25 mm)	lin. m.			0.00					
Conduit (50 mm)	lin. m.			0.00					
				TOTAL	0.00	0.00	0.00	0.00	0
Lighting									
Fluorescent fixture (600 X 1200)	each		0.82	0.00					
Fluorescent fixture (300 X 1200)	each		0.08	0.00					
Ballast	each		4432.00	0.00					
Lamps	each			0.00					
Complete fixture (600 X 1200)	each			0.00					
Complete fixture (300 X 1200)	each			0.00					
Emergency battery lights	each		6.66	0.00					
Exit lights	each		1.00	0.00					
Fire bells/alarms	each			0.00					
Miscellaneous (switches, sensors, etc.)	each		600.00	0.00					
				TOTAL	0.00	0.00	0.00	0.00	0
Other									
				TOTAL	0.00	0.00	0.00	0.00	0
Roofing									
Shingles - asphalt	sq. m.		10.72	0.00					
Tin	sq. m.		616.76	0.00					
Copper	sq. m.			0.00					
Waterproof EDPM	sq. m.		796.67	0.00					
Waterproof PVC	sq. m.			0.00					
Tar and gravel	sq. m.		608.85	0.00					
Other	sq. m.			0.00					
				TOTAL	0.00	0.00	0.00	0.00	0
Specialties & Miscellaneous									
Office Furnishings									
Furniture (workstations and chairs)	each								
Shelving	each								
Bulletin and white boards	each								
Building Furnishings									
Window Coverings (rolling shutters, blinds)	each								
Signs	each								
Lockers	each								
Metal partition (toilet)	each								
Plastic partition (toilet)	each								
Stud-type partition (demountable)	each								
Specialized Equipment									
Food service equipment	each								
Parking control equipment	each								
Waste/cleaning equipment	each								
Refrigeration equipment	each								
Lifts	each								
Elevators	each								
Escalators	each								
Dumbwaiters	each								
Communications	each								
Telecom raceways/cables	each								
Terminals and connectors	each								
Other	each								
				TOTAL	0.00	0.00	0.00	0.00	0
Packaging									
Cardboard Packaging	weight		60.00	0.00					
Plastic packaging	weight			0.00					
Other				0.00					
				TOTAL	0.00	0.00	0.00	0.00	0
Other									
				0.00					
				0.00					
				0.00					
				0.00					
				0.00					
				TOTAL	0.00	0.00	0.00	0.00	0
				TOTAL	0.00	0.00	0.00	0.00	0

NRC Construction, Renovation and Demolition PRE-WASTE AUDIT SUMMARY

Project Name	0
Project Type (Construction, Renovation or Demolition)	0
Area (sq. m)	0
Site Address	0
Contact Person & Telephone	0
Date	

Waste Audit Summary					
WASTE CATEGORY	Estimated Quantity Generated (Metric Tonnes)	Potential Quantity (Metric Tonnes)			Potential Diversion Rate
		Reuse	Recycle	Landfill	
Masonry and Pavement	0.00	0.00	0.00	0.00	#DIV/0!
Walls and Ceilings	0.00	0.00	0.00	0.00	#DIV/0!
Metal	0.00	0.00	0.00	0.00	#DIV/0!
Mechanical:					
HVAC	0.00	0.00	0.00	0.00	#DIV/0!
Plumbing	0.00	0.00	0.00	0.00	#DIV/0!
Fixtures	0.00	0.00	0.00	0.00	#DIV/0!
Other	0.00	0.00	0.00	0.00	#DIV/0!
Windows and Doors	0.00	0.00	0.00	0.00	#DIV/0!
Wood	0.00	0.00	0.00	0.00	#DIV/0!
Millwork and Finish Carpentry	0.00	0.00	0.00	0.00	#DIV/0!
Flooring	0.00	0.00	0.00	0.00	#DIV/0!
Electrical:				0.00	#DIV/0!
Wiring	0.00	0.00	0.00		
Lighting	0.00	0.00	0.00	0.00	#DIV/0!
Other	0.00	0.00	0.00	0.00	#DIV/0!
Roofing	0.00	0.00	0.00	0.00	#DIV/0!
Specialties & Miscellaneous	0.00	0.00	0.00	0.00	#DIV/0!
Packaging	0.00	0.00	0.00	0.00	#DIV/0!
Other	0.00	0.00	0.00	0.00	#DIV/0!
TOTALS	0.00	0.00	0.00	0.00	#DIV/0!

NRC Construction, Renovation and Demolition WASTE REDUCTION WORK PLAN

Project Name	0
Project Type (Construction, Renovation or Demolition)	0
Area (sq. m)	0
Site Address	0
Contact Person & Telephone	0
Date	

WASTE CATEGORY AND MATERIAL	Estimated Quantity (Metric Tonnes)	Proposed Action to Reduce, Reuse or Recycle Material (including end-destination)	Projected Quantity (Metric Tonnes)		
			Reuse	Recycle	Landfill
Masonry and Pavement					
Asphalt (cu. m.)	0.00				0.00
Concrete (walls, floors, stairs)	0.00				0.00
Brick, block, etc.	0.00				0.00
Stone (foundation)	0.00				0.00
Glass masonry	0.00				0.00
Marble	0.00				0.00
Granite	0.00				0.00
Clay tile	0.00				0.00
Other	0.00				0.00
Walls and Ceilings					
Drywall (12.5 mm)	0.00				0.00
Drywall (19 mm)	0.00				0.00
Cellulose insulation	0.00				0.00
Fiberglass insulation	0.00				0.00
Solid SM insulation	0.00				0.00
Ceiling tile (19 mm standard)	0.00				0.00
Glass (5 - 6 mm)	0.00				0.00
Acoustic composite (ceilings, walls)	0.00				0.00
Other	0.00				0.00
Windows and Doors					
Doors					
Wood (solid or hollow core)	0.00				0.00
Metal (hollow metal)	0.00				0.00
Garage	0.00				0.00
Windows	0.00				0.00
Wood frame	0.00				0.00
Plastic frame	0.00				0.00
Aluminum frame	0.00				0.00
Door Hardware	0.00				0.00
Locksets	0.00				0.00
Hinges, plates, stops, etc.	0.00				0.00
Other (closers, operators, etc.)	0.00				0.00
Other	0.00				0.00
Wood					
Rough (crating, timber, etc.)	0.00				0.00
Dimension (3 m studs)	0.00				0.00
Plywood (17mm)	0.00				0.00
Hardwood (floor)	0.00				0.00
Other	0.00				0.00
Millwork and Finish Carpentry					
Baseboards and casing (50 mm ht.)	0.00				0.00

Lower cabinets (c/w doors)	0.00			0.00
Upper cabinets (c/w doors)	0.00			0.00
Counters	0.00			0.00
Other	0.00			0.00
Flooring				
Carpet (roll)	0.00			0.00
Carpet tile	0.00			0.00
Sheet vinyl and linoleum	0.00			0.00
Rubber cove or carpet base	0.00			0.00
Terrazzo - 25 mm	0.00			0.00
Ceramic Tiles	0.00			0.00
Other	0.00			0.00
Metal				
Steel (structural, stairs, fabrications, joists, deck, siding)	0.00			0.00
Aluminum (structural, siding)	0.00			0.00
Light Metal	0.00			0.00
Studs	0.00			0.00
Ceiling grid	0.00			0.00
Miscellaneous	0.00			0.00
Other	0.00			0.00
Mechanical				
HVAC				
Solid ducts	0.00			0.00
Flex ducts	0.00			0.00
Metal diffuser	0.00			0.00
Light diffuser (boot only)	0.00			0.00
Plastic grilles	0.00			0.00
VAV boxes	0.00			0.00
Heat coils	0.00			0.00
A/C units, fan coil units, exhaust fans	0.00			0.00
Plumbing	0.00			0.00
Copper piping (12.5 to 19mm)	0.00			0.00
Steel piping (38 to 50mm)	0.00			0.00
Plastic piping (38 to 50mm)	0.00			0.00
Fixtures	0.00			0.00
Sinks (ceramic/porcelain)	0.00			0.00
Sinks (metal)	0.00			0.00
Faucets	0.00			0.00
Water Closet	0.00			0.00
Urinals (wall hung)	0.00			0.00
Other (drinking water fountain, insulation)	0.00			0.00
Electrical				
Wiring				
Data	0.00			0.00
Electrical (aluminum, copper, iron, etc)	0.00			0.00
Junction and outlet boxes (standard)	0.00			0.00
Cover plates	0.00			0.00
Electrical panels	0.00			0.00
Conduit (25 mm)	0.00			0.00
Conduit (50 mm)	0.00			0.00
Lighting				
Fluorescent fixture (600 X 1200)	0.00			0.00
Fluorescent fixture (300 X 1200)	0.00			0.00
Ballast	0.00			0.00

Lamps	0.00			0.00
Complete fixture (600 X 1200)	0.00			0.00
Complete fixture (300 X 1200)	0.00			0.00
Emergency battery lights	0.00			0.00
Exit lights	0.00			0.00
Fire bells/alarms	0.00			0.00
Micellaneous (switches, sensors, etc.)	0.00			0.00
Other	0.00			0.00
Roofing				
Shingles - asphalt	0.00			0.00
Tin	0.00			0.00
Waterproof EDPM	0.00			0.00
Waterproof PVC	0.00			0.00
Tar and gravel	0.00			0.00
Other	0.00			0.00
Specialties & Miscellaneous				
Office Furnishings	0.00			0.00
Furniture (workstations and chairs)	0.00			0.00
Shelving & Filing Cabinets	0.00			0.00
Bulletin and white boards	0.00			0.00
Building Furnishings	0.00			0.00
Window Coverings (rolling shutters, blinds)	0.00			0.00
Signs	0.00			0.00
Lockers	0.00			0.00
Metal partition (toilet)	0.00			0.00
Plastic partition (toilet)	0.00			0.00
Stud-type partition (demountable)	0.00			0.00
Specilaized Equipment	0.00			0.00
Food service equipment	0.00			0.00
Parking control equipment	0.00			0.00
Waste/cleaning equipment	0.00			0.00
Refrigeration equipment	0.00			0.00
Lifts	0.00			0.00
Elevators	0.00			0.00
Escalators	0.00			0.00
Dumbwaiters	0.00			0.00
Communications	0.00			0.00
Telecom raceways/cables	0.00			0.00
Terminals and connectors	0.00			0.00
Other	0.00			0.00
Packaging				
Cardboard Packaging	0.00			0.00
Plastic packaging	0.00			0.00
Other	0.00			0.00
Other				
	0.00			0.00
	0.00			0.00
	0.00			0.00
	0.00			0.00
	0.00			0.00
	0.00			0.00
	0.00			0.00
	0.00			0.00
	0.00			0.00
	0.00			0.00
Total	0.00		0.00	0.00

NRC Construction, Renovation and Demolition WASTE REDUCTION WORK PLAN SUMMARY

Project Name	0
Project Type (Construction, Renovation or Demolition)	0
Area (sq. m)	0
Site Address	0
Contact Person & Telephone	0
Date	

Waste Management Summary								
WASTE CATEGORY	Estimated Quantity (Metric Tonnes)	Proposed Action to Reduce, Reuse or Recycle Material (including end-destination)	Projected Quantity (Metric Tonnes)			Potential Diversion	Start date	End Date
			Reuse	Recycle	Landfill	Rate		
Masonry and Pavement	0.00		0.00	0.00	0.00	#DIV/0!		
Walls and Ceilings	0.00		0.00	0.00	0.00	#DIV/0!		
Windows and Doors	0.00		0.00	0.00	0.00	#DIV/0!		
Wood	0.00		0.00	0.00	0.00	#DIV/0!		
Millwork and Finish Carpentry	0.00		0.00	0.00	0.00	#DIV/0!		
Flooring	0.00		0.00	0.00	0.00	#DIV/0!		
Metal	0.00		0.00	0.00	0.00	#DIV/0!		
Mechanical:								
HVAC	0.00		0.00	0.00	0.00	#DIV/0!		
Plumbing	0.00		0.00	0.00	0.00	#DIV/0!		
Fixtures	0.00		0.00	0.00	0.00	#DIV/0!		
Other	0.00		0.00	0.00	0.00	#DIV/0!		
Electrical:								
Wiring	0.00		0.00	0.00	0.00	#DIV/0!		
Lighting	0.00		0.00	0.00	0.00	#DIV/0!		
Other	0.00		0.00	0.00	0.00	#DIV/0!		
Roofing	0.00		0.00	0.00	0.00	#DIV/0!		
Specialties & Miscellaneous	0.00		0.00	0.00	0.00	#DIV/0!		
Packaging	0.00		0.00	0.00	0.00	#DIV/0!		
Other	0.00		0.00	0.00	0.00	#DIV/0!		
TOTAL	0.00		0.00	0.00	0.00	#DIV/0!		

NRC Construction, Renovation and Demolition WASTE MATERIAL TRACKING FORM

(Entries required for every load leaving the site)

Project Name	0
Project Type (Construction, Renovation or Demolition)	0
Area (sq. m)	0
Site Address	0
Contact Person & Telephone	0
Date	

Load #	Date	Time	Hauler	If Applicable:		Material Type(s)
				Bin Size (yd ³)	Fill Level	
1	Dec 17/08	3:00pm	Waste Co.	20	3/4	Commingled Recyclates (metals, wood, concrete)
2	Dec 17/08	4:00pm	Waste Co.	30	Full	Untreated Wood
3	Dec 18/08	12:00pm	Waste Co.	20	Over Flowing	Miscellaneous Waste
4	Dec 19/08	12:00pm	Man and His Truck	N/A	N/A	Doors
5						
6						
7						
8						
9						

10						
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continue.....

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Waybill # (if applicable)	Destination	Weight (metric Tonnes)				Comments
		Reuse	Recycling	Unspecified Diversion (Reuse or Recycling)	Landfill	
12345	Waste Co.					Waste sent to commingling recycling facility. Total weight and % diversion to be reported by hauler
12346	Waste Co.					Total weight to be reported by hauler
12347	Landfill					Total weight to be reported by hauler
N/A	Resale					Totals weight estimated by hauler and PM



NRC Construction, Renovation and Demolition FINAL DIVERSION REPORT

Project Name	0
Project Type (Construction, Renovation or Demolition)	0
Area (sq. m)	0
Site Address	0
Contact Person & Telephone	0
Date	

Material	Actual Weight Diverted (metric tonnes)		Final Destination and End-Use of Diverted Materials	Total Weight Landfilled (metric tonnes)
	Re-used	Recycled		
Masonry and Pavement				
Walls and Ceilings				
Metal				
Mechanical:				
HVAC				
Plumbing				
Fixtures				
Other				
Windows and Doors				
Wood				
Millwork and Finish Carpentry				
Flooring				
Electrical:				
Wiring				
Lighting				
Other				
Roofing				
Specialties & Miscellaneous				
Cardboard				
Other Packaging				
Mixed Recycling				
General Waste				
Other				
TOTAL	0	0		0

TOTAL WEIGHT (metric tonnes)	Diversion Rate
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
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0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!
0	#DIV/0!

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 This Section specifies roles and responsibilities of Commissioning Training.
- .2 Related Sections:
 - .1 Section [___].

1.2 TRAINEES

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes [Property] [Facility] Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.3 INSTRUCTORS

- .1 NRC Representative will provide:
 - .1 Descriptions of systems.
 - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
 - .1 Start-Up, operation, shut-down of equipment, components and systems.
 - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
 - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
 - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.4 TRAINING OBJECTIVES

- .1 Training to be detailed and duration to ensure:
 - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
 - .2 Effective on-going inspection, measurements of system performance.
 - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
 - .4 Ability to update documentation.
 - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.5 TRAINING MATERIALS

- .1 Instructors to be responsible for content and quality.
- .2 Training materials to include:
 - .1 "As-Built" Contract Documents.
 - .2 Operating Manual.
 - .3 Maintenance Manual.
 - .4 Management Manual.
 - .5 TAB and PV Reports.
- .3 NRC Representative will review training manuals.
- .4 Training materials to be in a format that permits future training procedures to same degree of detail.
- .5 Supplement training materials:
 - .1 Transparencies for overhead projectors.
 - .2 Multimedia presentations.
 - .3 Manufacturer's training videos.
 - .4 Equipment models.

1.6 SCHEDULING

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, training sessions to be 2 hours in length.
- .3 Training to be completed prior to acceptance of facility.

1.7 RESPONSIBILITIES

- .1 Be responsible for:
 - .1 Implementation of training activities,
 - .2 Coordination among instructors,
 - .3 Quality of training, training materials,
- .2 NRC Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by NRC Representative.

1.8 TRAINING CONTENT

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
- .2 Content includes:
 - .1 Review of facility and occupancy profile.

- .2 Functional requirements.
 - .3 System philosophy, limitations of systems and emergency procedures.
 - .4 Review of system layout, equipment, components and controls.
 - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
 - .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
 - .7 Maintenance and servicing.
 - .8 Trouble-shooting diagnosis.
 - .9 Inter-Action among systems during integrated operation.
 - .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

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 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.
- .4 Refer to abatement specifications for additional procedures.

Part 2 PRODUCTS

2.1 Materials

- .1 13mm x 1220mm x 2440mm wood sheathing.
- .2 92mm metal studding or as required.
- .3 89mm 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, A/C, or roof modifications are to occur.
- .2 Construct barriers full height and line with polyethylene to ensure dust and watertightness.
- .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 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.
- .3 Remove interior protections only when approved by the Departmental Representative.

Part 4 REINSTATEMENTS

4.1 Finishes

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

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes the following:
 - .1 Demolition and removal of selected portions of interior building components and finishes.
 - .2 Repair procedures for selective demolition operations.
- .2 This section does not include the following:
 - .1 Removal of hazardous materials or asbestos abatement.
 - .2 Demolition of exterior building components or structural elements.
 - .3 Mechanical or electrical equipment, except as required to make minor modifications to allow the work to be completed.
- .3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; Contractor is required to develop these details further.

1.2 RELATED REQUIREMENTS

- .1 Section 22 05 05 - Selective Demolition for Plumbing
- .2 Section 23 05 05 - Selective Demolition for Heating, Ventilating, and Air Conditioning (HVAC)
- .3 Section 26 05 05 - Selective Demolition for Electrical

1.3 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.
- .3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.
- .5 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .6 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill, prepared in accordance with Section 01 74 19 - Waste Management and Disposal and as follows:

- .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.
- .7 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and Disposal.
- .8 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and Disposal.
- .9 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Departmental Representative for the material ownership as follows:
 - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Departmental Representative's property, demolished materials shall become Contractor's property and shall be removed from Project site.
 - .2 Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.
 - .3 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Departmental Representative's property:
 - .1 Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Departmental Representative.
 - .2 Coordinate with Departmental Representative, who will establish special procedures for removal and salvage.
- .2 Pre-Demolition Meeting: Convene pre-installation meeting with Contractor and Departmental Representative in accordance with Section 01 10 00 – General Instructions to:
 - .1 Confirm extent of salvaged and demolished materials
 - .2 Review Contractor's demolition plan.
 - .1 Verify existing site conditions adjacent to demolition work.
 - .2 Coordination with other construction sub trades.
- .3 Hold project meetings in accordance with agreement established between Contractor and Departmental Representative during kick-off meeting.
- .4 Ensure key personnel attend.
- .5 WMC must provide written report on status of waste diversion activity at each meeting.

- .6 Departmental Representative will provide written notification of change to meeting schedule established upon contract award.

1.5 ACTION AND INFORMATION SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Schedule of Selective Demolition Activities indicating the following:
 - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - .2 Coordinate with Departmental Representative ongoing site operations, and limit the number of interruptions during regular business hours.
 - .3 Interruption of utility services.
 - .4 Coordination for shutoff, capping, and continuation of utility services.
 - .5 Use of elevator and stairs.
 - .6 Locations of temporary partitions and means of egress, including for others affected by selective demolition operations.
 - .7 Coordination with Departmental Representative's continuing occupancy of portions of existing building.
 - .2 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction, and as follows:
 - .1 Proposed Dust Control and Noise Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Departmental Representative reserves the right to make modifications where proposed methods interfere with the Departmental Representative's ongoing operation
 - .2 Inventory: Submit a list of items that have been removed and salvaged after selective demolition is complete.
 - .3 Landfill Records: Indicate receipt and acceptance of wastes by a landfill facility.
- .2 Informational Submittals: Provide the following submittals when requested by the Departmental Representative:
 - .1 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including; but not limited to, lists of completed projects with project names and addresses, names and addresses of architects and owners, for work of similar complexity and extent.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:
 - .1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.

- .2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.
- .2 Qualifications: Provide proof of qualifications when requested by Departmental Representative:
 - .1 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project:
 - .1 Conform to the provincial Occupational Health and Safety Act and Regulation.
 - .2 Conform to Workers' Compensation Board Regulations.
 - .3 Conform to City of local municipal bylaws and regulations governing this type of work.

1.7 **SITE CONDITIONS**

- .1 Owner will occupy portions of building immediately adjacent to selective demolition area:
 - .1 Conduct selective demolition so that Owner's operations will not be disrupted.
 - .2 Provide not less than 72 hours' notice to Departmental Representative of activities that will affect Owner's operations.
- .2 Maintain access to existing means of egress, walkways, corridors, exits, and other adjacent occupied or used facilities:
 - .1 .1 Do not close or obstruct means of egress, walkways, corridors, exits, or other occupied or used facilities without written acceptance from authorities having jurisdiction.
- .3 Departmental Representative assumes no responsibility for condition of areas to be selectively demolished:
 - .1 Conditions existing at time of Pre Bid Site Review will be maintained by Departmental Representative as far as practical.
- .4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:
 - .1 Refer to Regulatory Requirements for directives associated with specific material types.
 - .2 Hazardous materials will be as defined in the Hazardous Materials Act.
 - .3 Hazardous materials removal will be coordinated by Departmental Representative before start of the Work.
 - .4 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Departmental Representative. Hazardous materials will be removed by Departmental Representative under a separate contract or as a change to the Work.

Part 2 Products

2.1 TEMPORARY SUPPORT STRUCTURES

- .1 Design temporary support structures required for demolition work and underpinning and other foundation supports necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

2.2 DESCRIPTION

- .1 This section of the Work includes, but is not necessarily limited to, the following:
 - .1 Demolition, removal completely from site, and disposal of all identified components, materials, equipment and debris.
 - .2 Selective demolition to allow new walls, bulkheads, ceilings and other materials to meet existing construction as indicated.
 - .3 All material from demolition shall be removed from site immediately with no salvage, selling, sorting or burning permitted on site.
 - .4 Retain items indicated on drawings for re use in new construction.

2.3 DEBRIS

- .1 Make all arrangements for transport and disposal of all demolished materials from the site.

2.4 EQUIPMENT

- .1 Provide all equipment required for safe and proper demolition of the building interiors indicated.

2.5 REPAIR MATERIALS

- .1 Use repair materials identical to existing materials:
 - .1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - .2 Use a material whose installed performance equals or surpasses that of existing material.
 - .3 Comply with material and installation requirements specified in individual Specification Sections.
- .2 Floor Patching and Levelling Compounds: Cement based, trowelable, self-levelling compounds compatible with specified floor finishes; gypsum based products are not acceptable for work of this Section.
- .3 Concrete Unit Masonry: Lightweight concrete masonry units, and mortar, cut and trimmed to fit existing opening to be filled. Provide standard hollow core units, square end units and bond beam units as indicated on drawings.
- .4 Prefinished Sheet Steel: Prefinished sheet steel, colour to match existing radiation cabinets, bent and profiled to match existing radiation cabinets.

- .5 Gypsum Board Patching Compounds: Joint compound to ASTM C475/C475M, bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with applicable standards.

2.6 EXISTING MATERIALS

- .1 Items to be retained for re use in new construction include, but are not limited to the following:
 - .1 Confirm with Departmental Representative any materials that appear to be in re-usable condition prior to disposal.
 - .2 Confirm with Departmental Representative any materials scheduled for re-use that are not in re-usable condition prior to installation.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that utilities have been disconnected and capped.
- .2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- .4 Notify the Departmental Representative where existing mechanical, electrical, or structural elements conflict with intended function or design:
 - .1 Investigate and measure the nature and extent of conflict and submit a written report to Departmental Representative.
 - .2 Departmental Representative will issue additional instructions or revise drawings as required to correct conflict.
- .5 Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- .1 Coordinate existing services indicated to remain and protect them against damage during selective demolition operations.
- .2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
 - .1 Arrange to shut off affected utilities with utility companies.
 - .2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
 - .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

- .4 Cut off pipe or conduit to a minimum of 25mm below slab, and remove concrete mound. Patch concrete using cementitious grout.
- .3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.
- .4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- .1 Identify and mark all equipment and materials identified to be retained by Departmental Representative or to be re used in subsequent construction. Separate and store items to be retained in an area away from area of demolition and protect from accidental disposal.
- .2 Post warning signs on electrical lines and equipment that must remain energized to serve other areas during period of demolition.
- .3 Confirm that all electrical and telephone service lines entering buildings are not disconnected.
- .4 Do not disrupt active or energized utilities crossing the demolition site.
- .5 Provide and maintain barricades, warning signs, protection for workmen and the public during the full extent of the Work. Read drawings carefully to ascertain extent of protection required.
- .6 Mark all materials required to be re used, store in a safe place until ready for re installation.
- .7 Adjust all junction boxes, receptacles and switch boxes flush with new wall construction where additional layers to existing construction are indicated.
- .8 Remove permanent marker lines used or found on exposed surfaces and at surfaces indicated for subsequent finish materials. Mechanically remove permanent marker lines and associated substrates where permanent marker lines occur and patch surface. Sealing or priming over permanent marker lines is not acceptable.

3.4 CONCRETE SLAB REINFORCING

- .1 Locate location of reinforcing steel in concrete slabs prior to cutting or coring using non-destructive, non-ionizing radio frequency locators.
- .2 Core concrete slabs to avoid reinforcing steel, electrical conduit or water pipes; adjust core location and coordinate with Departmental Representative where slab features interfere with core drilling.
- .3 Notify the Departmental Representative immediately for further instructions where coring or cutting will damage existing slab features.

3.5 SELECTIVE DEMOLITION

- .1 Demolish and dismantle work in a neat and orderly manner and in strict accordance with all regulations.

- .2 At end of each day's work, leave Work in safe condition so that no part is in danger of toppling or falling.
- .3 Demolish in a manner to minimize dusting and to prevent migration of dust.
- .4 Selling or burning of materials on the site is not permitted.
- .5 Remove concrete bases by cutting and chipping, take precautions against slab cracking and degradation. Grind edges smooth, fill and make level with self-levelling grout.
- .6 Fill all openings in concrete block walls with concrete masonry units, coursing to match existing, prepare ready to receive new finishes to match existing.
 - .1 Provide bond beams in new openings cut into existing concrete masonry unit walls.
 - .2 Provide finished end masonry units to patch and repair for new jamb sections in existing concrete masonry unit walls.
- .7 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.
- .8 Demolish resilient flooring and adhesive remnants as follows:
 - .1 Apply fine mist water spray to carpet as required to minimize dust generation during removal. Avoid spraying near electrical outlets.
 - .2 Remove adhesive to the greatest extent possible using scraping tools and as follows:
 - .1 Do not use solvent based cleaners to remove adhesive remnants.
 - .2 Lightly grind floor using machine designed for purpose to remove adhesive remnants.
 - .3 Vacuum floor ready for application of skim coating.
 - .4 Repair all slab depressions and damage with cementitious patching compound.
 - .5 Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.
 - .3 Floor substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through resilient flooring materials and carpets.
 - .4 Recycle materials in accordance with Section 01 74 19 - Waste Management and Disposal.
- .9 Demolish completely all ceiling panels and grid as indicated.
- .10 Remove all wall coverings scheduled for demolition. Patch and repair wall surfaces with skim coat of gypsum board joint compound leaving wall surfaces smooth and even ready for new wall finishes.
- .11 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.
- .12 Patch and repair all radiation cabinets, mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

3.6 PATCHING AND REPAIRING

- .1 Floors and Walls:
 - .1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.
 - .2 Provide a level and smooth surface having uniform finish colour, texture, and appearance.
 - .3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.
 - .4 Patch with durable seams that are as invisible as possible.
 - .5 Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - .6 Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
 - .7 Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- .2 Ceilings: patch, repair, or re hang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.7 PROTECTION

- .1 Prevent debris from blocking drainage inlets and systems and ground draining, and protect material and electrical systems and services that must remain in operation.
- .2 Maintain safe access to and egress from occupied areas adjoining.
- .3 Provide and maintain fire prevention equipment and alarms accessible during demolition.

