NRC·CNRC Administrative Services and Property Management

CNRC·NRC Services administratifs et gestion de l'immobilier

SPECIFICATION

SOLICITATION #:14-22098

BUILDING:	**M-23A** **1200 Montreal Road** **Ottawa, ON**
PROJECT:	**M-23A Nanolab Renovations**
PROJECT #:	**M23A-3966**
Date:	**December 2014**

SPECIFICATION

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

Construction Tender Form

Project Identification **M23A Nanolab Renovations**

Tender No.: **14-22098**

1.2 Business Name and Address of Tenderer

Name _____

Address _____

_____

Contact Person(Print Name) _____

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

1.3 Offer

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

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

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

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

1.3.1 Offer (continued)

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

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

1.4 Acceptance and Entry into Contract

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

1.5 Construction Time

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

1.6 Bid Security

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

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

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

1.7 Contract Security

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

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

1.8 Appendices

This Tender Form includes Appendix No. _____N/A_____.

1.9 Addenda

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

NUMBER	DATE	NUMBER	DATE

(Tenderers shall enter numbers and dates of addenda)

1.10 Execution of Tender

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

SIGNED, ATTESTED TO AND DELIVERED on the _____day of _____on behalf of

_____

(Type or print the business name of the Tenderer)

AUTHORIZED SIGNATORY (IES)

_____

(Signature of Signatory)

_____

(Print name & Title of Signatory)

_____

(Signature of Signatory)

_____

(Print name & Title of Signatory)

SEAL

BUYANDSELL NOTICE

M-23A Nanolab Renovations

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

Renovate two laboratory rooms and two offices, and provide new fume hoods and a fume exhaust system.

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 January 6th and January 8th , 2015 at **9:00** . Meet Allan Smith at Building M-23A, Main Entrance, 1200 Montreal Road, Ottawa, ON. Bidders who, for any reason, cannot attend at the specified date and time will not be given an alternative appointment to view the site and their tenders, therefore, will be considered as non-responsive. **NO EXCEPTIONS WILL BE MADE.**

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

3. TENDER CLOSING DATE:
Tender closing date is January 21st , 2015 at 14:00.

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

5. SECURITY REQUIREMENT FOR CANADIAN CONTRACTORS

5.1 MANDATORY SECURITY REQUIREMENT:

This procurement contains a mandatory security requirement as follows:

.1 The Contractor must, at all times during the performance of the Contract, hold a valid Designated Organization Screening (DOS), issued by the Canadian Industrial Security Director (CISD), Public Works Government Services Canada.

.2 The Contractor personnel requiring access to sensitive work site(s) must EACH hold a valid RELIABILITY STATUS, granted or approved by CISD/PWGSC.

.3 The Contractor must comply with the provisions of the:

a. Security Requirements Checklist attached at Appendix "D"

b. Industrial Security Manual (Latest Edition) available at: http://ssi-iss.tpsgc-pwgsc.gc.ca/msi-ism/msi-ism-eng.html

5.2 VERIFICATION OF SECURITY CLEARANCE AT BID CLOSING

.1 The Bidder must hold a valid Designated Organization Screening (DOS) issued by the Canadian Industrial Security Directorate (CISD), Public Works and Government Services Canada (PWGSC), TO BE INCLUDED WITH THEIR TENDER OR PROVIDED WITHIN 48 HOURS FROM THE DATE AND TIME OF TENDER CLOSING. Verifications will be made through CISD to confirm the security clearance status of the Bidder. Failure to comply with this requirement will render the bid non-compliant and no further consideration will be given to the bid.

.2 Within 72 hours of tender closing, the General Contractor must name all of his sub-contractors, each of whom must hold a valid RELIABILITY STATUS, granted or approved by CISD/PWGSC, or any other Federal Department or Agency along with the names and birthdates or security clearance certificate numbers of all personnel who will be assigned to the project.

.3 It is to be noted that any subcontractor required to perform any part of the work during the performance of the subsequent contract must also adhere to the mandatory security requirement of the contract. As well, no personnel without the required level of security will be allowed on site. It will be the responsibility of the successful bidder to ensure that the security requirement is met throughout the performance of the contract. The Crown will not be held liable or accountable for any delays or additional costs associated with the contractor's non-compliance to the mandatory security requirement. Failure to comply with the mandatory security requirement will be grounds for being declared in default of contract.

.4 For any enquiries concerning the project security requirement during the bidding period, the Bidder/Tenderer must contact the Security Officer @ 613-993-8956.

6.0 WSIB (WORKPLACE SAFETY AND INSURANCE BOARD)

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

7.0 OFFICE OF THE PROCUREMENT OMBUDSMAN

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

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

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

The Departmental Representative or his designate for this project is: **Allan Smith**
Telephone: **613 993-4926**

Contracting Authority for this project is: **Marc Bédard marc.bedard@nrc-cnrc.gc.ca**
Telephone: **613 993-2274**

INSTRUCTIONS TO BIDDERS

Article 1 – Receipt of Tender

1a) Tenders must be received not later than the specified tender closing time. Tenders received after this time are invalid and shall not be considered, regardless of any reason for their late arrival.

1b) A letter of printed telecommunication from a bidder quoting a price shall not be considered as a valid tender unless a formal tender has been received on the prescribed Tender Form.

1c) Bidders may amend their tenders by letter or printed telecommunication provided that such amendments are received not later than the specified tender closing time.

1d) Any amendments to the tender which are transmitted by telefax must be signed and must clearly identify the tenderer.

All such amendments are to be addressed to:

National Research Council of Canada
Marc Bedard, Senior Contracting Officer
Building M-22
Montreal Road, Ottawa, Ontario
K1A 0R6

Fax: (613) 991-3297

Article 2 – Tender Form & Qualifications

1) All tenders must be submitted on the Construction Tender Form and the tender must be signed in compliance with the following requirements:

a) Limited Company: The full names of the Company and the name(s) and status of the authorized signing officer(s) must be printed in the space provided for that purpose. The signature(s) of the authorized officer(s) and the corporate seal must be affixed.

b) Partnership: The firm name and the name(s) of the person(s) signing must be printed in the space provided. One or more of the partners must sign in the presence of a witness who must also sign. An adhesive coloured seal must be affixed beside each signature.

c) Sole Proprietorship : The business name and the name of the sole proprietor must be printed in the space provided. The sole proprietor must sign in the presence of a witness who must also sign. An adhesive coloured seal must be affixed beside each signature.

2) Any alterations in the printed part of the Construction Tender Form or failure to provide the information requested therein, may render the tender invalid.

3) All space in the Construction Tender Form must be completed and any handwritten or typewritten corrections to the parts so completed must be initialed immediately to the side of the corrections by the person or persons executing the tender on behalf of the the tenderer.

4) Tenders must be based on the plans, specifications and tender documents provided.

Article 3 - Contract

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

Article 4 – Tender Destination

1a) Tenders are to be submitted in sealed envelopes to:

National Research Council Canada
Administrative Services and Property Management Branch
1200 Montreal Road
Building M-22
Ottawa, ON
K1A 0R6

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

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

Article 5 - Security

1a) Bid Security is required and must be submitted in one of the following forms:

i) a certified cheque payable to the Receiver General for Canada and

drawn on a member of the Canadian Payments Association or a local cooperative credit society that is a member of a central cooperative credit society having membership in the Canadian Payments Association; **OR**

ii) bonds of the Government of Canada, or bonds unconditionally guaranteed as to principal and interest by the Government of Canada; **OR**

iii) a bid bond.

1b) Regardless of the Bid Security submitted, it should never be more than $250,000 maximum, calculated at 10% of the first $250,000 of the tendered price, plus 5% of any amount in excess of $250,000.

2a) Bid Security shall accompany each tender or, if forwarded separately from the tender, shall be provided not later than the specified tender closing time. Bid Security must be in the ORIGINAL form. Fax or photocopies and NOT acceptable. FAILURE TO PROVIDE THE REQUIRED BID SECURITY SHALL INVALIDATE THE TENDER.

2b) If the tender is not accepted, the Bid Security submitted pursuant to Article 8 shall be returned to the tenderer.

3a) The successful tenderer is required to provide security within 14 days of receiving notice of tender acceptance. The tenderer must furnish EITHER:

i) a Security Deposit as described in 1(b) above together with a Labour and Material Payment Bond in the amount of at least 50% of the amout payable under the contract, OR
ii) a Performance Bond and a Labour and Material Payment Bond – each in the amount of 50% of the amount payable under the contract.

3b) Should it not be possible to obtain a Labour Material Payment Bond as required under 3(a) above, on making application thereof to at least two acceptable Bonding Companies, an additional Security Deposit of a straight 10% of the amount payable under the contract must be furnished.

3c) Where a tender has been accompanied by a Security Deposit, as described in 1(b) above, the amount of the Security Deposit required under 3(a) above may be reduced by the amount of the Security Deposit which accompanied the tender.

3d) Bonds must be in an approved form and from the companies whose

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

Article 6 – Interest On Security Deposits

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

Article 7 – Sales Tax

1) The amount of the tender shall include all taxes as levied under the Excise Act, the Excise Tax Act, the Old Age Security Act, the Customs Act or the Customs Tariff, in force or applicable at the time.

2) In Quebec, the Provincial Sales Tax should not be included in the Tender Price as the Federal Government is exempt. Tenderers should contact the Provincial Revenue Minister to recover all taxes paid for goods and services rendered under this contract.

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

Article 8 – Examination of Site

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

Article 9 – Discrepancies, Omissions, Etc.

1a) Bidders finding discrepancies in, or omissions from, drawings, specifications or other documents, or having any doubt as to the meaning or intent of any part thereof, should at once notify the Engineer who will

send written instructions or explanation to all bidders.

1b) Neither the Engineer nor the Council will be responsible for oral instructions.

1c) Addenda or corrections issued during the time of the bidding shall be covered in the proposal. However, the contract supersedes all communications, negotiations and agreements, either written or oral, relating to the work and made prior to the date of the contract.

Article 10 – No additional Payments for Increased Costs

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

Article 11 – Awards

1a) The Council reserves the power and right to reject tenders received from parties who cannot show a reasonable acquaintance with and preparation for the proper performance of the class of work herein specified and shown on plans. Evidence of such competence must be furnished by the tenderers if required to do so.

1b) A tenderer may be required to furnish to the Contracting Office, National Research Council of Canada, Building M-22, 1200 Montreal Road, Ottawa, Ontario, K1A 0R6, Canada, unsigned copies of the insurance requirements as covered by the Insurance Conditions of the General Specification.

1c) The Council does not bind itself to accept the lowest or any tender.

Article 12 – Harmonized Sales Tax

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

Non-Resident Contractors

RST Guide 804
Published: August 2006
Content last reviewed: August 2010
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 × net book value at date of import × number of months in Ontario × tax rate

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

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

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

   net book value at date of import × tax rate

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

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

(See Completion of Contract section)

Manufacturing for Own Use

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)

Contracts with the Federal Government

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.

Exemptions

Contractors may supply and install equipment or materials for certain customers that may be entitled to an exemption from RST (e.g., manufacturers, Indian band councils, farmers and diplomatic organizations). The equipment or materials, when installed, becomes real property if it is permanently attached to land, or a fixture if it is permanently attached to a building or real property structure. Since contractors are liable for RST, they should contact the ministry to find out if the customer qualifies for exemption before tendering the contract on a tax-excluded basis.

Status Indians, Indian Bands and Band Councils

Non-resident contractors may purchase building materials exempt from Retail Sales Tax (RST) for certain buildings and structures situated on reserves. The cost of such projects must be paid by the band council, and the buildings must provide a community service for

the reserve. Contracts for the construction of an exempt community building project should be made on an RST-excluded basis. Non-resident contractors may purchase the materials exempt from RST by providing suppliers with a valid Purchase Exemption Certificate (PEC). As noted previously, only non-resident contractors who have registered with the ministry and posted a guarantee may issue a PEC. (See RST Guide 204 - Purchase Exemption Certificates).

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

Completion of Contract

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

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

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

All returns are subject to audit.

Legislative References

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

For More Information

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

Acceptable Bonding Companies

Published September 2010

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

1. Canadian Companies

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

Western Assurance Company
Western Surety Company

2. Provincial Companies

- Surety bonds issued by the following companies may be accepted provided that the contract of suretyship was executed in a province in which the company is licensed to do business as indicated in brackets.
- AXA Boreal Insurance Company (P.E.I., N.B., Que., Ont., Man., B.C.)

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

3. Foreign Companies

- Aspen Insurance UK Limited

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

Articles of Agreement

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

A1 Contract Documents

A2 Date of Completion of Work and Description of Work

A3 Contract Amount

A4 Contractor's Address

A5 Unit Price Table

Articles of Agreement

These Articles of Agreement made in duplicate this day of .

Between

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

and

(referred to in the contract documents as the "Contractor")

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

A1 Contract Documents
(23/01/2002)

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

1.1.1 these Articles of Agreement,

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

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

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

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

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

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

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

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

Articles of Agreement

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

1.2 **In the contract**

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

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

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

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

A2 Date of Completion of Work and Description of Work
(23/01/2002)

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

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

Articles of Agreement

A3 Contract Amount
(23/01/2002)

3.1 Subject to any increase, decrease, deduction, reduction or set-off that may be made under the Contract, Her Majesty shall pay the Contractor at the times and in the manner that is set out or referred to in the Terms of Payment

3.1.1 the sum of (GST/HST extra), in consideration for the performance of the work or the part thereof that is subject to Fixed Price Arrangement, and

3.1.2 a sum that is equal to the aggregate of the products of the number of units of Measurement of each class of labour, plant and material that is set out in a Final Certificate of Measurement referred to in GC44.8 multiplied in each case by the appropriate unit price that is set out in the Unit Price Table in consideration for the performance of the work or the part thereof that is subject to a Unit Price Arrangement.

3.2 For the information and guidance of the Contractor and the persons administering the contract on behalf of Her Majesty, but not so as to constitute a warranty , representation or undertaking of any nature by either party, it is estimated that the total amount payable by Her Majesty to the Contractor for the part of the work to which a Unit Price Arrangement is applicable will be approximately $N/A

3.3 A3.1.1 is applicable only to a Fixed Price Arrangement.

3.4 A3.1.2 and A3.2 applicable only to a Unit Price Arrangement.

A4 Contractor's Address
(23/01/2002)

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

Articles of Agreement

A5 Unit Price Table
(23/01/2002)

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

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

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

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

Articles of Agreement

Signed on behalf of Her Majesty by

_____

as Senior Contracting Officer

and _____

as _____

of the **National Research Council Canada**

on the _____

day of _____

Signed, sealed and delivered by

_____

as _____ and
Position

by _____

as _____
Position

of

on the _____

day of _____

Seal

TABLE OF CONTENTS..... Pages

Division 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

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Division 23 - HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

Division 26 - ELECTRICAL

Division 27 - COMMUNICATIONS

Division 28 - ELECTRONIC SAFETY AND SECURITY

END OF TABLE

1. SCOPE OF WORK

.1 Work under this contract covers the Nanolab renovations in the Council's Building M23a of the National Research Council.

2. WORK & MATERIALS SUPPLIED BY OWNER

.1 Work and materials not included in this contract are described on drawings and in this specification.

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

.3 Unless otherwise specified, accept owner-supplied materials at their storage location and provide all transportation as required.

.4 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.

3. LABOUR CONDITIONS AND FAIR WAGE SCHEDULE

.1 Comply with all labour conditions as specified by the Human Resources Development Canada, Labour Program, including those outlined in Appendix "D", Labour Conditions and Fair Wage Schedule.

4. WORKPLACE HAZARDOUS MATERIAL INFORMATION SYSTEM (WHMIS)

.1 The 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; and

.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.

5. EXAMINATION REQUIREMENTS OF BILL 208, SECTION 18(a)

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

.1 Asbestos

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

.2 In addition to the above designated substances, the following may also be present: none

6. GENERAL

.1 The word "provide" indicated in this Specification means to supply and install. Site Examination

7. COMPLETION

.1 All work is to be completed within 15 week(s) upon receipt of notification of acceptance of tender.

8. COST BREAKDOWN

.1 Submit, for approval by the Departmental Representative, a breakdown of tender before submitting the first request for progress payment.

.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.

9. 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. Security Deposit.

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. SITE VISITS

.1 For tendering purposes, the site visit(s) must be attended in the presence of the Departmental Representative.

12. MINIMUM STANDARDS

.1 Conform to or exceed minimum acceptable standards of the various applicable federal, provincial and municipal codes such as The National Building Code, The National Fire Code, Canadian Plumbing Code, Canadian Electrical Code, Canadian Code for Construction Safety and the Provincial Construction Safety Act.

.2 Work to conform to referenced standards and codes as reaffirmed or revised to date of specification.

13. FIRE AND GENERAL SAFETY

.1 Comply with the requirements of Fire Commissioner of Canada Standards No. 301 and 302.

.2 Comply with the requirements of the National Research Council, Fire Prevention Officer including those outlined in Section 01545.

.3 Comply with safety related instructions from the Departmental Representative or the National Research Council, Fire Prevention Officer.

.4 Comply with the National Building Code (Part 8, Construction Safety Measures) and the Provincial Construction Safety Act.

14. 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 Secure working area at the end of each day's work and be responsible for the same.

.9 Provide and maintain adequate safety barricades around the work sites to protect NRC personnel and the public from injury during the carrying out of work.

.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.

15. FASTENING DEVICES

.1 Do not use explosive actuated tools, unless permitted expressly by 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.

16. BILINGUALISM

.1 Ensure that all signs, notices, etc. are posted in both official languages.

.2 Ensure that all identification of services called for by this contract are bilingual.

17. TEMPORARY HEATING AND VENTILATING

.1 Does not apply.

18. DISCREPANCIES & INTERFERENCES

.1 Before tender closing, examine drawings and specifications. Report at once to the Departmental Representative, any defects, discrepancies, omissions or interferences affecting the work.

.2 Provide items mentioned in either the drawings or the specification.

.3 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.

.4 Any work done after such a discovery, until authorized, is at the contractor's risk.

.5 Where special interferences 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.

.6 Arrange all work so as not to interfere in any way with other work being carried out.

.7 Commencement of work will imply an acceptance of existing conditions.

19. 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.

20. 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.

21. 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.

22. 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.

23. 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 Obtain permission from the Departmental Representative to perform the specific tasks before scheduling any work outside normal working hours.

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

.5 All persons employed by the contractor, or by any subcontractor, and working on the site must wear and keep visible identification badges issued by the Council.

24. 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.

Notify Departmental Representative in writing of any changes in schedule.

.

.2 5 day(s) before the scheduled completion date arrange to do an interim inspection with the Departmental Representative.

25. SERVICE INTERRUPTIONS

.1 Arrange for all service interruptions with the Departmental Representative. Do not operate any NRC equipment or plant.

.2 Allow 72 hours notice prior to cutting into any existing service.

.3 All service interruptions are to be of minimum duration.

.4 Protect existing services as required and immediately make repairs if damage occurs.

.5 Provide detours, bridges, alternate feeds, etc., as required to minimize disruptions.

.6 Plan and perform work in advance in order to minimize disruption and service interruption.

26. SHOP DRAWINGS

.1 Submit to Departmental Representative for review, shop drawings, product data and samples specified within 2 week(s) 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 1 week basis and any changes to the list shall be immediately notified in writing to the Departmental Representative.

.3 Review shop drawings, data sheets and samples prior to submission.

.4 Submit 5 copies 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.

27. SAMPLES AND MOCK-UPS

.1 Submit samples in sizes and quantities 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 project.

28. 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.

29. SPECIFICATIONS, "AS BUILTS"

.1 The contractor shall keep on the site, one (1) up-to-date copy of all specifications, drawings and bulletins pertaining to the work, in good order, available to the Departmental Representative and to his representatives at all times.

.2 At least one (1) copy of such specifications and drawings shall be marked by the contractor to show all work "As Built" and shall be handed over to the Departmental Representative with the Application for Payment and for the Final Certificate of Completion.

30. 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.

31. PARTIAL OCCUPANCY

.1 NRC may request partial occupancy of the facility if the contract extends beyond the expected completion date.

32. USE OF SITE

.1 Restrict operations on site to the areas approved by the Departmental Representative at the time of tendering.

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

.3 Restrict parking to the designated areas.

.4 Do not restrict access to the building, routes, and services.

.5 Do not encumber the site with materials or equipment.

33. SITE ACCESS

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

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

.3 Obtain approval of Departmental Representative before temporarily suspending operations on site; before returning to the site and before leaving the site at the end of the job.

.4 Provide and maintain access to site.

.5 Build and maintain temporary roads and provide snow removal during period of work.

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

34. 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.

35. 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 eating.

.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.

36. 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 not permitted unless in the case of an emergency.

37. SANITARY FACILITIES

.1 Obtain permission from the Departmental Representative to use the existing washroom facilities in the building.

.2 The contractor is responsible for keeping facilities clean at all times.

38. PROJECT MEETINGS

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

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

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

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 NRC Fire Prevention Officer.

40. DRAINAGE

.1 Does not apply.

41. ENCLOSURE OF STRUCTURES

.1 Construct and maintain all temporary enclosures as required to protect foundations, sub-soil, concrete, masonry, etc., from frost penetration or damage.

.2 Maintain in place until all chances of damage are over and proper curing has taken place.

.3 Provide temporary weather tight enclosures for exterior openings until permanent sash and glazing and exterior doors are installed.

.4 Provide lockable enclosures as required to maintain the security of NRC facilities and be responsible for the same.

.5 Provide keys to NRC security personnel when required.

42. LAYOUT OF WORK

.1 Lay out the work carefully and accurately.

.2 Verify all dimensions and be responsible for them.

.3 Locate and preserve general reference points.

.4 Employ competent person to lay out work in accordance with control lines and grades provided by the Departmental Representative.

43. CONCEALING

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

44. SPACE CONFLICT

.1 Maintain an awareness of responsibility to avoid space conflict with other trades.

.2 Throughout the course of construction, keep continuously acquainted with field conditions, and the work being developed by all trades involved in the project.

45. 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 Departmental Representative's satisfaction.

.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 caulking in accordance with CAN/CGSB-19.13-M87 AND NBC 3.1.7.

46. 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.

47. 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

48. DISPOSAL OF WASTES

.1 Dispose of waste materials including volatiles, safely off NRC property. Refer to the article entitled "Fire & General Safety" of this section.

49. WARRANTY

.1 Refer to General Conditions "C", section GC32.

.2 Ensure that all manufacturers' guarantees and warranties are issued in the name of the Contractor and the National Research Council.

50. MAINTENANCE MANUALS

.1 Provide three (3) bilingual copies of maintenance manuals or two English and two French maintenance manuals immediately upon completion of the work and prior to release of holdbacks.

.2 Manuals to be neatly bound in hard cover loose leaf binders.

.3 Manuals to include operating and maintenance instructions, all guarantees and warranties, shop drawings, technical data, etc., for the material and apparatus supplied under this contract.

51. IDENTIFICATION BADGES

.1 Use of Identification Badges is mandatory in NRC buildings.

.2 Obtain all badges from the Security office.

52. 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 seven (7) 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 seven (7) working days before tender closing date or after the tender period, will not be considered.

53. DRAWINGS

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

3966-A01-A05, 3966-S01, 3966-M01-M03, 3966-E01-E03

END OF SECTION

Part 1 General

1.1 AUTHORITIES

.1 The Fire Commissioner of Canada (F.C.) 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.

.3 The Departmental Representative will consult with the Fire Prevention Officer (FPO) as and when required.

.4 The Departmental Representative will enforce these Fire Safety Requirements.

.5 Comply with the following standards as published by the Office of the Fire Commissioner of Canada:

.1 Standard No. 301 - June 1982 "Standard for Construction Operations";

.2 Standard No. 302 - June 1982 "Standard for Welding and Cutting".

1.2 Hot Work

.1 Permit:

.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 Site Review:

.1 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.

1.3 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:

NRC LOCATION	NON-NRC PHONES	CELLULAR OR NRC PHONES
Montreal Road Campus	**613-993-2411**	**333**
Uplands	**613-993-2411**	**333**
Carleton Place	**613-993-2411 OR**	**993-2411**

Greenbank	**613-993-2411 OR**	**993-2411**
Sussex Drive	**613-993-2411**	**333**

.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 the scene of fire to provide information and direction to the Fire Department personnel.

1.4 INTERIOR AND EXTERIOR FIRE PROTECTION & ALARM SYSTEMS

.1 DO NOT OBSTRUCT OR SHUT OFF FIRE PROTECTION EQUIPMENT OR ALARM 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.

1.5 FIRE EXTINGUISHERS

.1 Provide a minimum of 1-20 lb. ABC Dry Chemical Fire Extinguisher for every hot work operation.

.2 Provide fire extinguishers for hot asphalt and roofing operations as follows:

.1 Pot area - 1-20 lb. ABC Dry Chemical;

.2 Roof - 2-20 lb. ABC Dry Chemical.

.3 Provide fire extinguishers equipped as below:

.1 Pinned and sealed;

.2 With a pressure gauge;

.3 With an extinguisher tag signed by a fire extinguisher servicing company.

.4 Carbon Dioxide (C02) extinguishers will not be considered as substitutes for the above.

1.6 ROOFING

.1 Kettles:

.1 Arrange for the safe location of asphalt kettles and material storage with the Departmental Representative before moving them on site. Do not locate kettles on any roof or structure and keep them at least 10m away from a building and at a safe distance from parked automobiles.

.2 Equip kettles with thermometers or gauges that are in good working order.

.3 Do not operate kettles at temperatures in excess of 232^{o}C.

.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 12.

.5 Advise the Departmental Representative of container capacities prior to start of work.

.6 Keep compressed gas cylinders secured in an upright position and a minimum of 20 feet away from any 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 Provide a fire watch as required by article 13 of this section.

.4 Materials Storage:

.1 Store all combustible roofing materials at least 3m away from any structure and 6m from any kettle.

1.7 FIRE WATCH

.1 Provide a fire watch for a minimum of one hour after the termination of a hot work operation.

.2 Temporary heating, refer to General Instructions Section 01000.

.3 Equip fire watch personnel with fire extinguishers as required by article 5.

1.8 OBSTRUCT 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 the Fire Department personnel and their apparatus. This includes violation of minimum overhead clearance, erecting 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.

1.9 SMOKING

.1 Smoking is prohibited inside all NRC buildings.

.2 Obey all "NO SMOKING" signs.

1.10 RUBBISH AND WASTE MATERIALS

.1 Keep rubbish and waste materials to a minimum and a minimum of 20 feet from any kettle or torches.

.2 Do not burn rubbish on site.

.3 Removal:

.1 Remove all rubbish from work site at the end of the work day or shift, or as directed.

.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 as required in 10.3.1.

.5 Dumpsters:

.1 Consult the Departmental Representative to determine an acceptable safe location before bringing the dumpster on site.

1.11 FLAMMABLE LIQUIDS

.1 The handling, storage and use of flammable liquids are 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, provided they are stored in approved safety cans bearing the ULC seal of approval. Storage of quantities of flammable liquids exceeding 45 litres for work purposes, require the permission of the Departmental Representative.

.3 Transfer of flammable liquids is prohibited within buildings.

.4 Do not transfer flammable liquids in the vicinity of open flames or any type of heat producing device.

.5 Do not use flammable liquids having a flash point below 38 ^{o}C such as naphtha or gasoline as solvents or cleaning agents.

.6 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.

.7 Where flammable liquids, such as lacquers or urethane are used, assure proper ventilation and eliminate all sources of ignition. Inform the Departmental Representative prior to, and at the cessation of such work.

1.12 QUESTIONS AND/OR CLARIFICATION

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

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/exterior perimeter of corridor 100, in front of rooms 158 to 164.

Part 2 PRODUCTS

2.1 Materials

.1 1/2" x 4'-0" x 8'-0" wood sheathing.

.2 3-5/8" metal studding.

.3 3-1/2" spruce wood, construction grade studding.

.4 6 mil. polyethylene.

.5 Vinyl reinforced tarps.

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 Install wood sheathing in the new window openings temporarily until the new glazing units have been received.

.3 Inspect walls on a regular basis to ensure integrity of the assembly and to avoid dust and water infiltration to the interior of the building.

.4 Remove interior protections only when approved by the Departmental Representative.

Part 4 REINSTATEMENTS

4.1 Finishes

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

END OF SECTION

Part 1 GENERAL

1.1 Outline of Work

.1 Comply with the requirements of this section when performing the following work:

.1 Installing or removing non-friable asbestos containing products: vinyl tiles, acoustic tiles, gaskets, seals, packings, manufactured cement products containing asbestos such as boards or ceiling tiles.

.2 Removing drywall where asbestos joint filling compounds have been used and the quantity is less than 1 square meter. Removing asbestos containing ceiling tiles and the quantity is less than 7.5 square meters.

.3 Cutting, shaping, grinding, drilling or abrading non-friable asbestos-containing materials, using hand tools, or using power tools equipped with a HEPA filter Clearly indicate fabrication details, plans, elevations, hardware, and installation details.

1.2 Definitions

.1 HEPA vacuum: Vacuum equipment with a high efficiency particulate air filter system capable of collecting and retaining fibres greater than 0.3 microns in length at 99.97% efficiency.

.2 Amended water: water with a non-ionic surfactant wetting agent added to reduce water tension to allow thorough wetting of asbestos fibres.

.3 Non-Friable Material: Material that when dry cannot be crumbled, pulverized or powdered by hand pressure. Includes, but is not limited to the following asbestos containing products: vinyl asbestos floor tiles, resilient sheet flooring, acoustic ceiling and wall tiles, gaskets, seals, packings, friction products, drywall joint compounds and asbestos cement boards, shingles, tiles and piping.

1.3 Regulatory Agencies

.1 Comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in any case of conflict among these requirements or with these specifications the more stringent requirement shall apply.

.2 Comply with:

.1 Canada Labour Code Part IV, Canada Occupational Safety and Health Regulation Part X, "Dangerous Substances".

.2 Ontario Ministry of Labour Occupational Health and Safety Division Ontario Regulation 278/05 "Asbestos on Construction Projects and in Buildings & Repair Operation".

.3 Ontario Ministry of the Environment Regulation RRO 1990, Reg. 347 as amended to O. Reg.461/05, "Asbestos Waste Disposal".

.3 Compliance with Regulation 278/05 on every project is the responsibility of the owner and of every contractor, employer and worker engaged in or on the project.

1.4 Submittals

.1 Submit proof satisfactory to the Departmental Representative that suitable arrangements have been made with, and permission has been given by, the authority having jurisdiction to transport and to dispose of asbestos-containing waste in accordance with their requirements.

.2 Submit copies of dumping slips to confirm disposal of asbestos-containing waste in accordance with requirements of the authority having jurisdiction.

1.5 Existing Conditions

.1 Results of tests of asbestos-containing materials taken from surfaces within the scope of this project are available for inspection at NRC building M19. These are for general information only and are not necessarily representative of all asbestos-containing materials contained within the scope of this project.

.2 Notify the Departmental Representative of friable and non-friable material discovered during the work and not apparent from the drawings, specifications, or report, pertaining to the work. Do not disturb such material pending instructions from the Departmental Representative.

1.6 Instruction and Training

.1 Before commencing the work, provide every worker with instruction and training in the hazards of asbestos exposure, in personal protective measures and work practices, and in the use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators shall include:

.1 The limitations of the equipment.

.2 The inspection and maintenance of the equipment.

.3 The fitting of the equipment.

.4 The disinfecting of the equipment. Outline of Work

1.7 Worker Protection

.1 Workers shall wear respirators, protective clothing and footwear while in the work area.

.2 Respirators shall be non-powered, reusable, with a replaceable filter cartridge that is suitable for protection against asbestos, and shall be acceptable to the Provincial Authority having jurisdiction.

.3 Protective clothing shall consist of full body covering including head covering and snug fitting cuffs at the wrists, ankles and neck; constructed of a material which will not permit penetration of asbestos fibres. Clothing shall be of disposable type, capable of withstanding damp wiping, and/or limited washing. Protective clothing shall be made of either a polyolefin or a polypropylene fabric type, or of an approved equal material.

.4 Footwear shall be of a type that will prevent fibre penetration and shall be capable of being damp wiped.

.5 Eating, drinking, chewing, and smoking are not permitted in the work area.

.6 Before leaving the work area, workers shall decontaminate their protective clothing using a HEPA vacuum or by damp wiping and dispose of as contaminated waste. Waste containers shall be closed using appropriate industry standard methods.

.7 Workers shall wash hands and face when leaving the work area.

1.8 Hours of Work

.1 Work shall be performed during normal working hours.

Part 2 PRODUCTS

2.1 Materials

.1 Drop Sheets: As specified.

.1 Polyethylene: 0.15 mm (6 mil) thick.

.2 FR Polyethylene: 0.15 mm (6 mil) thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.

.3 Waste Containers: waste shall be contained in two separate containers, one inside the other. Both containers shall be 0.15mm (6 mil) thick sealable polyethylene waste bags. Waste containers shall have a preprinted cautionary asbestos warning in both official languages, clearly visible when ready for removal to the disposal site, identified as follows:

DANGER (50 mm lettering) (2")

CONTAINS ASBESTOS FIBRES

AVOID CREATING DUST (25 mm lettering) CANCER

AND LUNG (1") DISEASE HAZARD

DANGER (50 mm lettering) (2")

CONTIENT DES FIBRES D'AMIANTE

EVITETER DE FAIRE DE LA POUSSIERE (25 mm lettering)

RISQUE DE CANCER ET DE MALADIES PULMONAIRES

.4 Tape: Tape suitable for sealing polyethylene to surfaces under both wet conditions using amended water, and dry conditions.

Part 3 EXECUTION

3.1 Procedures

.1 Before beginning work, at each access to work areas, install warning signs approved by Departmental Representative and reading as follows:

CAUTION ASBESTOS HAZARD AREA (25 mm) (1")

NO UNAUTHORIZED ENTRY (20 mm) (3/4")

WEAR ASSIGNED PROTECTIVE EQUIPMENT.

BREATHING ASBESTOS DUST MAY CAUSE

SERIOUS BODILY HARM.

ATTENTION, PRÉSENCE D'AMIANTE (25 mm) (1")

ENTRÉE INTERDITE AUX PERSONNES NON

AUTORISÉES (20 mm) (3/4")

PORT OBLIGATOIRE DE VETEMENTS PROTECTEURS.

L'INHALATION DE POUSSIERE D'AMIANTE PEUT

CAUSER DES LÉSIONS CORPORELLES GRAVES.

.2 Before beginning the work remove visible dust from the surfaces in the work area, where dust is likely to be disturbed during the course of the work. Use a HEPA vacuum, or damp cloths, where damp cleaning does not create a hazard and is otherwise appropriate. Do not use compressed air to clean up or remove dust from any surface.

.3 Prevent the spread of dust from the work area using measures appropriate to the work to be done. Use polyethylene drop sheets over flooring, such as carpeting, that absorbs dust, and over all flooring in work areas where dust and contamination cannot otherwise be safely contained. Drop sheets cannot be reused and must be disposed of as asbestos waste. The spread of asbestos in the work area shall be prevented where practicable by disabling the ventilation system(s) or sealing the ducts to and from the work area.

.4 Removal of vinyl asbestos tile

.1 Start removal by wedging heavy duty scraper in seam of 2 adjoining tiles and gradually forcing edge of 1 tile up and away from floor. Do not break off pieces of tile, but continue to force balance of tile up.

.2 When first tile is removed, place it, without breaking into smaller pieces, into asbestos waste receptor. If tiles break use amended water from pump sprayer.

.3 Continue removal of tiles using hand tools and removing tiles intact wherever possible. When adhesive is spread heavily or is quite hard, it may prove easier to force scraper through tightly adhered areas by striking scraper handle with hammer using blows of moderate force while maintaining scraper at 25° to 30° angle to floor. When even this technique cannot loosen tile, removal can be simplified by heating tile with hot air gun or infrared heaters until heat penetrates through tile and softens adhesive. Do not use powered electric scrapers.

.4 After removal of small area scrape up adhesive remaining on floor with hand scraper until only thin smooth film remains. Where deposits are heavy or difficult to scrape, hot air gun or infra-red heaters may be used. Deposit scrapings into asbestos waste receptors. Do not dry scrape surface of adhering pieces of tile.

.5 On completion of area, clean floor with HEPA vacuum.

.5 Removal of asbestos sheet flooring

.1 Remove binding strips or other restrictive moldings.

.2 Make series of knife cuts 100 to 200 mm (4" to 8") apart through top layer and about halfway through asbestos felt backing, parallel to wall.

.3 Start at end of room farthest from door and pry up corner of strip to separate top sheet from backing layer using amended water to ensure backing layer is kept wet at all times. Pull top layer back upon itself slowly and evenly. Roll up top layer with vinyl face out into tight roll and tape or tie securely, and place in asbestos waste receptor.

.4 Continue with successive strips. Avoid walking on exposed asbestos felt backing. Remove maximum of 3 strips (ie., less than 600 mm (24")) before removing exposed felt backing.

.5 Remove adhered felt backing by wet scraping. Soak area with amended water applied by sprayer. Allow water to penetrate felt and scrape off adhered felt. Keep material wet. Place scrapings in asbestos waste receptor.

.6 Continue this procedure alternately removing top sheet and then wet-scraping felt, maximum of 3 strips at a time.

.7 When floor has been cleaned of felt, allow it to dry and vacuum up any residue with HEPA vacuum. Do not dry sweep.

.8 Thoroughly clean tools and equipment before reusing.

.6 Installing, cutting or drilling non-friable asbestos materials

.1 Wet all materials to be disturbed unless wetting creates a hazard or causes damage.

.2 Use a garden reservoir type, low velocity, fine mist sprayer. Perform work in a manner to reduce dust creation to lowest levels practicable.

.3 As necessary, use only hand tools for cutting and shaping.

.4 Immediately place waste in asbestos waste receptor. Clean area frequently during work with HEPA vacuum or with wet methods.

.5 Dispose of drop sheets as asbestos waste. Do not reuse.

.7 Removal of other non-friable asbestos materials

.1 This applies only to material which can be removed intact, or in sections, without producing pulverized or powdered waste. This is applicable to asbestos-cement board products, asbestos-containing drywall compound (less than 1 square meter) and gaskets, and similar items. This is also applicable to asbestos-containing lay-in acoustic tile provided it is minor and not involving more than 7.5 m² (80 sq. ft.).

.2 Where possible, wet all material to be disturbed.

.3 Undo fasteners if necessary to remove material. Whenever possible remove materials intact. Break only if unavoidable. If broken, wet freshly exposed edges.

.4 Wet material and use hand scraping to remove material adhering to substrate.

.5 Immediately place removed material except gypsum board, in asbestos waste receptor. Clean surrounding surfaces and asbestos work area frequently with HEPA vacuum or with wet methods.

.6 Asbestos cement board shall be completely wrapped with (FR) polyethylene and sealed with an approved tape.

.7 Dispose of drop sheets as asbestos waste. Do not reuse.

.8 Cleanup:

.1 Frequently during the work and immediately after completion, clean up dust and waste containing asbestos using a HEPA vacuum or by damp mopping.

.2 Place dust and waste containing asbestos in sealed, dust-tight waste bags. Drop sheets shall be wetted and folded to contain dust and then placed in waste bags.

.3 Immediately before their removal and disposal from the work area, clean each filled waste container using damp cloths or a HEPA vacuum and place in a second clean waste container.

.4 Seal and remove waste containers from site. Dispose of waste in accordance with requirements of Provincial and Federal authority having jurisdiction.

.5 Perform a final thorough cleanup of the work area and the adjacent areas affected by the work using a HEPA vacuum.

.6 Any contamination of surrounding areas noticed by visual inspection and/or air monitoring will require the complete enclosure and clean-up of the affected areas.

.7 Upon completion of the work, power tools, hand tools and equipment shall be damp wiped or vacuum cleaned using a HEPA vacuum. Wiping cloths shall be disposed of as asbestos waste.

END OF SECTION

Part 1 GENERAL

1.1 Outline of Work

.1 Comply with the requirements of this section when performing the following work:

.1 Removal or disturbance as specified of more than one square metre of friable asbestos containing material during the repair, alteration, maintenance or demolition of a 4 lab area, part corridor and spaces adjacent to demolition work within a building located 1200 Montreal road, Ottawa, Bldg M-23A.

.2 Remove and dispose as specified, all asbestos-containing insulation present on mechanical items. Remove and dispose of asbestos containing spray or trowel applied material, overspray, fallen material and settled dust, in area(s) specified and/or shown on Drawings.

.3 Remove, and dispose as contaminated materials, ceilings including tiles, plaster, drywall, grids, and other contaminated ceiling materials to extent shown or required by work of this Section. Installing or removing non-friable asbestos containing products: vinyl tiles, acoustic tiles, gaskets, seals, packings, manufactured cement products containing asbestos such as boards or ceiling tiles. NOTE: Remove, and dispose as contaminated waste, column cladding, partitions, masonry walls and other construction to extent required to access and remove friable asbestos containing material. This includes fire rated walls installed after application of fireproofing.

.4 Removing drywall where asbestos joint filling compounds have been used and the quantity is less than 1 square meter. Removing asbestos containing ceiling tiles and the quantity is less than 7.5 square meters.

.5 Cutting, shaping, grinding, drilling or abrading non-friable asbestos-containing materials, using hand tools, or using power tools equipped with a HEPA filter Clearly indicate fabrication details, plans, elevations, hardware, and installation details.

.6 For areas shown on Drawings, perform asbestos removal by full enclosure method. The glove bag method may be used for pipe insulation removal in other areas as appropriate for the nature of insulation and occupant access requirements.

.7 Apply slow drying sealer to all surfaces from which asbestos has been removed and all surfaces contaminated with asbestos.

.8 Maintain all designated electrical and mechanical services passing through the asbestos work area.

.9 All work is subject to inspection and air monitoring both inside and outside the asbestos work area. Any contamination of surrounding areas (indicated by visual inspection or air monitoring) shall necessitate complete enclosure and clean-up of affected areas.

.10 Asbestos removal to occur at appropriate times, after work hours, during each phase of construction.

1.2 Definitions

.1 HEPA vacuum: Vacuum equipment with a high efficiency particulate air filter system capable of collecting and retaining fibres greater than 0.3 microns in length at 99.97% efficiency.

.2 Amended water: water with a non-ionic surfactant wetting agent added to reduce water tension to allow thorough wetting of asbestos fibres.

.3 Asbestos Containing Materials (ACMs): materials that contain 0.5 provincial regulated amount per cent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.

.4 Authorized Visitors: Departmental Representatives, Consultants, and representatives of regulatory agencies.

.5 Non-Friable Material: Material that when dry cannot be crumbled, pulverized or powdered by hand pressure. Includes, but is not limited to the following asbestos containing products: vinyl asbestos floor tiles, resilient sheet flooring, acoustic ceiling and wall tiles, gaskets, seals, packings, friction products, drywall joint compounds and asbestos cement boards, shingles, tiles and piping.

.6 Polyethylene Sheeting Sealed With Tape: polyethylene sheeting of type and thickness specified, sealed with tape along all edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from water damage or damage by sealants, and to prevent escape of asbestos fibres through the sheeting into clean areas.

.7 Friable Material: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.8 Asbestos Work Areas: where actual removal and sealing and enclosure of spray or trowel-applied asbestos-containing materials takes place.

.9 Occupied Areas: any area of building or work site that is outside Asbestos Work Area.

.10 Negative Air Unit: a system which extracts air directly from the work area, filters such extracted air through a high efficiency particulate air filtering system, and discharges this air directly outside the work area to the exterior of the building. This system shall maintain a minimum pressure differential of 5 Pa (0.02 inches water column) relative to adjacent areas outside of work areas, be equipped with an alarm to warn of system breakdown, and be equipped with an instrument to continuously monitor and automatically record pressure differences.

.11 DOP Test: testing method used to determine integrity of Negative Pressure unit using dioctyl phthalate (DOP) HEPA-filter leak test.

.12 Airlock: a system for permitting ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, typically consisting of two curtained doorways at least 2 m (6 ft.) apart.

.13 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed as follows:

.1 Place two overlapping sheets of polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure vertical edge of other sheet along opposite vertical side of doorway.

.2 Reinforce free edges of polyethylene with duct tape and weight bottom edge to ensure proper closing.

.3 Overlap each polyethylene sheet at openings not less than 1.5 m on each side.

.14 Competent worker: in relation to specific work, means a worker who:

.1 Is qualified because of knowledge, training and experience to perform the work.

.2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.

.3 Has knowledge of all potential or actual danger to health or safety in the work.

.15 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.

1.3 Regulatory Agencies

.1 Comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in any case of conflict among these requirements or with these specifications the more stringent requirement shall apply.

.2 Comply with:

.1 Canada Labour Code Part IV, Canada Occupational Safety and Health Regulation Part X, "Dangerous Substances".

.2 Ontario Ministry of Labour Occupational Health and Safety Division Ontario Regulation 278/05 "Asbestos on Construction Projects and in Buildings & Repair Operation".

.3 Ontario Ministry of the Environment Regulation RRO 1990, Reg. 347 as amended to O. Reg.461/05, "Asbestos Waste Disposal".

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.205-[94], Sealer for Application to Asbestos-Fibre-Releasing Materials.

.4 Canadian Standards Association (CSA International)

.5 Department of Justice Canada

.1 Canadian Environmental Protection Act (CEPA), 1999.

.6 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.7 Underwriters' Laboratories of Canada (ULC)

.8 Compliance with Regulation 278/05 on every project is the responsibility of the owner and of every contractor, employer and worker engaged in or on the project.

.9 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

1.4 Submittals

.1 Submittals in accordance with Section 01000 General Instructions

.2 Before beginning work:

.1 Obtain from appropriate agency and submit to Departmental Representative necessary permits for transportation and disposal of asbestos waste. Ensure that dump operator is fully aware of hazardous nature of material being dumped, and proper methods of disposal. Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to receive and properly dispose of asbestos waste.

.2 Submit proof satisfactory to Departmental Representative that all asbestos workers have received appropriate training and education by a competent person on hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing. Submit proof of attendance in form of certificate.

.3 Ensure supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Departmental Representative. Submit proof of attendance in form of certificate. Minimum of one Supervisor for every ten workers.

.4 Submit layout of proposed enclosures and decontamination facilities to Departmental Representative for review.

.5 Submit documentation including test results for sealer proposed for use.

.6 Submit Provincial and/or local requirements for Notice of Project form.

.7 Submit proof of Contractor's Asbestos Liability Insurance.

.8 Submit Worker's Compensation Board status and transcription of insurance.

.9 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including but not limited to following:

.1 Encapsulants.

.2 Amended water.

.3 Slow drying sealer.

1.5 Existing Conditions

.1 Results of tests of asbestos containing materials to be handled, removed, or otherwise disturbed and disposed of during this Project are available for inspection bound into this specification at end of this Section. These are for general information only and are not necessarily representative of asbestos containing materials covered within scope of this Project.

.2 Notify the Departmental Representative of friable and non-friable material discovered during the work and not apparent from the drawings, specifications, or report, pertaining to the work. Do not disturb such material pending instructions from the Departmental Representative.

1.6 Quality assurance

.1 Regulatory Requirements: comply with Federal, Provincial and local requirements pertaining to asbestos, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01545 Safety Requirements.

.2 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area includes:

.1 Respirator: Provide appropriate respiratory equipment for all workers with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters

the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it to be repaired or replaced if torn. Requirements for each worker:

.1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters that have been tested as satisfactory, clean coveralls and head covers before entering Equipment and Access Rooms or Asbestos Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in clean change room.

.2 Remove gross contamination from clothing before leaving work area then proceed to Equipment and Access Room and remove clothing except respirators. Place contaminated work suits in receptacles for disposal with other asbestos - contaminated materials. Leave reusable items except respirator in Equipment and Access Room. Still wearing the respirator proceed naked to showers. Using soap and water wash body and hair thoroughly. Clean outside of respirator with soap and water while showering; remove respirator; remove filters and wet them and dispose of filters in container provided for purpose; and wash and rinse inside of respirator. When not in use in work area, store work footwear in Equipment and Access Room. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from work area or from Equipment and Access Room.

.3 After showering and drying off, proceed to clean change room and dress in street clothes at end of each day's work, or in clean coveralls before eating, smoking, or drinking. If re-entering work area, follow procedures outlined in paragraphs above.

.4 Enter unloading room from outside dressed in clean coveralls to remove waste containers and equipment from Holding Room of Container and Equipment Decontamination Enclosure system. Workers must not use this system as means to leave or enter work area.

.2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.3 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual asbestos abatement.

.4 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.

.5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

.6 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.7 Hours of Work

.1 Work shall be performed outside of normal working hours.

1.8 Waste Management And Disposal

.1 Place materials defined as hazardous or toxic in designated containers.

.2 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.3 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.

.4 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

1.9 Scheduling

.1 Not later than ten (10) days before beginning Work on this Project notify following in writing:

.1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.

.2 Regional Office of Labour Canada.

.3 Provincial/Territorial, Department of Labour.

.4 Disposal Authority.

.2 Inform sub-trades of presence of asbestos containing materials identified in Existing Conditions.

.3 Submit to Departmental Representative copy of notifications prior to start of Work.

.4 Hours of Work: perform work involving asbestos abatement located at 1200 Montreal road, Ottawa, Bldg M-24 during normal working hours. Include in Contract Sum additional costs due to this requirement.

1.10 Owner's Instructions

.1 Before beginning Work, provide to Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene including dress and showers, in entry and exit from Asbestos Work Area, in aspects of work procedures including glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.

.2 Instruction and training related to respirators includes, at minimum:

.1 Proper fitting of equipment.

.2 Inspection and maintenance of equipment.

.3 Disinfecting of equipment.

.4 Limitations of equipment.

.3 Instruction and training must be provided by competent, qualified person.

.4 Supervisory personnel to complete required training.

Part 2 PRODUCTS

2.1 Materials

.1 Polyethylene: minimum 0.15 mm thick unless otherwise specified; in sheet size to minimize joints.

.2 FR polyethylene: minimum 0.15 mm thick, woven fibre reinforced fabric bonded both sides with polyethylene.

.3 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

.4 Wetting agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether, or other material approved by [Departmental Representative] [Engineer] [Consultant] [___], mixed with water in concentration to provide adequate penetration and wetting of asbestos containing material.

.5 Waste Containers: contain waste in two separate containers.

.1 Inner container: 0.15 mm thick sealable polyethylene bag [or where glove bag method is used, glove bag itself.

.2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.

.3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site. Label

containers in accordance with Asbestos Regulations [29 CFR 1910.1001. Label in both official languages.

DANGER (50 mm lettering) (2")

CONTAINS ASBESTOS FIBRES

AVOID CREATING DUST (25 mm lettering) CANCER

AND LUNG (1") DISEASE HAZARD

DANGER (50 mm lettering) (2")

CONTIENT DES FIBRES D'AMIANTE

EVITETER DE FAIRE DE LA POUSSIERE (25 mm lettering)

RISQUE DE CANCER ET DE MALADIES PULMONAIRES

.6 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.

.7 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.

.8 Sealer: flame spread and smoke developed rating less than 50 and be compatible with new fireproofing.

.9 Sprayed fireproofing: ULC labelled and listed asbestos-free cementitious to provide degree of fire or thermal protection required [in accordance with Section 07810- Applied Fireproofing.

Part 3 EXECUTION

3.1 Procedures

.1 Before beginning work, at each access to work areas, install warning signs approved by Departmental Representative and reading as follows:

CAUTION ASBESTOS HAZARD AREA (25 mm) (1")

NO UNAUTHORIZED ENTRY (20 mm) (3/4")

WEAR ASSIGNED PROTECTIVE EQUIPMENT.

BREATHING ASBESTOS DUST MAY CAUSE

SERIOUS BODILY HARM.

ATTENTION, PRÉSENCE D'AMIANTE (25 mm) (1")

ENTRÉE INTERDITE AUX PERSONNES NON

AUTORISÉES (20 mm) (3/4")

PORT OBLIGATOIRE DE VETEMENTS PROTECTEURS.

L'INHALATION DE POUSSIERE D'AMIANTE PEUT

CAUSER DES LÉSIONS CORPORELLES GRAVES.

.2 Do construction occupational health and safety in accordance with Section 01545 Safety Requirements.

.3 Work Areas:

.1 Shut off and isolate air handling and ventilation systems to prevent fibre dispersal to other building areas during work phase. Conduct smoke tests to ensure that duct work is airtight. Seal and caulk joints and seams of active return air ducts within Asbestos Work Area.

.2 Preclean moveable furniture within proposed work area using HEPA vacuum and remove from work area to temporary location in to be determined by Departmental Representative on site.

.3 Preclean fixed casework, plant, and equipment within proposed work area, using HEPA vacuum and cover with polyethylene sheeting sealed with tape.

.4 Clean proposed work area[s] using, where practicable, HEPA vacuum cleaning equipment. If not practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum equipment.

.5 The spread of dust from the work area to be prevented by:

.1 Using enclosures of polyethylene or other suitable material that is impervious to asbestos (including, if the enclosure material is opaque, one or more transparent window areas to allow observation of the entire

work area from outside the enclosure), if the work area is not enclosed by walls.

.2 Using curtains of polyethylene sheeting or other suitable material that is impervious to asbestos, fitted on each side of each entrance or exit from the work area.

.6 Put negative pressure system in operation and operate continuously from time first polyethylene is installed to seal openings until final completion of work including final cleanup. Provide continuous monitoring of pressure difference using automatic recording instrument. The system to maintain a negative air pressure of 0.02 inches [5 Pa] of water, relative to the area outside the enclosed area. The system to be inspected and maintained by a competent person prior each use to ensure that there is no air leakage, and if the filter is found to be damaged or defective, it to be replaced before the ventilation system is used.

.7 Seal off openings such as corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.

.8 Cover floor and wall surfaces with polyethylene sheeting sealed with tape. Use sufficient layers of FR polyethylene on floors. Cover floors first so that polyethylene extends at least 300 mm up walls then cover walls to overlap floor sheeting.

.9 Build airlocks at entrances to and exits from work area[s] so that work area[s] are always closed off by one curtained doorway when workers enter or exit.

.10 At each access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in

parentheses indicates font size to be used: "CAUTION ASBESTOS HAZARD AREA (25 mm) NO UNAUTHORIZED ENTRY (19 mm) WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)".

.11 After work area isolation, remove heating, ventilating, and air conditioning filters, pack in sealed plastic bags 0.15 mm minimum thick and treat as contaminated asbestos waste. Remove ceiling - mounted objects such as lights, partitions, other fixtures not previously sealed off, and other objects that interfere with asbestos removal, as directed by Departmental Representative. Use localized water spraying during fixture removal to reduce fibre dispersal.

.12 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to Fire Commissioner of Canada Authority having jurisdiction.

.13 Where application of water is required for wetting asbestos containing materials, shut off electrical power, provide 24 volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical lines and equipment.

.14 After preparation of work area and Decontamination Enclosure Systems, for the removal of all other asbestos containing materials, remove within work area and dispose of as contaminated waste in specified containers. Spray asbestos debris and immediate work area with amended water to reduce dust, as work progresses.

.4 Worker Decontamination Enclosure System:

.1 Worker Decontamination Enclosure System includes Equipment and Access Room, Shower Room, and Clean Room, as follows:

.1 Equipment and Access Room: build Equipment and Access Room between Shower Room and work area, with two curtained doorways, one to Shower Room and one to work area. Install portable toilet, waste receptor, and storage facilities for workers' shoes and protective clothing to be reworn in work area[s]. Build Equipment and Access Room large enough to accommodate specified facilities, other equipment needed, and at least one worker allowing him /her sufficient space to undress comfortably.

.2 Shower Room: build Shower Room between Clean Room and Equipment and Access Room, with two curtained doorways, one to Clean Room and one to Equipment and Access Room. Provide constant supply of hot and cold or warm water. Cold and hot water source as noted on drawings Drains to common sewers are indicated on drawings. Provide piping and connect to water sources and drains. Pump waste water through 5 micrometre filter system acceptable to Departmental Representative before directing into drains. Provide soap, clean towels, and appropriate containers for disposal of used respirator filters.