3.8 CLEANING

- .1 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal, and as follows:
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .3 Divert excess materials from landfill.
- .4 Promptly as the Work progresses, and on completion, clean up and remove from the site all rubbish and surplus material. Remove rubbish resulting from demolition work daily.
- .5 Maintain access to exits clean and free of obstruction during removal of debris.
- .6 Keep surrounding and adjoining roads, lanes, sidewalks, municipal rights of way clean and free of dirt, soil or debris that may be a hazard to vehicles or persons.

- .7 Transport material designated for alternate disposal using approved facilities and organizations in accordance with applicable regulations.
- .8 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
 - .1 Disposal facilities must be those approved of and listed in CWM Plan.
 - .2 Written authorization from Departmental Representative is required to deviate from disposal facilities listed in WM Plan.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for careful removal and salvage, and reconditioning of building components identified for storage at a designated remote site, for storage on site, and subsequent reinstallation forming a part of Project ready for re use at a later date.

1.2 RELATED REQUIREMENTS

- .1 Section 01 10 00 – General Instructions
- .2 Section 01 74 19 – Waste Management and Disposal
- .3 Section 02 41 19.16 - Selective Interior Demolition
- .4 Section 22 05 05 - Selective Demolition for Plumbing

1.3 DEFINITIONS

- .1 Remove and Salvage: Detach items from existing construction and deliver them ready for reuse.
- .2 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination Existing Salvaged Work: Coordinate with Departmental Representative for confirmation of materials, components, and items of equipment identified for removal and salvage from their present existing locations and as follows:
 - .1 Items that are turned over to Departmental Representative.
 - .2 Off-site or on-site storage locations.
 - .3 Confirmation of items that are renovated or refurbished ready for reinstallation as a part of Work.
 - .4 Confirmation of items that Departmental Representative will not re use, but will retain as follows:
 - .1 Contractor is responsible for loading and handling identified salvaged items using their own forces and equipment.

Part 2 Products

2.1 SALVAGED ITEMS

.1 Items salvaged by Contractor include, but are not limited to:

Work	Deliver To
Diversion of miscellaneous office furniture from landfill through re-use/donation or recycling facilities (ie. metal filing cabinets and shelving, office desks and chairs, demountable panel partition systems, window blinds, wood cabinets, etc.)	Off-site applicable re-use or recycling facility
Lighting fixtures for salvage and re-installation	Departmental Representative approved storage location on-site for future re-installation
Diversion of miscellaneous metal mechanical equipment from landfill to appropriate recycling facility (ie. fan coil units, domestic cold water drinking fountains, mechanical piping (sprinkler, plumbing and chilled water), sheet metal ductwork and accessories, etc.)	Off-site applicable recycling facility
Diversion of miscellaneous metal electrical conduits and wiring from landfill through recycling	Off-site applicable recycling facility
Diversion of architectural elements from landfill through re-use/donation to appropriate recycling facility (ie. ceiling grids, metal blinds, metal studs, doors and associated hardware, glazing, etc.)	Off-site applicable re-use or recycling facility
Diversion of miscellaneous packaging materials and cardboard from landfill through recycling facilities (ie. plastic wrap, cardboard, wood pallets, etc.)	Off-site applicable re-use or recycle facility

.2 Confirm with Departmental Representative additional items that appear salvageable prior to disposal.

Part 3 Execution

3.1 SALVAGE

- .1 Remove and handle salvageable items from site to minimize damage and to ensure that usability is maintained.
- .2 Clean, decontaminate, or remediate hazardous substances (lead based paint, asbestos dust, PCB residue, and similar substances) from salvaged materials so they are safe for reuse or resale.
- .3 Place materials on pallets or wrap in protective film to ensure that loose pieces and projections do not cause injury to personnel, and that salvaged items remain as complete units.
- .4 Clean items of construction or building debris, or materials that are not a part of salvaged work before delivering to Departmental Representative.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 08 11 13 – Hollow Steel Doors & Frames
- .2 Section 08 34 73.13 – Acoustic Steel Door Frame Assemblies
- .3 Section 08 34 74 - Acoustic Steel Window Frame Assemblies
- .4 Section 09 21 16 - Gypsum Board Assemblies

1.2 Source Quality Control

- .1 Identify lumber and plywood by grade stamp of an agency certified by Canadian Lumber Standards Administration Board and in accordance with applicable CSA standards.

1.3 PRODUCTS

1.4 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:
 - .2 CSA O141-91.
 - .3 NLGA Standard Grading Rules for Canadian Lumber.
 - .4 Furring, blocking, nailing strips, grounds, rough bucks:
 - .5 Use S2S or S4S material.
 - .6 Board sizes: C or D species, utility grade.
 - .7 Dimension sizes: C or D species, utility grade.
 - .8 Plywood, exterior quality, GIS to CSA O121-M1978.

1.5 Fastenings & Hardware

- .1 In accordance with Part 9 of NBC 2010 as supplemented by following requirement except where specific type is indicated.
- .2 Nails, spikes and staples to NBC 9.23.3 except:

- .3 Use common spiral nails and spiral spikes except where indicated otherwise.
- .4 Use hot galvanized finish steel for exterior work, interior high humidity areas and for pressure treated lumber except where indicated otherwise.
- .5 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.
- .6 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 Engineer'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 06 10 00 - Rough Carpentry
- .2 Section 07 90 00 - Sealants
- .3 Division 22 Plumbing - Plumbing fixtures; sealant around countertop mounted items.

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 01 33 00.
- .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 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.

1.6 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.

1.7 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 backing sheet: to NEMA LD3 BKL grade, supplied by same manufacturer as facing sheet; white, 0.5 mm thick.
- .5 Laminated plastic cabinet liner sheet: supplied by same manufacturer as facing sheet, not less than 0.5 mm thick, white colour.
- .6 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.
- .7 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.
- .8 Sealer: Water-resistant sealer or glue acceptable to laminate manufacturer.
- .9 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.
 - .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;
- .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 **STAINLESS STEEL COUNTERTOP AND SINK**

- .1 Material: T304 Stainless Steel with #4 finish
- .2 Material and Thickness:
 - .1 All exposed surfaces shall be 16-gauge stainless steel reinforced on the underside by 16-gauge galvanized-steel channels, so spaced as to prevent twisting, oil-canning or buckling.
- .3 Construction:
 - .1 Exposed edges of tops shall be formed into a 83mm thick channel shape. Splash rails and curbs shall be formed from the same sheet as the top or so welded thereto that they form integral parts thereof. Top edges of curbs and splash-backs shall be formed into a channel shape.
 - .2 Where stainless-steel sinks are supplied, the sink bowl shall be so welded to the top as to form an integral part thereof. All welds shall be ground smooth and polished to a uniform satin finish over the entire top and sink assembly. Soldering of the sinks, curbs or splash-rails to the top shall not be permitted.
 - .3 After fabrication and polishing, surfaces of the tops shall be given a strippable protective coating to protect the tops during shipment and installation.
 - .4 Underside of tops and sinks shall be coated with a sound-deadener. This material shall be waterborne and non-flammable in its liquid state. Material to contain clay, which will act as a flame retardant. Material shall contain no volatile organic compounds (VOC).
- .4 Sink shall be a single bowl sink of stainless steel construction (type 304), nominal bowl dimensions 325mm long, 225mm wide with a nominal depth of 150mm. Sink shall include a 50mm drain hole centrally mounted in bowl and have 3 holes 1.25" diameter 32mm on 100mm centers for fixture trim with no overflow drain. All corners shall be

rounded with no burrs or sharp edges. Fixture Trim shall be provided by mechanical contractor. Coordinate work with mechanical contractor.

2.10 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.

2.11 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.

2.12 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 Provide four (4) hinges for doors up to 2030mm.
 - .4 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 Heavy duty: to match Hafele Accuride Model 9301.
 - .2 Acceptable manufacturers: Hafele, Blum/Richelieu, Hettich International.

2.13 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 "Eurocrew" 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.

2.14 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 mm. Keep joints 600 mm from sink cutouts.
- .9 Coordinate with architectural and mechanical documentation the sink size & installation location prior to cutting opening in countertop.

2.15 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 arises.
- .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 ROCKWOOL Safe'n'Sound Fire & Soundproof stone wool batt insulation designed for interior steel frame construction.
- .2 Refer to partition assemblies on drawings.

2.2 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect [specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

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, 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.
- .8

3.2 EXAMINATION

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

- .2 Visually inspect substrate in presence of Departmental Representative

END OF SECTION

Part 1 General

1.1 GENERAL SCOPE

- .1 Contractor to provide an original, complete insurance policy identifying specific coverage for torch applied systems.
- .2 The new roof system shall be as follows and as specified in the areas indicated on the drawings:
 - .1 Existing roof structure
 - .2 Air/vapour barrier.
 - .3 Combination of a min. 75 mm rigid polyiso insulation and sloped polyiso insulation
 - .4 50mm Torchable dual density insulation with integrated cover board protection.
 - .5 2-ply modified bituminous membrane.
- .3 Temporary overhead protection will be required above all entrances directly below the contract areas. Protection shall consist of standard steel scaffolding with prefabricated plywood and steel roof covers and shall be a minimum of 2.0m wide by 2.4m unrestricted clear height.
- .4 Access to roofs shall be by ladder. The ladder shall be removed and locked at the end of each work period.

1.2 RELATED SECTIONS

- .1 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA A123.22-08(r2013), Self-Adhering Polymer Modified Bituminous Membrane Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - .2 CSA A123.23-15 - Product specification for polymer-modified bitumen sheet, prefabricated and reinforced.
 - .3 CSA B149.1-10 (R2015), Natural Gas and Propane Installation Code
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint.
 - .2 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
- .4 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S107-10, Standard Methods of Fire Tests of Roof Coverings.
 - .2 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702.2-03, Standard for Mineral Fibre Thermal Insulation for Buildings.

- .4 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .5 CAN/ULC-S770-09, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning roofing Work, with roofing contractor's representative and NRC Departmental Representative to:
 - .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.

1.4 COORDINATION

- .1 Coordinate work of this Section with related work specified in other Sections to ensure construction schedule is maintained and water tightness and protection of the building and finished work is maintained at all times.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Provide two copies or an electronic copy of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations for all products to be incorporated in the new system.
 - .2 Provide two copies or an electronic copy of WHMIS Safety Data Sheets to NRC Departmental Representative for:
 - .1 Primers.
 - .2 Sealers.
 - .3 Liquid membrane.
 - .4 Adhesives.
- .2 Provide shop drawings:
 - .1 Indicate sloped insulation layout and details.
 - .2 Provide shop drawing or submittal indicating adhesive pattern specified by adhesive manufacturer for the required wind uplift pressures indicated on the Drawings.
 - .3 Provide shop drawings for suspended walkway at roof top unit. Drawings shall be stamped by a structural engineer, licensed in Ontario. Drawings shall indicate all required railings, stairs, platforms, bases, connections and attachments.

1.6 QUALITY ASSURANCE

- .1 Installer qualifications: Company or person specializing in application of modified bituminous roofing systems with 5 years documented experience, approved by manufacturer.

- .2 Only certified applicators are permitted to use torch welding equipment.
- .3 Hold a pre-installation meeting prior to the start of roofing works, with the roofing contractor's representative and the NRC Departmental Representative, to review installation conditions particular to this project.

1.7 FIELD QUALITY CONTROL

- .1 Water Testing:
 - .1 In the event the NRC Departmental Representative deems any of the Work to be deficient, provide water test of all flashing, projections, equipment on roof and roofing system. Co-ordinate test with the NRC Departmental Representative's operations personnel.
 - .2 Contractor is to assume all costs of testing and correction.
- .2 Adhesion Testing:
 - .1 If requested by the NRC Departmental Representative, at each roof drainage area, following installation of membrane base sheet, carry out adhesion tests to confirm adhesion of membrane to substrate and substrate layers to each other, down to first mechanically attached layer.
 - .2 Locations and timing of tests will be directed by NRC Departmental Representative. Provide labour and materials as required to assist NRC Departmental Representative in conducting tests.
 - .3 If inadequate adhesion is found, conduct further testing to determine the extent of the inadequate adhesion. Replace all defective areas to the satisfaction of the NRC Departmental Representative. Replace substrate materials as necessary with new materials, and patch cut tests with membrane patches extending at least 150 mm beyond the cut.
 - .4 Contractor is to assume all costs of testing and correction.

1.8 FIRE PROTECTION

- .1 Fire Extinguishers:
 - .1 Pressure rechargeable type with hose and shut-off nozzle,
 - .2 ULC labeled for ABC class protection.
 - .3 ULC labeled for A class protection, for wood, paper and fibreboard.
 - .4 Size 14 kg.
 - .5 Have one fully charged ABC extinguisher and one fully charged Type A extinguisher on roof per torch applicator, within 3 m of the propane source.
- .2 Maintain fire watch for 1 hours after each day's torching operations cease.

1.9 GENERAL REQUIREMENTS

- .1 Comply with the General Requirements, General Instructions and Supplementary Conditions.
- .2 Execute work in accordance with this Section and other related Sections, Drawings and Details.

- .3 Attach roofing to structure to meet requirements of insurance underwriter and authorities having jurisdiction.
- .4 Regard manufacturer's printed recommendations as minimum requirement for materials, methods and workmanship not otherwise specified.
- .5 Contact the NRC Departmental Representative if the specifications conflict with the manufacturer's recommendations. Otherwise it will be assumed that the Contractor and manufacturer are in agreement with procedures outlined.
- .6 Advise the NRC Departmental Representative of adjustments to specified roofing procedures caused by weather and site conditions. Make adjustment to specified procedures only after review with the NRC Departmental Representative.
- .7 Maintain equipment in good working order to ensure control of roofing operations and protection of work. Types of roofing equipment and laying techniques to be employed are to meet the approval of the NRC Departmental Representative.
- .8 Do not penetrate roof deck with any fastening devices that would do damage or impair the function of the assembly.
- .9 All temporary drains shall be connected with a mechanical connection (MJ coupling) or a U-flow connection, until new drains are installed.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of, sealing compounds, primers and caulking materials.
- .3 Manufacturer's recommendations for handling and storing products are to be considered a minimum requirement.
- .4 Materials shall be delivered to the site, undamaged and in their original packages, with manufacturer's labels visible, attesting to their conformity to specific standards.
- .5 Ensure that shelf life of materials has not expired.
- .6 Remove damaged material from site and replace all rejected materials with new product.
- .7 Elevate on raised platform and store as to prevent deformation of materials.
- .8 Provide and maintain dry, off-ground weatherproof storage.
- .9 Store rolls of membrane in upright position. Store membrane rolls with selvage edge up.
- .10 Remove only in quantities required for same day use.

- .11 Place plywood runways over completed Work and over areas not in Contract, as required, to enable movement of material and other traffic.
- .12 Store sealants at +5°C minimum.
- .13 Protect insulation by slitting manufacturer's packaging and installing a waterproof UV-resistant tarp.
- .14 Handle roofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.
- .15 Avoid stockpiling of materials or use of equipment on decks in a way which could cause overloading.

1.11 ENVIRONMENTAL REQUIREMENTS

- .1 Ensure protection of products that are sensitive to damage by moisture. Do not work during rain, snow or fog. Stop work and make watertight before the onset of inclement weather or when weather appears imminent.
- .2 Ensure protection of the building from weather at all times. If inclement weather is forecast or appears imminent, postpone work that would risk the building from moisture damage.
- .3 If it becomes apparent that work would threaten the building watertightness, the NRC Departmental Representative has the right to stop work. Any additional expenses due to work stoppage or postponement of work will be at the Contractor's expense.
- .4 Ambient Conditions
 - .1 Do not install roofing when ambient temperature remains below -18°C for torch application.
 - .2 Minimum ambient temperature for solvent-based adhesive is -5°C.
- .5 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.12 COMPATIBILITY

- .1 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a complete assembly. Provide written declaration to NRC Departmental Representative stating that materials and components, as assembled in system, meet this requirement.
- .2 Defective work resulting from work with incompatible materials will be considered the responsibility of the Contractor.
- .3 Repair all work that could result in damage or interfere with performance.

1.13 EXISTING SUBSTRATES

- .1 Following removal of existing material to the substrate, inspect the deck for soundness and notify the NRC Departmental Representative of any deck found unsound and not suitable for roofing. Do not commence work until conditions are documented and the NRC Departmental Representative rules on the acceptability of surfaces and/or corrective measures required. The cost of any delays due to postponement of work that results from investigating the site problem or obtaining a ruling will be at the NRC Departmental Representative's expense.
- .2 The commencement of work is proof that the Contractor has accepted surfaces as satisfactory and accepts responsibility for appearance and performance of completed work.
- .3 Defective work resulting from application of material on unsatisfactory surfaces will be considered the responsibility of the Contractor.
- .4 The Contractor will be responsible for all repairs, costs and pay all cost and fees required to rectify damage or defective work. Use materials and finish to match the original preconstruction conditions.

1.14 DAILY OPERATIONS

- .1 Unless otherwise specified, complete the entire roofing operation up to line of termination of each day's work, as required by design intent, in order to safeguard and protect the work and building from damage and weather.

1.15 EXAMINATION

- .1 Before proceeding with roofing application, ensure that:
 - .1 All surfaces are clean and free of debris, snow, frost and moisture.
 - .2 The deck is clean and sufficiently dry to ensure specified adhesion will be obtained.
 - .3 Adjacent construction and installation of related work (i.e. curbs, drains, penetrations, wood nailers, etc.) incorporated with the roof are complete.
 - .4 Roof deck is sound, existing fasteners are tight and irregularities are corrected to provide a suitable surface for new roofing.
- .2 Ensure substrate is smooth. Remove sharp edges or protrusions that could impair the function of the roof assembly.
- .3 Inform NRC Departmental Representative/NRC Departmental Representative in writing of any defects.

1.16 DRAINS AND DRAINAGE PLANE

- .1 Inspect surfaces and ensure that roof deck is level or sloped to drains in conforming to design intent.
- .2 Inspect surfaces and ensure that roof drains are set at a level to drain and are connected or capped.

- .3 Ensure plumbing is accessible and work can be completed as specified.
- .4 Inspect roof drains to ensure they are open and working properly.
- .5 Where specified or shown for areas with only one drain, provide overflow scuppers or drains to detail and specified requirements.

1.17 HIDDEN SERVICES

- .1 Investigate the location of all known hidden services by reviewing interior conditions, plans, specifications and drawings for the original building, any subsequent alterations, completion of cut tests and interviewing those involved in the construction and maintenance of building services. These services include but are not limited to mechanical, electrical, cable, communication, computer, security or roof assembly. Ensure all services are located and will be protected from damage under the Contract. In some cases, services may be located over the roof deck and within the roof assembly. Notify NRC Departmental Representative/NRC Departmental Representative in such occurrence and proceed with installation as directed.

1.18 EQUIPMENT

- .1 Inspect equipment affected by the work, including but not limited to rooftop equipment, curbs, existing drains and plumbing, mechanical, electrical and lightning protection services, to ensure they are in good repair and working order. Record any damage and advise the NRC Departmental Representative.
- .2 During re-roofing, ensure that all mechanical equipment, ducts, pipes, etc. are properly supported.
- .3 Notify NRC Departmental Representative and/or NRC Departmental Representative of any equipment which is not operational or damaged prior to the commencement of work.

1.19 ADVISE NRC Departmental Representative

- .1 Advise the NRC Departmental Representative of any unusual circumstances affecting the work. Notify the NRC Departmental Representative of any defective or malfunctioning equipment or drainage deficiencies. Do not commence work until defects and incorrect levels have been verified and rectified.

1.20 PROTECTION OF ROOFTOP EQUIPMENT

- .1 Remove any equipment and flashing intended for re-use and save from harm. Store in approved location and reset at project conclusion unless specified or shown to be removed.
- .2 Protect all openings, vents and stacks from weather and contamination from debris.
- .3 Provide temporary plumbers plugs to protect drains during roofing operations. Ensure that temporary protection is removed at completion of work period and/or at the end of each days work.

1.21 SERVICES

- .1 Services are to be left operational unless otherwise authorized by the NRC Departmental Representative.
- .2 Unless otherwise specified, the Contractor will be responsible for disconnection, relocation, re-installation and extending all services required to facilitate work under this Contract. Co-ordinate work with the NRC Departmental Representative and provide minimum of 48 hours notification if services are to be interrupted.
- .3 Contractor to verify location of services prior to commencement of work. Notify NRC Departmental Representative of any unusual conditions.
- .4 The Contractor and their employees must hold valid certificates for the work undertaken.
- .5 Complete work of this Section as required by local authorities having jurisdiction. Have work inspected and pay all fees relative to such inspection to ensure work meets with published standards and codes.
- .6 Submit Certificate or Letter of Approval by authority responsible for the work to the NRC Departmental Representative with final documentation.
- .7 All fans, air handling units, and any electrical equipment affected by the replacement of the roof sections under this Section, whether disconnected or extended must be inspected by an ESA representative to verify the integrity of the existing wiring and/or the new installation.

1.22 WARRANTY

- .1 Contractor's Warranty for Labour and Material:
 - .1 For Work of this Section 07 52 00 - Modified Bituminous Membrane Roofing, 12 months warranty period is extended to 24 months.
 - .2 Make all necessary repairs and replacements within 48 hours of receipt of written notification.
 - .3 Nothing contained in this Article shall be construed as in any way restricting or limiting the liability in common law and statutory liability of the Contractor.
 - .4 Provide these written warranties, confirming above, issued on the corporate letterhead, signed and sealed by an authorized signing officer. The warranties will specifically reference the name of the Building, location and NRC Departmental Representative.
- .2 Manufacturer's Warranty:
 - .1 Provide a 10-year membrane warranty.

Part 2 Products

2.1 GENERAL

- .1 All standards, regulations and specifications listed herein are considered to be the latest available edition.

2.2 PRIMERS

- .1 Asphalt Primer: To manufacturer's recommendations.
- .2 Self-adhesive membrane primer. As recommended by membrane manufacturer. Use low VOC, polymer emulsion-based primer, unless directed otherwise by NRC Departmental Representative on site.

2.3 AIR/VAPOUR BARRIER MEMBRANE

- .1 For concrete decks:
 - .1 Torch grade modified bituminous air/vapour barrier, with polyester or glass fleece reinforcement, minimum thickness 3 mm, top side sanded, having nominal weight of 180 g/m².
 - .1 Type 2.
 - .2 Class C - plain surfaced.
 - .3 Grade 1 - standard service.
 - .4 Top and bottom surfaces: sanded/polyethylene.

2.4 SELF-ADHERED MEMBRANE

- .1 To CSA A123.22, self-adhering membrane consisting of SBS rubberized asphalt compound laminated to a polyethelene film. Minimum thickness 1 mm.
 - .1 Standard of acceptance:
 - .1 Blueskin SA by Henry Bakor.
 - .2 GoldShield by IKO.
 - .3 Soprastick 1100 by Soprema.
 - .4 Vapour Barrier SA by Johns Manville.
 - .5 Or accepted alternate.

2.5 MEMBRANE AND MEMBRANE FLASHINGS

- .1 Acceptable membrane manufacturers:
 - .1 Soprema.
 - .2 IKO Industries Ltd.
 - .3 Henry Bakor.
 - .4 Johns Manville.
- .2 Base sheet membrane and base sheet membrane flashing (non-combustible substrates): To CSA A123.23.

- .1 Styrene-butadiene-styrene (SBS) elastomeric polymer polyester or composite polyester/fibreglass reinforcement.
- .2 Type B or Type C.
- .3 Grade 2.
- .4 Top and bottom surfaces:
 - .1 polyethylene/polyethylene.
- .3 Self-adhesive base sheet membrane flashing (combustible substrates): To CSA A123.23.
 - .1 Styrene-butadiene-styrene (SBS) elastomeric polymer prefabricated sheet, polyester or composite polyester and glass reinforcement.
 - .2 Type B or Type C.
 - .3 Grade 2.
 - .4 Top and bottom surfaces:
 - .1 Polyethylene/release paper.
- .4 Cap sheet membrane and membrane flashing: To CSA A123.23.
 - .1 Styrene-butadiene-styrene (SBS) elastomeric polymer, prefabricated sheet, polyester or composite polyester/fibreglass reinforcement.
 - .2 Type B or Type C.
 - .3 Grade 1, granule surfaced.
 - .1 Colour for granular surface: Gray.
 - .4 Grade 1-standard service.
 - .5 Bottom surface polyethylene.
- .5 Fireguard tape:
 - .1 Modified bituminous membrane supplied in strips, 150 mm wide, 1.6 mm thick, glass fleece reinforced with self-adhesive underside.
 - .2 Provided by membrane manufacturer.

2.6 LIQUID MEMBRANE

- .1 Two-component methacrylate or one component polyurethane/bitumen resin, solid content 80% or greater, compatible with roof membrane.
 - .1 Standard of acceptance:
 - .1 Alsan Flashing by Soprema.
 - .2 MS Detail by IKO.
 - .3 PermaFlash by Johns Manville.
 - .4 Or accepted alternate.
- .2 Reinforcement mesh: As recommended by liquid membrane manufacturer.

2.7 ADHESIVES

- .1 Adhesive for securing overlay board and insulation: To be fully compatible with all materials in the roofing assembly. Applicability of use to adhere the different materials in the roofing assembly to be included in the manufacturer's literature.

- .1 Standard of acceptance:
 - .1 Thermostik 880-33 by Henry Bakor.
 - .2 Duotack by Soprema.
 - .3 Millenium by IKO.
 - .4 Fas-n-free by Tremco.
 - .5 Insta-Stick by Instafoam Inc.
 - .6 Roof Assembly Adhesive by Chemlink.
 - .7 Olybond 500 by OMG.
 - .8 2-Part UIA by Johns Manville.
 - .9 Or accepted alternate.

2.8 ADHESIVES FOR MEMBRANE APPLICATION

- .1 Adhesive for securing Membranes: To be fully compatible with all materials in the roofing assembly. Applicability of use to adhere the different materials in the roofing assembly to be included in the manufacturer's literature.
 - .1 Standard of acceptance or approved equivalent:
 - .1 Coldply Trowel Grade by Soprema
 - .2 Cold Gold by IKO
 - .3 Powerply Adhesive by Tremco
 - .4 As specifically recommended by membrane manufacturer.

2.9 POLYISOCYANURATE INSULATION (INORGANIC)

- .1 Conforming to CAN/ULC S704, rigid foam board, Class 2 or 3, Type 3. Manufactured with HC blowing agent meeting requirements of CAN/ULC S-126, CAN/ULC S107 and CAN/ULC S770 for LTTR values. Approved and listed by Factory Mutual Global for 1-60 and 1-90 wind classification and FM 4450 requirements for Class 1 fire. Thickness as specified or shown with maximum board size 1200 mm x 1200 mm. Fibre-reinforced **inorganic facers** on both major surfaces of the core foam.