.3 Clean Room: build Clean Room between Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of enclosures and one to Shower Room. Provide lockers or hangers and hooks for workers' street clothes and personal belongings. Provide

storage for clean protective clothing and respiratory equipment. Install mirror to permit workers to fit respiratory equipment properly.

.5 Container and Equipment Decontamination Enclosure System:

.1 Container and Equipment Decontamination Enclosure System consists of Staging Area within work area, Washroom, Holding Room, and Unloading Room. Purpose of system is to provide means to decontaminate waste containers, scaffolding, waste and material containers, vacuum and spray equipment, and other tools and equipment for which Worker Decontamination Enclosure System is not suitable.

.1 Staging Area: designate Staging Area in work area for gross removal of dust and debris from waste containers and equipment, labelling and sealing of waste containers, and temporary storage pending removal to Washroom. Equip Staging Area with curtained doorway to Washroom.

.2 Washroom: build Washroom between Staging Area and Holding Room with two curtained doorways, one to Staging Area and one to Holding Room. Provide high - pressure low - volume sprays for washing of waste containers and equipment. Provide piping and connect to water sources and drains.

.3 Holding Room: build Holding Room between Washroom and Unloading Room, with two curtained doorways, one to Washroom and one to Unloading Room. Build Holding Room sized to accommodate at least two waste containers and largest item of equipment used.

.4 Unloading Room: build Unloading Room between Holding Room and outside, with two curtained doorways, one to Holding Room and one to outside.

.6 Construction of Decontamination Enclosures:

.1 Build suitable framing for enclosures , and line with polyethylene sheeting sealed with tape. Use sufficient layers of FR polyethylene on floors.

.2 Build curtained doorways between enclosures so that when people move through or when waste containers and equipment are moved through doorway, one of two closures comprising doorway always remains closed.

.7 Separation of Work Areas from Occupied Areas:

.1 Separate parts of building required to remain in use as indicated as indicated on drawings from parts of building used for asbestos abatement by means of airtight barrier system constructed as follows:

.1 Build suitable floor to ceiling lumber or metal stud framing, cover with polyethylene sheeting sealed with tape, and apply 9 mm minimum thick plywood. Seal joints between plywood sheets and between plywood and adjacent materials with surface film forming type sealer, to create airtight barrier.

.2 Cover plywood barrier with polyethylene sealed with tape, as specified for work areas.

.8 Maintenance of Enclosures:

.1 Maintain enclosures in tidy condition.

.2 Ensure that barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

.3 Visually inspect enclosures at beginning of each working period.

.4 Use smoke methods to test effectiveness of barriers when directed by Departmental Representative.

.9 Do not begin Asbestos Abatement work until:

.1 Arrangements have been made for disposal of waste.

.2 For wet stripping techniques, arrangements have been made for containing, filtering, and disposal of waste water.

.3 Work area and decontamination enclosures and parts of building required to remain in use are effectively segregated.

.4 Tools, equipment, and materials waste containers are on hand.

.5 Arrangements have been made for building security.

.6 Warning signs are displayed where access to contaminated areas is possible.

.7 Notifications have been completed and other preparatory steps have been taken.

3.2 SUPERVISION

.1 Minimum of one Supervisor at all times is required.

.2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos containing materials.

3.3 ASBESTOS REMOVAL

.1 Before removing asbestos:

.1 Prepare site.

.2 Spray asbestos material with water containing specified wetting agent, using airless spray equipment capable of providing "mist" application to prevent release of fibres. Saturate asbestos material sufficiently to wet it to substrate without causing excess dripping. Spray asbestos material repeatedly during work process to maintain saturation and to minimize asbestos fibre dispersion.

.2 Remove saturated asbestos material in small sections. Do not allow saturated asbestos to dry out. As it is being removed pack material in sealable plastic bags 0.15 mm minimum thick and place in labelled containers for transport.

.3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to Staging Area. Clean external surfaces thoroughly again by wet sponging before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure that containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.

.4 After completion of stripping work, wire brushed and wet sponged surfaces from which asbestos has been removed to remove visible material. During this work keep surfaces wet.

.5 Where Departmental Representative decides complete removal of asbestos containing material is impossible due to obstructions such as structural members or major service elements, [or because asbestos containing material was originally applied to asphaltic coating, and provides written direction, encapsulate material as follows:

.1 Apply surface film forming type sealer to provide 0.635 mm minimum dry film thickness over sprayed asbestos surfaces. Apply using airless spray equipment to avoid blowing off fibres. Use different colour for each coat. Use white colour for final coat. Apply penetrating type sealer to penetrate existing sprayed asbestos surfaces to uniform depth of 25 mm minimum. Apply penetrating type sealer to penetrate existing sprayed asbestos surfaces uniformly to substrate.

.6 After wire brushing and wet sponging to remove visible asbestos, and after encapsulating asbestos containing material impossible to remove, wet clean entire work area including Equipment and Access Room, and equipment used in process. After 24 hour period to allow for dust settling, wet clean these areas and objects again. During this settling period no entry, activity, or ventilation will be permitted. After second 24 hour period under same conditions, clean these areas and objects again using HEPA vacuum followed by wet cleaning. After inspection by Departmental Representative apply continuous coat of slow drying sealer to surfaces of work area. Allow at least 16 hours with no entry, activity, ventilation, or disturbance other than operation of negative pressure units during this period.

.7 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.8 Fire proofing: Refer to section 07810, Interior Cementitious Spray – Applied Fireproofing.

.9 Cleanup:

.1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.

.2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.

.3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

.4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.5 FINAL CLEANUP

.8 Following cleaning specified in the above, and when air sampling shows that asbestos levels on both sides of seals do not exceed 0.01 fibres/cc as determined by membrane filter method at 400-500X magnification phase contrast illumination, as described in NIOSH Method 94-113 or equivalent, proceed with final cleanup.

.9 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible asbestos containing particles observed during cleanup, immediately, using HEPA vacuum equipment.

.10 Place polyethylene seals, tape, cleaning material, clothing, and other contaminated waste in plastic bags and sealed labelled waste containers for transport.

.11 Include in clean-up Work areas, Equipment and Access Room, Washroom, Shower Room, and other contaminated enclosures.

.12 Include in clean-up sealed waste containers and equipment used in Work and remove from work areas, via Container and Equipment Decontamination Enclosure System, at appropriate time in cleaning sequence.

.13 Conduct final check to ensure that no dust or debris remains on surfaces as result of dismantling operations and carry out air monitoring again to ensure that asbestos levels in building do not exceed 0.01 fibres/cc. Repeat cleaning using HEPA vacuum equipment, or wet cleaning methods where feasible, in conjunction with sampling until levels meet this criteria.

.14 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled containers containing asbestos waste and dispose of to authorized disposal area in accordance with requirements of disposal authority. Ensure that each shipment of containers transported to dump is accompanied by Contractor's representative to ensure that dumping is done in accordance with governing regulations.

3.6 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS

.1 When cleanup is complete:

.1 Re-establish objects and furniture moved to temporary locations in course of Work, in their proper positions.

.2 Re-secure mounted objects removed in course of Work in their former positions.

.3 Re-establish mechanical and electrical systems in proper working order. Install new filters.

.4 Repair or replace objects damaged in the course of Work, as directed by Departmental Representative.

END OF SECTION

Part 1 GENERAL

1.1 Related Work Specified Elsewhere

.1 Modified Bitumen Membrane Roofing - Section 07 5200

1.2 General

.1 Provide wood blocking and sheathing for roofing and sheet metal work as indicated on the drawings or as required to complete the roof installation.

.2 Be responsible for the safe disposal of all debris caused by these operations, from the job site.

1.3 References

.1 CAN/CSA B111-1974(R2003) wire, Nails, Spikes and Staples.

.2 CAN/CSA O80 Series-97(R2002) Wood Preservation

.3 NLGA National Lumber Grades Authority, Standard Grading Rules for Canadian Lumber, 1987

.4 ULC underwriters' Laboratories of Canada.

1.4 Anchors and Fasteners

.1 Co-ordinate the location and installation of anchors and fasteners. Confirm types of fasteners to be utilized with Consultant.

.2 Do not use metals in combination that will set up electrolytic action.

.3 Use non-corrosive or galvanized steel fastenings, as approved by Consultant, or as otherwise specified.

.4 Space anchors within load bearing or shear capacity.

1.5 Quality Assurance

.1 Lumber shall bear the grading stamp of an agency certified by the Canadian Lumber Standards Administration Board.

1.6 Precautions

.1 Provide temporary protection, to the satisfaction of the Consultant, to render all wood blocking watertight, if for any reason permanent membrane protection cannot be provided within the same day.

.2 Ensure the base of any curbs are temporarily sealed to prevent water from entering below the curb assembly, or behind sheathing, should the roof assembly not be completed on the same day as the carpentry work.

Part 2 PRODUCTS

2.1 Dimension Lumber

.1 TO CAN/CSA 0141-91 and CAN3-086-M84 and to National Lumber Grades Authority Standard Grading Rules 1987-grade Category as follows:

.1 Light framing and blocking: species group spruce - "Construction" grade.

2.2 Fasteners

.1 Nails, spikes and staples: to CSA B111-1974; galvanized for exterior work. For sheathing, use #9 screws with Robertson or Philips head, complete with discs or specified adhesives. For blocking, use screws of sufficient length to penetrate second member a minimum of 38mm. Use expansion shields, friction fit pins or lag bolts in concrete.

2.3 Cement Board

.1 On verticals: 12mm Cement Board shall be a polymer modified concrete board, reinforced with alkali resistant mesh. Board to have a compressive strength of greater than 8Mpa and water absorption characteristics of less than 5% of its mass.

2.4 Pressure Treatment of Wood

.1 All wood blocking to be treated in accordance with CAN/CSA-080-1-M89

2.5 Wood Preservative

.1 Wood preservative: copper napthenate or penta-chlorophenol base, water repellent wood preservative to CSA 080-M89, coloured.

Part 3 APPLICATION

3.1 Securement of Blocking

.1 Secure to substrate with specified fasteners, galvanized, minimum 9mm diameter of a suitable length, placed in 2 rows, with each row spaced at 600mm on centres or as otherwise detailed. In concrete, fastener shall penetrate a minimum of 38mm and drill hole shall be 13mm deeper than fastener penetration.

.2 Double the amount of fasteners required for a distance of 2.4m from all outside corners.

3.2 Wood Preservative

.1 Cut all members to fit prior to installation and treat all faces and cuts with preservative prior to site fabrication of curbs.

3.3 Nailing

.1 All nails shall be long enough so that not less than half their length penetrates into the second member. Splitting of wood members shall be minimized by staggering the nails in the direction of the grain and by keeping nails well in from the edges.

END OF SECTION

Part 1 GENERAL

1.1 Related Work Specified Elsewhere

.1 Sealants - Section 07 9000

1.2 Samples

.1 Submit duplicate samples, 300 mm x 300 mm (1' x 1') of joints, edging, cutouts and postformed profiles in accordance with Section 010000.

1.3 Product Handling

.1 Do not store or install materials in areas where relative humidity is less than 25% or greater than 60% at 22°C (72°F).

Part 2 PRODUCTS

2.1 Materials

.1 Laminated plastic for flatwork: to CAN3-A172-M79, Grade GP, Type S, 1.25 mm (1/16") thick; based on BLACK solid colour with matt finish.

.2 Laminated plastic backing sheet: supplied by same manufacturer as facing sheet; not less than 0.5 mm ( ) thick and same thickness and colour as face laminate. Sanded one side.

.3 Plywood core: for surfaces with cutouts, to CSA O153-M1980 solid two sides, 19 mm (3/4") thick.

.4 Particleboard core: to CAN3-O188.1-M78, sanded faces, of thickness indicated.

.5 Laminated plastic adhesive: as recommended by plastic laminate manufacturer.

.6 Sealer: water resistant sealer or glue acceptable to laminate manufacturer.

.7 Sealant: one component silicone in accordance with Section 07900, colour selected by Engineer.

.8 Draw bolts and splines: as recommended by fabricator.

2.2 Shop Fabrication

.1 Comply with CAN3-A172-M79, Appendix "A".

.2 Obtain governing dimensions before fabricating items which are to accommodate or abut applicances, equipment and other materials.

.3 Ensure adjacent parts of continuous laminate work match in colour.

.4 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. For surfaces with cutouts for lavatories use plywood core. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths.

.5 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.

.6 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 deg. Do not mitre laminate edges.

.7 Apply laminate backing sheet to reverse side of core of plastic laminate work.

Part 3 EXECUTION

3.1 Installation

.1 Install work plumb, true and square, neatly scribed to adjoining surfaces.

.2 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.

.3 Provide cutouts for lavatories and other penetrations. Round internal corners, chamfer edges and seal exposed core.

.4 Use draw bolts and splines in countertop joints. Maximum spacing 450mm (1'-6"), 75mm (3") from edge. Make flush hairline joints.

.5 At junction of laminated plastic counter back splash and adjacent wall finish, apply small bead of sealant.

.6 Provide 19 mm (3/4") thick plywood core 400 x 800 mm (1' -4" x 2' -8") Fire Extinguisher mounting boards with 75 mm (3") radius rounded corners, plastic laminate to face and edges with balance laminate on back. Colour selected by the Engineer. Units shall be secured in position indicated with chrome plated dome head screws or toggle bolts. Installed boards shall resist a downward force of 100 kg (220 lbs).

.7 For site application, offset joints in plastic laminate facing from joints in core.

END OF SECTION

Part 1 GENERAL

1.1 Reference Standards

.1 Do work in accordance with elastomeric membrane manufacturer's printed application instructions, except where specified otherwise.

1.2 Quality Assurance

.1 Membrane: applied by applicator trained and approved by manufacturer for application of its products.

.2 Applicators: minimum 5 years proven experience.

.3 Manufacturers representative:

.1 Inspect substrate prior to commencement of work, during application of membrane and upon completion of work.

.2 Provide technical assistance to applicator and assist where required in correct installation of membrane.

1.3 Mock-Up

.1 Construct mock-ups in accordance with Section 01000.

.2 Construct mock-up 10 m² (108 ft²) minimum, of elastomeric membrane waterproofing including one lap joint, one inside corner, one outside corner and complete window. Mock-up may be part of finished work.

.3 Allow 24 hrs. for inspection of mock-up by Departmental Representative before proceeding with waterproofing work.

1.4 Samples

.1 Submit samples in accordance with Section 01000.

.2 Submit duplicate 300 x 300 mm (1' -0" x 1' -0") samples of sheet membrane material

Part 2 PRODUCTS

2.1 Materials

.1 Modified bitumen cold applied self-adherant sheet membrane such as Colphene 1000 GSA from Soprema, Blue Skin SSA from Bakor, Perm-A-Barrier System 4000 from Grace or equal approved by the Departmental Representative.

.2 Primer or surface conditioner as recommended by air-barrier membrane manufacturer.

.3 Mastic, adhesive tape and sealant as recommended by air-barrier membrane manufacturer.

2.2 Compatibility

.1 Use same membrane throughout whole project.

.2 All products to be from same manufacturer or to be approved by him.

Part 3 EXECUTION

3.1 Preparation

.1 Carefully inspect surfaces to be covered with air barrier membrane. Remove dirt, dust, peeling paint, or other substances that might impair adherence to air barrier.

.2 Remove sharp protuberences and round sharp angles.

.3 Secure unsound substrate, fill holes and cracks and even surface repaired.

3.2 Primer

.1 Follow manufacturer's printed instructions.

.2 Prime a surface area no bigger than what can be covered with air barrier within recommended setting time limits for primer used on the job.

.3 Re-prime surface areas where primer has set before being covered with membrane.

3.3 Application of Membrane

.1 Apply membrane over the entire exterior face of existing building, from two (2) feet below grade up to roof parapets.

.2 Provide air/watertight junction with existing roof waterproofing system.

.3 Coordinate work with other trades to ensure air-tightness at junction with windows, doors, louvers and other openings thru exterior walls.

.4 Detailed application of air barrier membrane should be similar to standard roof membrane details: reinforced corners, expansion joints, etc.; add bituminous flashings around wall penetrations, protrusions, etc.

.5 Install air barrier membrane plumb and on straight lines. Stagger end joints. Overlap as recommended.

.6 Provide positive seal at overlaps.

.7 Repair damages to air barrier as soon as they are discovered.

.8 Redo areas that prove to be unacceptable due to inadequate substrate preparation, deficient priming, defective materials, lack of bonding and/or improper installation.

3.4 Inspection

.1 Allow enough time to Departmental Representative for review of membrane installed before covering it with new insulation.

END OF SECTION

Part 1 GENERAL N/A

Part 2 PRODUCTS

2.1 Insulation

.1 Bulk insulation: fabricated from friction fit batts or rolls [glass fibre][mineral fibre], RSI 0.6 (R3.33) for each 25 mm (1") thickness. Extruded polystyrene: below grade: to CAN/CGSB-51.20-M87, type 4 having RSI 0.87 for each 25 mm (1") thickness to thickness indicated and having a compressive strength of 210 Kpa, square edges. Only polystyrene insulations listed on CGSB Qualified Products List (GP-41) are acceptable for use on this project. For roofing application, use polystyrene board with pre-grooved channels on the underface to facilitate drainage.

.2 Extruded polystyrene: Only polystyrene insulations listed on CGSB Qualified Products List (GP-41) are acceptable for use on this project. For roofing application, use polystyrene board with pre-grooved channels on the underface to facilitate drainage.

.3 Bulk insulation: fabricated from friction fit batts or rolls mineral fibre, RSI 0.6 (R3.33) for each 25 mm (1") thickness.

2.2 Accessories

.1 Insulation clips: impale type, perforated 50 x 50 mm (2" x 2") cold rolled carbon steel 0.8 mm (20 ga.) thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm (1") diameter washers of self locking type.

.2 Sealant: to CAN/CGSB-19.21-M87.

.3 Tape for sealing as recommended by manufacturer.

Part 3 EXECUTION

3.1 Workmanship

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation closely around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 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.

.5 Offset both vertical and horizontal joints in multiple layer applications.

.6 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.2 Semi-Rigid Insulation Installation

.1 Install glass fibre bulk insulation with insulation clips and disc, cut off fastener spindle 3 mm (1/8") beyond disc where installed to substrate. Install with adhesive to concrete substrate.

.2 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm (6") wide 0.15 mm (6 mil) polyethylene strip over joint using cmpatible adhesive before application of insulation.

END OF SECTION

Part 1 General

1.1 RELATED Work Specified Elsewhere

.1 Instructions to Bidders.

.2 General Conditions of Contract

.3 Rough Carpentry - Section 06 10 00

.4 Metal Flashing and trim - Section 07 62 00

.5 Mechanical - Section 15 40 00

1.2 GENERAL

.1 Provide the necessary labour and materials to complete the removal of the existing roofing system, sheet metal flashings and membrane down to the existing structural deck and install new roofing system as specified herein.

.2 Do roofing work in accordance with applicable standards in the Canadian Roofing Contractors Association (CRCA) roofing specifications manual.

.3 Remove and reinstate existing lightning protection to facilitate new roofing operations and submit certification that revisions comply with CAN/CSA-B72.

1.3 REFERENCES

.1 ASTM C79/C79M-01 CGSB 37-GP-9Ma Primer, Asphalt, Unfilled for Asphalt Roofing, Dampproofing and Waterproofing

.2 CGSB 37-GP-56M Membrane, Modified Bituminous, Prefabricated and Reinforced for Roofing

.3 CAN/CGSB 37.29-M89 Rubber-Asphalt Sealing compound.

.4 CSA B111-1974(R1998) Wire Nails, Spikes and Staples

.5 CAN/ULC-S704-2001 Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.(supersedes CN/CGSB 51.26)

.6 CRCA Canadian Roofing Contractors' Association Metric Specification Manual

1.4 PREPARATION

.1 All materials that may be reused on the new roof system, salvage and store for inspection by the Departmental Representative. Credits for such materials may be requested.

.2 The Contractor is solely responsible for the disconnection, relocation and re-

installation of all existing mechanical and electrical services as required.

.3 Ensure that the Departmental Representative is aware of any such work that may effect the interior environment of the building, prior to disconnection or shut down.

.4 Disconnection and reconnection of all electrical services to meet latest regulations of Canadian Electrical Code and applicable Municipal and Provincial Codes and Regulations. In each and every instance of application, Code, Regulation, Statute, By-Law or Specification, the most stringent requirements shall apply.

.5 Provide the Departmental Representative with a schedule indicating time and dates, for any work creating a disruption to the interior environment and obtain the Owner's written approval.

Part 2 Products

2.1 PERFORMANCE CRITERIA

.1 Compatibility between components of roofing system is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.

.2 Roofing System: to CSA A123.21 for wind uplift resistance.

2.2 ROOF ASSEMBLY

.1 Supply all labour and materials necessary to complete the new Modified Bitumen Membrane Roofing, as specified in the areas indicated on the drawings.

The Typical Roof Assembly shall be:
Vapour Barrier
75mm Rigid Insulation
6mm Asphalt Core Board
2 Ply Modified Bitumen Membrane

2.3 MEMBRANE FLASHING

.1 Supply all labour and materials necessary to complete the new two ply Modified Bitumen Membrane Flashings, as specified and detailed in the areas indicated on the drawings.

2.4 INSPECTION AND TESTING

.1 Inspection of membrane roofing and associated work will be done by the Departmental Representative. Notify the Departmental Representative at least 48 hours before commencement of any roofing work.

.2 The Departmental Representative reserves the right to have cut tests made in the presence of the Contractor. Costs of tests and subsequent repairs shall be borne by the Contractor.

.3 The Departmental Representative shall be notified in the event that the specifications conflict with the Manufacturer's recommendations or CRCA guidelines.

.4 The inspection and testing service does not relieve the Contractor of his responsibility for quality control of production and for errors made by him.

2.5 PRECAUTIONS

.1 Roofing shall not be carried out when materials are damp, or when ambient temperatures are less than minus ten (-10) degrees Celsius. (Postpone roofing work when inclement weather appears imminent.) Base sheet membranes shall be stored at above 10 degrees Celcius prior to use and shall be unrolled to relax prior to torching applications.

.2 Apply each part of roofing system only when surfaces are clean and dry.

.3 All adjacent parts of the building shall be protected from damage caused by roofing operations. Cover walls and other surfaces in the vicinity of hoisting apparatus with heavy canvas or other suitable protective material. Any damage caused by this contract shall be repaired to match the original materials and appearance.

.4 Locate equipment and materials in areas designated by the Departmental Representative.

.5 Conduct operations so as to leave deck exposed for minimum period of time. Protect, as required, to prevent water infiltration or environmental damage to building interior.

.6 Provide temporary membrane to render deck watertight, if for some unforseen reason work cannot be completed as specified. All temporary membranes shall be removed completely prior to any further roofing work.

.7 Where work must continue over finished roofing membrane, protect surface with minimum 12.5mm thick plywood sheets.

.8 Any sharp projections, that in the opinion of the Departmental Representative may penetrate the membrane, shall be ground smooth and flush.

.9 All aspects of the re-roofing operation shall follow in close sequence. No part of the operation shall be so far ahead of the succeeding part that the latter cannot be finished that working day.

.10 During roofing maintain a clean Site and keep 2 foam or dry type fire extinguishers on roof within easy access of torching application and in any open flame location while roofing is in progress. Verify no vent pipes venting flammable fumes (i.e. fuel storage tanks) are located in area of work. Do not have gasoline or other flammable solvents on roof while torching. Be vigilant against self-starting fires at end of roofing operations for day. Use a heat detector gun to spot any smouldering or concealed fire. Examine roof for hot spots 2 hour after completion of roofing operations, especially at

flashings and around roof penetrations. Alert watchman of such possibilities.

2.6 STORAGE

.1 Store membrane and other materials susceptible to damage from moisture, on dry base off ground and protected from damp, wet, freezing or contact with non-compatible materials. Membrane rolls shall be stored in an upright position.

.2 Deliver and store all materials in their original packaging; bearing the manufacturer's name, the grade, weight and standards pertaining thereto, as well as any other reference or markings considered standard.

.3 Any materials damaged and/or exposed to the elements and/or moisture, shall be removed from the work site at the discretion of the Departmental Representative.

.4 Stockpiling of materials on the roof will not be allowed. Distribute material as directed by the Departmental Representative.

2.7 COMPAIBILITY

.1 Compatibility between all components of roofing system is essential.

.2 The Contractor shall be responsible for ensuring that all items he elects to use are compatible with each other.

2.8 CUTTING, PATCHING AND MAKING GOOD

.1 Cut and modify existing surfaces, as required, to accommodate new work.

.2 Remove all items as shown or specified.

.3 Patch and make good all surfaces cut, damaged or disturbed, to Departmental Representative's satisfaction.

2.9 EXAMINATION

.1 Examine all surfaces to receive new roof assembly, and if corrective measures are necessary, report items to Departmental Representative in writing. Substrate shall be smooth, clean, dry and free from depressions or sharp edges. All required wood blocking and curbs shall be securely in place prior to start of roofing work.

.2 Inspect the substrates and all roof mounted mechanical equipment being affected by the work, to ensure they are in good repair and working order. Notify the Departmental Representative, in writing, prior to commencing contracted work, should corrective measures be required.

.3 Examine drawings and existing conditions, provide for all vents, curbs, stacks roof mounted equipment curbs, and other openings through membrane roofing.

2.10 CLEAN-UP

.1 Clean up as work progresses.

.2 Upon completion, remove scaffolding, temporary protections and surplus materials. Make good any defects noted at this stage.

.3 Clean areas affected under contract, to a condition at least equal to that previously existing and to satisfaction of the Departmental Representative.

.4 At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site and neatly stack material.

2.11 CO-ORDINATION

.1 Study all documents which describe, or are related to any operation before commencement of that operation. Report discrepancies discovered between existing conditions and documentation. Obtain ruling on required interpretation before commencing work.

.2 Ensure that materials, equipment, services and operatives are brought to site in sufficient quantity and in accordance with requirements of the work schedule.

2.12 WARRANTY

.1 **The warranty shall be a period of two (2) years from the date of final completion. Repair of any actual leaks shall also include the removal and replacement of all related moisture damage materials.**

.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 a manufacturers warranty, which shall guarantee the membranes and membrane flashing performance, for a period of ten years against manufacturing defects and premature deterioration.

.5 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 Owner.

Part 3 Products

3.1 SHEATHING

.1 See Section 06 10 0 for product and application requirements.

3.2 PRIMER

.1 Primer shall be dark brown or black bituminous emulsified primer (water based) shall be non-flammable, as recommended by the membrane manufacturer.

3.3 VAPOUR BARRIER

.1 Modified Bitumen Base Sheet Membrane: (Torch Application): to Class C, Grade 1 , material, reinforced with a minimum 180 gram/m sq non-woven polyester mat with minimum thickness 3mm to CGSB 37-GP-56M + Amdt. Dec. 85.

3.4 INSULATION

.1 Rigid closed cell polyisocyanurate insulation bonded on upper and lower surfaces to an organic \ inorganic facer. Material shall meet CAN/CGSB-51.26-M86 and CAN\UL-S126-M. The boards shall be distributed in **1200mm x 1200mm** panels, pre-wrapped to prevent moisture ingression. Standard of acceptance shall be Johns Manville E'NRG'Y 3,IKO Therm polyisocyanurate insulation or Atlas Roofing Corp AC FOAM II.

.2 Fibrous glass batts, friction fit, unfaced to CSA A101 latest edition.

3.5 ADHESIVES

.1 Adhesive for securing insulation, tapered insulation and overlay board shall be

.1 an asphalt extended vulcanized adhesive.

.2 a single component urethane adhesive, dispensed from a portable pre-pressurized container requiring no external power source.

.3 a single component solvent free moisture curing adhesive.

.4 a two component, elastomeric, moisture cured; low rise urethane foam adhesive that contains no solvents.

.2 Standard of Acceptance shall be Fas-n-free by Tremco, Cold Gold by IKO or Duotack by Soprema.

3.6 JOINT TAPE

.1 Joint tape for all vertical joints in cement board at parapets and curbs and all joints and transitions in protection board, shall be a self adhering modified bitumen membrane, as distributed by the membrane manufacturer. Tape shall be 150mm wide and a minimum of 1.2mm thick.