2.10 SLOPED INSULATION (INORGANIC)

- .1 Conforming to CAN/ULC S704, rigid foam board, Class 2 or 3, Type 3. Manufactured with HC blowing agent meeting requirements of CAN/ULC S-126, CAN/ULC S107 and CAN/ULC S770 for LTTR values. Approved and listed by Factory Mutual Global for 1-60 and 1-90 wind classification and FM 4450 requirements for Class 1 fire. Thickness as specified or shown with maximum board size 1200 mm x 1200 mm. Fibre-reinforced **inorganic facers** on both major surfaces of the core foam.
- .2 Insulation slopes shall be as indicated on the detailed drawings and roof plans. Modules shall be factory cut to correct slopes.
- .3 Sloped insulation must terminate at 0 thickness. Supply an additional nosing piece if required, factory fabricated of compatible, flame-resistant sloped rigid insulation material, to smoothly terminate sloped insulation at 0 thickness.

2.11 RIGID INSULATION (MINERAL WOOL)

- .1 Rigid, dual-density, dimensionally stable, mineral wool insulation board, FM 4470 for Class A fire. Thickness shall be 50mm as shown on Drawings with a maximum board size of 1200 mm x 666 mm.
 - .1 Intended for use with hot mop, torch applied or cold applied adhesive roofing membrane systems.
 - .2 a rigid dual density rock wool insulation board with top surface coated with bitumen for a torching application.
 - .3 Standard of acceptance:
 - .1 Rockwool Toprock DD Plus, as manufactured by Rockwool Ltd

2.12 SEALERS

- .1 Plastic cement: Asphalt, to CAN/CGSB-37.5.
- .2 For sealants, mastic, adhesives or caulk, refer to Section 07 92 00 – Joint Sealants.

2.13 WALKWAY MATERIALS

- .1 One additional ply of cap sheet membrane. Colour to be different from field membrane as selected by NRC Departmental Representative.

2.14 MEMBRANE FASTENING BAR

- .1 Galvanized sheet steel or extruded aluminum, thickness 1 mm (20 ga.), 38 mm width, supplied in minimum 2.4 m lengths, with pre-drilled 2 mm holes, secured with #14 stainless steel screws @ 150 mm c/c.

2.15 FASTENERS

- .1 Fasteners for exposed metal flashing and cladding to wood or steel: Minimum 38 mm #10 cadmium plated hex head screws, colour matched, with neoprene and steel washers.
- .2 Fasteners for plywood or sheet metal to concrete deck: Corrosion resistant purpose-made pre-drill, self-tapping concrete screws, minimum 4.78 mm diameter, minimum 25 mm penetration into concrete.
 - .1 Standard of acceptance:
 - .1 Tapcon.
 - .2 Or accepted alternate.
- .3 Fasteners for sheet metal into steel: Self-drilling, self-tapping screws, galvanized, #8 or larger size, Teks or equivalent, head to suit application.
- .4 Fasteners for sheet metal and wood to wood: Corrosion resistant #10 wood screws or nails to suit application.
- .5 Structural fasteners into wood: Lag screws, 12.7 mm diameter hot dipped galvanized steel, length 125 mm.

- .6 Expansion fasteners for wood plates and steel to concrete deck: AISI Type 304 stainless steel, with stainless nuts and washers.
 - .1 Standard of acceptance:
 - .1 Hilti Kwik Bolt TZ.
 - .2 Or accepted alternate.

2.16 PLUMBING VENTS

- .1 2-piece spun aluminum with integral flange, diameter to suit existing pipe size, equipped with vandal proof cap.
 - .1 Standard of acceptance:
 - .1 Flash-tite by Lexcor, EVF-1 by Thaler.
 - .2 Or accepted alternate.

Part 3 Execution

3.1 QUALITY OF WORK

- .1 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual and CRCA Roofing Specification Manual.
- .2 Do priming in accordance with manufacturer's written recommendations.
- .3 Fit the interface of all walls and roof assemblies with durable rigid material sheet metal or plywood providing connection point for continuity of air barrier.
- .4 Make assembly, component and material connections in consideration of appropriate design loads, with reversible mechanical attachments.
- .5 In the event that any product contains a manufacturing defect or anomaly, the Contractor shall notify the NRC Departmental Representative and manufacturer immediately and request direction.

3.2 REMOVAL OF EXISTING ROOFING

- .1 Remove all roofing, flashing and insulation materials down to existing vapour barrier.
- .2 Leave existing blocking and parapet construction in place where indicated
- .3 Where new overlay system is specified, pressure wash to remove all algae, loose granules and other deleterious substances.

3.3 EXAMINATION OF SUBSTRATE

- .1 Verification of Conditions:
 - .1 Inspect with NRC Departmental Representative conditions including parapets, construction joints, roof drains, plumbing vents and ventilation outlets to determine readiness to proceed.

- .2 Evaluation and Assessment:
 - .1 Prior to beginning of work ensure:
 - .1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
 - .2 Curbs have been built.
 - .3 Roof drains have been installed at proper elevations relative to finished roof surface.
 - .4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.
 - .3 Do not install roofing materials during rain or snowfall or when such weather is imminent.

3.4 MECHANICAL EQUIPMENT DISCONNECTION / MODIFICATION / RECONNECTION

- .1 Perform disconnection, extension, modification, and reconnection of mechanical equipment in accordance with drawings provided. Work shall be performed by a licensed trade sub-contractor. Obtain approval from NRC Departmental Representative prior to making adjustments not scheduled.
- .2 In general, Contractor is responsible for disconnection extension, modification, and reconnection of all operating HVAC equipment in work area. NRC Departmental Representative is responsible for disconnection (at interior) of those mechanical items indicated for removal by Contractor.
- .3 All mechanical equipment must be properly tagged out of service (especially where gas is present). ESA certificates are required for all mechanical and electrical reconnections.

3.5 PROTECTION OF IN-PLACE CONDITIONS

- .1 Cover walls, walks and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Protect roof from traffic and damage. Comply with precautions deemed necessary by NRC Departmental Representative.
- .4 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- .5 Metal connectors and decking will be treated with rust proofing or galvanization.
- .6 Fit the interface of the walls and roof assemblies with durable rigid material sheet metal or plywood providing connection point for continuity of air barrier.

3.6 PRIMING

- .1 Unless otherwise indicated or directed by NRC Departmental Representative, prime all surfaces which will be in direct contact with bituminous materials at the rate of 0.15 L/m² to manufacturer's recommendations. For self-adhering membrane, install primer at a rate recommended by manufacturer. Ensure that surfaces are tack-free before proceeding.
- .2 Limit quantity of primer at deck openings and points of termination and provide supplemental protection to prevent bleedthrough to the building interior.
- .3 Roll primer into surface.
- .4 Re-prime all surfaces, including pre-primed surfaces, that become contaminated with dust or become marred due to their exposure to roof traffic or weather.

3.7 TORCH-APPLIED AIR/VAPOUR BARRIER ON CONCRETE DECK

- .1 Ensure all surfaces to be covered with self-adhering membrane are complete and free of moisture and contaminants and surfaces are above 5°C (40°F). At temperatures below 5°C (40°F) heat materials to be covered with hot air gun. Store all materials in heated storage when temperatures fall below 5°C (40°F) and remove only as much material that can be used before cooling.
- .2 Prime all vertical surfaces to be covered with torch-applied membrane, and horizontal surfaces as required. Use roller application – no spray application permitted. Let primer tack dry and complete thumb test to test set-up.
- .3 Use fireguard tape or overlay board to protect all open joints in substrate and all combustible surfaces.
- .4 Working up slope from drain, install air/vapour barrier membrane using torch methods, true to line to completely cover the area intended to be protected to points shown on the drawing.
- .5 Membrane is to be installed without air blisters and wrinkles. Rework, repair or replace all poorly installed membrane. Do not stretch material that would result in pullback and deformity of the membrane at intersections.
- .6 Lap all side laps 75 mm and end laps 150 mm. Torch all seams to achieve bleedout. At nailable surfaces, secure all membrane on vertical surface at points of termination at 150 mm c/c, using large head roofing nails.
- .7 Turn up membrane 150 mm at edge where horizontal surface meets vertical planes. Lap onto existing surfaces as required to provide continuity of air/vapour barrier at terminations. Use fireguard tape or overlay board to protect all open joints in deck and all combustible surfaces
- .8 Seal all points of termination at horizontal planes and vertical surfaces with modified sealant. Tool sealant to consistent smooth and even surface.

- .9 Seal all perimeters and penetrations, and ensure drains are operational and prevent backflow, if air/vapour barrier is to be left exposed as an overnight temporary waterproofing.

3.8 INSULATION – ALL LAYERS – ADHESIVE ADHERED

- .1 Attach insulation as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 Install base insulation layer over air/vapour barrier to specified design intent and thickness. Secure insulation laid with adhesive, in pattern as per adhesive manufacturer's directions and as indicated. Apply boards before adhesive cures, skins over or loses adhesive qualities.
- .3 For subsequent layers of insulation, secure insulation laid with adhesive, in pattern as per adhesive manufacturer's recommendations and as indicated.
- .4 Stagger all joints of insulation a minimum 300 mm.
- .5 Stagger both end and side joints between insulation layers.
- .6 Butt sheets of insulation with moderate contact. Do not force insulation into place. Cut neatly at projections and points of termination. Replace all broken, damaged or misfit boards as work progresses.
- .7 Where necessary, back-cut insulation to allow it to conform and stay bonded to irregular surfaces without bridging. Subsequent to placement, walk insulation into place to ensure positive bonding is achieved.

3.9 SLOPED INSULATION

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 At all locations of sloped insulation provide shop drawings from sloped insulation manufacturer for NRC Departmental Representative's review prior to installation.
- .3 At all new and existing drain locations, provide sloped polyisocyanurate insulation sump around drain to promote positive drainage. Total sump size to be as shown on drawings, with maximum depression of 25 mm, unless otherwise indicated.
- .4 Installation methods for sloped insulation to be same as for upper layers of base insulation, using adhesive as specified.

3.10 MODIFIED BITUMINOUS MEMBRANE - GENERAL APPLICATION

- .1 Inspect and seal all substrates to eliminate fire hazard. Use fireguard tape as required or recommended by manufacturer.
- .2 Mechanical spreaders are not permitted to install modified membranes.

- .3 Use only bitumen, sealants, adhesive or mastics as specified by membrane manufacturer. Provide written approval from manufacturer when proposing any alternatives or substitutions.
- .4 Lay out all sheets as to allow them to relax a minimum of 30 minutes. When temperatures are below 4.4°C keep and lay out rolls in heated storage. Install rolls before temperature fallback of the sheet occurs.
- .5 Roof membrane to be installed in one sheet if possible.
- .6 Lay all membrane starting at low point to ensure that seams do not face water flow. Roll all membrane into place, true to line, free of buckles, air pockets, fishmouths and tears.
- .7 Overlap all end laps minimum 150 mm and side laps 75 mm.
- .8 Offset all side laps between plies by 50%.
- .9 Offset all end laps between plies minimum 1200 mm.
- .10 At valley locations, run membrane continuously with the slope of the main roof. Lay out all sheets to ensure minimum side laps are maintained through valley area and short section of roof beyond. At these locations the side laps for the main roof will increase. Install membrane to details and NRC Departmental Representative's direction onsite.
- .11 Ensure that a watertight seal is achieved at all overlaps and points of termination.
- .12 Carry base sheet flashing over face of building as shown on the drawings.
- .13 Carry membrane up all vertical surfaces to point shown. Cut off corners at 45° at end laps to be covered by the next roll prior to installation of following sheet.
- .14 Verify procedure with NRC Departmental Representative on site. Seal fasteners through membrane immediately with Type 'A' sealant.
- .15 Do not walk on membrane during applications and until sufficient cooling has taken place as to allow for traffic without doing damage or marking surface.

3.11 BASE SHEET FLASHINGS (SELF-ADHERED APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install gusset reinforcement pieces at all corner locations.
- .3 Ensure wall or eave surfaces are clean and dry, free of contaminants or other irregularities. Re-prime as necessary.
- .4 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Base sheet flashings to extend 100 mm onto roof surface and terminate as shown in drawings.

- .5 Place sheet into primer or adhesive and press into place using hand roller to ensure uniform adhesion. Use hot air welder on all seams and joints to ensure a waterproof seal on all points of termination. Apply flashings free of air pockets, voids, wrinkles or fishmouths.

3.12 BASE SHEET (COLD ADHESIVE APPLICATION) AT WALL DETAIL

- .1 All membranes within 1 m of wall detailing shall be applied by cold process.
- .2 Install base sheet membrane into full application of specified adhesive using notched squeegee as per manufacturer's recommendations. Install adhesive at rate and pattern recommended by membrane manufacturer, in continuous application including underlapping side and end laps.
- .3 Use broom or squeegee during membrane application to ensure complete bitumen embedment – free of wrinkles, air pockets or voids. Adhesive to flow continuously 7 mm beyond both sides of the roll.
- .4 Carry base sheet membrane to extend 50 mm up vertical surface and terminate as shown on drawings.
- .5 At terminations, on nailable vertical surfaces, extend membrane 50 mm up vertical surface and adhere to wall. Secure membrane at 225 mm c/c with nails or screws having 25 mm diameter caps.
- .6 Ensure that a watertight seal of all joints and points of termination is achieved.

3.13 CAP SHEET (COLD ADHESIVE APPLICATION) AT WALL DETAIL

- .1 All cap sheet applications within 1.0m of wall shall be a cold process application.
- .2 Install cap sheet membrane into full application of specified adhesive using notched squeegee as per manufacturer's recommendations. Install adhesive at rate not less than 0.7 L/m² in continuous application including underlapping side and end laps.
- .3 Use broom or squeegee during membrane application to ensure complete bitumen embedment – free of wrinkles, air pockets or voids. Adhesive to flow continuously 7 mm beyond both sides of the roll. Immediately provide granules to cover adhesive flow at side and end laps.
- .4 Ensure that a watertight seal of all joints and points of termination is achieved.

3.14 CAP SHEET FLASHINGS (COLD ADHESIVE APPLICATION) AT WALL DETAIL

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install base sheet gusset reinforcement pieces at all corner locations.

- .3 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Cap sheet flashings to extend 150 mm onto roof surface and terminate as shown in drawings. At wall locations, unless otherwise specified, cap sheet flashings to extend up to 50 mm higher than base sheet flashings.
- .4 Place sheet in adhesive and press into place to ensure uniform adhesion and 13 mm bitumen flow each side of the roll. Apply flashings free of air pockets, voids, wrinkles or fishmouths.
- .5 Take care to avoid excessive adhesive spillage on finished roof surface. Use a hot air welder where required for touch-ups or detail work in corner locations or as necessary.

3.15 BASE SHEET (TORCH APPLICATION)

- .1 Install 1-ply base sheet membrane running with the roof slope, starting at the low point. Layout roll in place to verify alignment and proper overlap and re-roll prior to torching.
- .2 Fully torch in place base sheet membrane using proper application techniques as specified by membrane manufacturer.
- .3 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify NRC Departmental Representative and obtain his approval for proposed repair methods. Questionable areas will require to be cut out and replaced.
- .4 Ensure that a watertight seal of all membrane joints and points of termination is achieved with a torch and trowel.
- .5 Terminate base sheet up all verticals 50 mm, secure on vertical with membrane fastening bar and fasteners @ 150 mm c/c.
- .6 Review base membrane for low areas (ponding) and correct with additional base sheet membrane.

3.16 BASE SHEET FLASHINGS (TORCH APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install gusset reinforcement pieces at all corner locations.
- .3 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Base sheet flashings to extend 100 mm onto roof surface and terminate as shown in drawings.
- .4 Install membrane by softening both contact surfaces simultaneously with recommended torching equipment. During application, unroll membrane slowly into fluid bitumen ensuring consistent 6 mm flow protrudes each side of the roll.

- .5 Unroll and work sheet into place using torch, trowel and wet sponge to ensure proper placement and adhesion.
- .6 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify NRC Departmental Representative and obtain his approval for proposed repair methods. Questionable areas will require to be cut out and replaced.

3.17 CAP SHEET (TORCH APPLICATION)

- .1 Prior to installation, unroll the cap sheet and check for granular embedment width and alignment.
- .2 Layout membrane to ensure side lap of cap sheet does not occur within 150 mm of roof drain.
- .3 Install specified cap sheet membrane running with the roof slope, starting at the low point. Layout roll in place to verify alignment and proper overlap and re-roll prior to torching. Offset cap sheet side laps 50% to base sheet side laps, ensure lap does not lie within 150 mm of a roof drain.
- .4 Install 1-ply cap sheet membrane full torched in place using proper application techniques as specified by the membrane manufacturer.
- .5 Install membrane by softening both contact surfaces simultaneously with recommended torching equipment. During application, unroll membranes slowly into fluid bitumen ensuring consistent 3 mm to 6 mm flow protrudes each side of the roll.
- .6 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify NRC Departmental Representative and obtain his approval for proposed repair methods. Questionable areas will require to be cut out and replaced
- .7 Using a torch and trowel, embed granules at end laps and where required on surface of cap sheet to ensure proper bonding of membrane overlaps.

3.18 CAP SHEET FLASHINGS (TORCH APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install base sheet gusset reinforcement at all corner locations.
- .3 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Cap sheet flashings to extend 150 mm onto roof surface and terminate as shown in drawings. At wall locations, unless otherwise specified, cap sheet flashings to extend up 50 mm higher than base sheet flashings.

- .4 Where required by Summary of Work and details, install 50 mm wide continuous strip of Type 'A' sealant to the tops of parapets or eaves to prevent bitumen spillage on the building exterior.
- .5 Install membrane by softening both contact surfaces simultaneously with recommended torching equipment. During application, unroll membrane slowly into fluid bitumen ensuring consistent 6 mm flow protrudes each side of the roll.
- .6 Unroll and work sheet into place using torch, trowel and wet sponge to ensure proper placement and adhesion.
- .7 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify NRC Departmental Representative and obtain his approval for proposed repair methods. *Questionable* areas will require to be cut out and replaced.
- .8 Touch up bare spots, corners, scuffs and bleedout runs on cap sheet with granules matching membrane colour, immediately following installation. Use hot air welder, torch or Type 'A' sealant to adhere granules to sheet.

3.19

DRIP FLASHINGS

- .1 Follow manufacturer's recommendations as to whether pre-finished flashings built into the roof are to be primed. When primer is required, prime top and underside of all drip flashings to be incorporated with roofing prior to application. Primer must be compatible with both membrane and finishes on pre-finished flashing material. Use primer supplied by the membrane manufacturer. All primer to be dry before proceeding.
- .2 Fabricate and install metal drip flashings built into the roof at locations noted on the drawings as per detail and Section 07 62 00 - Sheet Metal Flashing and Trim. Join flashing with S-lock on face and overlap horizontal joints 50 mm. Mitre and seal inside and outside corners of roof flanges. Seal all overlaps, apply sealant Type 'B' as metal flashing is being installed and clean off any material exposed to view. Avoid contact between caulking and bitumen products.
- .3 Install drip flashing true to line set on top of completed base sheet membrane roofing in continuous strip of Type 'A' sealant. Secure flashings with roofing nails installed in a double staggered row at 100 mm centres. Locate nails no closer than 75 mm from face.
- .4 Install an additional piece of base sheet (minimum 150 mm X 150 mm) centered over joints and corners of drip flashing and carried to within 25 mm of edge. Review procedures with the NRC Departmental Representative before proceeding.
- .5 Install 1-ply of base to 25 mm from drip edge and continuing a minimum of 150 mm beyond flashing flange. Ensure positive bond to all metal as to provide a continuous permanent watertight seal.

- .6 Install cap sheet as specified and trim flush with outside face with hot roofing knife. Work underlying surfaces with broom, roller or wet sponge as required to obtain a positive continuous permanent watertight seal.

3.20 ROOF DRAINS

- .1 See Section 22 05 11 – Plumbing and Drainage for plumbing work.
- .2 Install self-adhered membrane air seal around drain and extend onto air/vapour barrier minimum 150 mm.
- .3 Unless otherwise specified or shown, provide prefabricated sump of sloped polyisocyanurate insulation 1200 mm each side of the centre of the drain. Reduce polyisocyanurate insulation thickness to minimum 19 mm at drain to provide positive roof drainage (make allowance for thickness of all flanges and clamps) and ensure water flow will not be impeded.
- .4 Complete roof membrane, installing additional 1 m x 1 m base sheet flashing centred over drain opening.
- .5 Fully coat drain flange to receive roofing with modified sealant and continue modified bitumen over flange. Neatly trim and work membrane to interior face and seal with Type 'A' sealant.
- .6 Set clamping ring in solid bed of Type 'A' sealant. Secure clamp ring and integral screen as dictated by drain design immediately after membrane is installed. Tighten bolts to ensure a permanent watertight compression seal.
- .7 Install and bolt strainers with heavy iron mechanical bracket to ensure the drain screen remains permanently in place to the NRC Departmental Representative's approval.
- .8 Install test plug, water test roof and repair leaks. Remove test plug once complete.
- .9 Restore interior finishes affected by work of this Contract to match original materials and finishes to NRC Departmental Representative's approval. Insulate rainwater leader pipes as required by Summary of Work in accordance with Section 22 05 11 – Plumbing and Drainage.

3.21 PLUMBING VENTS, B-VENTS, STACKS AND SLEEVES

- .1 Inspect and clean soil pipes of debris to ensure they are operational.
- .2 Protect exposed surface during roofing operation and clean surfaces free of bitumen before leaving site.
- .3 Make all penetrations air and watertight at air/vapour barrier by installing self-adhesive membrane flashings 150 mm onto air/vapour barrier and carry up and around projection. Clamp in place and caulk.
- .4 Trim base sheet at roof projections.

- .5 Adjust existing pipes to new flashing heights by either cutting down or extending pipes with matching materials attached with mechanical couplers. Ensure pipes are 38 mm higher than flashing to allow for sealing to prevent condensation.
- .6 Clear all projections free of contaminants and seal junction of base sheet and roof projections with trowel applications of sealant as shown on drawings.
- .7 Install all metal flanges to be built into the membrane before the installation of cap sheet. Insulate sleeves in accordance with drawings as specified. Where required, install telescoping caps to detail.
- .8 Prime topside and underside of all flanges to be incorporated with roofing prior to application. Use primer supplied by the membrane manufacturer. All primer to be dry before installation of membrane roofing or flashing.
- .9 Before installing flashings, install 1-ply base sheet extending to opening. Set flanges in bed of Type 'A' sealant prior to membrane installation, as per manufacturer's recommendations.
- .10 Install 1-ply of base sheet flashings thermofused to the flange to within 25 mm from upturn and continuing a minimum of 225 mm beyond flange. Continue cap sheet to metal upturn. Seal around upturn junction with sealant and touch up with matching granules, as per manufacturer's recommendations.
- .11 Install rain collars over sleeves and stacks as indicated to match adjoining materials and seal with sealant as indicated on drawings.

3.22 LIQUID MEMBRANE FLASHING

- .1 Using a slow-speed mechanical agitator, thoroughly mix the entire container of resin for two minutes before the addition of catalyst. Pour the resin into a second container if you make a batch mix. Add pre-measured catalyst to the resin component according to the amounts indicated in manufacturer's Catalyst Mixing Chart. Add catalyst only to the amount of material that can be used within 10 to 15 minutes. Stir again for two minutes before applying.
- .2 Apply the first resin layer to the substrate using rollers, brushes or notched squeegees provided for this purpose. The thickness of the first layer must be 1.3 mm to 1.5 mm when wet.
- .3 Lay out the polyester reinforcement on the resin to prevent the formation of wrinkles, swellings or fishmouths.
- .4 Use rollers, brushes or notched squeegees in order to fully saturate resin reinforcement and remove wrinkles and air bubbles under the reinforcement. The appearance of the reinforcement should be slightly opaque without any white trace. It is important to correct these defaults before the resin cures.
- .5 Apply the second resin layer on top of the reinforcement using rollers, brushes or notched squeegees provided for this purpose. The second layer thickness must be 0.6 mm to 0.7 mm when wet.

- .6 Excess resin which is not absorbed should be used to saturate adjacent reinforcement.
- .7 The final resin coating should be smooth and even.
- .8 Each reinforcement shall overlap the previous one by 50 mm laterally and by 100 mm at the ends.

3.23 CLEAN UP

- .1 At all times, keep the premises free from accumulation of waste materials or rubbish. Stock piling of debris on the roof will not be permitted.
- .2 Repair defects in surface and bitumen runs with granules to match existing to leave the roof in an even consistent finish.
- .3 Leave roof clear of debris and bitumen left by spills and machine tracking.
- .4 Leave grounds and building free of debris and bitumen spread by pedestrian traffic where applicable.
- .5 Clean surfaces and penetrations of all contaminants and touch up to the satisfaction of the NRC Departmental Representative. Include rooftop equipment, curbs, soil stacks, sleeves, gas lines, vents, drains and ladders.
- .6 Check drains to ensure they are functional and where required remove all debris by vacuum.
- .7 At the completion of the work remove all rubbish, tools, equipment and surplus materials.
- .8 Be responsible to repair and pay all costs and fees required to rectify damage caused by work of the Contract with materials and finish to match original.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 07 52 00 – Modified Bituminous Membrane Roofing.

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM D523-14, Standard Test Method for Specular Gloss.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 2012.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA)
 - .1 Architectural Sheet Metal Manual – 2012.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit to the NRC Departmental Representative a list of materials intended for use before they are ordered.
 - .1 Submit manufacturer's printed product literature including product specifications and technical data sheets for sheet metal flashing fasteners and accessory materials. Include product characteristics, performance criteria, physical size, finish and limitation.
 - .2 Submit copies of WHMIS MSDS - Material Safety Data Sheets.
- .2 Samples:
 - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

1.4 COORDINATION

- .1 Coordinate work of this Section with Related Work specified in other Sections to ensure construction schedule is maintained and watertightness and protection of the building and finished work is maintained at all times.

1.5 EXAMINATION

- .1 Do not commence work until surface to be covered has been inspected.

- .2 Inspect work and advise the NRC Departmental Representative of conditions that would adversely affect the work of this trade.
- .3 Commencement of work is proof that the Contractor has accepted surfaces as satisfactory for intended operations and accepts responsibility for appearances and performance of completed work.
- .4 Repair damaged and inferior work caused by work of this Contract with materials and finish to match original to the NRC Departmental Representative's approval.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.
- .3 Manufacturer's recommendations for handling and storing products are to be considered a minimum requirement.
- .4 Materials shall be delivered to the site, undamaged and in their original packages, with manufacturer's labels visible, attesting to their conformity to specific standards.

Part 2 Products

2.1 GENERAL

- .1 All standards, regulations and specifications listed herein are considered to be the latest available edition.
- .2 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a completed assembly.

2.2 PREFINISHED SHEET METAL FLASHING

- .1 Pre-finished metal flashings: As shown on drawings, fabricate from 0.65 mm (22 ga.) steel to ASTM A653 Grade 230 with G90 zinc coating. Surface with Perspectra Series baked enamel finish. Colour to match existing from manufacturer's standard colour range.

2.3 ACCESSORIES

- .1 Metal cleat: Same material as metal flashings, 50 mm wide @ 600 mm c/c.
- .2 Continuous metal starter strip: 0.71 mm (21 ga.) galvanized steel, secured at 400 mm c/c.
- .3 Use galvanized, copper, aluminum or stainless steel nails or screws as most compatible with materials and preservatives being utilized.