3.7 OVERLAY BOARD

.1 Approved Overlay Board shall be a minimum of 6mm thick, asphalt based recovery board with non-woven glass facers, as distributed by the membrane manufacturer.

3.8 MODIFIED BITUMEN MEMBRANE

.1 Two (2) ply system made from prefabricated modified bitumen membranes containing minimum 15% of elastomer Styrene Butadiene Styrene (SBS) and reinforced with non-flammable, fireproof and stress resistant insert of glass fibre or polyester.

.1 Cap Sheet And Flashing (Torch Application): to be Class A, Grade 2 material, reinforced with 250 gram/m. sq. non-woven polyester mat with a minimum membrane thickness of 4mm to CGSB 37-GP-56M + Amdt. - Dec. 85. Granule colour to be selected by Owner and/or Consultant.

.2 Base Sheet and Flashing (Torch Application): to Class C, Grade 1 , material, reinforced with a minimum 180 gram/m sq non-woven polyester mat with minimum thickness 3mm to CGSB 37-GP-56M + Amdt. Dec. 85.

.2 Low Temperature Requirements: Grade 2 material to pass low temperature requirements at –30C to CGSB 37-GP-56M + Amdt. Dec. 85.

.3 Test Results: Test results from a certified independent laboratory showing conformance to above requirements shall be submitted with tender documents or within 48 hours of tender closing.

.4 Standard Of Acceptance: S.B.S. Modified Bitumen Membranes as manufactured by Soprema Waterproofing Inc., Monsey Bakor. or IKO.

3.9 ACCESSORIES

.1 Install insulation to meet thickness as required in scope of work and indicated on the drawings. Ensure polyethylene film on base sheet vapour barrier is completely removed prior to applying adhesives.

.2 Stagger all joints in the boards, for all layers, and adhere with continuous 12mm wide beads of adhesive spaced at 300mm O.C. Alternatively, adhesive may be applied by trowel 3mm thick and 40mm wide bands, 150mm apart. Follow Manufacturers printed instructions for the use of Tremco and IKO adhesives.

.3 In the sump area around the drain, reduce base insulation by 25mm and install sloped insulation as detailed.

.4 Cap all insulation, as detailed, with the overlay board, secured with the specified adhesives.

.5 Unless specifically stated otherwise, strictly follow the adhesives

Manufacturers printed instructions for the application of the adhesives, including spread patterns and requirements for walking over the boards.

.6 Stagger all joints in the insulation boards, for all layers, and adhere with continuous 12mm wide beads of adhesive spaced at 300mm O.C. Alternatively, adhesive may be applied by trowel 3mm thick and 40mm wide bands, 150mm apart. Follow Manufacturers printed instructions for the use of Tremco and IKO adhesives.

Part 4 Application

4.1 ASPHALT PRIMER

.1 Apply by brush, roller or spray, at a rate of 10m sq. per 4 litres over existing vapour barrier and new sheathing and allow to dry. Consult sheathing manufacturer for specific written instructions for primer applications.

4.2 VAPOUR BARRIER

.1 Install under new wood blocking as detailed on the drawings and lap over parapets.

.2 Commencing at the lowest point of the roof, apply vapour barrier by torching application. Apply membrane with 75mm side laps and 150mm end laps. Supplement adhesion where necessary with additional membrane strips to ensure waterproof protection until application of roof assembly.

.3 Ensure membrane is unrolled to enable membrane to relax prior to installation. Time required for relaxation will vary with weather conditions.

.4 Torch weld all lap joints by heat softening the membrane and pressing the edge of the membrane firmly with a roofing trowel. Ensure consistent adhesion has been achieved between the substrate and base sheet membrane.

4.3 INSULATION

.1 Install insulation to meet thickness as required in scope of work and indicated on the drawings. Ensure polyethylene film on base sheet vapour barrier is completely removed prior to applying adhesives.

.2 Stagger all joints in the boards, for all layers, and adhere with continuous 12mm wide beads of adhesive spaced at 300mm O.C. Alternatively, adhesive may be applied by trowel 3mm thick and 40mm wide bands, 150mm apart. Follow Manufacturers printed instructions for the use of Tremco and IKO adhesives.

.3 In the sump area around the drain, reduce base insulation by 25mm and install sloped insulation as detailed.

.4 Cap all insulation, as detailed, with the overlay board, secured with the specified adhesives.

.5 Unless specifically stated otherwise, strictly follow the adhesives Manufacturers printed instructions for the application of the adhesives, including spread patterns and requirements for walking over the boards.

.6 Stagger all joints in the insulation boards, for all layers, and adhere with continuous 12mm wide beads of adhesive spaced at 300mm O.C. Alternatively, adhesive may be applied by trowel 3mm thick and 40mm wide bands, 150mm apart. Follow Manufacturers printed instructions for the use of Tremco and IKO adhesives.

4.4 BASE SHEET

.1 Commencing at the lowest point of the roof, apply the base sheet by torching application, ensuring full adhesion to the substrate. Apply base sheet with 75mm side laps and 150mm end laps. Apply consistent pressure to ensure full adhesion and pressure roll all laps.

.2 Apply additional strips of membrane at deficient seams, where required to ensure protection, until cap sheet can be torch applied.

.3 Ensure base sheet is unrolled to enable membrane to fully relax prior to installation. Relaxation time will vary with weather conditions.

.4 All wrinkles and application deficiencies shall be cut out and repaired prior to cap sheet application.

4.5 CAP SHEET

.1 Plan the membrane application so that the laps are not superimposed over the laps of the base sheet. Mark a chalk line where the first course is to start. Unroll 2 - 3m of the membrane and line it up to the chalk line or to the selvage edge. Re-roll and commence application. If the roll goes out of line by more than 12mm, cut and re-align.

.2 With a torch, adhere one ply of the membrane, granule side up. Carefully heat the underside of the membrane and slowly unroll. Constantly check the adhesion to be certain that proper bonding is achieved.

.3 Side laps must cover the selvage edge and be a minimum of 75mm, end laps must be 150mm.

.4 Using a torch and round nosed roofing trowel, embed the surface granules into heated and soft bitumen, from the chalk line to the edge of the cap sheet at the top of the horizontal surface. A minimum distance of 150mm from the edge of the cap sheet.

4.6 MEMBRANE FLASHING

.1 Check sheathing manufacturers requirements for torching requirements. Ensure burning of scrim sheet does not interfere with adhesion of

membranes. Cut testing of all curb detailing shall be requested during the flashing installation.

.2 Plan 2 ply membrane flashing application so that laps are not superimposed over the laps on the underlying membrane.

.3 Install membrane flashing with full roll widths perpendicular to the deck, 1.0m wide maximum.

.4 Install reinforcing gussets at all inside and outside corners as per manufacturer's recommendations.

.5 Install base sheet flashing prior to horizontal cap sheet application. Extend membrane 100mm onto horizontal surface and 400mm up any verticals, or as indicated on the detail drawings. Set base sheet and cap sheet membrane flashing by torch application.

.6 Using a chalk line, lay out a straight line on the cap sheet surface. Set line parallel to the roof edge and 150mm from the base of the vertical. Install cap sheet flashing after application of horizontal cap sheet. Extend membrane 150mm onto horizontal surface and 400mm up verticals or as indicated on the Drawings.

.7 Granules shall be embedded for the preparation of the selvage where the membrane will overlap on the mineral surface.

.8 Using the propane torch, heat the back of the flashing strip until the coating flows and bonds to the roof and up to the vertical. Press in firmly for proper adhesion. Continue by bonding the upper portion to the wall, taking precautions not to stretch the membrane. Secure all membrane flashings to verticals with continuous securement strips installed along the top edge of membrane flashings and fastened at 300mm O.C. or as detailed. Lap all flashing strips to the selvage or a minimum of 75mm and seal the laps securely.

.9 Use a wet sponge to tamp the membranes in place at the junction of the horizontal and vertical surfaces.

.10 Torch application of membrane flashings shall be performed by skilled tradesmen in accordance with the manufacturer's recommendations.

4.7 COMPLETION OF DAY'S WORK

.1 Install water cut-offs at the end of each day's work; remove completely prior to continuing further roofing applications.

.2 Inspect all laps of the membrane application to ensure they are properly bonded. Repair any deficiencies prior to leaving the site for the day.

.3 Base sheet applications should not be left exposed overnight unless all seams are torch welded prior to leaving the work site.

.4 Provide a two (2) hour fire watch at the end of each day when torching membrane. Walk the day's entire production area to check for smoke and hot spots. The fire watch shall include use of a hand held digital infrared thermometer, which shall be scanned over the day's production area every 20 minutes.

4.8 GENERAL

.1 Patching of the cap sheet membrane shall be carried out utilizing patches with a minimum size of 450mm by 1000mm. Minimum length of cap sheet on flat run of roof shall not be less than 1000mm.

.2 Wrinkled or deformed ends of cap sheet rolls will not be tolerated and therefore must be discarded prior to application.

.3 Following completion of new roofing, torch soften and apply a liberal application of approved bulk type mineral granules to cap sheet membrane edges where asphalt has extruded or flowed beyond clean lines and to all surface damage.

.4 Splices in delivered rolls of membrane are to be removed. Cut back the roll 450mm on both sides of the splices and remove prior to installation.

END OF SECTION

Part 1 GENERAL

1.1 RELATED Work Specified Elsewhere

.1 Rough Carpentry - Section 06 10 00

.2 Modified Bituminous Membrane Roofing- Section 07 52 00

.3 Mechanical - Section 15 40 00

1.2 General

.1 Provide all sheet metal and fasteners required to cover new or existing parapets curbs, vents, caps, etc. as indicated on the drawings.

.2 All work to be performed by experienced mechanics skilled in the trade to the satisfaction of the Departmental Representative.

1.3 Warranty

.1 For work of this section, the 12 months warranty period prescribed in [subsection GC 32.2 of General Conditions "C"]is extended to [24] months.

Part 2 PRODUCTS

2.1 Materials

.1 Sheet Metal: Use one or more of the following for the particular application indicated on the drawings. [.1 Galvanized - 0.71 mm (0.028").] [.2 Copper - 0.68mm (0.027").] [.3 Aluminum 0.80mm (0.031") 35 type H.] [.4 Prefinished - as indicated on drawings.]

.2 Fasteners: non-corrosive colour to match exposed flashings.

.3 Unexposed: galvanized nails.

.4 Exposed: screws with neoprene washers under the heads.

.5 Caulking compound to CGSB 19-GP-5M colour to suit application.

.6 Solder to ASTM B32-93 45% tin, 55% lead. .

Part 3 EXECUTION

3.1 Execution

.1 Form sheet metal on a bending brake.

.2 Provide flush type expansion joints at the maximum of 2400 mm (8'-0").

.3 Back paint metal that comes in contact with other materials.

.4 Fasten all exposed metal with non-corrosive screws c/w neoprene washers under the heads.

.5 Caulk all joints indicated and all that are necessary to render installation watertight. Caulk around services at walls.

.6 Extend ducts indicated on drawings with metal and gauge to match existing.

.7 All metal flashings, reglets and parapets to be level and parallel with building lines.

END OF SECTION

Part 1 GENERAL

1.1 General

.1 One manufacturer's product only to be used throughout.

.2 Sealant must be approved by Departmental Representative as acceptable product.

.3 Exclude the following other sections of specifications; Flashing and Sheet Metal 076200, Glazing 08800, Painting 09900.

.4 Colours of all sealants to be selected by the Departmental Representative prior to proceeding.

Part 2 PRODUCTS

2.1 Materials

.1 Multi-purpose sealant: Silicone,"Dow Corning #732" or equivalent approved by Departmental Representative.

.2 Filler of backing material: white non-absorbent, closed cell foam polyethylene. Material 30-50% wider than joint width to receive same.

.3 Primers: sealant manufacturer's type.

.4 Cleaners: as recommended by sealant manufacturers.

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 Use bond breaking backing: to prevent sealant bonding to joint bottom.

.4 Prime joint sides in accordance with manufacturer's directions.

.5 Mask adjacent surfaces to prevent contamination by sealant. Remove mask immediately after joints completed.

3.2 Application

.1 Employ a professional applicator to run continuous non varying width and depth beads of sealant on joints.

.2 Apply sealant as per manufacturer's recommendations.

.3 Do not apply sealant when surrounding air temperature air is below 5°C.

.4 Immediately clean surplus compound from adjacent surfaces.

END OF SECTION

Part 1 GENERAL

1.1 Requirements of Regulatory Agencies

.1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4 S104M-80 revised 1985 and CAN4 S105M-1985 for ratings specified or indicated, for example ULC or Warnock-Hersey.

.2 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.

1.2 Shop Drawings

.1 Submit shop drawings in accordance with Section 01000.

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners openings, glazed.

Part 2 PRODUCTS

2.1 Hollow Metal Doors

.1 Steel: zinc coated .25 oz zinc per square foot content to ASTM A527.

.2 Flat sheet: face and back skins to be 18 (1.0mm) gauge thickness.

.3 Door Core:

.1 Hollow steel: vertically stiffened with steel ribs and all voids filled with semi-rigid fibrous insulation minimum density [24] kg/m³ [polystyrene][polyurethane].

.2 Bonded core: urethane or isocyanurate board insulation to CGSB 51-GP-21M-78.

.4 Hardware reinforcement: hinges 7 (3.7mm) gauge, lock box, closer mounting, 14 (1.6mm) gauge.

.5 Top and bottom channels closures: 14 (1.6mm) gauge.

.6 Primer: for touch-up zinc chromate CAN/CGSB-1.132-M90.

2.2 Materials Pressed Steel Frames

.1 Steel; zinc coated .25 oz zinc per square foot content to ASTM A527.

.2 All components; headers, jambs, screen stiles to be 16 (1.3mm) gauge thickness.

.3 Hardware reinforcement; minimum 7 (3.7mm) gauge for hinge plates min. 16 (1.3mm) gauge for closer mounting, panic sets, cylindrical and mortised locksets.

.4 Glazing stops: min. 20 (0.8mm) gauge.

.5 Temporary channel spreaders; min. 1.6mm (1/16").

.6 Guard and dust boxes; 0.8mm (0.031") thick.

.7 All anchors; drywall and masonry 18 (1.0mm) gauge, tube and screw 3/16" (5mm) dia. screws and 3/8" (10mm) dia. for labelled frames.

.8 Door bumpers; pressure fit black neoprene.

.9 Angle clips; min. 20 (0.8mm) gauge.

.10 Primer: for touch-up zinc chromate CAN/CGSB-1.132-M90.

Part 3 EXECUTION

3.1 Fabrication

.1 Prior to fabrication take critical measurements at site to facilitate installation and fitting of doors.

.2 Blank, drill, reinforce and tap frames to receive templated strikes, door closers and hinges.

.3 Cut frames, mitre accurately and form continuous invisible welds inside profile.

.4 Grind welded corners, fill exposed surface depressions and butted joints with metallic paste filler and sand to a smooth uniform finish.

.5 Protect strikes and hinges by guard boxes welded in place.

.6 Reinforce door transoms and heads for openings larger than 5'-0" (1500mm) with light structural section or as indicated.

.7 Fabricate doors as integral units, free from sag, distortion, wave or core ghosting, with slide interlocking edge seams.

.8 Bond steel sheets to approved core material. Fill voids in stiles with polyurethane.

.9 Exterior doors to have inverted top channel welded in place and filled with a metallic paste filler and sand to a smooth uniform finish.

.10 Glazing stops, zinc coat steel cut to suit glass opening sizes with butted corners for doors and frame screens. Secured in place with oval headed cadmium plated machine screws 8" o.c.

.11 Welding of door and frame components in accordance with CSA W59-M1989.

.12 Fabricate thermally broken frames for exterior doors using steel core, separating exterior portion of frame from interior portion with polyvinyl chloride thermal breaks.

3.2 Installation

.1 Provide each door frame with two rubber door silencers at head of each door, and three at the strike side.

.2 Provide two channel or angle spreaders per frame to ensure proper alignment. Where frames terminate at finished floor, provide angle clips for anchorage to slab.

.3 Provide six adjustable anchors for seven feet height of frames.

.4 Obtain hardware templates. Cut, blank-out, reinforce and drill all members accurately to receive hardware. Provide locating clips for mortise locks.

.5 Secure physical metal fire label, by means of pop rivets on labelled fire doors and frames. Label to carry qualifications of rating in accordance to Underwriters or Warnock-Hersey standards. Locate labels on hinge rebate of frames and hinge end of doors.

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 Construc- tion) 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 Hardware standards listed in Paragraph 2.2 can be obtained through NRC standing offer program.

.2 NRC has a bonded locksmith for our keying system on standing contract. See contract coordinator for information.

.3 Contractor will be responsible to have all cylinders keyed by NRC bonded locksmith on standing offer contract.

.4 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 listed below.

.2 Use one manufacturer's products only for all similar items.

2.2 Door Hardware Standards

.1 Hinges:

.1 Interior doors: Dorex 114.3mm x 101.6mm x 179 454 NRP X C15.

.2 Latching devices:

.1 Lockset "Yale" AU-5407-L x 626.
.2 Latchset "Yale" AU-5401-L x 626.

.3 Closers: Standard duty on:

.1 Interior doors "Norton" 1600BC-Reg x AL. Parallel arm.

.4 Astragal: Provide 3/16" thk. stainless steel astragal on inactive leaf.

.5 Door Holder: Provide "Hager" Kick down Door Holder 270C. S1-sprayed aluminum finish.

.6 Above hardware is standard NRC requirements unless specified or listed on drawings to be otherwise.

2.3 Fastenings

.1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.2 Exposed fastening devices to match finish of hardware.

.3 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.4 Use fasteners compatible with material through which they pass.

Part 3 EXECUTION

3.1 Installation

.1 Furnish door and frame manufacturer with complete instructions and templates for preparation of their work to receive hardware.

.2 Furnish manufacturer's instructions for proper installation of each hardware component.

.3 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.4 Weatherstripping and surface smoke seals 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 Samples

.1 Submit two 300 x 300 mm (1'-0" X 1'-0") samples of glass for approval by Engineer in accordance with Section 01000.

1.2 Warranty

.1 For work of this section, the 12 months warranty period prescribed in subsection GC 32.2 of General Conditions "C" .

Part 2 PRODUCTS

2.1 Glass Materials

.1 Safety glass: to CAN/CGSB-12.1-M90, laminated as indicated, 6mm thick unless indicated otherwise.

.2 Label: each light to be labelled, indicate name of manufacturer, thickness and quality of glass. Do not remove labels until final cleanup of project.

2.2 Glazing & Sealing Compound Materials

.1 Only compounds listed on the CGSB Qualified Products List are acceptable for use on this project.

.2 Sealing compound: two component, polysul- phide, CANCGSB-19.24-M90, type 2, Class A, colour selected by Engineer.

.3 Glazing type: self shimming, preformed butyl tape, 10-15 durometer hardness, paper release.

.4 Setting blocks: neoprene, Shore "A" durometer hardness 75-85, 100 mm (4") long, of thickness suitable to glazing condition to provide adequate glazing bite.

.5 Glazing splines: manufacturer's standard dry glazing splines to suit aluminum extrusions.

.6 Primer-sealers and cleaners: to glass manufacturer's standard.

Part 3 EXECUTION

3.1 Workmanship

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

.2 Apply primer-sealer to contact surfaces.

.3 Place setting blocks in accordance with manufacturer's instructions.

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

.5 Install removable stops, without displacing tape or sealant.

.6 .Provide edge clearance of 3 mm (1/8") minimum.

.7 Apply cap bead of sealant at exterior void.

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

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

.10 Use manufacturer's standard glazing system in accordance with the following.

3.2 Interior Glazing

.1 Dry method - tape/tape:

.1 Cut glazing tape to length and install against permanent stop, project 1.5 mm (1/16") above sightline.

.2 Place glazing tape on free perimeter of glass in same manner described above.

.2 Combination method - tape/sealant:

.1 Cut glazing tape to proper length and install against permanent stop, projecting 1.5 mm (1/16") above sightline.

.2 Fill gap between glass and applied stop with sealant to depth equal to bite of frame on glass to uniform and level line.

.3 Trim off excess tape to sightline.

3.3 Finishing

.1 Immediately remove sealant and compound droppings from finished surfaces. Remove labels after work is completed.

END OF SECTION

Part 1 GENERAL

Part 2 PRODUCTS

2.1 Materials

.1 Non-loadbearing channel stud framing: to ASTM C645-83; [38mm (1-5/8")][64mm (2-1/2")][92mm (3-5/8")][152mm (6")] stud sizes as indicated on drawings; roll formed from [0.53 mm (26 gauge)] [1.0mm (20 gauge)] electrogalvanized steel sheet; for screw attachment of gypsum board. Knock-out service holes at 460 mm (1'-6") centres.

.2 Use double track slip joint to maintain clearance under existing beams and structural slab decks to avoid transmission of structural loads to studs.

.3 Floor and ceiling tracks: to ASTM C645-92b; in widths to suit stud sizes, 32 mm (1-1/4") flange height.

.4 Metal channel stiffener: 38 x 20mm (1-1/2" x 3/4") size, 1.52 mm (16 gauge) thick cold rolled steel, coated with rust inhibitive coating.

.5 Metal channel Furring (Hat Channel type): 22 x 32/64mm (7/8" x1 ¼”- 2 ½ “) size, 1.52 mm (16 gauge) thick cold rolled steel, coated with rust inhibitive coating.

.6 Acoustical sealant: to CAN/CGSB-19.21-M87.

.7 Insulating strip: rubberized, moisture resistant 3 mm (1/8") thick cork strip, 12 mm (1/2") wide, with self sticking adhesive on one face, lengths as required.

Part 3 EXECUTION

3.1 Erection

.1 Align partition tracks at floor and ceiling and secure at 400 mm (16") oc maximum.

.2 Place studs vertically at 400mm (16") oc and not more than 50 mm (2") from abutting walls and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

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

.4 Attach studs to bottom using screws.

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

.6 Co-ordinate erection of studs with installation of door frames and special supports or anchorage for work specified in other Sections.

.7 Provide wood blocking secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, and base and upper cabinets, attached to steel stud partitions.

.8 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, using column clips or other approved means of fastening placed alongside frame anchor clips.

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

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

.11 Install hat channels to concrete or CMU block wall for furring purposes and to apply gypsum board finish..

.12 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.

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

.13 Install two continuous beads of acoustical sealant behind studs and tracks around perimeter of sound control partitions.

END OF SECTION

Part 1 GENERAL

1.1 Reference Standards

.1 Installation: to ASTM C636-92 except where specified otherwise.

1.2 Design Criteria

.1 Maximum deflection: 1/360th of span to ASTM C635-83 deflection test.

1.3 Samples

.1 Submit one representative sample of ceiling suspension system in accordance with Section 01000 if requested by Engineer.

.2 Ceiling system to show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes, acoustical unit installation.

Part 2 PRODUCTS

2.1 Materials

.1 Light duty system to ASTM C635-91.

.2 Basic materials for suspension system: commercial quality cold rolled steel, conforming to ASTM A525-91b and ASTM A526/A526M-90, zinc coated to Z275.

.3 Suspension system: non fire rated, made up as follows:

.1 two directional exposed tee bar grid

Exposed tee bar grid components: shop painted satin sheen white. Components die cut. Main tee with double web, rectangular bulb and 25 mm (1") rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs: lower flange extended and offset to provide flush intersection.

.4 Hanger wire: galvanized soft annealed steel 3.0 mm (1/8") dia. (12 gauge).

.5 Hangers: self-drilling type anchors similar to Phillips "Red Head" T-32.

.6 Carrying channels: 38 x 25 mm (1-1/2" x 1") channel, of 1.2 mm thick galvanized steel.

.7 Accessories: splices, clips, wire ties, retainers and wall moulding, flush, to complement suspension system components, as recommended by system manufacturer.

Part 3 EXECUTION

3.1 Installation

.1 Install suspension system to manufacturer's instruction.

.2 Secure hangers to overhead structure using attachment methods acceptable to engineer. Install hangers spaced at maximum 1200 mm (4'-0") centres and within 150 mm (6") from ends of main tees.

.3 Do not erect ceiling suspension system until work above ceiling has been inspected by Engineer.

.4 Lay out system according to reflected ceiling plan.

.5 Ensure suspension system is co-ordinated with location of related components.

.6 Install wall mould to provide correct ceiling height. Finished ceiling system to be level within 1:1000.

.7 Completed suspension system to support superimposed loads, such as lighting fixtures, diffusers and grilles, etc.

.8 Support light fixtures, diffusers, with additional ceiling suspension hangers within 150 mm (6") of each corner and at 600 mm (2'-0") around perimeter of fixture, also install at splices.

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

.10 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

3.2 Cleaning

.1 Touch up scratches, abrasions, voids and other defects in painted surfaces to the satisfaction of the Engineer.

END OF SECTION

Part 1 GENERAL

1.1 Reference Standards

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

Part 2 PRODUCTS

2.1 Gypsum Board

.1 Regular board: to CAN/CSA A82.27-M91 12.7mm (1/2") x 1200 mm (4'-0") wide x maximum practical length, edges tapered with round edge.

2.2 Metal Furring

.1 Metal furring, runners, hangers, tie wires & suspension to CSA A82.30-M1980, galvanized systems.

.2 Hangers: self-drilling type anchors similar to Phillips "Red Head" T-32.

.3 Drywall furring channels: 0.5 mm (0.02") core thickness galvanized steel channels for screw attachment of gypsum board.

2.3 Fastenings and Adhesives

.1 Nails, screws and staples: CAN/CSA- A82.31-M91.

.2 Laminating compound: to CAN/CSA-A82.31-M91, asbestos-free.

.3 Stud adhesive: to CAN/CGSB-71.25.

2.4 Accessories

.1 Casing beads, corner beads: 0.5 mm (0.02") base thickness commercial grade sheet steel with Z275 zinc finish to ASTM A525-91b, perforated flanges; one piece length per location.

.2 Acoustic sealant: to CAN/CGSB-19.21-M87.

.3 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Panel for joint sealants.

.4 Insulating strip: rubberized, moisture resistant, 3 mm (1/8") thick closed cell neoprene strip, 12 mm (1/2") wide, with self sticking permanent adhesive on one face; lengths as required.

.5 Joint compound: to CAN/CSA-A82.31-M91, asbestos-free.

Part 3 EXECUTION

3.1 Wall Furring

.1 Install wall furring for gypsum board wall finishes in accordance with CAN/CSA-A82.31-M91, except where specified otherwise.

.2 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.3 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

3.2 Gypsum Board Application

.1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply single layer gypsum board as indicated to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm (1'-0") oc.

3.3 Sound Attenuation Blanket

.1 N/a.

3.4 Control Joints

.1 N/a.

3.5 Access Doors

.1 Install access doors to electrical and mechanical fixtures specified in respective Sections.

.2 Rigidly secure frames to furring or framing systems.

3.6 Taping and Filling

.1 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.

.2 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.

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

.4 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.5 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for painting.

END OF SECTION

Part 1 GENERAL

1.1 General Requirements

.1 The General Conditions of the Contract, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 Section includes provision of all labour, materials, equipment and incidental services necessary to provide carpet floor finish, including primers, mortar, mastics and leveling fillers, adhesives, carpet material, accessories, and protection.

Part 2 PRODUCTS

2.1 Product Data

.1 Submit product data in accordance with Division 1. Submit product data for carpet, adhesive, carpet protection, mortar and subfloor filler.

.2 Submit WHMIS MSDS for all materials to be utilized or installed on site.

.3 Submit one (1) sample of each type of carpet tile specified.

2.2 Carpet Tile

.1 Interface, To Scale 172 * IC 50cm, colour: 7772 Blueprint.

2.3 Accessories

.1 Seaming tape: types recommended by carpet manufacturer for purpose intended.

.2 Adhesive: Non-release type: two-part polyurethane by carpet tile manufacturer. Low VOC content in accordance with CRI requirements.

.3 Carpet protection; non-staining heavy duty kraft paper, or cardboard.

.4 Sub-floor filler and patch: Portland cement based, premix latex requiring only water to produce paste: ‘Planipatch’ by Mapei or approved equal.

Part 3 EXECUTION

3.1 Demolition

.1 Remove dust, existing adhesive, dirt, sealer and wax from existing surfaces.

3.2 Examination

.1 Examine substrates for defects and determine level of preparation required prior to commencement of installation.

.2 Report any major defects such as cracks greater than 1/16" (1.5mm) in width, and variations in elevation greater than ¼" in 10 feet (6mm in 3m) in any direction or excessive moisture content in concrete slabs.

3.3 Preparation

.1 Prepare existing floor slab throughout project area for application of all floor covering systems and products. Remove ridges and bumps.

.2 Precondition carpeting following manufacturer's printed instructions.

3.4 Installation

.1 Install carpet using minimum number of pieces.

.2 Install carpeting after finishing work is completed to ceilings and perimeter walls, but prior to demountable partition installations. Carpet installation to be continuous under demountable partitions.

.3 Finish installation to present smooth wearing surface free from conspicuous seams, burring hand other faults. Lay tiles with butt seams.

.4 Use material from same dye lot. Ensure, pattern and texture match.

.5 Apply adhesive and install carpet tile in accordance with manufacturer's written instructions.

3.5 Protection of Finished Work

.1 Vacuum carpet areas clean immediately after completion of installation. Protect traffic areas for duration of construction with carpet protection. Prohibit traffic on carpet until adhesive is cured.

END OF SECTION

Part 1 GENERAL

1.1 Related Documents

.1 The General Conditions of the Contract, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

1.2 Summary

.1 Definitions: Resinous flooring includes penetrating, moisture tolerant, two-component epoxy primer, a high performance, three-component mortar consisting of epoxy resin, curing agent and selected, graded aggregates blended with inorganic pigments and a two-component, general service epoxy coating.

.2 Related Work

.1 SECTION - 03300 Cast In Place Concrete

.2 SECTION - 07000 Section Fluid Applied Waterproofing

.3 SECTION - 07900 Sealants

1.3 Submittals

.1 Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required. Include certification indicating compliance of materials with requirements.

.2 Samples: Submit, for verification purposes, 4-inch square samples of each type of resinous flooring required, applied to a rigid backing, in color and finish indicated.

.1 For initial selection of colors and finishes, submit manufacturer's color charts showing full range of colors and finishes available.

1.4 Quality Assurance

.1 Single Source Responsibility: Obtain primary resinous flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Contractor shall have completed at least five projects of similar size and complexity; Stonhard or approved equal. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.

.2 Pre-Installation Conference

.1 General contractor shall arrange a meeting not less than thirty days prior to starting work.

.2 Attendance

a. General Contractor
b. Architect/Owner's Representative
c. Manufacturer/Installer's Representative

.3 ISO 9002: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9002 registered quality system.

1.5 Delivery, Storage And Handling

.1 Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.

.2 All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

.3 Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 and 85^{o}F/16 and 30^{o}C.

1.6 Project Conditions

.1 Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

.2 Utilities, including electric, water, heat (air temperature between 60 and 85^{o}F/16 and 30^{o}C) and finished lighting to be supplied by General Contractor.

.3 Job area to be free of other trades during, and for a period of 24 hours, after floor installation.

.4 Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

1.7 Warranty

.1 Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) full year from date of installation.

Part 2 PRODUCTS

2.1 Colors

.1 Colors: As selected by Architect from manufacturer's standard colors.

2.2 Epoxy Flooring

.1 Stonclad GS coated with Stonkote GS4 as manufactured by Stonhard, Inc., Maple Shade, NJ, (800) 257-7953 is a nominal 1/4"/6mm thick system comprised of a penetrating, moisture tolerant, two-component epoxy primer, a high performance, three-component mortar consisting of epoxy resin, curing agent and selected, graded aggregates blended with inorganic pigments.

1. Physical Properties: Provide flooring system in which physical properties of topping including aggregate, when tested in accordance with standards or procedures referenced below, are as follows:

Compressive Strength (ASTM C-579)	10,000 psi
Tensile Strength (ASTM C-307)	1,750 psi
Flexural Strength (ASTM C-580)	4,000 psi
Hardness (ASTM D-2240/Shore D)	85-90
Bond Strength (ASTM D-4541)	>400 psi (100% concrete failure)
Impact Resistance (ASTM D-4226)	> 160 in. lbs.
Abrasion Resistance (ASTM D-4060, Taber Abrader CS-17 wheel)	0.1 gm max. weight loss
Coefficient of Friction (ASTM D-2047)	0.75
Flexural Modulus of Elasticity (ASTM C-580)	2.0×10^6 psi
Flammability	Self Extinguishing

(ASTM D-635)	Extent of burning 0.25 inches max.
Thermal Coefficient of Linear Expansion (ASTM C-531)	1.5×10^{-5} in/in^{o}C
Water Absorption (ASTM C-413)	0.2%
Heat Resistance Limitation	140^{o}F/60^{o}C (for continuous exposure) 200^{o}F/93^{o}C (for intermittent spills)
Cure Rate allow (at 77^{o}F/25^{o}C)	8 hours for foot traffic 24 hours for normal operations

2.3 Joint Sealant Materials

.1 Type produced by manufacturer of resinous flooring system for type of service and joint condition indicated.

Part 3 EXECUTION

3.1 Preparation

.1 Substrate: Concrete preparation shall be by mechanical means and include use of a scabbler, scarifier or shot blast machine for removal of bond inhibiting materials such as curing compounds or laitance.

3.2 Application

.1 General: Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.

.2 Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resinous flooring materials and substrate.

.3 Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using stainless steel finishing trowels.

3.3 Field Quality Control

.1 The right is reserved to invoke the following material testing procedure at any time, and any number of times during period of flooring application.

.2 The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.

.3 Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.

.4 If test results show materials being used do not comply with specified requirements, Contractor may be directed by Owner to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials.

3.4 Curing, Protection And Cleaning

.1 Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

.2 Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

.3 Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

END OF SECTION

Part 1 GENERAL

1.1 Related Documents

.1 The General Conditions of the Contract, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

1.2 Summary

.1 Related Work

.1 SECTION - 03300 Cast In Place Concrete
.2 SECTION - 07000 Section Fluid Applied Waterproofing
.3 SECTION - 07900 Sealants

1.3 References

.1 Reference is made to spec standards produced by various organizations to conform to edition of standards specified or, if not specified, to last edition as amended and revised to date of contract.

.2 Cure Rate (at 77°F/25°C)allow:

4 - 5 hours for tack free surface
24 hours minimum for normal operations

.3 Fire Resistance of Dry Film: Self Extinguishing

.4 Heat Resistance Limitation:

140°F/60°C (for continuous exposure),
200°F/93°C (for intermittent exposure)

.5 Percent solids: - 100%

.6 Pot Life @ 77°F/25°C: 35 minute.

1.4 Submittals

.1 **Product Data:** Submit manufacturer's technical data, installation instructions, and general recommendations for each epoxy flooring material required.

.2 **Samples:** Submit, for verification purposes, 300 mm x 300 mm (12"x12") square sample of each type of epoxy flooring required, applied to a rigid backing, in colour and finish indicated.

1.5 Quality Assurance

.1 Single Source Responsibility: Obtain primary resinous flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Contractor shall have completed at least five projects of similar size and complexity; Stonhard or approved equal. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.

.1 Arrange a meeting not less than thirty days prior to starting work.

1.6 Delivery, Storage And Handling

.1 Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.

.2 All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

.3 Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 and 90^{o}F/16 and 32^{o}C.

1.7 Mock-Up

.1 At site, under manufacturer's supervision, apply for approval 9 m^2 (100 sq ft) of complete floor finish in area designated, to match submitted samples. When approved, site applied sample to be standard for appearance, colour, texture, workmanship, etc., and all work to conform to this sample.

1.8 Project Conditions

.1 Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

.2 **TEMPERATURE:** Utilities, including electric, water, heat (air temperature between 60 and 90°F/16 and 32°C) and finished lighting to be supplied by General Contractor. Maintain ambient temperature of not less than 18°C/65°F and a floor temperature of not less than 16°C/60°F from [7] days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.3 **MOISTURE**: Ensure substrate is within moisture limits prescribed by [flooring] manufacturer.

.4 **SAFETY:** Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding the use, handling, storage and disposal of hazardous materials.

.5 Job area to be free of other trades during, and for a period of 24 hours, after floor installation.

.6 Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

.7 Manufacturer's representative must be on job site at start of installation.

1.9 Warranty

.1 Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) full year from date of installation.

Part 2 PRODUCTS

2.1 Colors

.1 Colors: As selected by Architect from manufacturer's standard colors.

.2 Epoxy Floor coating: 100% solids, 0 VOC, two-component general service epoxy coating. Acceptable manufacturer: Stonhard, STONKOTE GS4

Part 3 EXECUTION

3.1 Preparation

.1 **SUBSTRATE**: Concrete preparation shall be by mechanical means and include use of a scabbler, scarifier or shot blast machine for removal of bond inhibiting materials such as curing compounds or laitance.

3.2 Application

.1 **COATING:** Mix coating according to manufacturer's recommended procedures. Squeegee apply and backroll first coat. When surface is tack free, apply second coat to an actual dry film thickness of 200 - 250 microns (8 - 10 mil). Manufacturer: Stonhard, STONKOTE GS4

.2 **JOINT SEALANT:** Install manufacturer's epoxy or urethane sealant compatible with floor finish.

3.3 Field Quality Control

.1 The right is reserved to invoke the following material testing procedure at any time, and any number of times during period of flooring application.

.2 The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.

.3 Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.

.4 If test results show materials being used do not comply with specified requirements, Contractor may be directed by Owner to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials.

3.4 Curing, Protection And Cleaning

.1 Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

.2 Protect epoxy flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

.3 Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by epoxy flooring manufacturer.

END OF SECTION

Part 1 GENERAL

1.1 Samples

.1 Deliver on the Departmental Representative's request for approval, samples of materials proposed for use in the work. Make up samples 100mm wide by 300mm long (4" x 1'-0"). Finished work shall be equal to approved samples.

1.2 Qualifications

.1 Work shall be carried out by skilled labour under the supervision of a responsible and experienced foreman.

.2 Equipment shall be clean and in optimum working condition.

1.3 Protection

.1 Provide protective barriers and signs to protect the work and the public from contact with paint not yet dry.

.2 Protect surfaces likely to attract dust and insects thus liable to mar the finished surface.

.3 Have hardware, electrical and mechanical fittings removed and replaced by appropriate trades, else protect the above and other adjacent work.

1.4 Reference Standards

.1 Do painting and finishing to CGSB 85-GP series standards and to material manufacturer's instructions, except where specified otherwise.

.2 Stucco and Brick: Comply with CGSB 85-GP-31M.

.3 Ferrous Metal: Comply with CGSB 81-GP-10M, 11a, 12, 13 or 15 as applicable.

.4 Galvanized Steel: 85-GP-16M.

.5 Copper & Copper Alloys: 85-GP-20M.

.6 Interior Plaster and Wallboard: 85-GP-33M.

.7 Exterior Unpainted Wood: 85-GP-1M.

.8 Exterior Wood Previously Painted: 85-GP-2M.

1.5 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: to CGSB Standards listed in Finishing Formula.

.2 Paint materials for each coating formula to be product of a single manufacturer.

2.2 Finishing Formula

Apply number of coats of specified materials to designated surfaces as follows:

.1 Interior Finishes:

.1 Plaster and Gypsum Board Ceiling Apply:
- .1 one coat primer-sealer CAN/CGSB-1.119-M89.
- .2 two coats flat latex paint CAN/CGSB-100M.

.2 Plaster and Gypsum Board Walls Apply:
- .1 one coat primer-sealer CAN/CGSB-1.119-M89.
- .2 [two coats semi-gloss enamel CAN/CGSB-1.195.]

.3 Plaster and Gypsum Board Walls Apply:
- .1 one coat primer-sealer CAN/CGSB-1.119-M89.
- .2 two coats semi-gloss enamel CAN/CGSB-1.57-M90.

.4 Wood Doors, Trim, etc., apply:
- .1 one coat enamel undercoat CAN/CGSB-1.38-M91.
- .2 two coats semi-gloss enamel CAN/CGSB-1.57-M90.

.5 Cupboard and Drawer Interiors apply:
- .1 two coats varnish gloss CAN/CGSB-1.36-M90, Type II; cut 1st coat 25% with thinner CAN/CGSB-1.4-92.

.6 Asbestos-cement board apply:
- .1 one coat primer-sealer CAN/CGSB-1.119-M89.
- .2 two coats semi-gloss enamel CAN/CGSB-1.57-M90.

.7 Primed Ferrous Metal Surfaces apply:
- .1 one coat spot priming CAN/CGSB-1.40-M89.
- .2 one coat enamel undercoat CAN/CGSB-1.38-M91.
- .3 two coats semi-gloss enamel CAN/CGSB-1.57-M90.

.8 Galvanized and Zinc Coated Metal apply:

.1 one coat vinyl wash primer CAN/CGSB-1.121-93.
.2 one coat enamel undercoat CAN/CGSB-1.38-M91.
.3 two coats semi-gloss enamel CAN/CGSB-1.57-M90.

.9 Copper Piping and Fittings apply:
.1 one coat vinyl wash primer CAN/CGSB-1.121-93.
.2 one coat tinted enamel undercoat CAN/CGSB-1.38-M91.
.3 one coat semi-gloss enamel CAN/CGSB-1.57-M90.

.2 Exterior Finishes:

.1 Primed Ferrous Metal Surfaces apply:
.1 one coat spot priming CAN/CGSB-1.40-M89.
.2 one coat lead primer CAN/CGSB-1.40-M89.
.3 two coats exterior enamel CAN/CGSB-1.59-M89.

.2 Galvanized and Zinc Coated Metal apply:
.1 one coat vinyl wash primer CAN/CGSB-1.121-93.
.2 one coat steel primer CAN/CGSB-1.40-M89.
.3 two coats exterior enamel CAN/CGSB-1.59-M89.

.3 Masonry, Concrete and Cement Plaster Surfaces apply:
.1 two coats exterior masonry coating.

.4 Mechanical and Electrical Equipment:
.1 Un-insulated: Brush on one prime coat CAN/CGSB-1.40-M89 and as required to match adjacent wall or ceiling surfaces.
.2 Insulated: Apply one coat glue size and paint using CAN/CGSB-1.38-M91 as a primer. Finish to match adjacent surfaces.
.3 High Temperature: Apply two coats CAN/CGSB-1.143-M90.

Part 3 EXECUTION

3.1 Examination of Surfaces

.1 Examine the work to be finished to determine whether the surfaces are in proper condition to receive paint work.

3.2 Preparation of Surfaces

.1 General:

.1 Patch defective shop prime coats. Ensure that surfaces to be painted are smooth, level, dry, free from dust and any matter liable to interfere with adhesion of paint, cause bleeding or staining.

.2 Set all nails and screws below surface and putty flush.

.2 Substrates: Whenever substrates required repairs not covered by this specification, suspend work on the affected portion and advise the Departmental Representative. Paint repairs at completion as part of the original work.

.3 Glazing: Remove perished putty and defective stops and reset the glass, prime rabbets, replace broken glass, and reputty.

.4 Wood (Paint finish):

.1 Seal all knots and pitch streaks with CAN/CGSB-1.126-M91 if not previously painted. Comply with CAN/CGSB-85-GP-1M for exterior work, CAN/CGSB-85-GP-2M for repair work. Resecure loose items. Restore surfaces to their original shape by filling, before and after priming.

.2 .2 Sand all woodwork lightly between all coats, clean and dust.

.5 .5 Wood (varnish, lacquer, natural finishes):

.1 New Surfaces: Bleach out dark staining and restain to the general tint with non-grain-raising stains.

.2 Previously Coated Surfaces: Remove waxes, oils and other previous coatings with steel wool steeped in appropriate solvent then proceed as for new surfaces.

.6 Plaster: To be bone-dry, all patching and replacing complete before first coat of paint or sizing is applied. Sand smooth all roughness before any application of paint.

.7 Ferrous Metal: Remove dirt and grease with Benzene. Remove rust and defective paint down to bare metal and touch up with red lead. Paint ferrous metals immediately upon delivery on site.

.8 Sheet Metal: Treat galvanized sheet metal with a wash of phosphate conditioner prior to priming or a special coat of primer for that purpose. CGSB 31-GP-107MA.

.9 Metal:

.1 Unpainted: Clean down to good metal. Use appropriate metal filler to restore the original surface. Coat with CAN/CGSB-1.121-93.

.2 Painted: Clean paint by washing. Treat bare spots as above.

3.3 Application

.1 Varnish: Apply by brush only.

.2 Remove all paint liable to show or bleed through new finish. Prime uncoated surfaces only.

.3 Apply two finish coats to all previously finished or primed work.

.4 Give the Departmental Representative due notice and ample opportunity to inspect each coat and do not proceed with any coat until the last preceding coat is approved. Each coat shall be a different tint, under white a light blue.

.5 Apply no finish nor paint to wet, frozen or rusty surfaces.

.6 Clean castings with wire brushes.

.7 Do not paint at temperatures under 10°C (50°F) or over 35°C (95°F) (lacquer not lower than 15°C (59°F)) nor on surfaces where condensation is likely to form.

.8 Give additional coats to work which is unsatisfactory to the Departmental Representative after the application of the specified number of coats without extra compensation. Touch up dead or dull spots.

.9 Brush paint wood and metal surfaces. Other surfaces may be roller painted. Do not use rollers on uneven surfaces.

.10 Mix materials thoroughly, apply evenly, in full coats and free from sags, runs, crawls and other defects. Cut in neatly where required.

.11 Let each coat dry perfectly and hard before a following coat is applied.

.12 Finish ledges and surfaces above sight lines; tops, bottoms and edges of doors to match faces.

.13 Even up stained woodwork in colour as required by the nature of the wood.

.14 Apply all ready-mixed paint, lacquer, varnish or other finishes without cutting or admixture of any kind.

.15 Colour filler, if required. Work well into grain of wood, and before it sets, wipe clean.

.16 Do not apply exterior painting during rainy, foggy or humid weather.

.17 Apply material in accordance with the directions and instruction of their manufacturers.

.18 Doors, windows: and other shop made items, shop prime. Seal and paint the bottoms and edges of all doors before hanging.

.19 Allow a minimum of 24 hours between coats for oil based paints and 8 hours between coats of water based paints.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 00 10 00.

1.2 DEFINITIONS

.1 For purposes of mechanical sections, the following definitions shall apply:

.1 "Concealed" – mechanical services and equipment is suspended ceilings and in chases and furred spaces.

.2 "Exposed" – will mean not concealed as defined above.

1.3 EXAMIMATION OF THE SITE

.1 Carefully examine conditions at the site which will or may affect your work, and become familiar with both 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 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.

1.5 PERMITS, CERTIFICATIES & FEES

.1 Display all required permits on worksite.

.2 Obtain "Hot Work Permit" from Departmental Representative prior to commencement of soldering, welding or other high temperature work.

1.6 SUBMITTALS

.1 Shop drawings; submit drawings for review by Departmental Representative in accordance with Section 00 10 00.

.2 Shop drawings to show:

.1 Name of project,

.2 Name of contractor,

.3 Name of component

.4 Name of manufacturer and model number

.5 Name of service or system

.6 Date of delivery confirmed by the manufacturer

.3 Shop drawings and product data accompanied by:

.1 Mounting arrangements

.2 Overall dimensions, roughing-in dimensions and operating and maintenance clearances

.3 Detailed drawings of bases, supports, and anchor bolts.

.4 Acoustical sound power data, where applicable.

.5 Points of operation on performance curves.

.6 Manufacturer to certify current model production.

.7 Certification of compliance to applicable codes.

.4 Closeout Submittals:

.1 Three [3] Copies of operation and maintenance manual approved by, and final copies deposited with Departmental Representative.

.1 Each manual to be compiled in four basic parts:

.1 Part 1: System and Equipment Operation

.2 Part 2: System and Equipment Maintenance

.3 Part 3: System and Equipment Performance

.4 Part 4: System and Equipment Part List

.2 Operation data to include:

.1 Location: The location of major units and controls in the building.

.2 Equipment: Details of major equipment which make up the system.

.3 Start-up: Step-by-step instructions for the start-up of a system from the non-operating condition.

.4 Shut-down: Step-by-step instructions for the shut-down of a system to a non-operative state which will ensure the safety and maintainability of the equipment.

.5 Emergency Operation: Step-by-step instructions for the operation of systems which must continue to run despite equipment breakdown, power supply failure, etc.

.6 Charts and Diagrams: System schematics, control diagram, flow charts, etc.

.3 Maintenance data to include:

.1 System Maintenance: Information describing special maintenance requirements and instructions for draining, charging, filling, lubrication, inspection, access safety, etc.

.2 System Adjustment: Step-by-step instruction needed to maintain system within specified operative limits including manufacturer’s recommended maintenance instructions.

.3 Warranties: Listing of components of the systems which are covered by manufacturer extended warranties indicating effective dates and expiry dates.

.4 Inspection Certificates: Include copies of all inspection certificates issued by governing authorities.

.4 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.

.5 Part list to include:

.1 Equipment Part Lists: Manufacturer’s parts lists, preceded by an index. Include names and addresses of local suppliers for all items included in maintenance manuals.

.2 Spare Parts: Receipts for maintenance spare parts turned-over to Departmental Representative.

.6 Approvals:

.1 Submit one [1] copy 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 one [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 Pay particular attention to accurately dimensioning the exact location of all services terminated for future extension, all buried work and services, and work concealed within the building in concealed locations.

.3 Make available for reference purposes and inspection.

.4 Turn the marked-up white prints over to the Departmental Representative upon substantial completion of the work.

.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 upper 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.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 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.

.2 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.

.3 Bring prefabricated materials on the job site as and when required to be installed.

1.8 EQUIPMENT LIST

.1 Submit list of manufacturer's name and details of materials to be used on this project within 10 days after award of contract. Do not order equipment until list has been reviewed or approved.

1.9 METRIC & IMPERIAL MEASUREMENTS

.1 Generally, both metric and imperial units of measurement are given in Sections of the Specification governed by this Section. Metric conversions are "soft" and have been rounded off.

.2 Metric and Imperial Dimensions appearing on the drawings and in the specification shall conform to the following schedule:

METRIC	IMPERIAL
6 mm	¼"
12 mm	½"
20 mm	¾"
25 mm	1"
32 mm	1-¼"
40 mm	1-½"
50 mm	2"
65 mm	2-½"
75 mm	3"
100 mm	4"
150 mm	6"
200 mm	8"
250 mm	10"

Part 2 Products

2.1 HOISTING & SCAFFOLDING

.1 Provide all necessary hoists and scaffolding required for your work.

.2 Design and construction of scaffolding to be in accordance with CSA S269.2.

Part 3 Execution

3.1 CLEANING

.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 Departmental Representative. 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. Vacuum the interior of ductwork.

.3 Clean and refurbish all equipment and leave in first class operating condition including replacement of all filters in all air and piping systems.

3.2 PROTECTION

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

.2 Properly protect all of your equipment and materials on site from damage due to the elements, your work and the work of other trades.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Thermal insulation for piping.

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 (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma-[89], Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53-[95], Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.5 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

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

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

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.

.2 TIAC ss:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 21 05 01 Common Work Results - Mechanical.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 21 05 01 Common Work Results – Mechanical. Include product characteristics, performance criteria, and limitations.

.1 Submit one electronic copy of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 21 05 01 Common Work Results – Mechanical.

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 21 05 01 Common Work Results – Mechanical.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

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

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Fiberglass for heating water piping:

.1 Rigid, moulded sectional pipe insulation made from inorganic glass fibers to CGSB 51-GP-9M with a factory applied all-service jacket to CGSB 51-GP-52M and self-sealing lap.

.2 Acceptable product: Knauf ASJ-SSL, Johns Manville and Manson Alley K APT.

.2 Flexible Elastomeric for chilled water, domestic hot and cold water piping:

.1 Closed-cell fire-retardant sectional pipe insulation, to CGSB 51.40.

.2 Acceptable product: Armacell “Armaflex”.

2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, ULC listed for less than 25 flame spread and less than 50 smoke developed.

.2 Contact adhesive: quick setting for seams and joints.

.3 Canvas adhesive: washable .

.4 Twine: jute or fibrous glass twine.

.5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating cement to CGSB 51-GP-6M, and finishing cement to CGSB 51-GP-7MP.

2.5 VAPOUR RETARDER LAP ADHESIVE

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

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 JACKETS

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: White.

.3 Minimum service temperatures: -20 degrees C.

.4 Maximum service temperature: 65 degrees C.

.5 Moisture vapour transmission: 0.02 perm.

.6 Thickness: 0.5 mm.

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

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.

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

3.3 INSTALLATION

.1 Apply materials in accordance with manufacturer’s instructions and this specification.

.2 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Install hangers, supports outside vapour retarder jacket.

.3 Supports, Hangers:

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

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: at valves and unions at equipment.

.2 Design: to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: 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 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.

Applica-tion	Temp degrees C	Pipe sizes (NPS) and insulation thickness (mm)					
		Run out	to 1	1 1/4 to 2			
Hot Water Heating	60 - 94	25	25	38			
Domesti c HWS		13	13	19			
Domesti c CWS		13	13	19			
Chilled Water		13	13	19			

.3 Finishes:

.1 Fiberglass insulation: PVC jacket.

.2 Flexible Elastomeric insulation: No further finish.

3.7 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings in accordance with Section 21 05 01 – Common Work Results – Mechanical.

.2 Submit shop drawings for the following:

.1 Valves;

.2 Pressure gauges

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 21 05 01 – Common Work Results – Mechanical.

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

Part 2 Products

2.1 FASTENING AND SECURING HARDWARE

.1 Concrete inserts - Crane Canada Inc. #4M or equal for single or double pipe or duct runs and for equipment, Unistrut or equal inserts for multiple support systems.

.2 Concrete fasteners - "WEJ-IT" or equal anchors, lead cinch anchors and/or "STARR" or "PHILLIPS" self-drilling anchors.

.3 Masonry inserts - "WEJ-IT" or equal expansion shields and machine bolts, or, for light loads, fiber or lead plugs and screws.

.4 Drywall or plaster wall and/or ceiling fasteners - two-wing spring toggles.

.5 Structural steel fasteners - Grinnell or equal beam clamps.

2.2 PIPE, FITTINGS AND JOINTS

.1 Copper:

.1 For drainage and vent piping, use DWV grade hard temper copper to ASTM B306 with wrought copper solder type drainage fittings to C.S.A. B15.81 and ANSI B16.29 and 50% lead, 50% tin solder joints to ASTM B32, type 50A.

.2 For DHW, DCW, chilled water, heating water, argon, nitrogen, vacuum and compressed air piping, use Type "L" hard drawn seamless copper tubing to ASTM B88M, with wrought copper and bronze fittings to ANSI B16.22, and 95% tin, 5% antimony solder joints to ASTM B32 for domestic hot and cold

water piping, heating water piping, chilled water piping; and brazed joints made with "Sil-Fos" silver brazing alloy for argon, nitrogen, vacuum and compressed air piping.

2.3 UNIONS

.1 For use in copper piping, wrought copper unions to ANSI B16.22 with soldered or threaded ends.

2.4 DIELECTRIC COUPLINGS

.1 To be compatible with and to suit pressure rating of piping system.

.2 Where pipes of dissimilar metals are joined.

.3 Pipes 50mm (2") and under: isolating unions.

2.5 AUTOMATIC AIR VENTS

.1 Spirotherm Model Spirotop 1/2" high compression valve mechanism automatic air vent, with a non- ferrous metal body.

.2 Provide isolation valve at air vent.

2.6 DRAIN VALVES

.1 Minimum 20 mm (3/4") unless otherwise specified: straight pattern bronze ball valve with hose end male thread adapter and complete with cap and chain.

.2 Acceptable products: Jenkins Fig. 901CJ and Toyo Red & White Fig. No. 5046.

2.7 CHECK VALVES BRONZE & IRON

.1 For installation in chilled water piping.

.2 50mm (2") and under, soldered ends:

.1 For all services identified above, except steam and condensate.

.2 Y-pattern bronze body design with integral seat, 2-piece hinge disc construction and free rotating disc, 2070 kPa (300 psi) W.O.G. pressure rated.

.3 Acceptable product: Crane No. 1342, Jenkins Cat. 4093J, Toyo Red & Whie No. 237 and Kitz No. 30.

.3 50mm (2") and under, threaded ends:

.1 For all services identified above.