- .4 Nails: Annular threaded nails of length to penetrate into bases minimum 25 mm. No. 8 screws to penetrate wood 19 mm at 600 mm c/c.
- .5 Masonry fasteners: Tapcon, Permagrip or Tapgrip or Rawl. Spike sized to penetrate concrete 38 mm minimum as specified or shown.
- .6 Exposed fasteners: Where exposed fasteners are specified or as shown, use #10 screws with metal and neoprene washers pre-finished to match colour of flashing. Alternatively, use screws with colour match nylon caps where shown or approved by the NRC Departmental Representative.
- .7 Screws for starter strips and fascia: #8 @ 400 mm c/c.
- .8 Sealant: Refer to Drawings and Section 07 92 00 – Joint Sealants.
- .9 Touch-up paint: As recommended by prefinished material manufacturer.

2.4 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable details, as indicated. Where not indicated, follow applicable CRCA 'FL' series details and SMACNA architectural details.
- .2 Metal shall be formed on a bending brake, shaping trimmed and hard seaming shall be done on bench, as far as practicable, with proper sheet metal working tools. Angles of bends and folds for interlocking metal shall be made with full regard to expansion and contraction to avoid buckling and to avoid damaging metal surfaces.
- .3 Fabricate all possible work in shop in maximum 2400 mm lengths by brake forming, bench cutting, drilling and shaping. Match existing profiles where metal flashing is to be repaired.
- .4 Hem exposed edges on underside 13 mm. Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Dry joints are to be tight but not dented so as to permit slight adjustments of sheets and yet remain watertight.
- .7 Lock seams at all corners.
- .8 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .9 Supply all accessories required for installation of sheet metal work of this Section. Fabricate accessories of same material to which they will be used.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 SHEET METAL FLASHING INSTALLATION

- .1 Install sheet metal flashings at copings, walls, expansion joints, roof openings and other components required to protect the membrane flashings as shown on the drawings or otherwise required. Where not indicated, follow applicable CRCA 'FL' series details.
- .2 Install continuous concealed starter strips at all exterior faces. Install cleats between lock joints and as indicated to permanently hold flashing in place. Install hook strip fasteners with 2 fasteners per cleat.
- .3 Sheet metal work shall be installed to cover the entire area it protects and shall be watertight under all service and weather conditions. Install in a uniform manner, true to line, free of dents, warping and distortion.
- .4 Back-paint sheet metal that comes into contact with another kind of metal, masonry or concrete with bituminous paint at the rate of 0.15 L/m².
- .5 Install sheet metal with concealed fasteners at lock joints. Exposed fastening will only be permitted with the approval of the NRC Departmental Representative. When exposed fasteners are shown, space all fasteners evenly in an approved manner. Use lead plugs and screws with neoprene washers where fasteners are exposed, otherwise use concrete drive fasteners where metal flashings are installed over concrete masonry.
- .6 Install weather barrier membrane under sheet metal where indicated.
- .7 Join sheet metal by "S" lock seams, to permit thermal movement. Seal all fasteners and completely fill all joints with Type 'B' sealant as flashing is being installed. Clean off all excessive visible material subsequent to installation.
- .8 When flashing is being installed in more than one piece, offset joints in adjacent flashings by approximately 50%.
- .9 Form inside and outside corners by means of locked seams. Do not use pop rivets unless accepted by NRC Departmental Representative.
- .10 Slope all metal to interior of roof area to maintain slope, unless otherwise indicated. Do not form open joints or pockets that fail to drain water.

3.3 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment. Remove and replace all sheet metal sections that received surface damage or scratches during fabrication, delivery or installation.

- .2 For scratches and scuffs to be retained in the new installation, use touch up paint recommended by the metal material supplier.
- .3 Leave work areas clean, free from grease, finger marks and stains.

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 in accordance with submittal procedures of Section 01 33 00.
 - .2 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .3 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 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.

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 Top of fire-resistance rated masonry and gypsum board partitions.
- .3 Intersection of fire-resistance rated masonry and gypsum board partitions.
- .4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
- .5 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
- .6 Openings and sleeves installed for future use through fire separations.
- .7 Around mechanical and electrical assemblies penetrating fire separations.

- .8 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 2-Acoustic sealant: Synthetic Rubber Sealant, "Tremco Acoustical Sealant" or equivalent approved by Departmental Representative.
- .2 Type 3-Single Component Silicone: "Tremco Spectrum 1" or equivalent approved by Departmental Representative.
- .3 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.
- .4 Primers: sealant manufacturer's type.
- .5 Cleaners: as recommended by sealant manufacturers.
- .6 Sealant Colour: to Departmental Representatives selection from standard colour range.

2.2 Sealant Selection

- .1 Type-2; 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
- .2 Section 08 71 00 – Door Hardware
- .3 Section 09 11 10 - Metal Studs System
- .4 Section 09 91 00 - Painting

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 nominal clearance at jambs and head of frame. A clearance of 19 mm 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 01 33 00.
- .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 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.

1.6 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 PRIMER

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

2.3 PAINT

- .1 Touch up damaged galvanizing with rust-inhibitive primer.
- .2 Field paint steel 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.

2.4 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Metallic paste filler: to manufacturer's standard.
- .3 Sealant: in accordance with Section 07 90 00.

2.5 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: slip-on type construction.
 - .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.

2.6 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.

2.7 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.

2.8 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.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 .
- .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 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.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Acoustic steel frames.
- .2 Acoustic glass and glazing.
- .3 Perimeter and bottom acoustic seals, threshold and astragal.
- .4 Factory finishing.

1.2 RELATED SECTIONS

- .1 Section 07 90 00 – Sealants
- .2 Section 08 71 00 – Finish Hardware.
- .3 Section 09 81 16 - Acoustic Blanket Insulation
- .4 Section 09 91 00 - Painting

1.3 REFERENCES

- .1 ASTM A653/A653M-15e1 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM E90-09(2016) - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .3 ASTM E413-16 - Classification for Rating Sound Insulation.
- .4 AWS D1.1/D1.1M:2015, Structural Welding Code - Steel.
- .5 CSA G40.20-13/G40.21-13 - General requirements for rolled or welded structural quality steel / Structural quality steel.
- .6 ASTM C1172 - 14 Standard Specification for Laminated Architectural Flat Glass
- .7 ASTM C1036 - 16 Standard Specification for Flat Glass
- .8 CSDMA, Selection and Usage Guide for Steel Doors and Frames, 2009.
- .9 HMMA 802-07 - Manufacturing of Hollow Metal Doors and Frames.
- .10 HMMA 840-16 - Installation and Storage of Hollow Metal Doors and Frames.
- .11 HMMA 865-13 - Guide Specifications for Swinging Sound Control Hollow Metal Doors and Frames.
- .12 ICC/ANSI A117.1-2003- Accessible and Usable Buildings and Facilities.

- .13 NFPA 80-16 - Standard for Fire Doors and Other Opening Protectives.
- .14 UL 10C-16 - Standard for Positive Pressure Fire Tests of Door Assemblies.

1.4 REGULATORY REQUIREMENTS

- .1 Installed Door and Frame Assembly: Conform to NFPA 80 and UL 10C.
- .2 Conform to ICC/ANSI A117.1.

1.5 SUBMITTALS

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide product data on door construction.
- .3 Shop Drawings: Indicate door and frame elevations, anchor types and spacing, closure methods, finishes, location of cut-outs for hardware and cut outs for glazing.
- .4 Test Data:
 - .1 Submit test data indicating compliance with the Sound Transmission Class (STC) requirements. Include laboratory name, test report number, and date of test.
 - .2 Installation Instructions: Submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

- .1 Perform Work to requirements of CSDMA (Canadian Steel Door Manufacturers Association) and HMMA (Hollow Metal Manufacturers Association) standards.
- .2 Manufacturer: Minimum 5 years documented experience manufacturing sound control door assemblies.
- .3 Required attendance from relevant subcontractors, consultants, and manufacturer's representative. Review installation and coordination with other work.

1.7 DELIVERY, STORAGE AND PROTECTION

- .1 Comply with HMMA 840, and manufacturer's written instructions.
- .2 Weld minimum two temporary jamb spreaders per frame prior to shipment.
- .3 Remove doors and frames from wrappings or coverings upon receipt on site and inspect for damage. Leave doors covered for protection until hung. Store in vertical position, spaced with blocking to permit air circulation between components. Stand doors on top end, to avoid damage to bottom end.
- .4 Store materials out of water and covered to protect from damage.
- .5 Clean and touch up scratches or disfigurement caused by shipping or handling with zinc-rich primer.

1.8 WARRANTY

- .1 Manufacturer's Limited Warranty: Five (5) years from date of supply, covering material and workmanship.

Part 2 Products

2.1 MANUFACTURERS

- .1 AMBICO Limited; or approved equal.

2.2 PERFORMANCE REQUIREMENTS

- .1 Acoustic Performance: Minimum Sound Transmission Class (STC) as indicated on drawings tested to ASTM E90. Label indicating sound transmission class shall be applied to the steel window frame assembly.

2.3 MATERIALS

- .1 Sheet Steel:
 - .1 Galvanized steel ASTM A653/A653M, ZF75 (A25), minimum 1.5 mm thick.
- .2 Reinforcement: Same material as sheet steel.

2.4 FABRICATION

- .1 Manufacture doors and frames to STC rating as indicated on drawings, measured in accordance with ASTM E90.
- .2 Door thickness to meet STC rating
- .3 Steel Doors:
 - .1 Sheet steel faces, thickness, design, and core suitable to achieve specified STC performance.
 - .2 Acoustic core construction, longitudinal edges fully welded.
 - .3 Reinforce doors where surface-mounted hardware is required.
 - .4 Drill and tap for mortised, templated hardware.
 - .5 Top and Bottom Channels: Inverted, recessed, welded steel channels.
 - .6 Exit Device Vertical Rods: Surface mounted with concealed top rod; coordinate with exit hardware devices specified in Section 08 71 10.
 - .7 Astragals: Metal acoustic astragals with integral acoustic seals for double doors. Standard overlapping active/inactive.
 - .8 Factory installed glazing.
- .4 Steel Frames:
 - .1 Sheet steel, metal thickness as required to maintain door STC rating and fire ratings, mitred corners, fully welded seams.
 - .2 Factory assemble and fully weld frames.
 - .3 Mullions for Double Doors: Removable type.

- .4 Supply glazing loose, ready for field assembly.
- .5 Affix permanent nameplates to door and frame, indicating manufacturer's name, and STC rating.
- .6 Hardware:
 - .1 Pre-machine doors in accordance with templates from specified hardware manufacturers.
 - .2 Surface mounted closures will be reinforced for but not prepped or installed at factory.
 - .3 Factory install door hardware.

2.5 ACCESSORIES

- .1 Hinges: Cam lift type, by door manufacturer.
- .2 Glazing Stops: Formed galvanized steel channel, mitred corners; prepared for countersink style tamperproof screws.
- .3 Primer: Rust inhibitive zinc phosphate VOC compliant with local indoor air q
- .4 Threshold: Smooth and flush, to provide a seal for door in closed position.
- .5 Steel Astragal: Overlapping or meeting stile, supplied loose for field installation. Overlapping astragal to be a minimum 2 mm (14 ga) thick.
- .6 Perimeter Acoustic seals: Provide perimeter and bottom seals, tested as part of the ASTM E90 assembly to meet the specified STC rating.

2.6 FINISHES

- .1 Factory Door Finish: Factory applied zinc phosphate primer to be applied to all exposed surfaces. Touch-up only, where product has been welded and ground smooth.

Part 3 Execution

3.1 INSTALLATION

- .1 Install components to manufacturer's written instructions.
- .2 Install steel doors and frames to CSDMA and HMMA 840 standards and in accordance with NFPA 80 and UL 10C, and local authority having jurisdiction.
- .3 Install factory supplied glazing to frames.
- .4 Utilize welders certified by Canadian Welding Bureau (CWB) for field welding.
- .5 Coordinate with gypsum board wall construction for anchor placement.
- .6 Set frames plumb, square, level at correct elevation.
- .7 Allow for deflection to ensure that structural loads are not transmitted to frame.

- .8 Adjust operable parts for correct clearances and function.
- .9 Install and adjust perimeter and bottom acoustic seals.
- .10 Finish paint in accordance with Section 09 91 00.
- .11 Touch up painted finishes where damaged.

3.2 ERECTION TOLERANCES

- .1 Maximum deviation from square, alignment, twist and plumb: +/- 0.75 mm.

3.3 FIELD QUALITY CONTROL

- .1 Provide qualified manufacturer's representative to instruct installers on the proper installation and adjustment of door assemblies.
- .2 Provide manufacturer's representative to inspect door installation, and test minimum five (5) cycles of operation. Correct any deficient doors.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Acoustic pressed steel window frames. Items shall be fixed-in-place and shall be designed to be inoperable.
- .2 Glazed lite acoustic steel frames.
- .3 Factory-supplied glass and glazing.

1.2 RELATED SECTIONS

- .1 Section 07 90 00 - Sealants
- .2 Section 09 81 16 - Acoustic Blanket Insulation

1.3 REFERENCES

- .1 ASTM A480/A480M-06b - General Requirements for Flat-Rolled Stainless Heat-Resisting Steel Plate, Sheet, and Strip.
- .2 ASTM A653/A653M-06 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM E90-04 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .4 ASTM E413-04 - Classification for Rating Sound Insulation.
- .5 AWS D1.1/D1.1M:2006, Structural Welding Code - Steel.
- .6 CSDMA Selection and Usage Guide for Steel Doors and Frames, 1990.
- .7 HMMA 802-92 - Manufacturing of Hollow Metal Doors and Frames.
- .8 HMMA 840-99 - Installation and Storage of Hollow Metal Doors and Frames.
- .9 HMMA 865-03 - Guide Specifications For Swinging Sound Control Hollow Metal Doors and Frames.
- .10 ANSI/ICC A117.1-2003 - Standard for Accessible and Usable Buildings and Facilities

1.4 PERFORMANCE REQUIREMENTS

- .1 Acoustic Performance: Minimum Sound Transmission Class (STC) as indicated on drawings tested to ASTM E90. Label indicating sound transmission class shall be applied to the steel window frame assembly.

1.5 SUBMITTALS

- .1 Section 01 33 00: Submission procedures.

- .2 Product Data: Provide product data on window construction.
- .3 Shop Drawings: Indicate window frame elevations, anchor types and closure methods, finishes and cut outs for glazing.
- .4 Samples: Submit manufacturer's window frame corner sample.
- .5 Test Data:
 - .1 Submit test data indicating compliance with the Sound Transmission Class (STC) requirements. Include laboratory name, test report number, and date of test.
 - .2 Submit certification from test laboratory qualified under the National Voluntary Accreditation Program (NVLAP) of the U.S. Bureau of Standards.
- .6 Installation Instructions: Submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

- .1 Perform work to requirements of CSDMA (Canadian Steel Door Manufacturers Association) and HMMA (Hollow Metal Manufacturers Association) standards.
- .2 Manufacturer: Minimum 5 years documented experience manufacturing acoustic steel window frame assemblies.
- .3 Required attendance from relevant subcontractors, consultants, and manufacturer's representative. Review installation and coordination with other work.

1.7 DELIVERY, STORAGE AND PROTECTION

- .1 Comply with HMMA 840, and manufacturer's written instructions.
- .2 Remove window frames from coverings upon receipt on site and inspect for damage.
- .3 Store in vertical position, spaced with blocking to permit air circulation between components.
- .4 Store materials out of water and covered to protect from damage.
- .5 Clean and touch up scratches or disfigurement caused by shipping or handling with zinc-rich primer.

1.8 WARRANTY

- .1 Manufacturer's Limited Warranty: Five (5) years from date of supply, covering material and workmanship.

Part 2 Products

2.1 MANUFACTURERS

- .1 AMBICO Limited; or approved equal.

2.2 MATERIALS

- .1 Sheet Steel:
 - .1 Galvanized steel to ASTM A653/A653M, ZF180 (A60).
- .2 Reinforcement Channel: To CSA G40.20/G40.21, coating designation to ASTM A653/A653M, ZF75 and A25.

2.3 ACCESSORIES

- .1 Glazing Stops: Formed galvanized steel channel, mitred corners; prepared for countersink tamperproof screws.
- .2 Glass: Type as tested to achieve acoustic performance ratings. Glazing to be factory supplied loose ready for site installation by others.
- .3 Primer: Rust inhibitive zinc chromate.

2.4 FABRICATION

- .1 Manufacture window frame assemblies to STC rating as indicated on drawings, measured in accordance with ASTM E90. These items are designed to be fixed-in place and shall be inoperable.
 - .1 Factory assemble and weld window frames.
 - .2 Factory-supply glazing in conformance with tested standards. Glazing shall be supplied loose ready for field assembly by others. Glazing details will vary widely in accordance with specified STC ratings.
 - .3 Mitred corners, fully welded seams where window frame members intersect.
- .2 Affix permanent metal nameplates to window frame assembly, indicating manufacturer's name, frame tag and STC rating where it shall be clearly visible.

2.5 FINISHES

- .1 Factory Frame Finish: Factory applied zinc chromate primer to be applied to all exposed surfaces
- .2 Factory applied zinc chromate primer touch-up only, where product has been welded and ground smooth.

Part 3 Execution

3.1 INSTALLATION

- .1 Install components including acoustic window frame assemblies and glazing in accordance with manufacturer's written instructions.
- .2 Install steel window frames to CSDMA and HMMA 840 standards.
- .3 Utilize welders certified by American Welding Society (AWS) for field welding.
- .4 Coordinate with masonry wall construction for anchor placement.

- .5 Set frames plumb, square, level and at correct elevation.
- .6 Allow for deflection to ensure that structural loads are not transmitted to frame.
- .7 Finish paint in accordance with Section 09 91 00.

3.2 ERECTION TOLERANCES

- .1 Installation tolerances of installed frame for squareness, alignment, twist and plumbness are to be no more than $\pm 1/16$ in (1.5mm) in compliance with HMMA 841.

3.3 FIELD QUALITY CONTROL

- .1 Provide qualified manufacturer's representative to instruct installers on the proper installation and adjustment of window frame assemblies.
- .2 Provide manufacturer's representative to inspect window frame assembly installation. Correct any deficient window frame assemblies.

3.4 SCHEDULE

- .1 Acoustic Steel Window Frame Assembly Schedule:

Tag	Room	Nominal Size	Thickness	Material	Glazing	Fire Rating	STC Rating	Comments
W-01	151	Refer to drawings		GS	FS	NFR	53	vertical mullion, factory pre-installed
W-02	151	Refer to drawings		GS	FS	NFR	53	vertical mullion, factory pre-installed
<ul style="list-style-type: none"> • Material types: GS = Galvanized Steel • Glazing types: FS = Factory Supplied • Fire Label types: NFR= Non-fire rated 								

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:

- .1 Mortise latching device (D01, D03 only)
 - .1 Schlage L909x Series Electrified Mortise
 - .2 Deadbolt Model: Inside and outside cylinders
 - .1 L9495: Both levers EL
 - .2 Door strike to suit
- .2 Storeroom latching device by Schlage (D04, D05 only)
 - .1 Storeroom type
- .3 Door Holder:
 - .1 Kick down Door Holder 270C by Hager
 - .1 S1sprayed aluminum finish.
- .4 Door Stop:
 - .1 Half Dome Floor Mount: Provide 241F by Hager
 - .1 Cast brass, rubber bumper X 626.
- .5 Kick plates:
 - .1 To be adhered to both sides of door.
 - .2 Thickness: 2.0 mm, 630 stainless steel.
 - .3 Height: 305mm.
 - .4 Width: to suit each door.
 - .5 Hager", Door Protection Plate 200S.
- .6 Door Closer
 - .1 Heavy duty door closer by Hager, LCN or approved equal
 - .1 Rated for 320lbs min.
 - .2 Regular arm/parallel arm bracket
 - .3 Include integral overhead stop.
- .7 Single Door Exit devices (D02 only):
 - .1 Exit Device 98L-NL by Von Duprin (includes lever; for electric strike), 3' or 4' length (to be chosen base on door width), 630 finish.

- .8 Cylinders:
 - .1 Medeco, keyed to NRC key plan by Lister Lock.
 - .2 Contractor to carry all costs associated with keying of doors.
- .9 Electric Strikes:
 - .1 Pre-wired by door supplier.
 - .2 Model: HES 4500.
- .10 Transfer Hinge:
 - .1 Transfer Hinge EPT10-CON by Von Duprin
- .11 Hinges (Door D04 & D05 only):
 - .1 Interior doors: Dorex 114.3mm x 101.6mm x 179 454 NRP X C15.
- .12 Above hardware is standard NRC requirements unless specified or listed on drawings to be otherwise.
- .13 Refer to hardware groups on drawings.

2.3 Fastenings

- .1 Use tamper proof screws for door hardware used on door D03.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 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.
- .5 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 Perimeter Acoustical Gaskets 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.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 74 19 - Waste Management and Disposal
- .2 Section 09 21 16 Gypsum Board assemblies

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM A653M-09a Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A924M-09a General Requirements for Steel Sheet, Metallic-Coated by the Hot Dip Process
 - .3 ASTM C645-09, Specification for Nonstructural Steel Framing Members.
 - .4 ASTM C754-09a, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - .5 ASTM C919-08 Standard Practice for Use of Sealants in Acoustical Applications.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with requirements of Section 01 33 00 Submittal Requirements.
- .2 Provide product information for each type of product indicated in this specification.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Wherever a fire resistance classification is shown involving products specified in this section, provide assemblies that have been tested by an accredited testing agency in accordance with ULC S101 and that have achieved the required rating.
- .2 Submit the assembly listing for each required assembly, as issued by the testing agency, specifying the materials, accessories and application procedures required for the tested assembly, in accordance with the submittal requirements of Division 1.
- .3 Assembly listings indicated in the Contract Documents indicate the minimum level of acceptance with respect to fire-resistance requirements only.

1.5 DELIVERY STORAGE AND HANDLING

- .1 Do not store materials outside, or on site for more than 72 hours, or remove from wrappings until ready for use.
- .2 Protect materials from moisture.
- .3 Pack, ship and handle materials to prevent stress and damage.

Part 2 PRODUCTS

2.1 Materials

- .1 Non-loadbearing channel stud framing: to ASTM C645, 64mm, 92mm, 152mm stud sizes as indicated on drawings; roll formed from 0.5mm (25 gauge), 0.9mm (20 gauge), 1.6mm (16 gauge) electrogalvanized steel sheet; refer to drawings; for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.
- .2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 mm flange height.
- .3 Metal channel stiffener: 38 x 20mm 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 thick cork strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

Part 3 EXECUTION

3.1 Erection

- .1 Align partition tracks at floor and underside of slab and secure at oc spacing as indicated on drawings.
- .2 Place studs vertically at not more than 50 mm from abutting walls and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .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 base and upper cabinets, attached to steel stud partitions.
- .8 Provide two studs extending from floor to underside of slab 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 double track slip joints or 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 RELATED SECTIONS

- .1 Section 06 10 00 - Rough Carpentry
- .2 Section 07 21 16 - Insulation
- .3 Section 07 92 00 - Joint Sealants
- .4 Section 09 11 10 - Metal Studs System
- .5 Section 09 91 00 - Painting

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C36/C36M-[01], Specification for Gypsum Wallboard.
 - .2 ASTM C475-[01], Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .3 ASTM C514-[01], Specification for Nails for the Application of Gypsum Board.
 - .4 ASTM C557-[99], Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .5 ASTM C840-[01], Specification for Application and Finishing of Gypsum Board.
 - .6 ASTM C954-[00], Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .7 ASTM C1002-[01], Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .8 ASTM C1047-[99], Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .2 Association of the Wall and Ceilings Industries International (AWEI)
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-71.25-[M88], Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-[1988(R2000)], Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.

- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.4 SITE ENVIRONMENTAL REQUIREMENTS

- .1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

1.5 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit duplicate 300 x 300 mm size samples of gypsum board and 300 mm long samples of corner and casing beads insulating strip.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic and [polystyrene, corrugated cardboard packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.
- .4 Divert unused gypsum from landfill to gypsum recycling facility for disposal approved by NRC Departmental Representative.
- .5 Divert unused metal materials from landfill to metal recycling facility approved by NRC Departmental Representative.
- .6 Divert unused wood materials from landfill to recycling or composting facility approved by NRC Departmental Representative
- .7 Divert unused paint and caulking material from landfill to official hazardous material collections site approved by NRC Departmental Representative
- .8 Do not dispose of unused paint and caulking materials into sewer systems, into lakes, streams, onto ground or in other locations where it will pose health or environmental hazard.

Part 2 **Products**

2.1 **MATERIALS**

- .1 Standard board: to ASTM C36/C36M regular, Type X, 16 mm thick, 1200 mm wide x maximum practical length.
- .2 Metal furring runners, hangers, tie wires, inserts, anchors: to structure.
- .3 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .4 Resilient clips: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .5 Nails: to ASTM C514.
- .6 Steel drill screws: to ASTM C1002.
- .7 Stud adhesive: to ASTM C557.
- .8 Laminating compound: as recommended by manufacturer, asbestos-free.
- .9 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, zinc-coated by hot-dip process 0.5 mm base thickness, perforated flanges, one piece length per location.
- .10 Sealants: in accordance with Section 07 90 00 - Sealants.
- .11 Acoustic sealant: in accordance with Section 07 90 00 - Sealants.
- .12 Polyethylene: to CAN/CGSB-51.34, Type 2.
- .13 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 92 mm wide, with self sticking permanent adhesive on one face, lengths as required.
- .14 Joint compound: to ASTM C475, asbestos-free.

2.2 **FINISHES**

- .1 Texture finish: asbestos-free standard white texture coating and primer-sealer, recommended by gypsum board manufacturer.

Part 3 **Execution**

3.1 **ERECTION**

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing in accordance with ASTM C1280.

- .3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .13 Erect drywall resilient furring transversely across studs between the layers of gypsum board, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 38 mm common nail 25 mm drywall screw.

3.2 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single layer gypsum board to metal furring or framing using screw fasteners for first layer. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .2 Double-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
- .3 Apply 12mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed

building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.

- .4 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .5 Install gypsum board with face side out.
- .6 Do not install damaged or damp boards.
- .7 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.3 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre using contact adhesive for full length.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.
- .6 Provide continuous polyethylene dust barrier behind and across control joints.
- .7 Locate control joints at changes in substrate construction at approximate 10m spacing on long corridor runs.
- .8 Install control joints straight and true.
- .9 Install cornice cap where gypsum board partitions do not extend to ceiling.
- .10 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.
- .11 Splice corners and intersections together and secure to each member with 3 screws.
- .12 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .13 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

- .14 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
- .15 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .16 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .17 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .18 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .19 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .20 Mix joint compound slightly thinner than for joint taping.
- .21 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.
- .22 Allow skim coat to dry completely.
- .23 Remove ridges by light sanding or wiping with damp cloth.
- .24 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

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 E1414-11ae1 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 submittal procedures 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 Owner's representative 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 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.

1.10 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 – **Room 152, 152A, 152B, 152C:**
 - .1 Armstrong Ultima;
 - .2 CGC Mars.
 - .3 Certaineed Symphony M.
 - .11 Acceptable products and manufacturers – **Room 151A, 151B, 151C:**
 - .1 Halcyon Healthcare AP as manufactured by CGC Inc.
 - .2 Optima Health Zone as manufactured by Armstrong.
- .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 Certaineed
 - .2 Colour: flat white

2.4 SUSPENSION SYSTEM TRIM

- .1 Suspension trim system, straight and custom curved to suit installation, as indicated and as specified:
 - .1 Acceptable product and manufacturer: Compasso Suspension Trim as manufactured by CGC.
 - .2 Acceptable alternate product and manufacturer: Axiom Perimeter Trim as manufactured by Armstrong World Industries.
 - .3 Acceptable alternate product and manufacturer: Cloud Perimeter Trim as manufactured by Certainteed.
- .2 Trim: vertical face width to suit application unless indicated otherwise, with horizontal legs to match ceiling grid, with hems formed for attachment to mounting clips, complete with all necessary manufacturer's standard trim and accessories.
- .3 Splice plate: steel finished to match trim, snap-in fit.
- .4 Attachment clips: Hot dipped galvanized and finished to match trim, snap-in fit.