.2 Y-pattern bronze body design with integral seat, 2-piece hinge disc construction and free rotating disc, 2070 kPa (300 psi) W.O.G. pressure rated.

.3 Acceptable product: Crane No. 137, Jenkins Cat. 4092J, Toyo Red & White No. 238, and Kitz No. 29.

2.8 BALL VALVES

.1 For installation in domestic water, heating water, chilled water, argon gas, nitrogen, vacuum and compressed air piping.

.2 50mm (2") and under, soldered ends:

.1 2-piece body, large bore, blowout-proof stem, 4140 kPa (600 psi) W.O.G. pressure rated.

.2 Acceptable product: Crane No. 9322, Jenkins Fig. No. 904J, Toyo Red & White Fig. 5049A, and Kitz No. 59.

.3 50mm (2") and under, threaded ends:

.1 2-piece body, large bore, blowout-proof steam, 4140 kPa (600 psi) W.O.G. pressure rated.

.2 Acceptable product: Crane No. 9302, Jenkins Fig. No. 903J, Toyo Red & White Fig. 5044A and Kitz No. 58.

2.9 CIRCUIT BALANCING VALVES

.1 For balancing and shut-off service in heating water piping.

.2 Sizes 12mm (1/2") and 20mm (3/4"), soldered ends:

.1 Y-pattern, bronze body c/w two brass metering ports, memory feature and capable of precise flow measurement, flow balancing and drip tight shut-off.

.2 Acceptable product: TA Hydronics TBV-S.

.3 50mm (2") and under:

.1 Y-pattern, bronze body c/w two brass metering ports, memory feature and capable of precise flow measurement, flow balancing and drip tight shut-off.

.2 Provide c/w pre-formed insulated container to double as insulation after valve is installed.

.3 Acceptable product: TA Hydronics STAD.

2.10 PIPELINE STRAINERS

.1 For installation in heating water and chilled water piping.

.1 50mm (2") and under, soldered ends:

.1 Bronze "Y" strainer minimum 1380 kPa (200 psi) steam pressure rated, Type 304 20 mesh stainless steel screen.

.2 Acceptable product: Mueller #353-1/2M and Spirax Sarco TBT.

2.11 PIPE HANGERS & SUPPORTS

.1 Fabricate hangers and supports in accordance with ANSI B31.1 and MSS-SP58.

.2 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, suspend hangers from steel channels or angles. Provide all supplementary structural members as necessary.

.3 Upper attachments for connecting to structural member shall be Grinnell or equal, suitable in all respects for the application.

.4 For horizontal piping - adjustable steel clevis hangers and/or adjustable roller hangers as required.

.5 For vertical copper pipe: carbon steel copper finished to MSS-SP58-1983, type 42.

.6 For groups of pipe having the same slope - black structural steel angle wall brackets and/or black steel channels or angles of proper dimension supported by hanger rods and/or Unistrut Ltd. or equal support assemblies.

.7 Hanger rods shall be black steel, round, threaded, to ASTM A-36, sized to suit the loading, complete with captive machine nuts with washers at hangers.

.8 Acceptable manufacturers of pipe hanger and support hardware are Grinnell, Crane Canada Ltd., Myatt and Apex.

2.12 PRESSURE GAUGES

.1 Pressure Gauges:

.1 Trerice 700LF Series or equal, 100mm (4") dial size with stainless steel or black phenol case, bayonet ring and glass window, stainless steel rotary type movement and Bourdon tube and socket to CGSB 91-GP-3.

.2 Dial face shall be white with black figures reading in both metric and imperial units; pointer shall be micrometer adjustable type. Accuracy to be no less than 1% of full scale.

.3 Gauge shall be filled with glycerin or silicone-according to ambient temperature requirements.

.4 Provide bronze stop cocks, iron coil siphon for steam service, snubber for pulsating service and diaphragm protection seals to protect pressure/vacuum-sensing devices.

.2 Pressure gauges scale ranges shall be such that the working pressure of the system for which the instrument is provided is at the approximate mid-point of the instrument scale.

.3 Acceptable manufacturers of pressure gauges are Trerice, Weiss, Ashcroft and Winters.

2.13 FLEXIBLE CONNECTIONS

.1 For pipe sizes 50mm (2") and under:

.1 Hydro-Flex PCM-X, flexible piping connector with Type 321 stainless steel.

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 OF FASTENING & SECURING HARDWARE

.1 Provide all fastening and securing hardware required for supporting and/or securing your work unless otherwise noted.

.2 Where inserts are required in set concrete work, drill a neat hole of the proper diameter and depth in the concrete and insert an anchor into the hole to accept the hanger rod, bolt, etc., or where concrete mass permits, use self-drilling concrete anchors.

.3 Fasten hanger and support provisions to masonry with expansion shields and machine bolts, or, for light loads, use lead plugs and screws.

.4 In drywall or plaster walls and/or ceilings use two-wing toggles and for heavy loads, provide steel anchor plates with two (2) or more toggles to spread the load.

.5 Provide beam clamps for attaching hanging and/or support provisions to structural steel, or where approved by the Engineer weld the hanging and support provisions to the structural steel.

.6 DO NOT use explosive powder actuated fasteners.

3.3 GENERAL PIPING INSTALLATION REQUIREMENTS

.1 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping wherever practical.

.2 Provide unions or flanges in piping at all connections to valves, strainers, pressure reducing valve, backflow preventers and similar piping system components which may need maintenance or repair, and wherever else indicated on the drawings.

.3 Carefully clean all pipe and fittings prior to installation. Temporarily cap or plug ends of pipe and equipment which are open and exposed during construction to prevent debris from entering the ductwork, piping or equipment.

.4 Provide anchors to secure pipework to the structure. Anchors shall be of a size and type to securely anchor the pipe at the point shown.

.5 Compensate for pipe expansion by the use of swing joints or expansion loops unless otherwise noted. Generally, expansion facilities are indicated on the drawings but exact expansion compensation facilities shall suit the piping as installed and exact detail drawings of expansion compensation facilities must be submitted for review.

3.4 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 or flexible connections when equipment mounted on vibration isolation and when piping subject to movement.

3.5 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, and components.

.3 Provide clearance for installation of insulation.

3.6 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.

3.7 AIR VENTS

.1 Install automatic air vents as specified and properly sized piping air chamber at all high points in all water piping systems, at equipment connections, and wherever else shown and/or specified..

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

3.8 PIPE JOINT REQUIREMENTS

.1 Ream pipes, clean scale and dirt, inside and outside, before and after assembly.

.2 Make all soldered joints in copper piping using flux suitable for and compatible with the type of solder being used. Clean the outside of the pipe end and inside of the fitting, valve, etc., prior to soldering.

3.9 INSTALLATION OF BALL VALVES

.1 Provide ball valves in piping in sizes 50mm (2") and under associated with the following systems:

- .1 domestic water systems;
- .2 hot water heating system;
- .3 chilled water system;
- .4 nitrogen gas pipe;
- .5 argon gas pipe;
- .6 vacuum pipe;

.7 compressed air system.

.2 On system piping where joints are made with "Sil-Fos" silver brazing alloy, use threaded valves with threaded to sweat adaptors to avoid heat damage to the valve.

3.10 INSTALLATION OF CIRCUIT BALANCING VALVES

.1 Provide circuit balancing valves where shown on the drawings and where specified herein.

.2 Coordinate locations with the trade performing the balancing work.

.3 Balance water systems to equipment flows indicated on drawings.

3.11 INSTALLATION OF PIPELINE 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.

3.12 INSTALLATION OF PIPE HANGERS & SUPPORTS

.1 Provide all required hangers and supports unless otherwise noted. For insulated pipe, size the hanger or support to suit the insulated pipe and install the hanger or support on the outside of the insulation.

.2 Hang and/or support horizontal steel and copper pipe above ground by means of hangers and/or supports specified hereinbefore in this Section, spaced in accordance with the following schedule:

PIPE SIZE:	ROD DIAMETER	MAXIMUM SPACING: STEEL	MAXIMUM SPACING: COPPER
Up to DN32 (1 ¼”)	10 mm (3/8”)	2.1 m (7’)	1.8 m (6’)
DN40 (1 ½”)	10 mm	2.7 m (9’)	2.4 m (8’)
DN50 (2”)	10 mm	3.0 m (10’)	2.7 m (9’)

.3 Support vertical pipes by means of supports specified hereinbefore in this Section at maximum 3.6m (12') intervals or at every floor whichever is lesser.

.4 Provide pipe covering shields, sized to suit insulated pipe, between insulated pipe and the pipe hanger or support for all piping. Ensure that on cold piping the insulation vapour barrier remains intact.

.5 Support bare copper tubing using specially made copper or plastic coated copper tubing hangers, or provide proper plastic inserts or tape to isolate the ferrous hangers and supports from the bare copper tubing. Cloth backed rubber adhesive tapes (i.e. duct tape)are not acceptable.

.6 Where pipes having the same slope are grouped and a common hanger or support is used, hanger or support spacing shall suit the spacing requirement of the smallest pipe in the group.

.7 Where pipes change direction, either horizontally or vertically, provide a hanger or support on the horizontal pipe not more than 300mm (12") from the elbow. Where pipes drop from tee branches, support the tees in both directions not more than 50mm (2") on each side of the tee.

.8 Provide all additional structural steel channels, angles, etc., required to support pipes. All materials shall be machine cut square and true and shall be prime coat painted as a minimum and finish painted if exposed.

.9 Do not use perforated band, wire, chain or solid ring hangers.

.10 Offset hanger so that rod is vertical in operating position.

.11 Adjust hangers to equalize load.

3.13 INSTALLATION OF PRESSURE GAUGES

.1 Install a pressure gauge in piping at the following locations:

.1 Suction and discharge of pumps.

.2 Upstream and downstream of PRV's.

.3 In other locations as indicated.

.2 Locate direct reading thermometers and gauges for reading from floor.

.3 Use extensions where pressure gauges and thermometers are installed through insulation.

3.14 IDENTIFICATION

.1 Provide pipe, duct and equipment identification as specified hereinafter.

.2 Equipment:

.1 Manufacturer's nameplates:

.1 Provide metal nameplate on each piece of equipment, mechanically fastened with raised or recessed letters.

.2 Manufacturer's nameplate to indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.

.3 Locate nameplates so that they are easily read. Do not insulate or paint over plates.

.2 System nameplates:

.1 Provide laminated plastic plates with black face and white centre of minimum size 90 x 40 x 2.5mm nominal thickness (3 1/2" x 1 1/2" x 3/32") engraved with 6mm (1/4") high lettering. Use 25mm (1") lettering for major equipment.

.2 Fasten nameplates securely in conspicuous place. Where nameplates cannot be mounted on cool surface, provide standoffs.

.3 Identify equipment type and number (eg. Pump No. 2), service and areas or zone of building served, (eg. South Zone Chilled Water).

.4 Submit list of nameplates for review prior to engraving.

.3 Piping:

.1 Identify medium in piping with markers showing name and service including temperature, pressure and directional flow arrows in accordance with CGSB 24-GP-3a.

.2 Manufactured pipe markers and colour bands:

.1 Manufactured from mat vinyl 1mm (0.004") thick, industrial quality, chemical resistant, with waterproof contact adhesive, suitable for operating temperature of 120 °C (250 °F). Apply to prepared surfaces.

.2 Sticker shall be one piece and shall include the primary classification colour, the name of the material conveyed and directional flow arrows printed either in black or white to contrast with background colour.

.3 The label to be designed to completely surround the pipe to give full 360 degree visibility.

.4 Character size shall suit the pipe outside diameter.

.5 Acceptable manufacturer: Multiface 360 by Arkon, Inc. (available from Guillevin International).

.6 Location:

.1 Locate markers and classifying colours on piping systems so they can be seen from floor.

.2 Piping runs at least once in each room.

.3 Maximum 15m (50') between identifications in open areas.

.4 Both sides where piping passes through walls, partitions and floors.

.5 At point of entry and leaving, where piping is concealed in pipe chase or other confined space, and at each access opening.

.6 At start and end points of runs and at each piece of equipment.

.7 At major manual and automatic valves immediately upstream of valves.

3.15 PIPE LEAKAGE TESTING

.1 General for all pipe leakage testing:

.1 After piping has been placed in position and all branch piping installed, but before the piping has been concealed, and before equipment, fixtures and fittings have been connected, test all piping in the presence of the governing authorities, if required, and the Engineer or his qualified representative. Test results will be

documented and co-signed by the Engineer or his representative and by the installer.

.2 Testing and witnessing procedures shall be in accordance with the Class of piping installation as specified hereinafter.

.3 Bear all costs required for inspection test fees, apparatus, equipment, testing medium, freeze protection, retesting and making good any damage.

.4 Remove and re-install materials, controls, or equipment that can be damaged from excessive pressure or test medium. Test piping in sections or install filler sections required to test piping in one network. Suitable precautions in the event of piping system rupture shall be taken to eliminate hazards to personnel in the proximity of piping being tested.

.5 Provide a test gauge and a valved connection point for owner's recorder or gauge in each test section of piping. Pressure range of gauge shall not exceed 150% of the specified test pressure. I.E., test pressure 690 kPa (100 psi) - maximum gauge range 1035 kPa (150 psi).

.6 Generally, pneumatic testing shall not be used unless the Departmental Representative specifically permits its use as an alternative to hydrostatic testing. Pneumatic testing will only be considered if the piping systems are designed so that they cannot be filled with water or if the piping systems are to be used in services where traces of water cannot be tolerated.

.7 Pneumatic testing, where permitted by the Departmental Representative, shall be done in strict accordance with the ASME Code for Power Piping, B31.1.

.8 When permitted by the Departmental Representative, test medium supplied from cylinders or other high pressure sources shall be introduced to the system by means of a mechanical pressure regulator. The gas used as the test medium shall be non-flammable and non-toxic.

.9 Make tight leaks found during tests while the piping is under pressure, and if this is impossible, remove and refit the piping and reapply the test until satisfactory results are obtained.

.10 Where leaks occur in threaded joints in steel piping, no caulking of these joints will be allowed under any conditions.

.2 Piping Leakage Test Classification:

.1 Class "A" - Piping installations in new construction or renovation work which require witness and approval of the Departmental Representative, or the Departmental Representative’s qualified representative and a representative of a recognized authority having jurisdiction as follows:
- Plumbing - City of Ottawa
- Fire Protection Systems - Regional Office of Fire Commission of Canada
- Pressure Vessels, Steam, H.P. Gases, Power Piping - TSSA
- Natural and Propane Gas - TSSA
- Flammable or Combustible Liquids - Regional Fire Commissioner's Office

.2 Class "B" - Piping installations in new construction or renovation work which require witness and approval of the Departmental Representative, or the Departmental Representative’s qualified representative only.

.3 Class "C" - Piping installations in renovation work only which are short in developed length, small in scope of work, or a valved part or section of an existing single pipe distribution system, which requires witness and approval by

the Departmental Representative, or the Departmental Representative's qualified representative only.

.3 Pipe Leakage Testing Procedures - Classes "A" & "B":

.1 Drainage & Vent Piping:

.1 Hydrostatically test new drainage and vent piping by securely closing all openings and pipe ends, and filling piping with water up to the highest level and ensuring the water stands at the same level for a minimum of four (4) hours.

.2 Domestic Water Piping:

.1 Test piping with cold water at a pressure of 1½ times normal working pressure but not less than 690 kPa (100 psi) and maintain the pressure for a minimum of four (4) hours.

.3 Heating Water Piping:

.1 Test piping with cold water at a pressure of 1½ times normal working pressure but not less than 690 kPa (100 psi) for four (4) hours.

.4 Compressed Air Piping:

.1 Test piping with cold water at a pressure of 1-1/2 times the normal working pressure but not less than 345 kPa (50 psi) for four (4) hours.

.2 Following completion of the test, completely drain the water from the piping system and using compressed air, purge all residual water.

.4 Identification of Piping Class:

.1 Testing and witnessing procedures for piping systems on this project shall conform to the following schedule:

SERVICE	CLASS OF TEST
Drainage & Vent	B
Domestic Water	B
Heating Water	B
Chilled Water	B
Vacuum	B
Nitrogen	B
Argon	B
Compressed Air	B

3.16 CUTTING & PATCHING

.1 Refer to the article entitled "Cutting and Patching" of Section 00 10 00 for general requirements.

.2 Accurately and carefully mark out the location and extent of cutting or drilling required and coordinate with the trade(s) performing the work.

.3 Size openings to leave 12mm (½") clearance around the pipes or pipe insulation. Pack and seal the void between the opening for the length of the opening with material as described in Section 00 10 00.

.4 Note that where drilling is required in water-proof slabs, size the openings to permit installation of pipe sleeves as described hereinbefore.

3.17 DISCONNECTING & REMOVAL WORK

.1 Where indicated on the drawings, disconnect and remove items of existing mechanical work. Where piping, ductwork and other equipment are removed, disconnect at the point of supply, remove obsolete connecting services and make the system safe.

.2 Unless otherwise noted, all materials which are not to be relocated or reused shall become your property and shall be removed from the site and disposed of.

3.18 INTERRUPTIONS TO & SHUT DOWNS OF MECHANICAL SERVICE & SYSTEMS

.1 All shut-downs and interruptions to existing mechanical services and systems shall be coordinated fully with and performed at times acceptable to the owner.

.2 Do not operate any NRC equipment or plant. Prior to each shut-down or service interruption, inform the Engineer in writing of this requirement and he will arrange to have the shut-down performed by the owner's personnel.

.3 Note that work associated with shut-downs and interruptions shall be carried out as continuous operations to minimize the shut-down time and to reinstate the systems as soon as possible, and, prior to any shutdown, ensure that all materials and labour required to complete the work for which the shut-down is required are available at the site.

3.19 MECHANICAL CONNECTION FOR EQUIPMENT SUPPLIED BY OTHERS

.1 Provide all the required mechanical trade connections to equipment provided and/or supplied by other trade sections and the owner.

.2 Confirm exact locations of equipment prior to roughing-in.

.3 Obtain accurately dimensioned rough-in drawings and connection details from the Engineer if applicable.

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 Departmental Representative within 10 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-1-2002.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.

.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 condition.

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Departmental Representative in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

1.9 START OF TAB

.1 Notify Departmental 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 Laboratory HVAC systems: plus 5 %, minus 0 %.

.2 All other HVAC systems: plus 5%, minus 5%.

.3 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 Departmental Representativelist 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 Departmental Representative.

1.13 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.1 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Departmental Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.
.2 Details of TAB procedures employed.
.3 Calculations procedures.
.4 Summaries.

1.15 TAB REPORT

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.
.2 System schematics.

.3 Submit 1 electronic copy of TAB Report to Departmental Representative for verification and approval, in English.

1.16 VERIFICATION

.1 Reported results subject to verification by Departmental Representative.

.2 Provide personnel and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results as directed by Departmental Representative.

.4 Bear costs to repeat TAB as required to satisfaction of Departmental Representative.

1.17 SETTINGS

.1 After TAB is completed to satisfaction of Departmental Representative, 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 Departmental Representative.

1.19 AIR SYSTEMS

.1 Standard: TAB to most stringent of this section or TAB standards of AABC, NEBB, SMACNA, and ASHRAE.

.2 Do TAB of systems, equipment, components, controls specified Division 23.

.3 Qualifications: personnel performing TAB to be current member in good standing of AABC or NEBB.

.4 Quality assurance: perform TAB under direction of supervisor qualified by AABC or NEBB.

.5 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.

.6 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.

.3 For multi-speed equipment (i.e. fan coil units) readings to be performed at all speed settings.

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

1.20 HYDRONIC SYSTEMS

.1 Definitions: for purposes of this section, to include low pressure hot water heating, chilled water, condenser water, glycol systems.

.2 Standard: TAB to be to most stringent of this section or TAB standards of AABC, NEBB, SMACNA and ASHRAE.

.3 Do TAB of all systems, equipment, components, controls specified Division 23.

.4 Qualifications: personnel performing TAB to be current member in good standing of AABC or NEBB.

.5 Quality assurance: perform TAB under direction of supervisor qualified by AABC or NEBB.

.6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: Flow rate, static pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, electrical power, voltage, noise, vibration.

.7 Locations of equipment measurement: To include, but not be limited to, following as appropriate:

.1 Inlet and outlet of each heat exchanger (primary and secondary sides), boiler, chiller, coil, humidifier, cooling tower, condenser, pump, PRV, control valve, other equipment causing changes in conditions.

.2 At each controller, controlled device.

.8 Locations of systems measurements to include, but not be limited to, following as appropriate: Supply and return of each primary and secondary loop (main, main branch, branch, sub-branch of all hydronic systems, inlet connection of make-up water.

1.21 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.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1- GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI/ASHRAE 110, Method of Testing Performance of Laboratory Fume Hoods.
- .2 ANSI/AIHA Z9.5, Laboratory Ventilation.

.2 Public Works and Government Services Canada (PWGSC)
- .1 PWGSC MD15128, Laboratory Fume Hoods.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 QUALITY ASSURANCE

.1 Test Agency: fume hood tests to be performed by qualified independent testing agency with proven experience in Work of this Section and in accordance with PWGSC MD15128.

.2 Test Agency Qualification: submit proof of qualifications to Departmental Representative to demonstrate:
- .1 Minimum 3 years experience in testing of fume hoods.

PART 2 - PRODUCTS

2.1 TESTING EQUIPMENT

.1 Test equipment to ANSI/AIHA Z9.5 and PWGSC MD 15128.

.2 Data logger:
- .1 Speed: 10 Hz or better.
- .2 Memory: sufficient to allow data collection for duration of test.

.3 In-duct flow sensor to measure flow response:
- .1 Speed: 10 Hz.
- .2 Range: 95 L/s to 950 L/s.
- .3 Accuracy: ± 5%.

.4 Thermal anemometer:
- .1 Mounting: on stand with probe fixed at each traverse grid location.
- .2 Include: averaging function over twenty second period for each location or output recorded

for 20 seconds minimum at a rate of one reading/second on data logger.

.3 Accuracy:

.1 Below 0.50 m/s: ± 0.025 m/s.

.2 0.50 m/s and over: ± 5%.

.5 Detector for tracer gas containment:

.1 Type: continuous reading.

.2 Minimum Detectable Level (MDL): 0.01 ppm.

.3 Accuracy: concentrations below 0.1 ppm: ±25%; concentrations above 0.1 ppm: ±10%.

.6 Smoke generator:

.1 Use smoke generator and diffuser complying with PWGSC MD15128.

PART 3 - EXECUTION

3.1 AS INSTALLED (AI) AND INTEGRATED SYSTEMS TESTS

.1 Perform AI and integrated systems tests as follows:

.1 After entire laboratory HVAC and exhaust systems have been tested and balanced (TAB), and TAB and Performance Verification (PV) reports have been submitted and accepted.

.2 HVAC and exhaust systems are in full operation.

.3 Room temperatures are maintained between 22 degrees C and 24.5 degrees C., recorded and submitted with fume hood test documentation.

.4 At specified laboratory space pressurization.

.5 Under deviation of space pressurization due to laboratory door opening and closing, change of laboratory operating modes, upset conditions, and other causes of change in laboratory air pressure.

.6 As part of commissioning of integrated HVAC and exhaust systems and laboratory space pressurization tests included in commissioning process.

.2 After installation, test each fume hood to ANSI/ASHRAE 110 and PWGSC MD15128 at design sash position to ensure compliance with design criteria in PWGSC MD15128.

3.2 "AI" TESTS FOR HIGH PERFORMANCE FUME HOODS

.1 Cross draft tests:

.1 Test air currents external to fume hood to PWGSC MD15128.

.2 Ensure velocity of cross draft does not exceed 50% of average face velocity.

.3 Record measurements as follows:

.1 Using thermal anemometer take readings 1.5 m above floor, 500 mm from sash, at centre, and left and right posts of fume hood.

.2 Take readings at 1 reading/second, recorded to obtain average, and maximum and minimum values over a duration of 20 seconds at each location.

.2 Visualization (smoke) tests:

.1 Extent of tests and performance criteria: to PWGSC MD15128.

.3 Face velocity and flow response test pass ratings: to PWGSC MD15128 and ANSI/ASHRAE 110.

.1 Average face velocity for high performance fume hoods: 0.30 m/s, with no reading less than

0.25 m/s.

.4 Tracer Gas tests:
- .1 Performance criteria: to PWGSC MD15128.
- .2 Conduct tests at target average face velocity.
- .3 Use approved tracer gas.
- .4 Perform tests with probe at height of 450 mm above work surface for countertop mount fume hood, 1500 mm above finished floor for walk-in fume hood.
- .5 Leakage with sash at normal operating position:
  - .1 Average leakage: 0.05 ppm maximum.
  - .2 Peak reading: 0.25 ppm.

.2 Peripheral scan:
- .1 Record significant peak readings and their locations.
- .2 Record 30 second rolling averages.
- .3 Maximum 0.25 ppm for any 30 second rolling average.
- .4 Include readings in test report.

.3 Sash Movement Effect (SME), to determine potential for escape after movement of sash to ANSI/ASHRAE 110 procedures:
- .1 Maximum 45 second rolling average: 0.05 ppm.

3.3 FUME HOOD MONITOR AND ALARM TESTS

.1 Fume Hood Monitor:
- .1 Provide 3 point calibration.
- .2 Ensure each monitor initiates alarms (audible, visual, and BMS) when unsafe velocity conditions occur.
- .3 Ensure monitor readings are displayed in metres per second, to 2 decimal places.

.2 Fume Hood Monitor/Alarm testing:
- .1 Monitor accuracy test: ensure monitor is accurate within 5% of average face velocity.
- .2 Alarm enunciation test: ensure alarm occurs beyond ±20% of design flow set point.
- .3 Alarm response enunciation test: ensure alarm delay is 10 seconds maximum.

3.4 FUME HOOD STATIC PRESSURE TEST

.1 With sash at design position and face velocity at target setting, fume hood static pressure: less than 62 Pa.

3.5 NOISE LEVEL TEST

.1 With sash at design position and face velocity at target setting, noise level at working position in front of fume hood: less than 70 dBA.

3.6 VERIFICATION LABELS

.1 Affix label to front of fume hood indicating verification, name of testing agency, and date.

3.7 COMMISSIONING - INTEGRATED SYSTEMS TESTS

.1 Fume hood testing to commence only after laboratory HVAC systems are fully commissioned, including calibration of airflow controls, calibration of automatic temperature controls, balance of air supply, completion of duct traverse on each fume hood exhaust duct, and completion of an air balance of the total exhaust flow.

.2 Test fume hoods in conjunction with complete laboratory integrated HVAC and exhaust systems commissioning testing including, room air flow patterns, temperature, humidity, pressurization, noise, and vibration.

3.8 REPORTS

.1 Ensure test reports are signed by testing agency before submitting to Departmental Representative.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 00 10 00 – General Instructions.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 00 10 00 – General Instructions.

3.10 PROTECTION

.1 Protect adjacent materials from work associated with testing and maintenance of fume hoods.

END OF SECTION

Part 1 General

1.1 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 Reference Standards:

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE/IESNA 90.1; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM International Inc.

.1 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature 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 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

.5 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.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 21 05 01 Common Work Results – Mechanical.

.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.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 21 05 01 Common Work Results – Mechanical.

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

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 Fiberglass board, for casings, plenums and rectangular ductwork:

.1 Rigid board insulation made from inorganic glass fibers to CGSB-51-GP-10M with a factory-applied reinforced vapour retarder to CGSB 51-GP-52M.

.2 Acceptable product: Knauf Insulation Board, Johns Manville and Manson AK Board FSK.

.2 Fiberglass blanket, for round ductwork:

.1 Flexible blanket type insulation made from inorganic glass fibers to CGSB 51-GP-11M with a factory-applied vapour barrier facing to CGSB 51-GP-52M.

.2 Acceptable products: Knauf Duct Wrap FSK, Johns Manville and Manson Alley-Wrap FSK.

2.3 JACKETS

.1 Canvas:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: compatible with insulation.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

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

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: quick setting on mineral wool, to ASTM C449.

.4 Tape: self-adhesive, aluminum, plain, 75 mm wide minimum.

.5 Contact adhesive: quick-setting

.6 Canvas adhesive: washable.

.7 Tie wire: 1.5 mm stainless steel.