2.5 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 65 19 Resilient Tile Flooring

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 submittal procedures of Section 01 33 00 – 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 mock-ups specified for each floor covering product specified, in accordance with requirements of Section 01 33 00 – Submittal Procedures..
- .2 Accepted mock-up 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 for incorporation into manual specified in Section 01 10 00.

1.9 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, Style B-cove minimum for resilient floor, 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.

2.2 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 29 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 coved type base for carpet tile and resilient tile floor finish.
- .10 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 submittal procedures of Section 01 33 00.
- .2 Submit triplicate of each floor covering tile colour selected, pattern and texture specified, in size specified.
- .3 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 requirements of Section 01 33 00.
- .2 Include floor pattern as directed by Departmental Representative.
- .3 Accepted mockup may form part of finished Work.

1.8 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for resilient flooring for incorporation into manual specified for closeout procedures in Section 01 10 00.

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 20oC for at least 48 hours immediately before installation.

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 Refer to drawings.

2.2 STATIC RESILIENT DISSIPATIVE TILE FLOORING (SDT)

- .1 All static dissipative tile flooring materials shall be the products of the same single manufacturer.
- .2 Static dissipative tile: 305 mm square x 3.2 mm thick tile.
 - .1 Acceptable Product: Electrotile static dissipative tile as manufactured by American Biltrite Flooring.
 - .2 Pattern: White/ Black SDT-111

- .3 Characteristics:
 - .1 Homogenous product; the entire thickness is the wear layer.
 - .2 Complies with ASTM F 1700, Class 1, type A requirements.
 - .3 Complies with EOS/EDS 7.1S (ASTM-F150) requirements.
 - .4 Refer to the product's Technical Specifications data sheet for detailed specifications

2.3 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 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.
- .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 Busbar/ grounding strips for static resilient dissipative tile flooring.

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 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.
- .13 Install edge reducer strips at unprotected or exposed edges where flooring terminates. Securely bond to subfloor in straight true line.
- .14 Install reducer and transition strips between floor areas which do not meet flush with each other. Securely bond to subfloor in straight true line.
- .15 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 Perform initial maintenance in accordance with tile manufacturer's recommendations using manufacturer's recommended materials.

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 08 11 13 - Hollow Steel Doors & Frames
- .2 Section 08 34 73.13 - Steel Sound Control Door and Frame Assemblies
- .3 Section 08 34 74 - Acoustic Steel Window Frame Assemblies
- .4 Section 09 21 16 – Gypsum Board Assemblies

1.2 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.

1.3 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

1.4 PERFORMANCE REQUIREMENTS

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

1.5 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.

1.6 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.

1.7 SUBMITTALS

- .1 Submittals in accordance with submittal procedures of Section 01 33 00 – Submittal Procedures.
- .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 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
 - .5 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 include following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.

1.8 MOCK-UPS:

- .1 Construct mock-ups in accordance with quality assurance requirements of Section 01 33 00 – 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.

1.9 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.

1.10 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 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.

1.11 EXTRA MATERIALS:

- .1 Submit maintenance materials in accordance with closeout submittals requirements of Section 01 10 00.
- .2 Deliver extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels.
- .3 Quantity: provide one one-litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

- .4 Delivery, storage and protection: comply with Departmental Representative requirements for delivery and storage of extra materials.

1.12 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; or approved equal
 - .2 P2: Sherwin Williams, Gauntlet Grey, SW 7019; or approved equal
 - .3 P3: Sherwin Williams, ProMar 400 Flat, Black, B30B04600 (on exposed underside of concrete slab and concrete beams); or approved equal

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:

Ceiling: Gloss Level 1 - Matte Finish (flat)	Gloss @ 60 degrees Max. 5	Sheen @ 85 degrees Max. 10
Walls: Gloss Level 5 - Traditional Semi-Gloss Finish	35 to 70	
- .2 Gloss level ratings of painted surfaces as indicated and as noted on Finish Schedule.

2.5 INTERIOR PAINTING AND RE-PAINTING SYSTEMS

- .1 Galvanized metal: New interior doors, frames.
 - .1 INT 5.3M – Waterborne Light Industrial Coating, MPI gloss level 5 (semi-gloss) finish.
- .2 Dressed lumber: including doors, door and window frames, casings, mouldings:
 - .1 INT 6.3BB - Waterborne alkyd MPI gloss level 5 (semi-gloss) finish for interior doors in non-humid locations only.
- .3 Electrical backer boards.
 - .1 INT 6.4P – Intumescent fire retardant alkyd coating, gloss level 1 (flat) finish, ULC listed.
- .4 Plaster and gypsum board walls: gypsum wallboard and textured finishes:
 - .1 INT 9.2B - High performance architectural latex, gloss level 5 (semi-gloss) finish.
- .5 Plaster and gypsum board ceilings, soffits and bulkheads: plaster, gypsum wallboard and textured finishes:
 - .1 INT 9.2B - High performance architectural latex, gloss level 1 (flat) finish.
- .6 Concrete horizontal surfaces: Mechanical room floor and housekeeping pads:
 - .1 INT 3.2L - Waterborne epoxy floor finish.

2.6 EXISTING PAINTED STEEL SURFACES

- .1 Paint system applicable to:
 - .1 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.

2.7 EXISTING CONCRETE SURFACES

- .1 Primer: ProMar 200 Latext Primer B28W02600 as manufactured by Sherwin Williams (on exposed underside of concrete slab and concrete beams).

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 %.

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 Exposed edges of existing metal trench covers
 - .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 SUBMITTALS

- .1 Submittals: in accordance with Section 00 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 00 10 00 – General Instructions.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 00 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 00 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 001000.

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 00 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 00 10 00 – General Instructions
- .2 Section 00 15 45 – General Safety Section and Fire Instructions
- .3 Section 21 05 01 – Common Work Results- Mechanical

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.60-[M89], Interior Alkyd Gloss Enamel.
 - .2 CAN/CGSB-24.3-[92], 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 SYSTEM NAMEPLATES

- .1 Colours:
 - .1 Hazardous: red letters, white background.
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
 - .1 3 mm thick white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
 - .1 Conform to following table:

Size #	No. of	Height of	
mm	Sizes (mm)	Lines	Letters

1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

.4 Locations:

- .1 Terminal cabinets, control panels: Use size #[5].
- .2 Equipment in Mechanical Rooms: Use size #[9].

2.3 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.

2.4 PIPING SYSTEMS GOVERNED BY CODES

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

2.5 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
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Oxygen	Yellow	OXYGEN
Compressed air (700 kPa)	Green	COMP. AIR [_____] kPa
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS

2.6 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.

2.7 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.

2.8 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates as specified in section 25 05 54 – EMCS Identification.

2.9 LANGUAGE

- .1 Identification to be in English and French.

PART 3 - EXECUTION

3.1 TIMING

- .1 Provide identification only after all painting specified Section [09911 - Interior 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 17 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 00 10 00 – General Instructions.

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 TIAC Code A-6: flexible elastomeric thermal insulation, black in color,
 - .1 Insulation: CAN/UL S102/ASTM C 177
 - .2 Maximum "k" factor: 0.036 W/m°C at 24°C to ASTM C 177.
 - .3 Temperature Range: -183 to 105 °C

2.3

INSULATION SECUREMENT

- .1 Tape: self-adhesive, reinforced aluminum 50 mm wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.
- .4 Single/double bands: stainless steel, 19 mm wide, 05 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 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
 - .3 Standard of acceptance or equivalent: FlexClad-400.

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 hanger.

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 runouts to plumbing fixtures, chrome plated piping, valves, 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
Chilled Water Pump Casing		A-3	25	25	25	25	38
Domestic cold water		A-3	25	25	25	25	25
Refrigerant (liquid)		A-6	25	25	38	38	38
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 00 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 plumbing pumps.
- .2 Related Sections:
 - .1 Section 00 10 00 – General Instructions
 - .2 Section 00 15 45 – General Safety Section and Fire Instructions
 - .3 Section 21 05 01 – Common Work Results- Mechanical
 - .4 Section 21 05 02 – Mechanical Identification
 - .5 Section 23 05 13 – Common Motor Requirements for HVAC
 - .6 Section 23 05 23.01 – Valves- Bronze
 - .7 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment
 - .8 Section 26 05 00 – Common Work Results- Electrical
 - .9 Section 26 05 21 – Wires and Cables (0-1000V)

1.2 REFERENCES

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

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 00 10 00 – General Instructions
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
- .3 Shop Drawings.
 - .1 Submit shop drawings to indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
 - .2 Wiring and schematic diagrams.
 - .3 Dimensions and recommended installation.
 - .4 Pump performance and efficiency curves.
- .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 Manufacturers' Field Reports: manufacturers' field reports specified.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 00 10 00 – General Instructions, include:
 - .1 Manufacturer's name, type, model year, capacity and serial number.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list with names and addresses.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section.
 - .1 Co-ordination with other building subtrades.
 - .2 Review manufacturer's installation instructions and warranty requirements.
- .2 Health and Safety:
 - .1 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 Store and manage hazardous materials in accordance with Section 00 10 00 – General Instructions and Section 00 15 45 – General Safety Section and Fire Instructions.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials in accordance with Section 00 10 00 – General Instructions.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 Products

2.1 UNDER SINK PUMP

- .1 As indicated on pump schedule on drawing on drawing 6018-M03.
- .2 Construction:
 - .1 Basin is polypropylene with “O”-rings for water tight seal.
 - .2 5 USGAL nominal capacity tank.
 - .3 2in FNPT discharge outlet, 2” FNPT Vent and 1-1/2” FNPT inlet.
 - .4 IAPMO listed
 - .5 Removable cover.
 - .6 Piggyback diaphragm operation switch.
- .3 Motor: Refer to schedule on drawing 6018-M03.
- .4 Acceptable Material: Little Giant model WRS-5 or approved equal.

2.2 CONDENSATE PUMP

- .1 As indicated on pump schedule on drawing on drawing 6018-M03.
- .2 Construction:
 - .1 Centrifugal pump design with a stainless steel motor shaft.
 - .2 ABS construction on tank, volute, motor cover and housing, polypropylene impeller, check valve Acetal,.
 - .3 3/8 barbed discharge outlet, three 1-1/8” inlet opening with 2 caps.

- .4 Automatic start/ Stop operation controlled via float switch with overflow detection.
- .5 Built in check valves .
- .6 Removable cover.
- .7 Max operating temperature 140F (60C)
- .3 Motor: Refer to schedule on drawing 6018-M03.
- .4 Acceptable Material: Little Giant model VCMA-15 or approved equal.
- .5

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 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .2 Ensure pump and motor assembly do not support piping.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Check power supply.
 - .2 Check starter protective devices.
- .2 Start-up, check for proper and safe operation.

3.4 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified herein.
 - .2 Procedures:
 - .1 Check power supply.
 - .2 Check for safe and proper operation.
 - .3 Check settings, operation of operating, limit, audible/visual alarms, other protective devices.

3.5 PV – UNDER SINK AND CONDENSATE PUMPS

- .1 Application tolerances:
 - .1 Flow: plus 10%; minus 10%.
- .2 Timing:
 - .1 Whenever float switch is activated pump shall run till float switch de-activates pump.
- .3 PV Procedures:
 - .1 Fill sump at rate slower than capacity of pump #1.

- .2 Record levels at which pump starts and stops. Determine flow rate by observing time taken to down water level.
- .3 Adjust water level controls as necessary.
- .4 Check level at which high water level alarm starts and stops. Adjust as necessary.
- .4 Check removability of pumps for servicing without interfering with installation or operation of other equipment.

3.6

REPORTS

- .1 In accordance with Section 00 10 00 – General Instructions: reports, supplemented as specified.
- .2 Include:
 - .1 PV results on approved PV Report Forms.
 - .2 Product Information report forms.
 - .3 Pump performance curves (family of curves) with final point of actual performance.

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 23 05 23.01 Valves – Bronze.
- .2 23 05 23.05 Butterfly Valves
- .3 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, 300, 400, 600, 900, 1500 and 2500.
- .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-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 01000
- .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 00 10 00 – General Instructions **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. **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.

2.5 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 00 10 00 – General Instructions.
- .2 Section 00 15 45 – General Safety Section and Fire Instructions.
- .3 Section 01 74 11 – Cleaning.
- .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-[1972(R1996)], 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-[00], Commercial Adhesives.

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 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 00 10 00 – General Instructions and 00 15 45 - General Safety Section and Fire Instructions.

- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: in accordance with Section 00 10 00 – General Instructions.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary, storm 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 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 74 11 - Cleaning.

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'. Type 2, mechanical spaces: all duco coated cast iron body, reversible flashing clamp with seepage openings and adjustable 8" diameter nickel bronze 1/2" thick strainer, secured with S.S. screws, 4" throat on strainer. Provide trap primer connection 'P'. c/w round top oval integral funnel (F19) where indicated.

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.

2.3 WATER HAMMER ARRESTORS

- .1 Stainless steel construction, piston type: Normal operating pressure 35 to 250 PSIG. Spike pressure 1,500 PSIG.
- .2 Copper construction, piston type, working pressure, 150 psig from 33 to 180 deg F PDI-WH201.

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".
- .1 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.

2.5 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

2.6 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

2.7 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

2.8 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.

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.

3.6 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 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx)
Requirements: General Requirements, 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.

3.10 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 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.
- .6 Access doors:
 - .1 Verify size and location relative to items to be accessed.
- .7 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .8 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.
- .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

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

1.4 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.

- .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, 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 fire stopping 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 74 11 - Cleaning.
 - .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 00 10 00 – General Instructions.
 - .2 Section 00 15 45 - General Safety Section and Fire Instructions.
 - .3 Section 21 05 01 – Common Work Results- Mechanical
 - .4 Section

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 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.
- .3 Quality Control: 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.
- .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 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 00 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: separate waste materials for in accordance with Section 00 10 00 – General Instructions and 02 42 00- Removal and Salvage of Construction Materials.

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 373 W (1/2 HP) : speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.
- .3 Motors 373 W (1/2 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 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 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 00 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 Concrete housekeeping pads, hangers and supports for mechanical piping, ducting and equipment.**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.**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 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.
- .3 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.
- .5 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
- .6 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
- .7 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.
- .8 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 SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of [Section 05 12 23 - Structural Steel for Buildings](#). Submit calculations with shop drawings.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

- .1 Provide templates to ensure accurate location of anchor bolts.

2.9 OTHER EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports from structural grade steel meeting requirements of [Section 05 12 23 - Structural Steel for Buildings](#).

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 Pipework greater than NPS 12: to MSS SP69.
- .7 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 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 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.

1.2 QUALIFICATIONS OF TAB PERSONNEL

- .1 Submit names of personnel to perform TAB to NRC Representative within 30 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 specified standards and report to NRC Representative in writing proposed procedures which vary from standard.
- .2 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 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weatherstripping, 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 10 %.

1.11 ACCURACY TOLERANCES

- .1 Measured values accurate to within plus or minus 2 % of actual values.

1.12 INSTRUMENTS

- .1 Prior to TAB, submit to NRC Representative list of instruments used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 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 Calculation procedures.
 - .4 Summaries.

1.15 TAB REPORT

- .1 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
- .2 Submit PDF copy of TAB to NRC Representative for review before inclusion in O&M manual.

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 [Departmental Representative] [Engineer] [Consultant] [___], replace drive guards, close access doors, lock devices in set positions, 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 this section.
- .2 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB, qualified to standards of AABC or NEBB.

- .3 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.
- .4 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.
- .5 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.20 OTHER TAB REQUIREMENTS

- .1 General requirements applicable to work specified this paragraph:
 - .1 Qualifications of TAB personnel: as for air systems specified this section.
 - .2 Quality assurance: as for air systems specified this section.
- .2 Laboratory fume hoods:
 - .1 Standard: Treasury Board of Canada Handbook of Occupational Health and safety, 4th edition.
 - .2 TAB procedures: as described in standard.
- .3 Building pressure conditions:
 - .1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions at all times.
- .4 Zone pressure differences:
 - .1 Adjust HVAC systems, equipment, controls to establish specified air pressure differentials, with systems in every possible combinations of normal operating modes.

1.21 POST-OCCUPANCY TAB

- .1 Measure DBT, NC levels, in occupied zone of following areas: SDA Room.

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 00 10 00 – General Instructions.
- .2 Section 00 15 45 – General Safety Section and Fire Instructions

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, 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 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168, Adhesive and Sealant Applications.
- .6 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .7 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 00 10 00 – General Instructions.
- .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.
 - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.
- .3 Samples:
 - .1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
 - .2 Mount sample on 12 mm plywood board.
 - .3 Affix typewritten label beneath sample indicating service.
- .4 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 3 years successful experience in this size and type of project, member of TIAC.

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 and ULC markings.

- .3 Packaging Waste Management: in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 Lagging adhesive: compatible with insulation.
 - .1 Maximum VOC limit to GSES GS-36.
- .2 Aluminum:
 - .1 To ASTM B209 with moisture barrier as scheduled in PART 3 of this section.
 - .2 Thickness: 0.50 mm sheet.
 - .3 Finish: Stucco embossed.
 - .4 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.
 - .1 Stainless steel:

2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
 - .1 Maximum VOC limit to GSES GS-36.
- .2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

- .4 ULC Listed Canvas Jacket:
 - .1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .5 Outdoor Vapour Retarder Mastic:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
 - .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².
- .6 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.
- .7 Contact adhesive: quick-setting
 - .1 Maximum VOC limit to GSES GS-36.
- .8 Canvas adhesive: washable.
 - .1 Maximum VOC limit to GSES GS-36.
- .9 Tie wire: 1.5 mm stainless steel.
- .10 Banding: 12 mm wide, 0.5 mm thick stainless steel.
- .11 Facing: 25 mm stainless steel hexagonal wire mesh stitched on one face of insulation.
- .12 Fasteners: 2 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, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers 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 in space being served			[none]
Outside air ducts to mixing plenum	[C-1]	[yes]	[25]
Mixing plenums	[C-1]	[yes]	[25]
Exhaust duct between dampers and louvres	[C-1]	[no]	[25]
Rectangular ducts outside	[C-1]	[special]	[50]
Round ducts outside	[C-1]	[special]	[50]
Acoustically lined ducts	[none]		

- .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	Round 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 74 11 - Cleaning.

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 00 10 00 – General Instructions.
- .2 Section 00 15 45 – General Safety Section and Fire Instructions.

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 00 10 00 – General Instructions

1.5 DELIVERY, STORAGE AND HANDLING

- .1 See Section 00 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

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

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". .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.**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 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 NRC Representative'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.
- .2 Terminate blowdown piping over the nearest funnel and floor drain unless otherwise noted.
- .3 Locate strainers so they are easily accessible for service.
- .4 Install ahead of each automatic control valve and radiation and as indicated on drawing.
- .5 Install ahead of each pump.

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.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for copper tubing and fittings for refrigerant.

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, 300, 400, 600, 900, 1500 and 2500.
 - .3 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
 - .4 ASME B31.5, Refrigeration Piping and Heat Transfer Components.
- .2 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 Canadian Standards Association (CSA International)
 - .1 CSA B52, Mechanical Refrigeration Code.
- .4 Environment Canada (EC)
 - .1 EPS 1/RA/1, Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.
- .5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .4 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 Co-ordination with other building sub-trades.
- .4 Review manufacturer's installation instructions and warranty requirements.
- .5 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .6 Trades people to be journeyman and graduate from a recognized college refrigeration trade program.

Part 2 Products

2.1 TUBING

- .1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.
 - .1 Hard copper: to ASTM B280, type [ACR] [B].
 - .2 Annealed copper: to ASTM B280, with minimum wall thickness as per CSA B52 and ASME B31.5.

2.2 FITTINGS

- .1 Service: design pressure 2070 kPa and temperature 121°C.
- .2 Brazed:
 - .1 Fittings: wrought copper to ASME B16.22.
 - .2 Joints: silver solder, 45% Ag - 80% Cu - 5% P and non-corrosive flux for copper to steel or brass; Silfoss-15 for copper to copper.
- .3 Flanged:
 - .1 Bronze or brass, to ASME B16.24, Class 150 and Class 300, tongue and groove type.
 - .2 Gaskets: suitable for service.
 - .3 Bolts, nuts and washers: to ASTM A307, heavy series.
- .4 Flared:
 - .1 Bronze or brass, for refrigeration, to ASME B16.26.

2.3 PIPE SLEEVES

- .1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

- .1 7/8 OD and under: Class 500, 3.5 MPa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture-proof seal for below freezing applications, brazed connections.

- .2 Over 7/8 OD: Class 375, 3 MPa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and forged brass bonnet, moisture-proof seal for below freezing applications, brazed connections, non-rotating, self aligning swivel disc, Teflon seat, -40°C - 163°C.
- .3 Ball valves 7 3/8 to 3 1/8 OD: maximum WP 4MPa, -40°C to 149°C, live loaded stem seal, double “O” ring hermetically sealed body, blowout proof stem, seal cap “O” ring sealed, valve position indicators, forged brass body bonnet, brass cap, triple sealed plated steel item, Teflon ball seals and gasket, extended copper connections, helium leak test to maximum 0.28 g/yr.
- .4 Check valves 7/8 OD to 3 1/8 OD cast bronze body, brass bonnet, Teflon seat, internal parts removable minimum opening pressure 3.5 kPa, maximum WP 3.5 kPa - 29°C to 149°C, UL and CSA approved.
- .5 Check valves 3/8 to 7/8 OD: brass construction, Teflon seal, removable piston, maximum WP 3.5 kPa, -40°C to 149°C, suitable for high side, low side and hot gas. UL and CSA approved, maximum opening pressure 3.5 kPa.

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 GENERAL

- .1 In accordance with Section 23 05 05 – Installation of Pipework, supplemented as specified herein.
- .2 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5.

3.3 BRAZING PROCEDURES

- .1 Bleed inert gas into pipe during brazing.
- .2 Remove valve internal parts, solenoid valve coils, sight glass.
- .3 Do not apply heat near expansion valve and bulb.

3.4 PIPING INSTALLATION

- .1 General:
 - .1 Soft annealed copper tubing: bend without crimping or constriction, Hard drawn copper tubing: do not bend. Minimize use of fittings.
- .2 Hot gas lines:
 - .1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.

- .2 Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.
- .3 Provide inverted deep trap at top of risers.
- .4 Provide double risers for compressors having capacity modulation.
 - .1 Large riser: install traps as specified.
 - .2 Small riser: size for 5.1 m/s at minimum load. Connect upstream of traps on large riser.

3.5 PRESSURE AND LEAK TESTING

- .1 Close valves on factory charged equipment and other equipment not designed for test pressures.
- .2 Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively.
- .3 Test Procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

3.6 FIELD QUALITY CONTROL

- .3 Site Tests/Inspection
 - .1 Close service valves on factory charged equipment.
- .4 Ambient temperatures to be at least 13 degrees C for at least 12 hours before and during dehydration.
- .5 Use copper lines for largest practical size to reduce evacuation time.
- .6 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa absolute and filled with dehydrated oil.
- .7 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.
- .8 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:
 - .1 Twice to 14 Pa absolute and hold for 4 h.
 - .2 Break vacuum with refrigerant to 14 KPa.
 - .3 Final to 5 Pa absolute and hold for at least 12 h.
 - .4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.
 - .5 Submit test results to Owner's Representative.
- .9 Charging:
 - .1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.
 - .2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close

- charging valve and start up. With unit operating, add remainder of charge to system.
- .3 Re-purge charging line if refrigerant container is changed during charging process.
- .10 Checks:
- .1 Make checks and measurements as per manufacturer's operation and maintenance instructions.
- .2 Record and report measurements to Owner's Representative.
- .11 Manufacturer's Field Services:
- .1 Have manufacturer of products, supplied under this Section, review work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of work with Contract.
- .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, at stages listed:
- .1 After delivery and storage of products, and when preparatory work, or other work, on which the work of this Section depends, is complete but before installation begins.
- .2 Twice during progress of work at 25% and 60% complete.
- .3 Upon completion of the work, after cleaning is carried out.
- .4 Obtain reports, within three (3) working days of review, and submit, immediately, to Owner's Representative.

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 00 10 00 – General Instructions.
 - .2 Section 00 15 45 – General Safety Section and Fire Instructions.

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 00 10 00 – General Instructions.
- .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.
- .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 00 10 00 – General Instructions.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning on-site installations.
 - .1 Verify project requirements.
 - .2 Review installation 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 00 15 45 - General Safety Section and Fire Instructions.

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. Refer to section 00 10 00 – General Instructions.
- .2 It is the full responsibility of the contractor to ensure 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 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 SECURITY SCREEN

- .1 Heavy gauge galvanized steel or aluminum mesh, 12mm x 12mm (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 Install automatic control dampers and similar duct mounted control components supplied.

.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:
 - .1 300 x 300 mm for servicing entry.
 - .2 200 x 200 mm for viewing.
 - .3 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 SECURITY SCREEN

- .1 Provide security screens where indicated on the drawings.

.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 00 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 SECTION INCLUDES

- .1 Materials and installation for acoustic duct lining.

1.2 RELATED SECTIONS

- .1 Section 00 10 00 – General Instructions.
- .2 Section 00 15 45 – General Safety Section and Fire Instructions.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM).
 - .1 ASTM C423, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
 - .2 ASTM C916, Standard Specification for Adhesives for Duct Thermal Insulation.
 - .3 ASTM C1071, Standard specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
 - .4 ASTM C1338, Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
 - .5 ASTM G21, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- .2 Department of Justice Canada (Jus).
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Fire Protection Association (NFPA).
 - .1 NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- .5 North American Insulation Manufacturers Association (NAIMA).
 - .1 NAIMA AH116, Fibrous Glass Duct Construction Standards.
- .6 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA).
 - .1 SMACNA, HVAC DCS, HVAC, Duct Construction Standards, Metal and Flexible.
 - .2 SMACNA IAQ Guideline for Occupied Buildings 95.
- .7 Transport Canada (TC).
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .8 Underwriter's Laboratories of Canada (ULC).

- .1 CAN/ULC-S102-[03-EN], Methods of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 00 10 00 – General Instructions.

1.5 HEALTH AND SAFETY

- .1 Do construction occupational health and safety in accordance with Section 00 15 45 – General Safety Section and Fire Instructions.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 00 10 00 – General Instructions.
- .2 Protect on site stored or installed absorptive material from moisture damage.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Ensure emptied containers are sealed and stored safely.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 DUCT LINER

- .1 General:
 - .1 Mineral Fibre duct liner: air surface coated.
 - .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102.
 - .3 Fungi resistance: to ASTM C1338.
- .2 Rigid:
 - .1 Use on flat surfaces.
 - .2 25 mm thick, to ASTM C1071, Type 2, fibrous glass rigid board duct liner.
 - .3 Density: 48 kg/m³minimum.
 - .4 Thermal resistance to be minimum 0.76 (m². degrees C)/W for 25 mm thickness when tested in accordance with ASTM C177, at 24 degrees C mean temperature.
 - .5 Maximum velocity on faced air side: 20.3 m/sec.
 - .6 Minimum NRC of 0.70 at 25 mm thickness based on Type A mounting to ASTM C423.
- .3 Flexible:
 - .1 Use on round or oval surfaces.