.8 Fasteners: 2 mm diameter pins with 35mm square 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 Ensure surfaces are clean, dry, and free from foreign material.

3.3 INSTALLATION

.1 Apply materials in accordance with manufacturer’s instructions and as indicated.

.2 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Ensure hangers, and supports are outside vapour retarder jacket.

.3 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.4 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:

	Vapour Retarder	Thickness (mm)
Supply air ducts	yes	25
Exhaust duct 3 m (10’) from exterior wall or roof deck	[no]	[50]

3.5 CLEANING

.1 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 ductwork and accessories.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, [95].

1.3 SUBMITTALS

.1 Submit shop drawings in accordance with Section 21 05 01 – Common Work Results – Mechanical, for the following:

.1 Grilles and diffusers;

Part 2 Products

2.1 STEEL DUCTWORK

.1 Prime quality galvanized sheet steel with metal gauges in accordance with SMACNA standards to suit the duct configuration and classification.

2.2 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.

2.3 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, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m^2.

.3 Acceptable manufacturers are Duro-Dyne Ltd., "Durolon", Ventfabrics "Ventglas" and Elgen Engineering Ltd. "Neoprene".

2.4 ROUND TO RECTANGULAR DUCT CONNECTIONS

.1 Nailor-Hart Industries Inc. "Spin-In" galva- nized 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.

2.5 SPLITTER DAMPERS

.1 Minimum No. 20 U.S.S. gauge galvanized steel damper blade, reinforced as required to suit blade size and system velocity, each complete with a self-locking splitter damper operating assembly.

2.6 BLANCING 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.

2.7 BANCKDRAFT 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

2.8 ACCESS DOORS IN DUCTS

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:

.1 Up to 300 x 300 mm: two sash locks.

.2 301 to 450 mm: four sash locks.

2.9 SECURITY SCREEN

.1 Heavy gauge galvanized steel or aluminum mesh, 12mm x 12mm (1/2" x 1/2"), sized as indicated on the drawings.

2.10 BIRD SCREEN

.1 Heavy gauge galvanized steel or aluminum mesh 12 mm x 12 mm (1/2" x 1/2") sized as indicated on the drawings.

2.11 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., Ruskin Air and Sound Control, and Carnes

2.12 TURNING VANES

.1 Shop fabricated single thickness without trailing edge, to recommendations of SMACNA and as indicated.

2.13 ROOF DUCT SUPPORT

.1 Bases shall be injection molded high density/high impact polypropylene with UV inhibitors and antioxidants. Base density shall be 894 kg/m^3 (55.8 lb/ft^3). Size shall be 457 x 457 x 75 mm (18”x18”x3”).

.2 Stainless steel frames shall be 2.7 mm (12 gauge), roll-formed 3-sided tubular shape 41 mm (1 5/8”) or 48 mm (1 7/8”) channel as required by loading, perforated with 14 mm (9/16”) holes at 48 mm (1 7/8”) centers on three sides.

.3 Nuts and Washers: Stainless steel.

.4 Acceptable products are PHP-D duct support system 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 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 Carefully clean all ducts prior to installation. Temporarily cap ends of duct which are open and exposed during construction to prevent debris from entering the ductwork.

.3 Install ductwork which is to be insulated such that it has sufficient clearance to permit insulation to be applied continuously and unbroken around the duct except at fire barriers, in which case, terminate the insulation at each side of the fire barrier.

.4 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.

.3 Install automatic control dampers and similar duct mounted control components supplied by control contractor.

.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 Install 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.

.3 Minimum distance between metal parts when system in operation: 75 mm.

.4 Install in accordance with recommendations of SMACNA.

.5 When fan is running:

.1 Ducting on sides of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.5 Splitter Dampers:

.1 Provide splitter dampers in ductwork where shown and/or specified and/or required to ensure system balancing. Install splitter dampers such that they cannot vibrate and rattle and such that the damper operation mechanism is in an easily operable location.

.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 Backdraft Dampers:

.1 Provide backdraft dampers in the ductwork where shown.

.2 Install and secure such that the dampers cannot move or rattle.

.8 Access Doors and Viewing Panels:

.1 Size:

.1 300 x 300 mm for viewing.

.2 As indicated.

.2 Locations:

.1 Control dampers.

.2 Devices requiring maintenance.

.3 Required by code.

.4 Reheat coils.

.5 Elsewhere as indicated.

.9 Security Screen:

.1 Provide security screens where indicated on the drawings.

.10 Bird Screen:

.1 Provide galvanized steel or aluminum bird- screen over air intake and exhaust air openings in walls where indicated.

.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.

.12 Turning vanes:

.1 Install in accordance with recommendations of SMACNA and as indicated.

.13 Roof duct support:

.1 Layout isolation pads supplied by contractor, according to the ductwork layout.

.2 Place bases on isolation pads.

.3 Insert the legs of duct support into bases and attach with 63.5 mm (2 ½") bolt and 12.7 mm (1/2") nut.

.4 Adjust width up to bottom of ducting.

.5 Make sure the duct and supports are level, both vertically and horizontally, and proper spacing is maintained.

.6 Check that weight of the duct is distributed evenly throughout the system.

3.3 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1- GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI/ASHRAE 110, Method of Testing Performance of Laboratory Fume Hoods.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-12.1, Tempered and Laminated Safety Glass.

.3 National Fire Protection Association (NFPA)
- .1 NFPA 45, Standard on Fire Protection for Laboratories Using Chemicals.

.4 National Plumbing Code of Canada

.5 Public Works and Government Services Canada (PWGSC)
- .1 PWGSC MD15126, Minimum Guidelines for Laboratory HVAC and Exhaust Systems.
- .2 PWGSC MD15128, Laboratory Fume Hoods.
- .3 PWGSC CP.1 to CP.13, Commissioning Manuals and Guidelines.

.6 Scientific Furniture and Equipment Association (SEFA)
- .1 SEFA 1, Recommended Practices for Laboratory Fume Hoods.
- .2 SEFA 2, Recommended Practices for Installations.
- .3 SEFA 3, Recommended Practices for Laboratory Work Surfaces.
- .4 SEFA 7, Recommended Practices for Fixtures.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Co-ordination: co-ordinate work of this Section with work of other trades for proper time and sequence to avoid construction delays.

.2 Pre-installation Meetings:
- .1 Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with general contractor's representative, and Departmental Representative to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other building construction subtrades.
  - .4 Review manufacturer's written installation instructions and warranty requirements.
- .2 Notify attendees 2 weeks prior to meeting.
- .3 Ensure meeting agenda includes review of methods and procedures related to fume hood installation including co-ordination with related work.
- .4 Record meeting proceedings including corrective measures and other actions required to ensure successful completion of work and distribute to each attendee within 1 week of meeting.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Contract Conditions and Section 00 10 00 - General Instructions.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for fume hood components and accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit list of fume hood materials, components and accessories to be incorporated into Work.

.3 Include product names, types and series numbers for fume hood components and accessories.

.4 Include contact information for manufacturer for fume hood components and accessories used on this Project.

.5 Submit WHMIS MSDS in accordance with Section 00 10 00 - General Instructions.

.3 Shop Drawings:

.1 Submit drawings in accordance with Section 00 10 00 - General Instructions.

.2 Include on drawings:

.1 Materials and profiles and provide full-size, scaled details of components for each type of fume hood.

.2 Details of construction with dimensions, cross sections, and adjacent equipment.

.3 Roughing-in dimensions for plumbing, laboratory services, and electrical.

.4 Test and Evaluation Reports:

.1 Submit detailed performance reports in accordance with PWGSC MD15128, fume hood design criteria and materials thickness. Include hood superstructure details.

.1 Indicate exhaust air flow rate.

.2 Indicate pressure drop through fume hood.

.5 Field reports: submit manufacturer's field reports within 3 days of manufacturer representatives' site visit.

.6 Submit detailed seismic anchorage and attachment drawings and calculations complying with requirements and regulations for seismic restraint (where applicable).

1.4 CLOSEOUT SUBMITTALS

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

.2 Supply operation and maintenance data for incorporation into manual specified in Section 00 10 00 - General Instructions.

.1 Submit information for instructions for safe and proper operation of fume hoods. Include:

.1 Written instructions booklet showing additional information on safe, proper operation and maintenance, components parts list, and nearest local manufacturer's representative for components and emergency repairs.

.3 Record Documentation:

.1 Submit list of materials used in fume hood work.

.2 Submit methodology for sealing joints.

.4 Warranty: submit warranty documents specified.

.5 Acceptance verification check sheet.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Supply special tool for opening sash beyond normal opening position if applicable.

1.6 QUALITY ASSURANCE

.1 Fume hood, components and accessories to be manufactured by single manufacturer.

.2 Manufacturers will only be approved for this project after verification is made of fume hood test facility at manufacturer's factory location.

.1 Testing facility to comply with ANSI/ASHRAE 110 requirements.

.2 Ensure data readings are digitally recorded and raw data submitted in electronic format approved by Departmental Representative.

.3 Certification: submit catalogued or published certified ratings obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying performance capabilities, including "As Manufactured (AM)" tests in accordance with PWGSC MD15128.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 00 10 00 - General Instructions and manufacturer's written instructions.

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

.1 Upon arrival and before installation, demonstrate that fume hood is consistent with prototype and product data, and has not been damaged in transit.

.2 Ensure fume hood bears CSA label.

.3 Inspect fume hood and record condition.

.4 After check of fume hood inspection has been carried out have Departmental Representative sign sheet and submit sheet as part of record documentation.

.3 Storage and Handling Requirements:

.1 Store and protect fume hood, components and accessories from nicks, scratches, and blemishes.

.2 Replace defective or damaged materials with new.

1.8 WARRANTY

.1 Project Warranty: refer to General Conditions for project warranty provisions.

PART 2 - PRODUCTS

2.1 DESCRIPTION

.1 Laboratory fume hood: ventilated, enclosed work space, designed for continuous use to capture, confine and exhaust fumes, vapours and particulates generated within fume hood cavity.

.2 Factory fabricated package, piped and wired for single connections to exhaust system, electrical power, laboratory services, water supply, and laboratory drainage system.

.3 Acceptable manufacturer: Labcrafters Air Sentry series or approved equal.

2.2 DESIGN CRITERIA

.1 Fume hood, controls and alarms: ULC labelled.

.2 Fume hood face velocity:

- .1 Face velocity for high performance fume hoods: 0.25-0.35 m/s.
- .2 Design sash position (normal operating sash height) at 450 mm.
- .3 Noise level (with sash in normal operating position) at 500 mm from sash: 70 dBA maximum.

.3 Seismic: ensure fume hood manufacturer supplies anchor bolts and templates.

- .1 Ensure anchor bolts are sized to withstand seismic zone acceleration and velocity requirements for location.
- .2 Seismic zone for this project: Western Quebec Seismic Zone.

.4 Meet performance criteria in PWGSC MD15128.

.5 Construct to SEFA 1 Recommended Practices for Laboratory Fume Hoods.

2.3 HIGH PERFORMANCE COUNTERTOP MOUNT FUME HOODS

.1 Nominal sizes:

- .1 Width: 1800 mm nominal.
- .2 Height: 1500 mm nominal.
- .3 Depth: 990 mm nominal.

.2 Sash: 6.4 mm thick minimum tempered safety glass to CAN/CGSB-12.1 in corrosion resistant PVC track with provisions for both raising/lowering sash and sliding sash horizontally.

- .1 Sash handle: Type 316 stainless steel with #4 satin finish, designed to eliminate eddies in plane of sash opening and thin enough in profile to minimize interference with line-of-sight of fume hood user.
- .2 Clear openable height to 700 mm.

.3 Sash opening: normal operating position to:

- .1 Form part of fume hood design criteria.
- .2 Ensure normal operating position is labelled on front.
- .3 Ensure opening is restricted by sash stop.

.4 Normal operating position of sash:
.1 450 mm opening above airfoil.

.4 Counterbalance mechanism: use single counterweight, stainless steel multi-strand wires, 39 mm minimum diameter nylon-tired ball-bearing pulley assembly, cable retaining device, assembled to prevent creep or tilting of sash during operation.
.1 Sash to move easily and quietly with one finger operation, and remain in place where it is stopped.
.2 Spring counterbalance mechanisms not acceptable.
.3 Sash to open and close against rubber bumper stops, installed to ensure user can readily adjust sash opening when moving sash from either end.
.4 In event of failure of counterbalance mechanism, sash must remain 50 mm minimum above lowest part of airfoil.
.5 Sash guides; full length corrosion resistant extruded PVC tracks.

.5 Sash stop: include physical stop to prevent sash from opening beyond normal operating position under regular working conditions.
.1 Allow sash to open beyond normal operating position when placing apparatus in hood.
.2 Ensure sash automatically resets to normal operating limit.

.6 Sash for horizontal and combination sashes:
.1 Arrange horizontal sliding panels to ensure maximum opening area resulting from any orientation or configuration of sash panels does not exceed design opening area.

.7 Horizontal air-foil:
.1 1.9 mm type 316 stainless steel with #4 satin finish, installed 25 mm above raised portion of work surface and designed for eddy-free air entry.
.2 Project into fume hood beyond edge of sash.
.3 Design airfoil to eliminate reverse flow within 75 mm of plane of sash.

.8 Work surface: recess epoxy resin work surface 25 mm minimum thickness to contain spills and include coved corners and 6.4 mm minimum raised edges. Construct to SEFA 3.
.1 Ensure joints with interior panels are sealed.
.2 Adhere 50 mm minimum line of yellow PVC tape to work surface 150 mm inside plane of sash for full width of work surface.

.9 Interior panels:
.1 Fibreglass reinforced plastic (FRP): 6.4 mm thick minimum heat and chemical resistant FRP, finished with white non-porous surface and fastened with stainless steel screws.
.1 Flexural strength: 96.5 MPa.
.2 Flame spread: 25 or less.
.2 Interior access panels: gasketted, removable and replaceable without use of special tools.

.10 Fastenings: ensure fastenings inside fume hood are corrosion resistant and remain unaffected by repeated manipulations.

.11 Baffles: construct baffles from same material as interior panels or chemically resistant powder coated aluminum.
.1 Design baffles to provide multiple exhaust slots to minimize variations in face velocity across sash opening when sash is in normal operating position.
.2 Set baffles at manufacturer's plant on basis of prototype testing, and permanently mark

setting.

.12 Exhaust duct collar: 254 mm diameter, integral with top panel and constructed from stainless steel, with bell-mouthed entry, and flanged to accept exhaust duct.

.1 Exhaust duct collar size: to provide exhaust flow velocity of 5.0 m/s minimum.

.13 Exterior panels:

.1 Cold rolled steel to ASTM A 1008/A 1008M finished with powder coating procedure, fastened using concealed stainless steel screws and devices.

.1 Do not use external screws.

.2 Ensure panels are easily removable to allow access to services.

.2 Top closure panels: of same material and finish as exterior panels and designed to enclose ductwork up to ceiling.

.1 Ceiling heights as indicated on Architectural drawing.

.3 Finish: electrostatically applied urethane powder coat of selected colour and baked in controlled high temperature oven to assure a smooth, hard satin finish.

.1 Ensure surfaces have a chemical resistant, high-grade laboratory furniture quality finish with thicknesses as follow:

.1 Exterior surfaces exposed to view: 0.0375 mm average and 0.03 mm minimum.

.2 Backs of hood and other surfaces not exposed to view: 0.025 mm average.

.3 Colour selected from manufacturer's standard range by Departmental Representative.

.14 Superstructure: rigid self-supporting unit consisting of double wall construction with outer metal shell and inner lining of corrosion-resistant material.

.1 Panels must be attached to full frame construction, minimum 1.9 mm galvanized members.

.1 Attach panels and brackets to eliminate screw heads and metallic brackets from hood interior.

.2 Double wall to house and conceal steel framing members, attaching brackets and remote operating service fixture mechanisms, and complete with:

.1 Include levelling screws.

.15 Vertical side posts of fume hood face: radiused airfoil shape to reduce eddies and promote smooth entry of air into hood.

.1 Ensure service fixtures do not disturb air flow pattern.

.2 Incorporate removable panels to provide access to service valves as indicated.

.3 Ensure unit is capable of accepting 4 maximum plumbing and laboratory services on each side of opening.

.4 Include light switch, monitor and alarm.

.5 For electrical receptacles requirement, refer to electrical drawings.

.16 Monitors and alarms:

.1 For each fume hood provide monitor with alarm capability.

.2 Monitor to provide visual display showing average face velocity and provide visual and audible alarms configured to alert when flow or velocity varies more than ± 10% from design flow set point.

.1 Monitor accuracy: ± 5% of measured parameter.

.2 Report readings and all alarms to Building Automation System (BAS).

.3 Include manual silencing switch for audible alarm only, designed to automatically reset to recommence monitoring function.

.4 Ensure visual alarm remains lit until alarm condition has been rectified.

.3 Monitor should have rechargeable battery backup for up to 4 hours of operation.

.4 Include test circuits, relays, switches, and other controls required to permit maintenance personnel to test signal function.

.5 Field set-up: minimum 3 point calibration.

.6 Analog output, 0-10 V, proportional to face velocity.

.7 Visual displays:

.1 Display of velocity reading; resolution 0.01 m/s.

.2 Green LED for safe operation.

.3 Red LED for alarm or unsafe operation.

.17 For Light Fixture and Factory wire electrical outlets and switches, please refer to electrical drawing and specification for detail.

2.4 HIGH PERFORMANCE WALK-IN FUME HOODS

.1 Same requirement for high performance countertop mount fume hood, except the following,

.2 Nominal sizes:

.1 Width: 1800 mm nominal.

.2 Height: 2800 mm nominal.

.3 Depth: 1470 mm nominal.

.3 Sash: 6.4 mm thick minimum tempered safety glass to CAN/CGSB-12.1 in corrosion resistant PVC track with provisions for both raising/lowering sash and sliding sash horizontally.

.1 Sash handle: Type 316 stainless steel with #4 satin finish, designed to eliminate eddies in plane of sash opening and thin enough in profile to minimize interference with line-of-sight of fume hood user.

.2 Consists of both top and bottom sash.

.4 Sash opening: normal operating position to:

.1 Form part of fume hood design criteria.

.2 Ensure normal operating position is labelled on front.

.3 Ensure opening is restricted by sash stop.

.4 Normal operating position of sash:

.1 650 mm opening above airfoil or full horizontal opening of both top and bottom sashes.

.5 Work surface: Not Applicable.

.6 Containment base pan: : aluminum checker plate pan 4.8 mm minimum thickness to contain spills and include sealed corners and 25 mm minimum raised edges on three sides, the front edge shall have a 100mm wide ledge leading to 25 mm high containment curb. Dimension of the pan to fit the work area inside walk-in fume hood.

2.5 LABORATORY SERVICES

.1 To SEFA 7.

.2 Remote controls:

.1 Brass body, universal joint, bolted and flanged and with chromium plated finish to

ASTM B 456.

.2 Gas: CGA approved.

.3 Install remote controls on vertical side posts of fume hood face, located to avoid interference with smooth entry of air into hood.

.4 Include needle valves on all services except gas service.

.5 Equip remote controls with universal joints, wall flanges, couplings and tailpieces for connection to services.

.3 Outlets:

.1 Forged or cast brass body complete with tailpiece for connection to service piping.

.2 Turrets and handles to be of forged brass.

.3 Finish: inside fume hood powder coating corrosion-resistant fluorocarbon.

.4 Include powder coating corrosion-resistant finish for service outlets inside fume hoods.

.5 For Electrical, please refer to electrical drawing and specifications for detail.

.6 Plumbing: include domestic cold water service as indicated.

.1 Isolating valves: include remote controlled valves located within end panels, controlled by handles projecting through side posts of fume hood.

.2 Locate to avoid interference with smooth entry of air into fume hood.

.7 Fixtures: except for de-ionized, RO and pure water, fixtures exposed within fume hood to have chemical-resistant metallic bronze finish.

.1 Ensure portions exposed to fume hood exterior are chrome plated.

.8 For countertop mount fume hood only, Cup sinks: 75 x 150 mm oval, rigidly clamped in approved manner to work surface, with approved acid-resisting seal, 40 mm drain with cross strainer debris catcher.

.1 Standing waste and overflow with 76 long minimum PVC tailpiece.

.1 Install with rim above work surface to prevent spills entering waste system.

.2 Finish welds smooth and polished.

.2 Cold water faucets: wall mounted on side panel inside fume hood with rigid gooseneck of heavy duty 10 mm brass pipe with integral backflow preventer upstream from serrated nozzle and remote control on exterior panel.

.9 Gas: single straight serrated nozzle outlet with flange, mounted on side panel inside fume hood.

.1 Remote control on exterior panel.

.10 Compressed air and vacuum outlet: single straight serrated nozzle outlet with flange, mounted on side panel inside fume hood.

.1 Remote control on exterior panel.

.11 Identify service fixtures using colour coding as follows:

Service	Letter Coding	Colour Coding
Cold water	CW	Green
Vacuum	VAC	Yellow
Compressed air	AIR	Orange
Nitrogen	N	Blue
Argon	A	White

.12 For both countertop mount and walk-in fume hoods, locate the remote controls and outlets for services in the following order,

Left Side Post	Right Side Post
Argon	Nitrogen
Vacuum	Compressed Air
Cold Water	Cold Water

.13 All laboratory services shall be factory pre-piped to a point of connection 50 mm above the hood roof. Pressure test all pre-piped lines in the factory.

.14 Access to services:

.1 Ensure fume hood manufacturer includes cut-outs on side post.

.2 Cap unused openings with cap plugs of same material as exterior panels.

.3 Ensure service connections are accessible from fume hood exterior through removable access panels.

.4 Include isolating valves on building side of services.

.5 Where two or more fume hoods are installed side by side, use interior access panels of same material as interior panels, with bevelled edges, moulded PVC gaskets, and secured with non-corrosive fasteners set flush with face of access panel.

.15 Corrosion resistant label:

.1 Provide corrosion-resistant label permanently attached to fume hood exterior with abbreviated information relating to sash position and recommended location of apparatus and accessories when placed within the fume hood.

.16 Base furniture:

.1 Refer to architectural drawing and specification for detail.

2.6 FABRICATION

.1 Do welding to CSA W48.

2.7 ACCESSORIES

.1 Heat shields: install where required to protect interior panels from radiant heat.

.1 Ensure shields are easily removable for cleaning and do not compromise safe operation of fume hood.

2.8 SOURCE QUALITY CONTROL

.1 "As Manufactured" Testing Equipment: to PWGSC MD15128.

.1 Data logger:

.1 Recording interval: 10 Hz or better.

.2 Memory: sufficient to allow data collection for duration of test.

.2 In-duct flow sensor to measure flow response:

.1 Speed: 10 Hz.

.2 Range: 95 L/s to 950 L/s.

.3 Accuracy: ± 5 %.

.3 Thermal anemometer:

.1 Mounting: on stand with probe fixed at each traverse grid location.

.2 Include: averaging function over 20 second period for each location or output recorded for 20 seconds minimum at a rate of 1 reading/second on data logger.

.3 Accuracy:

.1 Below 0.50 m/s: ± 0.025 m/s.

.2 0.50 m/s and over: ± 5 %.

.4 Detector for tracer gas containment:

.1 Type: continuous reading.

.2 Minimum Detectable Level (MDL): 0.01 ppm.

.3 Accuracy:

.1 Concentrations below 0.1 ppm: ± 25%.

.2 Concentrations above 0.1 ppm: ±10%.

.5 Smoke generator:

.1 Use smoke generator and diffuser complying with PWGSC MD15128.

.2 Conduct "as manufactured" (AM) tests in manufacturer's testing facility to ANSI/ASHRAE 110 procedures and PWGSC MD15128 before transportation to site.

.3 Ensure tests achieve performance criteria in accordance with PWGSC MD15128.

.1 Issuance of purchase order will be made only by General Contractor after Departmental Representative has received and approved in writing factory performance test report certifying test results.

.4 Conduct "AM" tests as follows:

.1 With fume hood empty.

.2 With fume hood loaded to simulate apparatus in hood.

.1 Locate simulated apparatus 150 - 250 mm behind plane of sash in manner approved by Departmental Representative as follows:

.1 1 - 3.8 litre paint can.

.2 1 - 300 x 300 x 450 mm cardboard box.

.3 4 - 150 x 150 x 300 mm cardboard boxes.

.3 With simulated cross-drafts:

.1 Challenge with 0.25 m/s using 620 mm recirculation fan under conditions as follows:

.1 Air directed horizontally at 45 degrees to plane of sash.

.5 Conduct "As Manufactured" (AM) Fume Hood Performance Tests as follows:

.1 Visualization (smoke) tests: meet or exceed performance criteria of PWGSC MD15128 .

.2 Face velocity and flow tests: to PWGSC MD15128 and ANSI/ASHRAE 110.

.1 Average face velocity: 0.3 m/s, with variation allowed for individual readings; maximum ±20 %.

.2 CAV bypass effectiveness at 150 mm sash opening: 0.75 m/s maximum average face velocity.

.3 Tracer gas tests: to PWGSC MD15128.

.1 Conduct tests at target average face velocity.

.2 Use approved tracer gas.
.3 Perform tests with probes at heights of 560 mm above work surface.
.4 Leakage with sash at normal operating position:
.1 Average leakage: 0.025 ppm maximum.
.2 Peak reading: 0.100 ppm.
.5 Leakage with sash in fully open position:
.1 Average leakage: 0.05 ppm maximum.
.2 Peak reading 0.25 ppm.
.6 Peripheral scan:
.1 Record significant peak readings and their locations.
.2 Record 30 second rolling averages.
.3 Maximum 0.25 ppm for any 30 second rolling average.
.4 Include readings in test report.
.7 Sash movement effect (SME), to determine potential for escape after movement of sash to ANSI/ASHRAE 110 procedures.
.1 Maximum 45 second rolling average: 0.05 ppm

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

.1 Install to SEFA 2.

.2 Install plumb, with work surface level to within 1.5 mm in 3000 mm by adjusting base unit levelling screws.

.3 Secure fume hood to base furniture or floor using stainless steel fasteners spaced at 750 mm maximum on centre maximum.
.1 Use 4 minimum for each fume hood.

.4 Secure fume hood to meet seismic criteria.

.5 Connect plumbing, laboratory services, electrical services, exhaust system, and BAS to fume hood.

3.3 FUME HOOD SYSTEM INTEGRATION - GENERAL REQUIREMENTS

.1 General Requirements: fully integrate fume hood exhaust systems into laboratory HVAC system and into BAS in order to maintain specified pressurization requirements and to maintain fume hood performance.

.1 Minimum air flow with sash closed: to ANSI/AIHA Z9.5.

.2 Operating Modes:

.1 Occupied - in use: generation of hazardous products occurring.

.2 Occupied - not in use: as when apparatus is being assembled.

.3 Unoccupied - in use: generation of hazardous products occurring while fume hood is unattended. Sash is closed.

.4 Standby: fume hood not in use: no active generation of hazardous products, minimum air flow. Sash closed.

.3 Fume Hood System Integration with Dedicated Exhaust Fan:

.1 No local control of exhaust fan permitted.

.2 Ensure exhaust fan does not shut down except when fume hood is decommissioned, for apparatus assembly or for service procedures.

.4 Monitor:

.1 Green light to indicate "power on" and "safe to operate".

.2 Audible and visual alarms: horn, buzzer or bell and red light to indicate air velocity out of range and "not safe to operate".

.1 Use fume hood only when safety controls are satisfied.

.2 Override audible alarm using silencing relay switch (red light to remain on) until abnormal condition is rectified.

.3 Reset alarm system automatically when safe conditions restored.

.3 Ensure complete operating instructions for alarm system are secured to fume hood.

.4 Interlock fume hood exhaust system with HVAC system.

.1 Ensure fume hood exhaust fan continues to run upon activation of building fire alarm system.

3.4 CONNECTION TO EMERGENCY POWER

.1 Connect exhaust fan to emergency power source for all fume hoods.

.2 Make connections to CAN/CSA-Z316.5 and CAN/CSA-C22.2 No.61010-1.

3.5 ADJUSTING

.1 Adjust operable hardware for correct function.

.2 Ensure sash does not bind while opening and closing.