- .2 25 mm thick, to ASTM C1071 Type 1, fibrous glass blanket duct liner.
- .3 Density: 24 kg/m³ minimum.
- .4 Thermal resistance to be minimum 0.37 (m².degrees C)/W for 12 mm thickness, at 24 degrees C mean temperature.
- .5 Maximum velocity on coated air side: 30.5 m/sec.
- .6 Minimum NRC of 0.65 at 25 mm thickness based on Type A mounting to ASTM C423.

2.2 ADHESIVE

- .1 Adhesive: to NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29 degrees C to plus 93 degrees C.
- .3 Water-based fire retardant type.

2.3 FASTENERS

- .1 Weld pins 2.0 mm diameter, length to suit thickness of insulation. Metal retaining clips, 32 mm square.

2.4 JOINT TAPE

- .1 Poly-Vinyl treated open weave fiberglass membrane 50 mm wide.

2.5 SEALER

- .1 Meet requirements of NFPA 90A and NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68 degrees C to plus 93 degrees C.

Part 3 Execution

3.1 GENERAL

- .1 Do work in accordance with as indicated except as specified otherwise.
- .2 Line inside of ducts where indicated.
- .3 Duct dimensions, as indicated, are clear inside duct lining.

3.2 DUCT LINER

- .1 Install in accordance with manufacturer's recommendations, and as follows:
 - .1 Fasten to interior sheet metal surface with 100% coverage of adhesive to ASTM C916
 - .1 Exposed leading edges and transverse joints to be factory coated or coated with adhesive during fabrication.

- .2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425 mm on centres to compress duct liner sufficiently to hold it firmly in place.
 - .1 Spacing of mechanical fasteners in accordance with SMAC HVAC DCS.
- .2 In systems, where air velocities exceeds 20.3 m/sec, install galvanized sheet metal nosing to leading edges of duct liner.

3.3 JOINTS

- .1 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:
 - .1 Bed tape in sealer.
 - .2 Apply two coats of sealer over tape.
- .2 Replace damaged areas of liner at discretion of NRC Representative.
- .3 Protect leading edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

3.4 OPERATION REQUIREMENTS

- .1 Operational requirements in accordance with Section 00 10 00 – General Instructions, include:
 - .1 Cleaning materials and schedules.
 - .2 Repair and maintenance materials and instructions.

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 00 10 00 – General Instructions.
 - .2 Section 00 15 45 – General Safety Section and Fire Instructions
 - .3 Section 21 05 01 – Common Work Results- Mechanical
 - .4 Section 21 05 02 – Mechanical Identification
 - .5 Section 23 05 13 – Common Motor Requirements for HVAC
 - .6 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 00 10 00 – General Instructions. 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 00 10 00 – General Instructions.

1.4 QUALITY ASSURANCE

- .1 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 00 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 00 10 00 – General Instructions.

Part 2 Products

2.1 GENERAL

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity.
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board if applicable.
 - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: as directed by Departmental Representative.
- .5 All new and existing diffusers, grilles and registers as well as any associated ductwork is to be cleaned and vacuumed (within vacuum hose length)
- .6 Refer to drawing 60---M03 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 RETURN AND EXHAUST GRILLES AND REGISTERS

- .1 General: with opposed blade dampers.
- .2 Refer to schedule on M-03 for basis of design
- .3 Type EG1: steel construction 19 mm border, single 45 degrees deflection, horizontal face bars. Finish: White. Acceptable Material: EH Price, Titus, Nailor or approved equal.
- .4 Type RG1 and RG4: steel construction, 19 mm border, single 45 degrees deflection, vertical face bars. Finish: White. Acceptable Material: EH Price, Titus, Nailor or approved equal.
- .5 Type RG2 and RG3 steel construction, perforated face. Finish: White. Acceptable Material: EH Price, Titus, Nailor or approved equal.

2.4 DIFFUSERS

- .1 General: volume control dampers with flow straightening devices and gaskets.
- .2 Refer to schedule on drawing M-03 for basis of design
- .3 Type SD1: steel, round type, having adjustable pattern, duct mounted. Finish: white. Acceptable Material: EH Price, Titus, Nailor or approved equal.
- .4 Type SD2, SD3, SD4: steel square type, perforated face having adjustable pattern, lay-in mounted. Finish: White. Acceptable Material: EH Price, Titus, Nailor 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 oval 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 00 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, components and installation for heat reclaim devices.
- .2 Related Sections.
 - .1 Section 00 10 00 – General Instructions.
 - .2 Section 00 15 45 – General Safety Section and Fire Instructions.
 - .3 Section 01 91 31- Commissioning (Cx) Plan.
 - .4 Section 23 05 13 – Common Motor Requirements for HVAC Equipment.
 - .5 Section 23 33 00 - Air Duct Accessories.

1.2 REFERENCES

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 84, Method of Testing Air-to-Air Heat Exchangers (ANSI approved).
- .2 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 00 10 00 – General Instructions. Include product characteristics, performance criteria, and limitations.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 00 10 00 – General Instructions.
- .3 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 00 10 00 – General Instructions.
- .4 Certificates:
 - .1 Catalogued or published ratings: obtained from tests carried out by manufacturer or those ordered from independent testing agency signifying adherence to codes and standards in force.
 - .2 Provide confirmation of testing.
- .5 Shop drawings shall indicate unit dimensions, unit weight, required clearances, wall, door and base construction details, coil rack and drain pan details, isolation base detail, isolator selection, field connection details, damper details, lifting lug details, and trapping requirements for cooling coil condensate.

- .6 Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, metal gauges and finishes of materials.
- .7 Provide fan curves with specified operating point clearly plotted.
- .8 Submit sound power levels for both fan inlet and outlet at rated capacity. Provide sound power levels at the inlet and outlet of the unit.
- .9 Submit product data of filter media, filter performance data, filter assembly, and filter frames.
- .10 Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
- .11 Submit manufacturers recommended installation instructions. Shop drawings shall include all general information defined by Section 00 10 00 – General Instructions. Omission of any of the above information will cause shop drawings to be immediately returned without review

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 00 15 45 – General Safety Section and Fire Instructions.
- .2 The following are to be used as selection criteria and are to be as specified: Air flow rates, external static pressures, water flow rates. The following are to be equaled or bettered: Coil face velocities, filter face velocities, casing leakage rates. The following are to be met within 10% of specified values: Water pressure drops.
- .3 Provide unit produced by a recognized manufacturer who maintains a local service agency and parts stock.
- .4 Air handling units and major components shall be products of the manufacturer regularly engaged in production of such equipment.
- .5 Fans shall conform to AMCA bulletins regarding testing and construction. (Airfoil fans shall bear the AMCA certified rating seal for airflow and sound).
- .6 Coils shall be ARI certified.
- .7 Filter media shall be ULC listed.
- .8 Unit shall be factory ETL(c) approved
- .9 After construction, units shall be cleaned thoroughly before shipping. All floor surfaces and wall surfaces shall be thoroughly degreased and cleaned. After cleaning, units shall be shrink wrapped using a heavy gauge heat shrinkable plastic wrap.
- .10 During storage, contractor shall store units in a dry heated environment. Fan wheels shall be rotated monthly during storage. Units shall be regularly inspected for moisture and any job site moisture shall be immediately removed.

.1

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 00 10 00 – General Instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 MAINTENANCE

.1 Extra Materials:

.1 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.

Part 2 Products

2.1 GENERAL

.1 Basis of design: Unit is based off a Haakon model XXXX, any alternates to be submitted before the date specified in procurement documents during the tendering process.

.2 Comply with ASHRAE 84.

2.2 DESCRIPTION

.1 Provide factory assembled air handling unit in configuration as indicated on drawings. Unit shall include all specified components installed at the factory. Field fabrication of units and their components will not be accepted.

.2 All units shall be inspected by the customer prior to shipment. Inspection shall be of unit completely assembled.

.3 The unit shall be designed to be supported by a roof curb.

.4 Unit shall be shipped in one piece.

2.3 ROOF CURBS

1.1.1. Roof curbs shall be manufactured from 12 gauge galvanized steel.

1.1.2. A pressure treated 2 x 4 nailing strip shall be provided around the upper perimeter.

1.1.3. Interior of the curb shall be insulated with 2” fiberglass insulation the propylene facing.

- 1.1.4. Roof curb height shall be 600mm (24 in). Manufacturer shall supply seismic restraints to secure the air handling unit to the roof curb in accordance with the National Building Code.
- 1.1.5. Construct curb enclosure with mill finish aluminum counter flashing top cap sealed into roof membrane on "Soprema" or similar base sheet on 19mm dens deck board on stud frame. Fix 12mm pressure treated plywood to top of enclosure. Coordinate location with other trades. Curb base to extend 152mm minimum past base of new mechanical unit.
- 1.1.6. New modified bitumen base and cap sheet at roof curb. 2 ply to overlap existing roofing membrane 305mm and extend vertically to underside of new curb flashing.
- 1.1.7. Seal penetrations with liquid applied membrane.

2.4 ACOUSTICAL PERFORMANCE

- .1 The casing shall have been tested for acoustical performance by an independent laboratory that is accredited. Manufacturers shall submit sound data in compliance with the following:
- .2 Test methods and facilities used to establish sound transmission loss values shall conform explicitly with the ASTM designation E90-85 and E413-73.

.3 Sound Transmission Loss DB ASTM E-90 & E413-73

	1	2	3	4	5	6	7	8	
2" wall	18	19	27	33	43	52	52	52	STC=37
4" wall	20	20	28	41	51	56	55	57	STC=40

- .4 Test methods and facilities used to establish sound absorption values shall conform explicitly with the requirements of the ASTM Standard Test Method for Sound Absorption Coefficients by the Reverberation Method: ASTM C423-84A and E795-83.

Sound Absorption ASTM C423-84A & E795-83

	1	2	3	4	5	6	7	8	
2" wall	.10	.23	.75	1.08	1.05	.99	.97	.95	STC=37
4" wall	.40	.65	1.38	1.28	1.09	1.05	1.02	1.02	STC=40

2.5 CASING

- .1 Walls and roofs including the wall separating the supply air return/exhaust airstreams shall be constructed of 16 gauge galvanized steel 2" thick acoustic thermal panels. The inner liner shall be 22 gauge solid galvanized steel, for supply air stream and 22 gauge solid 304SS for exhaust air stream. Insulation shall be 2" thick 4.0 lb. density mineral fiber. Provide neoprene liner to seal insulation in sections with perforated panels. All permanently joined flanged panel surfaces shall be sealed with an individual strip of 1/8" X 3/8" tape sealer. Wall (and roof) seams shall be turned inward to provide a clean flush exterior finish. All panel seams shall be sealed during assembly to produce an airtight unit.
- .2 Outdoor units shall have roof panels broken outward to provide a lapped joint watertight seal. Outdoor roofs shall be sloped a minimum of 5/8" away from the access side.

- .3 On outdoor units, screws and other similar fastening devices shall not penetrate the roof deck or the top of standing seems.

2.6 INSULATION

- .1 All insulation used in air handling unit walls, roof and base shall have a Flame spread rating of less than 25 and a Smoke Developed rating of less than 50 per ASTM E84 and UL 723 and Can/ULC S102-M88.
- .2 Insulation shall meet NFPA 90A and 90B.

2.7 STRUCTURAL BASE CONSTRUCTION

- .1 Units shall be constructed from a minimum C6x8.2 lb./sq.ft. channel structural steel perimeter base, with intermediate tubular steel supports. Perimeter structural steel base shall be designed to directly support the weight of the walls. Intermediate tubular structural steel and channel iron shall support the weight of all internal components (i.e. fans, coils, enthalpy wheels, etc.). Structural steel base shall be designed so that it can be point loaded or set on an unlevel surface and shimmed by the contractor within 2 foot spans without deflecting more than ¼ inch. The structural steel base shall be either I-beam construction or C-channel (not box channel) so that the base will shed all water. Base shall be provided with lifting lugs, minimum four (4) per shipping split. Formed metal bases formed from sheet metal will not be acceptable. Base shall prevent wall panel joints from separating during lifting, transportation and rigging.
- .2 Lifting lugs shall be located and engineered to properly support the loads within. Manufacturers shall provide a load point calculation along with detailed lifting lug information as part of the shop drawing package.
- .3 A 0.12" thick aluminum checker plate floor shall be installed on the base. Floor seams shall be continuously welded providing a completely flat unit floor. Standing seems will not be accepted in any section. Refer to specification item **2.19** for optional factory flood testing. A 1-1/2" perimeter collar shall be provided to ensure the unit is internally watertight. The collar shall be alternately screwed down and tack welded to the unit base on one (1) foot centers. Caulk joint to be watertight.
- .4 The base shall be insulated with 3" thick, 1-1/2 lb. density fibreglass insulation and sheeted with a 22 gauge galvanized steel liner. The base liner shall be broken, tack welded and sealed for rigidity and vapour barrier integrity.

2.8 ACCESS DOORS

- .1 Access door construction and thickness shall match the rest of the unit casing. Corners shall be welded for rigidity. Spot welding of corner seems will not be accepted. 4.0 lb. density insulation shall be sandwiched between the outer and inner skins. A 10" round (double pane) tempered glass window shall be provided in each door.

- .2 Provide Two chrome plated "Ventlok" Model #310 high pressure latches operable from either side of the door. Hinges shall be continuous piano type stainless steel. Door openings shall be fully gasketed with continuous 1/2" closed cell hollow round black gasket with a metal encapsulated reinforced backing that mechanically fastens to the door opening perimeter. Door frames shall be framed from 16 gauge galvanized steel with the outside of the door flush to the unit. Minimum door width shall be as shown on the plans but in no case shall an access door be less than 18". Door height shall be the maximum permitted by the height of the unit up to 72".
- .3 Doors shall open against positive pressure.

2.9 FANS

- .1 All fans shall be tested in accordance with AMCA Standards 210-70 and 310 Test Codes for Air Moving Devices. Backward inclined fans shall bear the AMCA sticker for both air and sound performance.
- .2 Fan Wheels and Shafts: Provide air foil blades on all fan wheels. Provide solid shafts keyed to the fan wheel. Coat fan shaft with rust inhibitor. Hollow shafts will not be acceptable.
- .3 Fan bearings shall be self-aligning pillow block, grease lubricated, extra heavy-duty anti-friction ball or spherical roller type selected for an L10 life of 200,000 hours at design operating conditions.
- .4 Fan and motor shall be mounted on an all welded, structural steel, prime coated internal isolation base. The outlet of the fan shall be separated from the unit casing by means of a factory installed flexible connection. The internally mounted motor shall be provided on a slide rail base to allow proper adjustment of belt tension.
- .5 Provide an OSHA approved fully enclosed metal belt guard having side of galvanized steel and expanded metal face. Belt guard shall be sized to allow either sheave to be increased by two sizes.
- .6 Provide fixed pitch sheaves rated at 150% of motor nameplate H.P. On air handling units with variable speed drives, mount the VSD on the unit. Factory wire between the VSD and fan motors. Ensure all casing penetrations are sealed to be air tight. Provide a terminal block within the VSD for field termination of line side wiring.
- .7 Provide plenum fan inlets on the fan wall and air outlets from the casing with a smooth bellmouth fitting with radius to match casing thickness, and free of protruding structural members and flanges.
- .8 Plenum fan assembly must have an enclosed safety screen as per OSHA Standards.
- .9 Unit shall be complete with top exhaust air connection for a field installed stack to ensure discharge at greater than 10ft above the roof level and minimum 3000fpm velocity. Stack shall be field supplied and installed by others.

2.10 MOTORS

- .1 Motors shall be designed for severe duty in accordance with IEEE 841 standards and shall meet NEMA MG1 Part 31. Motors shall be operable at 575Volts, 60 Hz, 3-phase.
- .2 Motor enclosure shall be totally enclosed fan cooled and rated to IP55. A non-metallic cooling fan shall be provided. Frame, end bells and fan cowl shall be manufactured of heavy duty cast iron. The end plates shall be sealed to the frame joints. Enclosure shall be epoxy coated and rated for ASTM B117-90 96 hour salt spray test.
- .3 Motor windings shall have class F insulation with class B temperature rise ratings. Windings shall be 200C inverter spike resistant wire. Motor windings shall withstand 2000V transients. Motor service factor shall be 1.15 on sine wave power and 1.0 on VFD power.
- .4 Bearings shall be re-greasable without disassembly and provide for the elimination of purged grease. Bearing life shall be a minimum of L10 at 50000 hours. Bearing seals shall be Inpro or equivalent.
- .5 Motors shall be balanced to less than 0.08 inches per second (filter out) and the vibration test data shall be shipped with the motor.
- .6 Nameplates shall be stainless steel and contain both NEMA data and bearing data.
- .7 Motors used with variable frequency drives shall be provided with a brush system to electrically ground the shaft and discharge any induced voltage on the motor shaft, with a direct path to ground.
- .8 Motor shall be provided with a 5 year warranty.
- .9 Exhaust fan motor shall be explosion proof and mounted out of the airstream as arrangement-4.
- .10 Acceptable motor manufacturers are Reliance-Baldor, US Motors, and TECO-Westinghouse.

2.11 VIBRATION ISOLATION

- .1 An integral all weld steel vibration isolation base shall be provided for the fan and motor.
- .2 Provide open spring mounts with iso stiff springs, sound deadening pads and leveling bolts.
- .3 Horizontal stiffness shall be equal to vertical stiffness.
- .4 Spring deflection shall be 2".
- .5 Isolators shall have earthquake restraints. Upon request, the unit manufacturer shall submit a restraint detail certified by a professional engineer.

2.12 PREFILTERS

- .1 Prefilters shall be 2"-50mm Camfil-Farr 30/30, medium efficiency MERV 8A, pleated, disposable type. The filter shall be listed by Underwriters Laboratories as Class 2.
- .2 Prefilters shall be installed in a prefabricated channel rack.
- .3 Prefilters shall be lift out from upstream access section.

2.13 DRAINS

- .1 Provide 1 1/4" capped floor drain connections on the side of the unit for complete drainability of the base pan for the following sections:
 - 1.1 Fresh Air Plenum

2.14 LIGHTS

- .1 Marine lights with LED bulbs and protective cast metal cage and glass globes complete with duplex receptacles shall be installed on the wall across from the access doors. One (1) switch with an indicator light shall be installed on the exterior of the unit. Factory wire from switch to all lights in EMT conduit with liquid tight connections. At all split sections, provide a one foot long piece of flexible conduit, with the extra wire spooled, for reconnection on site by the installing contractor. Electrical power shall be 120V/1/60.

2.15 FILTER GAUGES

- .1 Provide Dwyer 2000 magnehelic gauges.
- .2 Magnehelic gauges shall be accurate to +/- 2% of full range.
- .3 Provide sensing probes for each gauge.
- .4 Provide one gauge flush mounted into the casing for each filter bank.

2.16 ALUMINUM AIRFOIL DAMPERS

- .1 Aluminum airfoil frames and blades shall be a minimum of 12 gauge extruded aluminum. Blades to be 6" wide single air foil design.
- .2 Frames shall be extruded aluminum channel with grooved inserts for vinyl seals. Standard frames 2" x 4" x 5/8" on linkage side, 1" x 4" x 1" on the other sides.
- .3 Pivot rods shall be 7/16" hexagon extruded aluminum interlocking into blade section. Bearings to be double sealed type with a Celcon inner bearing on a rod within a Polycarbonate outer bearing inserted into frame so that the outer bearing cannot rotate.

- .4 Bearing shall be designed so that there are no metal-to-metal or metal-to-bearing riding surfaces. Interconnecting linkage shall have a separate Celcon bearing to eliminate friction in linkage.
- .5 Blade linkage hardware is to be installed in frame out of airstream. All hardware to be on non-corrosive reinforced material or cadmium plated steel.
- .6 Damper seals shall be designed for minimum air leakage by means of overlapping seals.
- .7 Internal hollows of outdoor and exhaust air dampers shall be insulated with 7/8" thick polyurethane foam with R factor of 5.0 per inch. Blades shall be 100% thermally broken. Frame shall be insulated with polystyrene, R factor of 5.0 per inch.
- .8 Damper blades shall be maximum 40" long per section.
- .9 Dampers greater than 2 sections wide shall be provided with a blade jumper
- .10 Acceptable dampers are: T.A. Morrison "TAMCO series 1000" and T.A. Morrison "TAMCO series 9000" for OA/EA dampers.

2.17 TEST PORTS

- .1 Provide 0.5" diameter test ports for unit air stream testing in each plenum section between each component within the AHU. Test ports shall have a tube that extends between the inside and outside of the unit and a screwed cap on the exterior to allow access. The test ports shall have been flanged on the exterior to allow air seal and shall be flanged on the interior to cover the penetration of the casing.

2.18 HEAT PIPE

- .1 Air-to-air Energy Recovery Heat Pipes to be supplied by Heat Pipe Technologies Inc. to exchange heat/cooling between two air streams for summer and winter operation without changing the physical attitude of the Heat Pipe to accommodate the summer and winter operation. The Heat Pipes shall be inside and integral to the equipment cabinet in a horizontal plane.
- .2 Catalogued or published ratings shall be those obtained from tests carried out by the manufacturer or independent testing agency signifying adherence to codes and standards in force. Provide confirmation of testing.
- .3 Heat pipe manufacturers must have a minimum ten years' experience in building heat pipes and be able to supply a list of installations that have been commissioned for a period of over five years to be considered.
- .4 The tubes shall be copper, of specific design for Heat Pipe application, permanently expanded into the fin collars to form firm, rigid, and complete pressure contacts at all operating conditions. Aluminum tubes will not be allowed.

- .5 The fin surface shall be continuous plate type aluminum fins of specific design to produce maximum heat transfer effectiveness for Heat Pipe applications. Airside pressure loss shall be as given on the schedule. Fin density and the number of rows of tubes shall be as specified.
- .6 Heat transfer fluid shall be selected on the basis of operating temperature and compatibility with tube material and shall be classified as Safety Group A1 in ASHRAE Standard 34-1992. Do not use HCFC based refrigerants.
- .7 Heat Pipe capacities, entering and leaving dry and wet bulb temperatures and face velocity shall be as specified.
- .8 The frames and mounting structure shall be minimum 20 gauge type 304 stainless steel. The supply and exhaust air streams shall be isolated from each other by a foam filled double separating partition. Cross contamination between the air streams is not acceptable.
- .9 Heat Pipe interconnecting piping and circuitry shall be as specified by HPT design. Each circuit shall be individually processed, charged, and hermetically sealed.
- .10 Provide face and bypass dampers to bypass air around the supply side of the Energy Recovery Heat Pipe for freeze protection. Bypass damper shall also be provided on the exhaust side for economizer operation. Dampers shall be as specified elsewhere in this specification.

2.19 FINISH

- .1 Unit shall be finished painted with two components, etch bond primer and finish painted with alkyd enamel, color as selected by Owner. All uncoated steel shall be painted with grey enamel. All metal surfaces shall be prepainted with vinyl wash primer to ensure paint bonds to metal. Outdoor unit shall be finish coated with polyurethane paint. Paint for outdoor units shall be tested to ATSM B117 for 5000hr salt spray endurance.

2.20 AIR LEAKAGE TESTING

- .1 Unit manufacturer shall factory pressure test each air handling unit to ensure the leakage rate of the casing does not exceed 1.0% of the unit air flow at 1.5 times the rated total static pressure for 2" thick casing units. Leakage test shall be performed with VFD and humidifier panels installed.
- .2 Test shall be conducted in accordance with SMACNA duct construction manual. A calibrated orifice shall be used to measure leakage airflow.
- .3 "Double duct" or "side by side" units shall have each duct or side tested independently.

2.21 FLOOD TESTING

- .1 All unit bases shall be flooded to a level of 1.25" after manufacturing to assure no leakage through the floor and the perimeter water barrier. The results of the flood test shall be certified by the manufacturer

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 manufacturers recommendations.
- .2 Install units on a flat surface level within 1/8 inch and of sufficient strength to support the units.
- .3 Provide components furnished as per manufacturer's literature.
- .4 Provide all water piping so water circuits are serviceable, without having to dismantle excessive lengths of pipe.
- .5 Provide valves in water piping upstream and downstream of each coil for isolating the coils for maintenance and to balance and trim the system.
- .6 Provide drain valves and vent cocks to each coil.
- .7 Provide strainers ahead of all pumps and automatic modulating valves.
- .8 Provide certified wiring schematics to the electrical division for the equipment and controls.
- .9 Provide all necessary control wiring as recommended by the manufacturer.
- .10 Provide condensate traps in accordance with manufacturers recommendations.
- .11 Insulate all piping and equipment mounted inside the corridor.

3.3 Unit shall be complete with top exhaust air connection for field supplied and installed stack to ensure discharge at greater than 10ft above the roof level and minimum 3000fpm velocity

3.4 FIELD QUALITY CONTROL

- .1 Tests:
 - .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

3.5 CLEANING

- .1 Proceed in accordance with Section 00 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 00 10 00 – General Instructions.
 - .2 Section 00 15 45 – General Safety Section and Fire Instructions.
 - .3 Section 21 05 01 – Common Work Results- Mechanical
 - .4 Section 21 05 02 – Mechanical Identification
 - .5 Section 23 05 13 – Common Motor Requirements for HVAC
 - .6 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC
 - .7 Section 26 05 00 – Common Work Results- Electrical

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 00 10 00 – General Instructions. Include product characteristics, performance criteria, and limitations.
 - .1 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 00 10 00 – General Instructions.

1.4 QUALITY ASSURANCE

- .1 Health and Safety:
 - .1 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 manufacturer's written instructions and Section 00 10 00 – General Instructions.

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

Part 2 Products

2.1 FAN COIL UNITS

- .1 Cabinet: steel, 1.2 mm thick, ceiling mounting, concealed. Front inlet/ back outlet.
- .2 Refer to Fan Coil Schedule on drawing 6018-M03 for performance specifications of all fan coil units and basis of design.
- .3 Elements: stainless steel sheathed with corrosion protected aluminum fins covering full length of element.
- .4 Blower motors: ECM, single phase.
- .5 Wall mounted thermostats: supplied by BAS contractor.
- .6 Fan delay switch.
- .7 Disconnect switch.
- .8 Fresh air duct adapter.
- .9 Filter: replaceable.
- .10 Assembly fully wired to one outlet location.
- .11 Multiple knockouts for up to 38 mm diameter conduit.
- .12 Acceptable Material: IEC, McQuay, Magic Aire, Williams, Greenheck, United Cool Ai 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 In accordance with manufacturer's instructions
- .2 Hang units.
- .3 Make power and control connections.
- .4 Make piping connections (if applicable)
- .5 Co-ordinate ducting of supply, return and fresh air with Division 23.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

3.4 CLEANING

- .1 Proceed in accordance with Section 00 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

1 REFERENCES

- .1 Perform all work to meet or exceed the requirements of the Canadian Electrical Code, CSA Standard C22.1 - (latest edition).
- .2 Consider CSA Electrical Bulletins in force at time of tender submission, while not identified and specified by number in this Division, to be forming part of related CSA Part II standard.
- .3 Do overhead and underground systems in accordance with CSA C22.3 except where specified otherwise.
- .4 Where requirements of this specification exceed those of above mentioned standards, this specification shall govern.
- .5 Notify the NRC Departmental Representative as soon as possible when requested to connect equipment supplied by NRC which is not CSA approved.
- .6 Refer to Sections 01 10 00 & 01 35 30.

2 PERMITS AND FEES

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

3 START-UP

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

4 INSPECTION AND FEES

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

5 OPERATION & MAINTENANCE (O&M) MANUALS

- .1 O&M manuals to include but not limited to
 - .1 Letter of warranty
 - .2 ESA inspection certificate
 - .3 Fire alarm verification report

- .4 Updated panel schedule c/w circuit breaker size
- .5 Shop drawings
- .6 As-builts
- .7 Load balancing report
- .8 Mechanical equipment start up reports
- .9 Seismic review letter
- .2 Refer to 00 10 00 for additional information.

6 FINISHES

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

7 ACOUSTICAL PERFORMANCE

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

8 EQUIPMENT IDENTIFICATION

- .1 Identify with 3mm (1/8") letter, Brother, P-Touch non-smearing tape, or an alternate approved by the NRC Departmental Representative, all electrical outlets shown on drawings and/or mentioned in the specifications. These are the lighting switches, exit signs, recessed and surface mounted receptacles such as those in offices and service rooms and used to plug in office equipment, telecommunication equipment or small portable tools. Indicate only the source of power (Ex. for a receptacle fed from panel L32 circuit #1: "L32-1").
- .2 P-Touch label to be:
 - .1 Black letters on a white background for normal power circuits.
 - .2 Black letters on a yellow background for emergency power circuits.
 - .3 White letters on a red background for fire alarm device.
- .3 Light fixtures are the only exceptions for electrical equipment identification (except as noted in 8.14 below). They are not to be identified.
- .4 Identify with lamoid nameplates all electrical equipment shown on the drawings and/or mentioned in the specification such as motor control centers, switchgear, splitters, fused switches, isolation switches, motor starting switches, starters, panelboards, transformers, high voltage cables, industrial type receptacles, junction boxes, control panels, etc.,

regardless of whether or not the electrical equipment was furnished under this section of the specification.

- .5 Coordinate names of equipment and systems with other Divisions to ensure that names and numbers match.
- .6 Wording on lamicoïd nameplates to be approved by the NRC Departmental Representative prior to fabrication.
- .7 Provide two sets of lamicoïd nameplates for each piece of equipment; one in English and one in French.
- .8 Lamicoïd nameplates shall identify the equipment, the voltage characteristics and the power source for the equipment. Example: A new 120/240 volt single phase circuit breaker panelboard, L16, is fed from panelboard LD1 circuit 10.

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

PANNEAU L16
120/240 V
ALIMENTE PAR LD1-10
- .9 Provide warning labels for equipment fed from two or more sources - "DANGER MULTIPLE POWER FEED" black letters on a yellow background. These labels are available from NRC's Facilities Maintenance group in building M-19.
- .10 Lamicoïd nameplates shall be rigid lamicoïd, minimum 1.5 mm (1/16") thick with:
 - .1 Black letters engraved on a white background for normal power circuits.
 - .2 Black letters engraved on a yellow background for emergency power circuits.
 - .3 White letters engraved on a red background for fire alarm equipment.
- .11 For all interior lamicoïd nameplates, mount nameplates using two-sided tape.
- .12 For all exterior lamicoïd nameplates, mount nameplates using self-tapping 2.3 mm (3/32") dia. slot head screws - two per nameplate for nameplates under 75 mm (3") in height and a minimum of 4 for larger nameplates. Holes in lamicoïd nameplates to be 3.7 mm (3/16") diameter to allow for expansion of lamicoïd due to exterior conditions.
 - .1 No drilling is to be done on live equipment.
 - .2 Metal filings from drilling are to be vacuumed from the enclosure interiors.
- .13 All lamicoïd nameplates shall have a minimum border of 3 mm (1/8"). Characters shall be 9 mm (3/8") in size unless otherwise specified.
- .14 Identify lighting fixtures which are connected to emergency power with a label "EMERGENCY LIGHTING/ÉCLAIRAGE D'URGENCE", black letters on a yellow background. These labels are available from NRC's Facilities Maintenance group in building M-19.
- .15 Provide neatly typed updated circuit directories in a plastic holder on the inside door of new panelboards.

- .16 Carefully update panelboard circuit directories whenever adding, deleting, or modifying existing circuitry.
- .17 Identify molded case breaker with lamicaid nameplate.

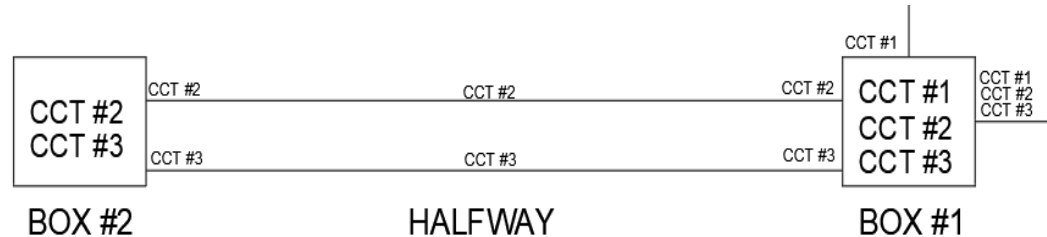
9 WIRING IDENTIFICATION

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

10 CONDUIT AND CABLE IDENTIFICATION

- .1 All new conduits to be factory painted, colour-coded EMT, type as follows:
 - .1 Fire alarm – red conduit
 - .2 Emergency power circuits – yellow conduit
 - .3 Voice/data – blue conduit
 - .4 Gas detection system – purple conduit
 - .5 Building Automation system – orange conduit
 - .6 Other base building low voltage control system – white conduit
 - .7 Security system – green conduit
 - .8 Research center control system – black conduit
- .2 Apply paint to the covers of junction boxes and condulets of existing conduits as follows:
 - .1 Fire alarm – red
 - .2 Emergency power circuits – yellow
 - .3 Voice/data – blue
 - .4 Gas detection system – purple
 - .5 Building Automation system – orange
 - .6 Other base building low voltage control system - white
 - .7 Security system – green
 - .8 Research center control system - black
- .3 For system running with cable, half-lap wrap with dedicated coloured PVC tape to 100 mm width, tape every 5 m and both sides where cable penetrates a wall.
- .4 All other systems to follow site instruction from NRC departmental representative.
- .5 Identify all electrical circuits in every junction box and pull box on the box cover with 9mm letter size P-touch label. Identify all electrical circuits on each conduit end where conduit penetrates a wall ,enclosure ,junction box or pull box , and halfway of each conduit run between walls ,enclosures ,junction boxes or pull boxes with 3mm letter size P-touch label..

- .6 Identify electrical circuit on each cable 250MCM or larger with lamacoid nameplate, or cable 4/0 or smaller with P-touch label, on every splitter, every 30m of each cable run and cable end where cable penetrates a wall, enclosure, junction box or pull box.
- .7 Sample diagram shown as below:



11 MANUFACTURER'S & APPROVALS LABELS

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

12 WARNING SIGNS AND PROTECTION

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

13 LOAD BALANCE

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

14 MOTOR ROTATION

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

15 GROUNDING

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

16 TESTS

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

17 COORDINATION OF PROTECTIVE DEVICES

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

18 WORK ON LIVE EQUIPMENT & PANELS

- .1 NRC requires that work be performed on non-energized equipment, installation, conductors and power panels. For purposes of quotation assume that all work is to be done after normal working hours and that equipment, installation, conductors and power panels are to be de-energized when worked upon.
- .2 Coordinate all shutdowns with the NRC departmental representative. High voltage (more than 1KV) grounding must be provided by certified electrician.

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 Unless 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 Copper compression connectors to CSA C22.2 N0.65 are required sized for conductors
- .2 When used in hazardous area, connectors should be certified for such location in Class, Division and Group.
- .3 For conductors size of 8 AWG or larger, use bolted or compression solderless type connectors.
- .4 Use high temperature connectors and insulation on all connections of high temperature conductors.
- .5 Where connector types are called for on the drawings or in the specification, do not use other types.
- .6 Lugs, terminals, screws used for termination of wiring to be suitable for copper conductors.
- .7 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 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-09, Canadian Electrical Code, Part 1, 21st Edition

PART 2 - PRODUCTS

2.1 SPLITTERS

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Surface Mounted: screw-on flat, turned edge covers

PART 3 - EXECUTION

3.1 SPLITTER INSTALLATION

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Install terminal block as indicated in Type T cabinets.
- .3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1

3.3 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00.
- .2 Identification Labels: size 2 indicating system name, voltage and phase 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 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

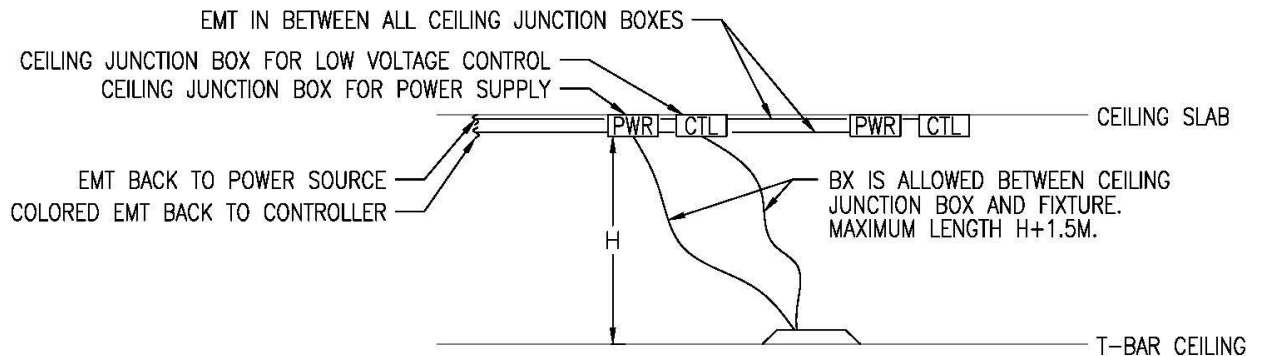
- .1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.
- .2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

Part 2 Products

2.1 RACEWAYS

- .1 General:
 - .1 Unless otherwise noted, all wires to run inside raceways, either in ceiling space, open space or surface mounted.
- .2 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.
- .3 Bushings and Connectors:
 - .1 Insulated type, with the insulation an integral part of the fitting.
- .4 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.
- .5 Pull Cord:
 - .1 Polypropylene cord in empty conduit.
- .6 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).

- .7 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.
- .8 Use AC90 (BX) cable **only** under the following conditions:
 - .1 Wiring from a junction box to a recessed device, such as lighting fixture, sensor, speaker, BAS control device, etc. in suspended ceilings. Cable length not to exceed straight run from junction box to device plus 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 for 120V AC circuits.
 - .6 Sample diagram shown as below:



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 (including Teck cable) 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 10 00.
- .2 Submit stamped engineered drawings for structures supporting transformers on walls or other structures other than the floor.
- .3 Prior to any installation of circuit breakers in either a new or existing installation, Contractor must submit three (3) copies of a certificate of origin, from the manufacturer, duly signed by the factory and the local manufacturer's representative, certifying that all circuit breakers come from this manufacturer, they are new and they meet standards and regulations. These certificates must be submitted to the Departmental Representative for approval.
 - .1 The above applies to all breakers rated above 240V.
 - .2 The above applies to all breakers rated up to 240V and 100A or more.
- .4 A delay in the production of the certificate of origin won't justify any extension of the contract and additional compensation.
- .5 Any work of manufacturing, assembly or installation should begin only after acceptance of the certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate the manufacturer listed on circuit breakers to authenticate all new circuit breakers under the contract at the Contractor's expense.
- .6 In general, the certificate of origin must contain:
 - .1 The name and address of the manufacturer and the person responsible for authentication. The responsible person must sign and date the certificate;
 - .2 The name and address of the licensed dealer and the person of the distributor responsible for the Contractor's account.
 - .3 The name and address of the Contractor and the person responsible for the project.
 - .4 The name and address of the local manufacturer's representative. The local representative must sign and date the certificate.
 - .5 The name and address of the building where circuit breakers will be installed:
 - .1 Project title.
 - .2 End user's reference number.
 - .3 The list of circuit breakers.

1.2 IDENTIFICATION

- .1 Identification as per Section 26 05 00.

Part 2 Products

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 Meet NEMA ST-20 standards for sound level.
- .10 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 match existing panel.

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 05 00 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 22 19, 26 29 03 & 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 10 00.

1.4 IDENTIFICATION

- .1 Identification as per Section 26 05 00.

Part 2 Products

2.1 WIRING DEVICES

- .1 Switches:
 - .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 LED occupancy sensor (wall mounted):
 - .1 120V, suitable for use with installed light fixture.
 - .2 Rated for 600W LED.
 - .3 Can be set to Manual-ON/Automatic-OFF or Auto-ON/Auto-OFF.
 - .4 Adjustable delayed-OFF time.
 - .5 Suitable for use in "3-way" configuration where indicated.
 - .6 Fire year warranty.
 - .7 Standard of acceptance: Hubbell, Leviton, Philips or equivalent approved by NRC Departmental Representative.

- .3 LED occupancy sensor (ceiling mounted):
 - .1 120V, suitable for use with installed light fixture.
 - .2 360° coverage pattern.
 - .3 No minimum load requirements.
 - .4 Adjustable delayed-OFF time.
 - .5 No field calibration or sensitivity adjustments required.
 - .6 Fire year warranty.
 - .7 Standard of acceptance: Philips LRM2377 or equivalent approved by NRC Departmental Representative.
- .4 LED dimmable motion switches:
 - .1 Dimmer with dual technology utilizes PIR/Microphonics detection to control LED fixtures.
 - .2 180° sensor field-of-view.
 - .3 Up to 20' motion detection.
 - .4 Integrated photocell with adaptive daylight harvesting.
 - .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 120V.
 - .8 5 year warranty.
 - .9 Standard of acceptance: Sensorswitch WSX-PDT-D-VLP-WH.
- .5 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.
 - .4 Standard of acceptance: Hubbell, Leviton, Philips or equivalent approved by NRC Departmental Representative.
- .6 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.

- .7 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 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 Baked enamel finish.
 - .1 Metal surfaces of luminaire housing and reflectors finished with high gloss powder coated baked enamel applied after fabrication to give smooth uniform appearance, free from pinholes or defects.

2.2 METAL SURFACES

- .1 Metal surfaces to be minimum 20 gauge steel.

2.3 LIGHT CONTROL DEVICES

- .1 All luminaire lenses to be injection moulded clear virgin acrylic unless otherwise noted.

2.4 LUMINAIRES

- .1 LED
 - .1 Type 1: Track mounted single cell LED provide short or medium throw illumination.
 - .1 120V, LED, suitable for surface or track mounted.
 - .2 5-year warranty.
 - .3 Suitable for dimming
 - .4 Adjustable angle.

- .5 3000k colour temperature, 82 CRI, minimum 2000 lumen output minimum.
- .6 Standard of acceptance: ETC ARCP1.
- .2 Type 2: Track mounted mini LED wash light with zoom optics.
 - .1 120V, LED, suitable for surface or track mounted.
 - .2 5-year warranty.
 - .3 Suitable for dimming
 - .4 9°-78°zoom optics
 - .5 3000k colour temperature, 82 CRI, minimum 1500 lumen output minimum.
 - .6 Standard of acceptance: ETC IRWLZ.
- .3 Type 3: Track mounted LED framing projector light with zoom optics.
 - .1 120V, LED, suitable for surface or track mounted.
 - .2 5-year warranty.
 - .3 Suitable for dimming
 - .4 25°-50°zoom optics
 - .5 3000k colour temperature, 82 CRI, minimum 1000 lumen output minimum.
 - .6 Standard of acceptance: ETC IRFPZ.
- .4 Type 4: Track mounted Mini LED
 - .1 120V, 220-250mm long, LED track light, suitable for surface or track mounting.
 - .2 5-year warranty.
 - .3 Suitable for dimming
 - .4 Die-cast fixture body.
 - .5 3000k colour temperature, minimum 600 lumen output.
 - .6 19°, 26°,36° and 50°interchangeable lens tubes
 - .7 Standard of acceptance: ETC 4ML

2.5 MOUNTING SYSTEM

- .1 Track structure.
 - .1 Aluminum extrusion, can be supported up to 10' centers with a distributed load capacity up to 300lb.
 - .2 100lb maximum point load
 - .3 Anodized black color
 - .4 Pigtail adapters to provide power and data connection for fixture
- .2 Electrical
 - .1 Supports two 120V circuits and data. 2-circuit contains two hots and two neutrals.
 - .2 Supports all feeds and coupler accessories
 - .3 Grounding connection provided through the aluminum tack profile

- .4 DMX/RDM built in; supports up to 32 DMX devices per data run; Supports up to 20RDM devices per data run
- .3 Mechanical
 - .1 6061 T6 aluminum finished in black anodizing
 - .2 Coupler accessories constructed from steel and finished in black powder coat paint
 - .3 Mounts to building structure using standard Unistrut hardware
- .4 Standard of acceptance: ETC DataTrack Backbone

Part 3 Execution

3.1 INSTALLATION

- .1 Supply and install all lighting fixtures complete with lamps, switches, supports, etc., to provide a complete working lighting system.
- .2 Locate and install luminaires as indicated.

3.2 LUMINAIRE SUPPORTS

- .1 Install track system as per manufacturer's instruction. Provide Unistrut to attach to structural ceiling. Provide additional support when hang from T-bar ceiling.
- .2 Provide all required parts and accessories to form a complete system
- .3 Confirm mounting height on site. Coordinate installation with other disciplines to avoid conflict.

3.3 WIRING

- .1 Connect luminaires to lighting circuits directly for exit fixtures and exterior floodlights.

3.4 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 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 00 10 00.

Part 2 Products

2.1 EXIT LIGHTS

- .1 New
 - .1 Housing: Metal construction using Canadian cold-rolled steel. Frame and back plate shall each be of a one-piece construction.
 - .2 Faceplate(s) shall be constructed of robust clear poly-carbonate panels with an opaque border colored factory-white.
 - .3 Universal pictogram sign. Two pictogram films per face, for direction selection.
 - .4 Long-life white LED light source. Consumes less than 2.5W in AC mode and 1W in DC mode.
 - .5 Meets or exceeds CSA 22.2 No.141-10 standard for pictogram exit signs.
 - .6 Two-wire universal AC input: 120 to 347V. Two-wire standard DC input: 6 to 24Vdc.
 - .7 Universal mounting: end, wall or ceiling.
 - .8 Standard of acceptance: Thomas&Betts LS series. LS1WU for single face and LS2WU for double face.
- .2 Existing
 - .1 Housing: one piece extruded aluminum with aluminum grey baked epoxy finish.
 - .2 Face plates:
 - .1 Extruded 2.5 mm (0.1") thick aluminum complete with knock-out arrows.
 - .2 Single and double face (refer to drawings).
 - .3 Letters: 114 mm (6") high reading EXIT and SORTIE.
 - .4 Mounting: universal-surface-end and ceiling with canopy.

- .5 Downlight: prismatic plastic.
- .6 Lamp: LED 120VAC
- .7 To meet CAN/CSA C860-01

Part 3 Execution

3.1 EXIT LUMINAIRES

- .1 Connect fixtures to emergency power circuits as indicated.
- .2 Ensure that the exit light circuit breaker is locked in the "ON" position.

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.
- .2 Treasury Board Standard TBITS 6.9 “Telecommunications Wiring Systems in Government-owned and leased buildings’.

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 Cable tray to be basket type, aluminum, class C.
- .3 Tele-Power poles/Jiffy poles: 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 to a point indicated on drawings.
- .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) and ANSI/TIA/EIA-607.

3.2 CABLE TRAY SYSTEM

- .1 Install complete cable tray system.
- .2 Use 10mm threaded rod for support. Attached cable tray directly to building structure, not any other equipment or ductwork.
- .3 Cable tray system installation shall comply with ANSI/TIA/EIA 569-D.
- .4 Thoroughly bonding the cable tray as per ANSI/TIA/EIA-607. Provide dedicated bonding wire from cable tray system to building communication grounding system.

3.3 MOUNTING

- .1 Recess mount wall outlets unless otherwise indicated. Mount wall outlets to height specified in section 26 27 26 or as indicated.

3.4 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.

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 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.

2.2 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 trouble and alarm zone wiring to be class "A" using #16 TEW colour coded stranded copper wire, and in accordance with manufacturer's requirements. Connect two red and two zone colour wires to each device. If the colour coding is not given on drawings, coding will be provided after contract is awarded.
- .6 Run all four zone or signal circuit wires in the same conduit (i.e. Do not install only two of the four zone wires in a conduit - all four zone wires must be in each conduit.)

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.

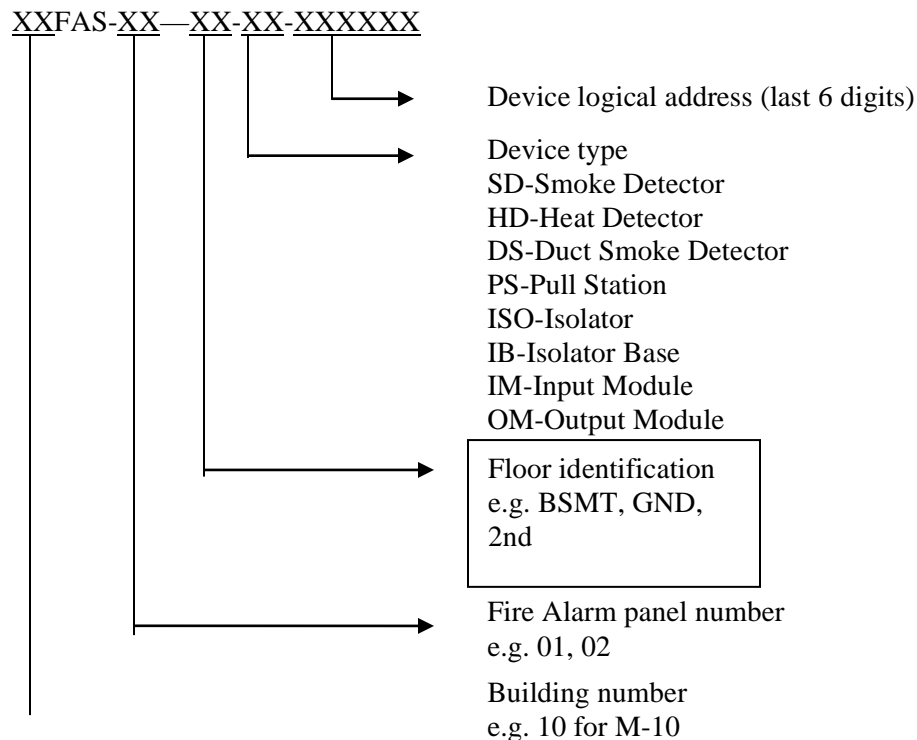
- .7 Leave 6 inch loops of wire in all junction boxes.
- .8 For new installations, no splicing of wires is to be made.
- .9 For renovations, splices may be made in junction boxes other than those at heat detectors after receiving approval of the NRC Departmental Representative. All splices must be soldered 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 lamicoid 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.
- .2 Conventional (non-addressable) devices:
 - .1 Integrate any new zones installed as part of this project into the monitoring system at building M-1. This is to be done by factory trained technician.
 - .2 Remove from the monitoring system at building M-1 any zones removed as part of this project.
 - .3 Make appropriate changes to the monitoring system at building M-1 to reflect any zone location changes as appropriate.
 - .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 CS2.1.2 plus an additional amount that is equal to 10% of the contract amount referred to in the Articles of Agreement.
- 2.2 A performance bond and a labour and material payment bond referred to in CS2.1 shall be in a form and be issued by a bonding or surety company that is approved by Her Majesty.
- 2.3 The amount of a security deposit referred to in CS2.1.2 shall not exceed \$250,000 regardless of the contract amount referred to in the Articles of Agreement.
- 2.4 A security deposit referred to in CS2.1.2 and CS2.1.3 shall be in the form of
 - 2.4.1 a bill of exchange made payable to the Receiver General of Canada and certified by an approved financial institution or drawn by an approved financial institution on itself, or
 - 2.4.2 bonds of or unconditionally guaranteed as to principal and interest by the Government of Canada.
- 2.5 For the purposes of CS2.4
 - 2.5.1 a bill of exchange is an unconditional order in writing signed by the Contractor and addressed to an approved financial institution, requiring the said institution to pay, on demand, at a fixed or determinable future time a sum certain of money to, or to the order



of, the Receiver General for Canada, and

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



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

**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
3. a) Subcontract Number / Numéro du contrat de sous-traitance	3. b) Name and Address of Subcontractor / Nom et adresse du sous-traitant

4. Brief Description of Work / Brève description du travail

5. a) Will the supplier require access to Controlled Goods?
Le fournisseur aura-t-il accès à des marchandises contrôlées? No / Non Yes / Oui

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

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

6. a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets?
Le fournisseur ainsi que les employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS?
(Specify the level of access using the chart in Question 7. c)
(Préciser le niveau d'accès en utilisant le tableau qui se trouve à la question 7. c) No / Non Yes / Oui

6. b) Will the supplier and its employees (e.g. cleaners, maintenance personnel) require access to restricted access areas? No access to PROTECTED and/or CLASSIFIED information or assets is permitted.
Le fournisseur et ses employés (p. ex. nettoyeurs, personnel d'entretien) auront-ils accès à des zones d'accès restreintes? L'accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS n'est pas autorisé. No / Non Yes / Oui

6. c) Is this a commercial courier or delivery requirement with **no** overnight storage?
S'agit-il d'un contrat de messagerie ou de livraison commerciale **sans** entreposage de nuit? No / Non Yes / Oui

7. a) Indicate the type of information that the supplier will be required to access / Indiquer le type d'information auquel le fournisseur devra avoir accès

Canada <input type="checkbox"/>	NATO / OTAN <input type="checkbox"/>	Foreign / Étranger <input type="checkbox"/>
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7. b) Release restrictions / Restrictions relatives à la diffusion

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"/> Specify country(ies): / Préciser le(s) pays :	All NATO countries Tous les pays de l'OTAN <input type="checkbox"/> Restricted to: / Limité à : <input type="checkbox"/> Specify country(ies): / Préciser le(s) pays :	No release restrictions Aucune restriction relative à la diffusion <input type="checkbox"/> Restricted to: / Limité à : <input type="checkbox"/> Specify country(ies): / Préciser le(s) pays :
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7. c) Level of information / Niveau d'information

PROTECTED A PROTÉGÉ A <input type="checkbox"/> PROTECTED B PROTÉGÉ B <input type="checkbox"/> PROTECTED C PROTÉGÉ C <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 UNCLASSIFIED NATO NON CLASSIFIÉ <input type="checkbox"/> NATO RESTRICTED NATO DIFFUSION RESTREINTE <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"/>	PROTECTED A PROTÉGÉ A <input type="checkbox"/> PROTECTED B PROTÉGÉ B <input type="checkbox"/> PROTECTED C PROTÉGÉ C <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"/>
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Security Classification / Classification de sécurité
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Contract Number / Numéro du contrat
Security Classification / Classification de sécurité

PART A (continued) / PARTIE A (suite)

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets? No Yes
 Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS? Non 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? No Yes
 Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate? Non 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 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 EMBLEMES			

Special comments:
 Commentaires spéciaux : _____

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

10. b) May unscreened personnel be used for portions of the work? No Yes
 Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail? Non Oui
 If Yes, will unscreened personnel be escorted?
 Dans l'affirmative, le personnel en question sera-t-il escorté? No Yes
 Non 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? No Yes
 Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS? Non Oui

11. b) Will the supplier be required to safeguard COMSEC information or assets? No Yes
 Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC? Non 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? No Yes
 Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ? Non 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? No Yes
 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? Non Oui

11. e) Will there be an electronic link between the supplier's IT systems and the government department or agency? No Yes
 Disposera-t-on d'un lien électronique entre le système informatique du fournisseur et celui du ministère ou de l'agence gouvernementale? Non Oui



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? No Yes
 La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE? Non Oui

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

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

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



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

PART D - AUTHORIZATION / PARTIE D - AUTORISATION

13. Organization Project Authority / Chargé de projet de l'organisme			
Name (print) - Nom (en lettres moulées)		Title - Titre	Signature
Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
14. Organization Security Authority / Responsable de la sécurité de l'organisme			
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
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 type="checkbox"/> No / Non <input type="checkbox"/> Yes / Oui
16. Procurement Officer / Agent d'approvisionnement			
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
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

Security Classification / Classification de sécurité
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Instructions for completion of a Security Requirements Check List (SRCL)

The instruction sheet should remain attached until Block #17 has been completed.

GENERAL - PROCESSING THIS FORM

The project authority shall arrange to complete this form.

The organization security officer shall review and approve the security requirements identified in the form, in cooperation with the project authority.

The contracting security authority is the organization responsible for ensuring that the suppliers are compliant with the security requirements identified in the SRCL.

All requisitions and subsequent tender / contractual documents including subcontracts that contain PROTECTED and/or CLASSIFIED requirements must be accompanied by a completed SRCL.

It is important to identify the level of PROTECTED information or assets as Level "A," "B" or "C," when applicable; however, certain types of information may only be identified as "PROTECTED". No information pertaining to a PROTECTED and/or CLASSIFIED government contract may be released by suppliers, without prior written approval of the individual identified in Block 17 of this form.

The classification assigned to a particular stage in the contractual process does not mean that everything applicable to that stage is to be given the same classification. Every item shall be PROTECTED and/or CLASSIFIED according to its own content. If a supplier is in doubt as to the actual level to be assigned, they should consult with the individual identified in Block 17 of this form.

PART A - CONTRACT INFORMATION

Contract Number (top of the form)

This number must be the same as that found on the requisition and should be the one used when issuing an RFP or contract. This is a unique number (i.e. no two requirements will have the same number). A new SRCL must be used for each new requirement or requisition (e.g. new contract number, new SRCL, new signatures).

1. Originating Government Department or Organization

Enter the department or client organization name or the prime contractor name for which the work is being performed.

2. Directorate / Branch

This block is used to further identify the area within the department or organization for which the work will be conducted.

3. a) Subcontract Number

If applicable, this number corresponds to the number generated by the Prime Contractor to manage the work with its subcontractor.

b) Name and Address of Subcontractor

Indicate the full name and address of the Subcontractor if applicable.

4. Brief Description of Work

Provide a brief explanation of the nature of the requirement or work to be performed.

5. a) Will the supplier require access to Controlled Goods?

*The Defence Production Act (DPA) defines "Controlled Goods" as certain goods listed in the Export Control List, a regulation made pursuant to the *Export and Import Permits Act* (EIPA). Suppliers who examine, possess, or transfer Controlled Goods within Canada must register in the Controlled Goods Directorate or be exempt from registration. More information may be found at www.cgd.gc.ca.*

b) Will the supplier require access to unclassified military technical data subject to the provisions of the Technical Data Control Regulations?

The prime contractor and any subcontractors must be certified under the U.S./Canada Joint Certification Program if the work involves access to unclassified military data subject to the provisions of the Technical Data Control Regulations. More information may be found at www.dlis.dla.mil/jcp.

6. Indicate the type of access required

Identify the nature of the work to be performed for this requirement. The user is to select one of the following types:

a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets?

The supplier would select this option if they require access to PROTECTED and/or CLASSIFIED information or assets to perform the duties of the requirement.

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.

The supplier would select this option if they require regular access to government premises or a secure work site only. The supplier will not have access to PROTECTED and/or CLASSIFIED information or assets under this option.

c) Is this a commercial courier or delivery requirement with no overnight storage?

The supplier would select this option if there is a commercial courier or delivery requirement. The supplier will not be allowed to keep a package overnight. The package must be returned if it cannot be delivered.

7. Type of information / Release restrictions / Level of information

Identify the type(s) of information that the supplier may require access to, list any possible release restrictions, and if applicable, provide the level(s) of the information. The user can make multiple selections based on the nature of the work to be performed.

Departments must process SRCLs through PWGSC where:

- contracts that afford access to PROTECTED and/or CLASSIFIED foreign government information and assets;
- contracts that afford foreign contractors access to PROTECTED and/or CLASSIFIED Canadian government information and assets; or
- contracts that afford foreign or Canadian contractors access to PROTECTED and/or CLASSIFIED information and assets as defined in the documents entitled Identifying INFOSEC and INFOSEC Release.

a) Indicate the type of information that the supplier will be required to access

Canadian government information and/or assets

If Canadian information and/or assets are identified, the supplier will have access to PROTECTED and/or CLASSIFIED information and/or assets that are owned by the Canadian government.

NATO information and/or assets

If NATO information and/or assets are identified, this indicates that as part of this requirement, the supplier will have access to PROTECTED and/or CLASSIFIED information and/or assets that are owned by NATO governments. NATO information and/or assets are developed and/or owned by NATO countries and are not to be divulged to any country that is not a NATO member nation. Persons dealing with NATO information and/or assets must hold a NATO security clearance and have the required need-to-know.

Requirements involving CLASSIFIED NATO information must be awarded by PWGSC. PWGSC / CIISD is the Designated Security Authority for industrial security matters in Canada.

Foreign government information and/or assets

If foreign information and/or assets are identified, this requirement will allow access to information and/or assets owned by a country other than Canada.

b) Release restrictions

If **Not Releasable** is selected, this indicates that the information and/or assets are for **Canadian Eyes Only (CEO)**. Only Canadian suppliers based in Canada can bid on this type of requirement. NOTE: If Canadian information and/or assets coexists with CEO information and/or assets, the CEO information and/or assets must be stamped **Canadian Eyes Only (CEO)**.

If **No Release Restrictions** is selected, this indicates that access to the information and/or assets are not subject to any restrictions.

If **ALL NATO countries** is selected, bidders for this requirement must be from NATO member countries only.

NOTE: There may be multiple release restrictions associated with a requirement depending on the nature of the work to be performed. In these instances, a security guide should be added to the SRCL clarifying these restrictions. The security guide is normally generated by the organization's project authority and/or security authority.

c) Level of information

Using the following chart, indicate the appropriate level of access to information/assets the supplier must have to perform the duties of the requirement.

PROTECTED	CLASSIFIED	NATO
PROTECTED A	CONFIDENTIAL	NATO UNCLASSIFIED
PROTECTED B	SECRET	NATO RESTRICTED
PROTECTED C	TOP SECRET	NATO CONFIDENTIAL
	TOP SECRET (SIGINT)	NATO SECRET
		COSMIC TOP SECRET

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets?

If Yes, the supplier personnel requiring access to COMSEC information or assets must receive a COMSEC briefing. The briefing will be given to the "holder" of the COMSEC information or assets. In the case of a "personnel assigned" type of contract, the customer department will give the briefing. When the supplier is required to receive and store COMSEC information or assets on the supplier's premises, the supplier's COMSEC Custodian will give the COMSEC briefings to the employees requiring access to COMSEC information or assets. If Yes, the Level of sensitivity must be indicated.

9. Will the supplier require access to extremely sensitive INFOSEC information or assets?

If Yes, the supplier must provide the Short Title of the material and the Document Number. Access to extremely sensitive INFOSEC information or assets will require that the supplier undergo a Foreign Ownership Control or Influence (FOCI) evaluation by CIISD.

PART B - PERSONNEL (SUPPLIER)

10. a) Personnel security screening level required

Identify the screening level required for access to the information/assets or client facility. More than one level may be identified depending on the nature of the work. Please note that Site Access screenings are granted for access to specific sites under prior arrangement with the Treasury Board of Canada Secretariat. A Site Access screening only applies to individuals, and it is not linked to any other screening level that may be granted to individuals or organizations.

RELIABILITY STATUS	CONFIDENTIAL	SECRET
TOP SECRET	TOP SECRET (SIGINT)	NATO CONFIDENTIAL
NATO SECRET	COSMIC TOP SECRET	SITE ACCESS

If multiple levels of screening are identified, a Security Classification Guide must be provided.

b) May unscreened personnel be used for portions of the work?

Indicating Yes means that portions of the work are not PROTECTED and/or CLASSIFIED and may be performed outside a secure environment by unscreened personnel. The following question must be answered if unscreened personnel will be used:

Will unscreened personnel be escorted?

If No, unscreened personnel may not be allowed access to sensitive work sites and must not have access to PROTECTED and/or CLASSIFIED information and/or assets.

If Yes, unscreened personnel must be escorted by an individual who is cleared to the required level of security in order to ensure there will be no access to PROTECTED and/or CLASSIFIED information and/or assets at the work site.

PART C - SAFEGUARDS (SUPPLIER)

11. INFORMATION / ASSETS

a) Will the supplier be required to receive and store PROTECTED and/or CLASSIFIED information and/or assets on its site or premises?

If Yes, specify the security level of the documents and/or equipment that the supplier will be required to safeguard at their own site or premises using the summary chart.

b) Will the supplier be required to safeguard COMSEC information or assets?

If Yes, specify the security level of COMSEC information or assets that the supplier will be required to safeguard at their own site or premises using the summary chart.

PRODUCTION

c) Will the production (manufacture, repair and/or modification) of PROTECTED and/or CLASSIFIED material and/or equipment occur at the supplier's site or premises?

Using the summary chart, specify the security level of material and/or equipment that the supplier manufactured, repaired and/or modified and will be required to safeguard at their own site or premises.

INFORMATION TECHNOLOGY (IT)

d) Will the supplier be required to use its IT systems to electronically process and/or produce or store PROTECTED and/or CLASSIFIED information and/or data?

If Yes, specify the security level in the summary chart. This block details the information and/or data that will be electronically processed or produced and stored on a computer system. The client department and/or organization will be required to specify the IT security requirements for this procurement in a separate technical document. The supplier must also direct their attention to the following document: Treasury Board of Canada Secretariat - Operational Security Standard: Management of Information Technology Security (MITS).

e) Will there be an electronic link between the supplier’s IT systems and the government department or agency?

If Yes, the supplier must have their IT system(s) approved. The Client Department must also provide the Connectivity Criteria detailing the conditions and the level of access for the electronic link (usually not higher than PROTECTED B level).

SUMMARY CHART

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.

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

PROTECTED	CLASSIFIED	NATO	COMSEC
PROTECTED A	CONFIDENTIAL	NATO RESTRICTED	PROTECTED A
PROTECTED B	SECRET	NATO CONFIDENTIAL	PROTECTED B
PROTECTED C	TOP SECRET	NATO SECRET	PROTECTED C
	TOP SECRET (SIGINT)	COSMIC TOP SECRET	CONFIDENTIAL
			SECRET
			TOP SECRET

12. a) Is the description of the work contained within this SRCL PROTECTED and/or CLASSIFIED?

If Yes, classify this form by annotating the top and bottom in the area entitled “Security Classification”.

b) Will the documentation attached to this SRCL be PROTECTED and/or CLASSIFIED?

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).

PART D - AUTHORIZATION

13. Organization Project Authority

This block is to be completed and signed by the appropriate project authority within the client department or organization (e.g. the person responsible for this project or the person who has knowledge of the requirement at the client department or organization). This person may on occasion be contacted to clarify information on the form.

14. Organization Security Authority

This block is to be signed by the Departmental Security Officer (DSO) (or delegate) of the department identified in Block 1, or the security official of the prime contractor.

15. Are there additional instructions (e.g. Security Guide, Security Classification Guide) attached?

A Security Guide or Security Classification Guide is used in conjunction with the SRCL to identify additional security requirements which do not appear in the SRCL, and/or to offer clarification to specific areas of the SRCL.

16. Procurement Officer

This block is to be signed by the procurement officer acting as the contract or subcontract manager.

17. Contracting Security Authority

This block is to be signed by the Contract Security Official. Where PWGSC is the Contract Security Authority, Canadian and International Industrial Security Directorate (CIISD) will complete this block.

Instructions pour établir la Liste de vérification des exigences relatives à la sécurité (LVERS)

La feuille d'instructions devrait rester jointe au formulaire jusqu'à ce que la case 17 ait été remplie.

GÉNÉRALITÉS - TRAITEMENT DU PRÉSENT FORMULAIRE

Le responsable du projet doit faire remplir ce formulaire.

L'agent de sécurité de l'organisation doit revoir et approuver les exigences de sécurité qui figurent dans le formulaire, en collaboration avec le responsable du projet.

Le responsable de la sécurité des marchés est le responsable chargé de voir à ce que les fournisseurs se conforment aux exigences de sécurité mentionnées dans la LVERS.

Toutes les demandes d'achat ainsi que tous les appels d'offres et les documents contractuels subséquents, y compris les contrats de sous-traitance, qui comprennent des exigences relatives à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS doivent être accompagnés d'une LVERS dûment remplie.

Il importe d'indiquer si les renseignements ou les biens PROTÉGÉS sont de niveau A, B ou C, le cas échéant; cependant, certains types de renseignements peuvent être indiqués par la mention « PROTÉGÉ » seulement. Aucun renseignement relatif à un contrat gouvernemental PROTÉGÉ ou CLASSIFIÉ ne peut être divulgué par les fournisseurs sans l'approbation écrite préalable de la personne dont le nom figure à la case 17 de ce formulaire.

La classification assignée à un stade particulier du processus contractuel ne signifie pas que tout ce qui se rapporte à ce stade doit recevoir la même classification. Chaque article doit être PROTÉGÉ et/ou CLASSIFIÉ selon sa propre nature. Si un fournisseur ne sait pas quel niveau de classification assigner, il doit consulter la personne dont le nom figure à la case 17 de ce formulaire.

PARTIE A - INFORMATION CONTRACTUELLE

Numéro du contrat (au haut du formulaire)

Ce numéro doit être le même que celui utilisé sur la demande d'achat et services et devrait être celui utilisé dans la DDP ou dans le contrat. Il s'agit d'un numéro unique (c.-à-d. que le même numéro ne sera pas attribué à deux besoins distincts). Une nouvelle LVERS doit être utilisée pour chaque nouveau besoin ou demande (p. ex. un nouveau numéro de contrat, une nouvelle LVERS, de nouvelles signatures).

1. Ministère ou organisme gouvernemental d'origine

Inscrire le nom du ministère ou de l'organisme client ou le nom de l'entrepreneur principal pour qui les travaux sont effectués.

2. Direction générale ou Direction

Cette case peut servir à fournir plus de détails quant à la section du ministère ou de l'organisme pour qui les travaux sont effectués.

3. a) Numéro du contrat de sous-traitance

S'il y a lieu, ce numéro correspond au numéro généré par l'entrepreneur principal pour gérer le travail avec son sous-traitant.

b) Nom et adresse du sous-traitant

Indiquer le nom et l'adresse au complet du sous-traitant, s'il y a lieu.

4. Brève description du travail

Donner un bref aperçu du besoin ou du travail à exécuter.

5. a) Le fournisseur aura-t-il accès à des marchandises contrôlées?

La *Loi sur la production de défense* (LPD) définit « marchandises contrôlées » comme désignant certains biens énumérés dans la Liste des marchandises d'exportation contrôlée, un règlement établi en vertu de la *Loi sur les licences d'exportation et d'importation* (LLEI). Les fournisseurs qui examinent, possèdent ou transfèrent des marchandises contrôlées à l'intérieur du Canada doivent s'inscrire à la Direction des marchandises contrôlées ou être exemptés de l'inscription. On trouvera plus d'information à l'adresse www.cgp.gc.ca.

b) 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?

L'entrepreneur et tout sous-traitant doivent être accrédités en vertu du Programme mixte d'agrément Etats-Unis / Canada si le travail comporte l'accès à des données militaires non classifiées qui sont assujetties aux dispositions du Règlement sur le contrôle des données techniques. On trouvera plus d'information à l'adresse www.dlis.dla.mil/jcp/.

6. Indiquer le type d'accès requis

Indiquer la nature du travail à exécuter pour répondre à ce besoin. L'utilisateur doit choisir un des types suivants :

a) Le fournisseur et ses employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS?

Le fournisseur choisit cette option s'il doit avoir accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS pour accomplir le travail requis.

b) 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.

Le fournisseur choisit cette option seulement s'il doit avoir accès régulièrement aux locaux du gouvernement ou à un lieu de travail protégé. Le fournisseur n'aura pas accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS en vertu de cette option.

c) S'agit-il d'un contrat de messagerie ou de livraison commerciale sans entreposage de nuit?

Le fournisseur choisit cette option s'il y a nécessité de recourir à un service de messagerie ou de livraison commerciale. Le fournisseur ne sera pas autorisé à garder un colis pendant la nuit. Le colis doit être retourné s'il ne peut pas être livré.

7. Type d'information / Restrictions relatives à la diffusion / Niveau d'information

Indiquer le ou les types d'information auxquels le fournisseur peut devoir avoir accès, énumérer toutes les restrictions possibles relatives à la diffusion, et, s'il y a lieu, indiquer le ou les niveaux d'information. L'utilisateur peut faire plusieurs choix selon la nature du travail à exécuter.

Les ministères doivent soumettre la LVERS à TPSGC lorsque:

- les marchés prévoient l'accès aux renseignements et aux biens de nature PROTÉGÉS et/ou CLASSIFIÉS étrangers ;
- les marchés prévoient aux entrepreneurs étrangers l'accès aux renseignements et aux biens de nature PROTÉGÉS et/ou CLASSIFIÉS canadiens; ou
- les marchés prévoient aux entrepreneurs étrangers ou canadiens l'accès aux renseignements et aux biens de nature PROTÉGÉS et/ou CLASSIFIÉS tels que définis dans les documents intitulés Moyens INFOSEC détermination et Divulgateion de INFOSEC.

a) Indiquer le type d'information auquel le fournisseur devra avoir accès

Renseignements et/ou biens du gouvernement canadien

Si des renseignements et/ou des biens canadiens sont indiqués, le fournisseur aura accès à des renseignements et/ou à des biens PROTÉGÉS et/ou CLASSIFIÉS appartenant au gouvernement canadien.

Renseignements et/ou biens de l'OTAN

Si des renseignements et/ou des biens de l'OTAN sont indiqués, cela signifie que, dans le cadre de ce besoin, le fournisseur aura accès à des renseignements et/ou à des biens PROTÉGÉS et/ou CLASSIFIÉS appartenant à des gouvernements membres de l'OTAN. Les renseignements et/ou les biens de l'OTAN sont élaborés par des pays de l'OTAN ou leur appartiennent et ne doivent être divulgués à aucun pays qui n'est pas un pays membre de l'OTAN. Les personnes qui manient des renseignements et/ou des biens de l'OTAN doivent détenir une autorisation de sécurité de l'OTAN et avoir besoin de savoir.

Les contrats comportant des renseignements CLASSIFIÉS de l'OTAN doivent être attribués par TPSGC. La DSICI de TPSGC est le responsable de la sécurité désigné relativement aux questions de sécurité industrielle au Canada.

Renseignements et/ou biens de gouvernements étrangers

Si des renseignements et/ou des biens de gouvernements étrangers sont indiqués, ce besoin permettra l'accès à des renseignements et/ou à des biens appartenant à un pays autre que le Canada.

b) Restrictions relatives à la diffusion

Si **À ne pas diffuser** est choisi, cela indique que les renseignements et/ou les biens sont **réservés aux Canadiens**. Seuls des fournisseurs canadiens installés au Canada peuvent soumissionner ce genre de besoin. NOTA : Si des renseignements et/ou des biens du gouvernement canadien coexistent avec des renseignements et/ou des biens réservés aux Canadiens, ceux-ci doivent porter la mention **Réservé aux Canadiens**.

Si **Aucune restriction relative à la diffusion** est choisi, cela indique que l'accès aux renseignements et/ou aux biens n'est assujéti à aucune restriction.

Si **Tous les pays de l'OTAN** est choisi, les soumissionnaires doivent appartenir à un pays membre de l'OTAN.

NOTA : Il peut y avoir plus d'une restriction s'appliquant à une demande, selon la nature des travaux à exécuter. Pour ce genre de contrat, un guide de sécurité doit être joint à la LVERS afin de clarifier les restrictions. Ce guide est généralement préparé par le chargé de projet et/ou le responsable de la sécurité de l'organisme.

c) Niveau d'information

À l'aide du tableau ci-dessous, indiquer le niveau approprié d'accès aux renseignements et/ou aux biens que le fournisseur doit avoir pour accomplir les travaux requis.

PROTÉGÉ	CLASSIFIÉ	NATO
PROTÉGÉ A	CONFIDENTIEL	NATO NON CLASSIFIÉ
PROTÉGÉ B	SECRET	NATO DIFFUSION RESTREINTE
PROTÉGÉ C	TRÈS SECRET	NATO CONFIDENTIEL
	TRÈS SECRET (SIGINT)	NATO SECRET
		COSMIC TRÈS SECRET

8. Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS?

Si la réponse est Oui, les membres du personnel du fournisseur qui doivent avoir accès à des renseignements ou à des biens COMSEC doivent participer à une séance d'information COMSEC. Cette séance sera donnée au « détenteur autorisé » des renseignements ou des biens COMSEC. Dans le cas des contrats du type « personnel affecté », cette séance sera donnée par le ministère client. Lorsque le fournisseur doit recevoir et conserver, dans ses locaux, des renseignements ou des biens COMSEC, le responsable de la garde des renseignements ou des biens COMSEC de l'entreprise donnera la séance d'information COMSEC aux membres du personnel qui doivent avoir accès à des renseignements ou à des biens COMSEC.

9. Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate?

Si la réponse est Oui, le fournisseur doit indiquer le titre abrégé du document, le numéro du document et le niveau de sensibilité. L'accès à des renseignements ou à des biens extrêmement délicats INFOSEC exigera que le fournisseur fasse l'objet d'une vérification Participation, contrôle et influence étrangers (PCIE) effectuée par la DSICI.

PARTIE B - PERSONNEL (FOURNISSEUR)

10. a) Niveau de contrôle de la sécurité du personnel requis

Indiquer le niveau d'autorisation de sécurité que le personnel doit détenir pour avoir accès aux renseignements, aux biens ou au site du client. Selon la nature du travail, il peut y avoir plus d'un niveau de sécurité. Veuillez noter que des cotes de sécurité sont accordées pour l'accès à des sites particuliers, selon des dispositions antérieures prises auprès du Secrétariat du Conseil du Trésor du Canada. La cote de sécurité donnant accès à un site s'applique uniquement aux personnes et n'est liée à aucune autre autorisation de sécurité accordée à des personnes ou à des organismes.

COTE DE FIABILITÉ	CONFIDENTIEL	SECRET
TRÈS SECRET	TRÈS SECRET (SIGINT)	NATO CONFIDENTIEL
NATO SECRET	COSMIC TRÈS SECRET	ACCÈS AUX EMBLEMES

Si plusieurs niveaux d'autorisation de sécurité sont indiqués, un guide de classification de sécurité doit être fourni.

b) Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail?

Si la réponse est Oui, cela veut dire que certaines tâches ne sont pas PROTÉGÉES et/ou CLASSIFIÉES et peuvent être exécutées à l'extérieur d'un environnement sécurisé par du personnel n'ayant pas d'autorisation de sécurité. Il faut répondre à la question suivante si l'on a recours à du personnel n'ayant pas d'autorisation de sécurité :

Le personnel n'ayant pas d'autorisation de sécurité sera-t-il escorté?

Si la réponse est Non, le personnel n'ayant pas d'autorisation de sécurité ne pourra pas avoir accès à des lieux de travail dont l'accès est réglementé ni à des renseignements et/ou à des biens PROTÉGÉS et/ou CLASSIFIÉS.

Si la réponse est Oui, le personnel n'ayant pas d'autorisation de sécurité devra être escorté par une personne détenant la cote de sécurité requise, pour faire en sorte que le personnel en question n'ait pas accès à des renseignements et/ou à des biens PROTÉGÉS et/ou CLASSIFIÉS sur les lieux de travail.

PARTIE C - MESURES DE PROTECTION (FOURNISSEUR)

11. RENSEIGNEMENTS / BIENS :

a) Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS?

Si la réponse est Oui, préciser, à l'aide du tableau récapitulatif, le niveau de sécurité des documents ou de l'équipement que le fournisseur devra protéger dans ses installations.

b) Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC?

Si la réponse est Oui, préciser, à l'aide du tableau récapitulatif, le niveau de sécurité des renseignements ou des biens COMSEC que le fournisseur devra protéger dans ses installations.

PRODUCTION

c) Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ?

Préciser, à l'aide du tableau récapitulatif, le niveau de sécurité du matériel que le fournisseur fabriquera, réparera et/ou modifiera et devra protéger dans ses installations.

TECHNOLOGIE DE L'INFORMATION (TI)

d) 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?

Si la réponse est Oui, préciser le niveau de sécurité à l'aide du tableau récapitulatif. Cette case porte sur les renseignements qui seront traités ou produits électroniquement et stockés dans un système informatique. Le ministère/organisme client devra préciser les exigences en matière de sécurité de la TI relativement à cet achat dans un document technique distinct. Le fournisseur devra également consulter le document suivant : Secrétariat du Conseil du Trésor du Canada – Norme opérationnelle de sécurité : Gestion de la sécurité des technologies de l'information (GSTI).

e) Y aura-t-il un lien électronique entre les systèmes informatiques du fournisseur et celui du ministère ou de l'agence gouvernementale?

Si la réponse est Oui, le fournisseur doit faire approuver ses systèmes informatiques. Le ministère client doit aussi fournir les critères de connectivité qui décrivent en détail les conditions et le niveau de sécurité relativement au lien électronique (habituellement pas plus haut que le niveau PROTÉGÉ B).

TABLEAU RÉCAPITULATIF

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.

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.

PROTÉGÉ	CLASSIFIÉ	NATO	COMSEC
PROTÉGÉ A	CONFIDENTIEL	NATO DIFFUSION RESTREINTE	PROTÉGÉ A
PROTÉGÉ B	SECRET	NATO CONFIDENTIEL	PROTÉGÉ B
PROTÉGÉ C	TRÈS SECRET	NATO SECRET	PROTÉGÉ C
	TRÈS SECRET (SIGINT)	COSMIC TRÈS SECRET	CONFIDENTIEL
			SECRET
			TRÈS SECRET

12. a) La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE?

Si la réponse est Oui, classifier le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de

sécurité » au haut et au bas du formulaire.

b) La documentation associée à la présente LVERS sera-t-elle PROTÉGÉE et/ou CLASSIFIÉE?

Si la réponse est Oui, 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).

PARTIE D - AUTORISATION

13. Chargé de projet de l'organisme

Cette case doit être remplie et signée par le chargé de projet pertinent (c.-à-d. la personne qui est responsable de ce projet ou qui connaît le besoin au ministère ou à l'organisme client. On peut, à l'occasion, communiquer avec cette personne pour clarifier des renseignements figurant sur le formulaire.

14. Responsable de la sécurité de l'organisme

Cette case doit être signée par l'agent de la sécurité du ministère (ASM) du ministère indiqué à la case 1 ou par son remplaçant ou par le responsable de la sécurité du fournisseur.

15. Des instructions supplémentaires (p. ex. Guide de sécurité, Guide de classification de la sécurité) sont-elles jointes?

Un Guide de sécurité ou un Guide de classification de sécurité sont utilisés de concert avec la LVERS pour faire part d'exigences supplémentaires en matière de sécurité qui n'apparaissent pas dans la LVERS et/ou pour éclaircir certaines parties de la LVERS.

16. Agent d'approvisionnement

Cette case doit être signée par l'agent des achats qui fait fonction de gestionnaire du contrat ou du contrat de sous-traitance.

17. Autorité contractante en matière de sécurité

Cette case doit être signée par l'agent de la sécurité du marché. Lorsque TPSGC est le responsable de la sécurité du marché, la Direction de la sécurité industrielle canadienne et internationale (DSICI) doit remplir cette case.