3.6 FIELD QUALITY CONTROL

.1 Field Tests:

.1 Conduct integrated "as installed" (AI) tests in accordance with Section 23 05 93.13 - Testing, Adjusting and Balancing of Fume Hoods.

.2 Field Inspection: co-ordinate field inspection in accordance with Section 00 10 00 – General Instructions.

.3 Manufacturer's Services:

.1 Co-ordinate manufacturer's services with Section 00 10 00 – General Instructions.

.1 Have manufacturer review work involved in handling, installation, protection, and cleaning of fume hood components and accessories, and submit written reports in acceptable format to verify compliance of Work with Contract conditions.

.2 Manufacturer's Field Services: include manufacturer's field services consisting of product use recommendations and periodic site visits for product installation review in accordance with manufacturer's instructions.

.1 Report inconsistencies from manufacturer's recommendations immediately to Departmental Representative.

.3 Schedule site visits to review work at stages listed:

.1 After delivery and storage of fume hood components and accessories, and when preparatory work on which 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 Work, after cleaning is carried out.

.4 Obtain reports within three days of review and submit immediately to Departmental Representative.

3.7 COMMISSIONING TESTS FOR INTEGRATED FUME HOOD SYSTEMS

.1 Do commissioning tests in accordance with PWGSC CP.1 to CP.13.

.2 Test fume hoods in conjunction with complete laboratory integrated HVAC and exhaust systems commissioning testing including, room air flow patterns, temperature, humidity, pressurization, noise, and vibration.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 00 10 00 – General Instructions.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 00 10 00 – General Instructions.

3.9 PROTECTION

.1 Protect installed fume hood components from damage during construction.

.2 Repair damage to adjacent materials caused by fume hood installation.

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 00 10 00 & 0015 45.

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 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.

6 ACOUSTICAL PERFORMANCE

.1 In general provide equipment producing minimal sound levels in accordance with the best and latest practices established by the electrical industry.

.2 Do not install any device or equipment containing a magnetic flux path metallic core, such as gas discharge lamp ballasts, dimmers, solenoids, etc., which are found to produce a noise level exceeding that of comparable available equipment.

7 EQUIPMENT IDENTIFICATION

.1 Identify with 3mm (1/8") Brother, P-Touch non-smearing tape, or an alternate approved by the NRC Departmental Representative, all electrical outlets shown on drawings and/or mentioned in the specifications. These are the light switches, recessed and surface mounted receptacles such as those in offices and service rooms and used to plug in office equipment, telecommunication equipment or small portable tools. Indicate only the source of power (Ex. for a receptacle fed from panel L32 circuit #1: "L32-1").

.2 Light fixtures are the only exceptions for electrical equipment identification (except as noted in 7.13 below). They are not to be identified.

.3 Identify with lamicoid nameplates all electrical equipment shown on the drawings and/or mentioned in the specification such as motor control centers, switchgear, splitters, fused switches, isolation switches, motor starting switches, starters, panelboards, transformers, high voltage cables, industrial type receptacles, junction boxes, control panels, etc., regardless of whether or not the electrical equipment was furnished under this section of the specification.

.4 Coordinate names of equipment and systems with other Divisions to ensure that names and numbers match.

.5 Wording on lamicoid nameplates to be approved by the NRC Departmental Representative prior to fabrication.

.6 Provide two sets of lamicoid nameplates for each piece of equipment; one in English and one in French.

.7 Lamicoid nameplates shall identify the equipment, the voltage characteristics and the power source for the equipment. Example: A new 120/240 volt single phase circuit breaker panelboard, L16, is fed from panelboard LD1 circuit 10.

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

PANNEAU L16
120/240 V
ALIMENTE PAR LD1-10

.8 Provide warning labels for equipment fed from two or more sources - "DANGER MULTIPLE POWER FEED" black letters on a yellow background. These labels are available from NRC's Facilities Maintenance group in building M-19.

.9 Lamicoid nameplates shall be rigid lamicoid, minimum 1.5 mm (1/16") thick with:

.1 Black letters engraved on a white background for normal power circuits.

.2 Black letters engraved on a yellow background for emergency power circuits.

.3 White letters engraved on a red background for fire alarm equipment.

.10 For all interior lamicoid nameplates, mount nameplates using two-sided tape.

.11 For all exterior lamicoid 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 lamicoid nameplates to be 3.7 mm (3/16") diameter to allow for expansion of lamicoid due to exterior conditions.

.1 No drilling is to be done on live equipment.

.2 Metal filings from drilling are to be vacuumed from the enclosure interiors.

.12 All lamicoid nameplates shall have a minimum border of 3 mm (1/8"). Characters shall be 9 mm (3/8") in size unless otherwise specified.

.13 Identify lighting fixtures which are connected to emergency power with a label "EMERGENCY LIGHTING/ÉCLAIRAGE D'URGENCE", black letters on a yellow background. These labels are available from NRC's Facilities Maintenance group in building M-19.

.14 Provide neatly typed updated circuit directories in a plastic holder on the inside door of new panelboards.

.15 Carefully update panelboard circuit directories whenever adding, deleting, or modifying existing circuitry.

8 WIRING IDENTIFICATION

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

.2 Maintain phase sequence and colour coding throughout.

9 CONDUIT AND CABLE IDENTIFICATION

.1 Apply red paint to the covers of junction boxes and condulets of fire alarm conduits.

.2 Apply yellow paint to the covers of junction boxes and condulets of emergency power circuits.

.3 Apply blue paint to the covers of junction boxes and condulets of voice/data cables.

10 MANUFACTURER'S & APPROVALS LABELS

.1 Ensure that manufacturer's registration plates are properly affixed to all apparatus showing the size, name of equipment, serial number, and all information usually provided, including voltage, cycle, phase and the name and address of the manufacturer.

.2 Do not paint over registration plates or approval labels. Leave openings through insulation for viewing the plates. Contractor's or sub-contractor's nameplate not acceptable.

11 WARNING SIGNS AND PROTECTION

.1 Provide warning signs, as specified or to meet requirements of Authorized Electrical Inspection Department and NRC Departmental Representative.

.2 Accept the responsibility to protect those working on the project from any physical danger due to exposed live equipment such as panel mains, outlet wiring, etc. Shield and mark all live parts with the appropriate voltage. Caution notices shall be worded in both English and French.

12 LOAD BALANCE

.1 Measure phase current to new panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes, and revise panelboard schedules.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

13 MOTOR ROTATION

.1 For new motors, ensure that motor rotation matches the requirements of the driven equipment.

.2 For existing motors, check rotation before making wiring changes in order to ensure correct rotation upon completion of the job.

14 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.

15 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.

16 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.

17 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.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

.1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.

.2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

Part 2 Products

2.1 BUILDING WIRES AND GENERAL REQUIREMENTS

.1 Conductor material for branch circuit wiring and grounding:

- .1 Stranded copper.
- .2 Neutral wire: continuous throughout its length without breaks.
- .3 Separate insulated green grounding conductors in all electrical conduits.
- .4 All wire and cable insulation shall meet the C.S.A. Standards for the types and services hereinafter specified. Colours as per section 4-036 of Electrical Code.
- .5 Where otherwise specified, use wire and cable types as follows:
  - .1 Type R90 XLPE cross-link polyethylene stranded for applications using wires sized No. 8 and larger.
  - .2 Type T90 stranded for applications using wires sized No. 10 and smaller.
  - .3 For fire alarm wiring refer to Section 283100.
  - .4 Approved heat resistant wire for wiring through and at lighting and heating fixtures. Where insulation types are shown on the drawings other types shall not be used unless the specification is more restrictive.
- .6 Use 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 or switches or 15 amp receptacles in partitions having removable wall panels, or
  - .3 When specifically called for on drawings.
- .7 Use stranded wire no smaller than No. 12 AWG for lighting and power and no smaller than No. 16 AWG for control wiring.
- .8 Conductors shall be soft copper properly refined and tinned having a minimum conductivity of 98%.

Part 3 Execution

3.1 BUILDING WIRES

.1 Install building wires as follows:

.1 Make joints, taps and splices in approved boxes with solderless connectors. Joints and/or splices are not acceptable inside a panelboard.

.2 Ensure the lugs accommodate all the strands of the conductor.

.3 Replace any wire or cable showing evidence of mechanical injury.

.4 Use No. 10 AWG for branch circuit wiring extending more than 30 m (100 ft.) to farthest outlet from panel.

.5 Circuit numbers indicated on the drawing are intended as a guide for the proper connection of multi-wire circuits at the panel.

.6 Take care to keep the conductors free from twisting.

.7 Use an approved lubricant for pulling in conduit.

.8 Leave sufficient slack on all runs to permit proper splicing and connection of electrical devices.

.9 Branch circuit wiring of 120 volt applications to be multi-wire utilizing common neutrals. Under no condition shall any switch break a neutral conductor.

.10 Provide and install an approved fire- retardant wrap or coating for PVC jacketed cables installed in a grouped configuration of two or more.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

.1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.

.2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

Part 2 Products

2.1 WIRE AND BOX CONNECTORS

.1 Pressure type wire connectors sized to fit conductors.

2.2 WIRING TERMINATIONS

.1 Provide first grade wire and cable connectors suitable for the service on which they are used and install them in accordance with the latest trade practice.

.2 Provide high quality extruded copper-free aluminium (0.4% or less) connectors for single and multi conductor cable. Steel and then zinc plated connectors for multi conductor cables.

.3 When used in hazardous area, connectors should be certified for such location in Class, Division and Group.

.4 For large conductor sizes, use bolted or compression solderless type connectors.

.5 Use high temperature connectors and insulation on all connections of high temperature conductors.

.6 Where connector types are called for on the drawings or in the specification, do not use other types.

.7 Lugs, terminals, screws used for termination of wiring to be suitable for copper conductors.

.8 For fire alarm wiring refer to Section 28 31 00.

Part 3 Execution

3.1 INSTALLATION

.1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.

.2 Bond and ground as required [to CSA C22.2No.41].

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

.1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.

.2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative’s approval.

Part 2 Products

2.1 FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Fittings for liquid-tight flexible conduits shall be liquid-tight connectors.

.3 Provide expansion couplings for all conduits running in slabs through expansion joints. These shall be the type approved for use in concrete with a bonding conductor.

2.2 OUTLET BOXES

.1 Size boxes in accordance with CSA-C22.

.2 Unless otherwise specified, provide galvanized steel outlet boxes at least 40mm (1-1/2") deep, single or ganged style, of proper size to accommodate devices used and shall be equipped with covers as necessary of the type designed for the specified fittings. Pull boxes shall be steel and shall be galvanized or painted to prevent rusting. For lighting fixture outlets, use 100mm (4") octagon boxes.

.3 Equip with plaster rings for flush mounting devices in finished walls.

.4 Blank cover plates for boxes without wiring devices.

.5 Equip with centre fixture studs for light fixtures.

.6 Use cast boxes where indicated and for surface mounted wiring. In areas above hung ceilings where appearance is not significant, pressed steel surface boxes may be used.

.7 Supply all outlet boxes and pull boxes sized according to code requirements unless specified otherwise on the drawings.

2.3 SUPPORT HARDWARE

.1 Use 10mm (3/8") threaded rod for suspended unistrut and conduit.

.2 Unless otherwise specified, use 41mm x 41mm (1-5/8" x 1-5/8") galvanized steel unistrut for conduit support systems.

Part 3 Execution

3.1 INSTALLATION

.1 Install outlet boxes as follows:

.1 Support boxes independently of connecting conduits.

.2 Make necessary mounting adjustments to the outlet to match interior finish.

.3 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of construction material.

.4 Where more than one conduit enters a switch or receptacle box on the same side, provide a 100mm (4") minimum square box with a suitable plaster ring.

.5 Location and appearance to be to the NRC Departmental Representative's approval.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

.1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.

.2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

Part 2 Products

2.1 RACEWAYS

.1 Conduit:

.1 Each length of conduit to be new and bear the CSA Stamp of Approval.

.2 Conduit, unless otherwise noted, to be EMT, no smaller than 12mm (1/2").

.2 Bushings and Connectors:

.1 Insulated type, with the insulation an integral part of the fitting.

.3 Conduit Fastening:

.1 One hole malleable iron straps to secure surface conduits. Two hole straps for conduits larger than 50mm (2").

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits.

.4 Pull Cord:

.1 Polypropylene cord in empty conduit.

.5 Unless specifically called for on the drawings, do not use flexible conduits but it is recognized that there may be applications where this material will be useful, such as equipment connections, etc. In such cases, obtain permission for its use from the NRC Departmental Representative. For tender purposes, assume that flexible conduits will not be permitted unless specifically called for on the drawings or equipment specifications. All flexible conduits for vapour-tight applications shall be liquid-tight flexible conduits (seal-tight).

.6 Provide expansion couplings for all conduits running in slabs through expansion joints. These shall be the type approved for use in concrete with a bonding conductor.

2.2 SUPPORT HARDWARE

.1 Use 10mm (3/8") threaded rod for suspended unistrut and conduit.

.2 Unless otherwise specified, use 41mm x 41mm (1-5/8" x 1-5/8") galvanized steel unistrut for conduit support systems.

Part 3 Execution

3.1 RACEWAYS

.1 Install raceways as follows:

.1 Rigidly supported.
.2 Workmanlike manner.
.3 Maintain maximum headroom.
.4 Concealed in finished area.
.5 Surface-mounted in open area.
.6 Do not pass conduits through structural members except as indicated.
.7 Parallel to or at right angles to the building lines.
.8 Thoroughly ream all conduits at ends and terminate with appropriate locknuts and bushings.
.9 Cause minimum interference in spaces through which they pass.
.10 Plug or cap conduit during construction to protect from dust, dirt or water.
.11 Unless specifically indicated on drawings or with the permission of the NRC Departmental Representative, do not cast conduits in concrete.
.12 Dry conduits out before installing wire.
.13 Mechanically bend steel conduit larger than 22 mm (3/4") diameter. 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.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 00 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 applied 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 projet.

.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.

.7

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, Cutler-Hammer, Siemens.

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 PANELBOARDS

.1 600 volt panelboards: bus and breakers rated for 18,000 amp r.m.s. symmetrical interrupting capacity or as indicated.

.2 250 volt branch circuit panelboards to have minimum interrupting capacity of 10,000 amp r.m.s. symmetrical.

.3 Panelboards are to have a main breaker that 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 or bolt-on breakers.

.9 Trim and door finish: baked grey enamel.

.10 Drip shield.

.11 Complete circuit directory with typewritten legend showing description of each circuit.

.12 Manufacturer: Square D, Cutler-Hammer, Siemens.

2.4 MOULDED 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.

.6 Circuit breakers minimum rating: 10K for 120/240V and 25K for 600/347V or greater if indicated.

.7 Standard of acceptance: Square D, Cutler-Hammer, Siemens.

2.5 FUSES

.1 250V and 600V time delay, rejection style, HRC-I, Class RK5.

.2 Standard of acceptance: Gould-Shawmut.

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 PANELBOARDS

.1 Locate panelboards as indicated and mount securely, plumb, and square, to adjoining surfaces.

.2 Mount panels to height specified in section 26 27 26 or as indicated.

.3 Connect loads to circuits as indicated.

.4 Connect neutral conductors to common neutral bus.

3.4 MOULDED CASE CIRCUIT BREAKERS

.1 Install circuit breakers as indicated.

3.5 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 00 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 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.

.3 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 Weatherproof covers as indicated.

.5 Multi-outlet covers as indicated.

.4 Splitters, Junction Boxes & Cabinets:

.1 Sheet metal enclosure, welded corners and formed cover, provided as required.

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.

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.

3.3 WIRING DEVICES

.1 Install wiring devices as follows:

.1 Where more than one local device is shown at one location, they are to be set under one cover plate.

.2 Install single throw switches with handle in "up" position when switch closed.

.3 Devices in gang type outlet box when more than one device is required in one location.

.4 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.5 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

.6 Install metal barriers where required.

.7 Remove insulation carefully from ends of conductors and connect wiring as required.

.8 Bond and ground as required.

3.4 SPLITTERS AND DEVICES

.1 Installation of splitters, junction boxes, pull boxes & cabinets as follows:

.1 Mount plumb, true and square to the building lines.

.2 Install in inconspicuous but accessible locations.

.3 Install pull boxes so as not to exceed 30 m (100') of conduit run between boxes or as indicated.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Common Work Results - Electrical Section 26 05 00

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 00 10 00.

.2 Include schematic, wiring, interconnection diagrams.

.3 Indicate:

- .1 Mounting method and dimensions.
- .2 Starter size and type.
- .3 Layout of identified internal and front panel components.
- .4 Enclosure types.
- .5 Wiring diagram for each type of starter.
- .6 Interconnection diagrams.

.4 Motors specified and supplied with mechanical equipment. Refer to Division 23.

1.3 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 00 10 00.

.2 Include operation and maintenance data for each type and style of starter.

Part 2 Products

2.1 MATERIALS

.1 Starters:

- .1 IEC rated starters not acceptable.

2.2 MANUAL MOTOR STARTERS

.1 Single and three phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:

- .1 Switching mechanism, quick make and break.
- .2 One and three overload heaters as indicated, manual reset, trip indicating handle.

.2 Accessories:

- .1 Toggle switch, key switch or pushbutton as specified.
- .2 Indicating light: type and colour as indicated.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

.3 Standard of acceptance: Square D, Class 2510 or approved equal.

2.3 FULL VOLTAGE MAGNETIC STARTERS

.1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Power and control terminals.

.4 Wiring and schematic diagram inside starter enclosure in visible location.

.5 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include motor circuit interrupter or circuit breaker with operating lever on outside of enclosure to control motor circuit interrupter or circuit breaker and provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Locking in "ON" position.

.3 Independent locking of enclosure door.

.4 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:

.1 Pushbuttons and selector switches: type and labelled as indicated.

.2 Indicating lights: type and color as indicated.

.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

.4 Standard of acceptance: Square D, Class 8539 or approved equal.

2.4 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00.

2.5 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 260500.

Part 3 Execution

3.1 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Install control devices and relay panels and interconnect as indicated.

.3 Install correct fuses and overload device elements.

.4 Megger all motors. Dry out motor if dampness is present in accordance with manufacturer's recommendations.

.5 For installation of motor with mechanical equipment refer to Division 23.

.6 Make connection to motor as indicated. Use liquid-tight PVC jacketted flexible conduit between rigid conduit and motor.

.7 Make flexible conduit long enough to permit movement of motor.

3.2 TESTS

.1 Perform tests in accordance with Section 26 05 00 and Manufacturer's instructions.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Common Work Results - Electrical Section 26 05 00

1.2 DESCRIPTION

.1 This specification is to cover a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.

.2 The drive manufacturer shall supply the drive and all necessary controls as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of twenty years. All VFDs installed on this project shall be from the same manufacturer.

1.3 QUALITY ASSURANCE

.1 Referenced Standards:

1. Institute of Electrical and Electronic Engineers (IEEE)
   - .1 Standard 519-1992, IEEE Guide for Harmonic Content and Control.

.2 Underwriters laboratories
- .1 UL508C

.3 National Electrical Manufacturer's Association (NEMA)
- .1 ICS 7.0, AC Adjustable Speed Drives

.4 IEC 16800 Parts 1 and 2

.5 CSA 22.2

.2 Qualifications:

.1 VFDs and options shall be UL listed and CSA approved as a complete assembly. VFDs that require the customer to supply external fuses for the VFD to be UL listed are not acceptable. VFDs requiring additional branch circuit protection are not acceptable. The base VFD shall be UL listed for 100 KAIC without the need for input fusing.

1.4 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 00 10 00.

.2 Include schematic, wiring, interconnection diagrams.

.3 Indicate:

- .1 Outline dimensions, conduit entry locations and weight.
- .2 Customer connection and power wiring diagrams.
- **.3** Complete technical product description include a complete list of options provided. **Any portions of the specifications not complied with must be**

clearly indicated or the supplier and contractor shall be liable to provide all components required to meet the specification.

.4 Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).

.1 The VFD manufacturer shall provide calculations; specific to the installation, showing total harmonic voltage distortion is less than 5%. Input filters shall be sized and provided as required by the VFD manufacturer to ensure compliance with the IEEE electrical system standard 519. All VFDs shall include a minimum of 5% equivalent impedance reactors, **no exceptions**.

.4 Motors specified and supplied with mechanical equipment. Refer to Division 23.

1.5 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 00 10 00.

.2 Include operation and maintenance data for each type and style of starter.

.3 On completion of the installation, the supplier shall provide the following:

.1 Full commissioning report documenting all programmable settings, AC input voltage, DC Bus voltage, current draw at maximum speed, and a description of ambient conditions.

.2 One operator’s manual for each VFD installed.

.3 One 8.5" x 11" wiring diagram for each VFD installed.

1.6 GENERAL DESIGN CHARACTERISTICS

.1 The VFD shall be of the Pulse Width Modulated (PWM) type.

.2 The VFD shall be rated for variable torque applications, with an overload rating of 110% for 60 seconds.

.3 All VFD’s shall be factory UL/cUL Listed.

.4 All packaged drive systems shall be CSA Listed.

.5 The VFD shall have the capability of operating multiple motors. The minimum VFD continuous current rating shall be the sum of the full load current ratings of the connected motors.

.6 The VFD shall have a minimum displacement power factor of 0.96 or higher at all output frequencies.

.7 The VFD manufacturer shall have a minimum of ten years experience in the Canadian Market.

Part 2 Products

2.1 VARIABLE FREQUENCY DRIVES

.1 The VFD package as specified herein shall be enclosed in a NEMA rated enclosure, completely assembled and tested by the manufacturer in an ISO9001 facility. The VFD tolerated voltage window shall allow the VFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.

.1 Environmental operating conditions: $0 – 40^0$ C continuous. Altitude 0 to 3300 feet above sea level, up to 95% humidity, non-condensing. All circuit boards shall have conformal coating.

.2 The VFD shall operate within the following rated values.

.1 Output Frequency Range: 0.1 to 400 Hz.

.2 Overload Rating: VT – 110% for 60 seconds

.3 Input Voltage: 3 phase + ground , 600V +10% / -20%

.4 Input Frequency: 48-62 Hz

.3 The VFD shall be designed to include the following protective functions and display for maintainability:

.1 *Instantaneous Over Current Protection*: The VFD output shall be turned off if the operating current exceeds the specified level.

.2 *Motor Overload Protection*: cUL/CSA approved electronic thermal overload protection.

.3 *External Trip Input*: Programmable for either N/O or N/C operation.

.4 *Over Voltage Protection*: The VFD output shall turned off if the DC Bus voltage exceeds the specified level.

.5 *Ground Fault Protection*: The VFD output shall turned off in the event of a ground fault.

.6 *Line or Load Phase Loss Protection*: Programmable for enable - disable

.7 *Software Lock*: The VFD shall include a software function that prevents changes to the user-defined settings.

.8 *CPU or EEPROM Error*: The VFD output shall turned off in the event of an error in the CPU or EEPROM.

.4

.2 All VFDs shall have the following features:

.1 All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.

.2 The keypad shall include Hand-Off-Auto selections and manual speed control. There shall be fault reset and “Help” buttons on the keypad. The Help button shall include “on-line” assistance for programming and troubleshooting.

.3 There shall be a built-in time clock in the VFD keypad. The clock shall have a battery back-up with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power up. The clock shall also be programmable to control start/stop

functions, constant speeds, PID parameter sets and output relays. The VFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent timer functions that have both weekday and weekend settings. Capacitor backup is not acceptable.

.4 The VFD shall be capable of starting into a coasting load (forward or reverse) up to full speed and accelerate or decelerate to set point without safety tripping or component damage (flying start).

.5 The overload rating of the drive shall be 110% of its normal duty current rating for 1 minute every 10 minutes, 130% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.

.6 The VFD shall have 5% equivalent impedance internal reactors to reduce the harmonics to the power line and to add protection from AC line transients. The 5% equivalent impedance may be from dual (positive and negative DC bus) reactors, or 5% AC line reactors. VFDs with only one DC reactor shall add an AC line reactor.

.7 The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp, and 5% equivalent impedance internal reactors.

.8 The VFD shall provide a programmable proof of flow Form-C relay output (broken belt / broken coupling). The drive shall be programmable to signal this condition via a keypad warning, relay output and/or over the serial communications bus. Relay outputs shall include programmable time delays that will allow for drive acceleration from zero speed without signaling a false underload condition.

.3 All VFDs to have the following adjustments:

.1 Three (3) programmable critical frequency lockout ranges to prevent the VFD from operating the load continuously at an unstable speed.

.2 Two (2) PID Setpoint controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD, using the microprocessor in the VFD for the closed loop control. The VFD shall have 250 ma of 24 VDC auxiliary power and be capable of loop powering a transmitter supplied by others. There shall be two parameter sets for the first PID that allow the sets to be switched via a digital input, serial communications or from the keypad for night setback, summer/winter setpoints, etc. There shall be an independent, second PID loop that can utilize the second analog input and modulate one of the analog outputs to maintain setpoint of an independent process (ie. valves, dampers, etc.). All setpoints, process variables, etc. to be accessible from the serial communication network.

.3 Two (2) programmable analog inputs shall accept current or voltage signals.

.4 Two (2) programmable analog outputs (0-20ma or 4-20 ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference, and other data.

.5 Six (6) programmable digital inputs.

.6 Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. The relays shall

be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating 2 amps RMS. Outputs shall be true Form-C type contacts; open collector outputs are not acceptable.

.7 Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.

.8 Two independently adjustable accel and decel ramps with 1 – 1800 seconds adjustable time ramps.

.9 The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.

.10 The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows higher carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.

.11 The VFD shall include password protection against parameter changes.

.4 The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (LED and alpha-numeric codes are not acceptable). All VFD faults shall be displayed in English words.

.5 All applicable operating values shall be capable of being displayed in engineering (user) units. A minimum of three operating values from the list below shall be capable of being displayed at all times. The display shall be in complete English words (alpha-numeric codes are not acceptable):

.1 Output Frequency
.2 Motor Speed (RPM, %, or Engineering units)
.3 Motor Current
.4 Drive Temperature
.5 DC Bus Voltage
.6 Output Voltage

.6 The VFD shall include a fireman's override input. Upon receipt of a contact closure from the fireman's control station, the VFD shall operate in one of two modes: 1) Operate at a programmed predetermined fixed speed or operate in a specific fireman's override PID algorithm that automatically adjusts motor speed based on override set point and feedback. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlock, and force the motor to run in one of the two modes above. "Override Mode" shall be displayed on the keypad. Upon removal of the override signal, the VFD shall resume normal operation.

.7 Serial Communications

.1 The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, BACnet, Johnson Controls N2 bus, and Siemens Building Technologies FLN. Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority (i.e. BTL Listing for BACnet). Use of non-certified protocols is not allowed.

.2 The BACnet connection shall be an RS485, MS/TP interface operating at 9.6, 19.2, 38.4, or 76.8 Kbps. The connection shall be tested by the BACnet Testing Labs (BTL) and be BTL Listed. The BACnet interface shall conform to the BACnet standard device type of an Applications Specific Controller (B-ASC). The interface shall support all BIBBs defined by the BACnet standard profile for a B-ASC including, but not limited to:

.1 Data Sharing – Read Property – B.

.2 Data Sharing – Write Property – B.

.3 Device Management – Dynamic Device Binding (Who-Is; I-AM).

.4 Device Management – Dynamic Object Binding (Who-Has; I-Have).

.5 Device Management – Communication Control – B.

.3 Serial communication capabilities shall include, but not be limited to; run-stop control, speed set adjustment, proportional/integral/derivative PID control adjustments, current limit, accel/decel time adjustments, and lock and unlock the keypad. The drive shall have the capability of allowing the DDC to monitor feedback such as process variable feedback, output speed / frequency, current (in amps), % torque, power (kW), kilowatt hours (resettable), operating hours (resettable), and drive temperature. The DDC shall also be capable of monitoring the VFD relay output status, digital input status, and all analog input and analog output values. All diagnostic warning and fault information shall be transmitted over the serial communications bus. Remote VFD fault reset shall be possible.

.8 EMI / RFI filters. All VFDs shall include EMI/RFI filters. The VFD shall comply with standard EN 61800-3 for the First Environment, restricted level with up to 100’ of motor cables. No Exceptions. Certified test lab test reports shall be provided with the submittals.

.9 All VFDs through 60HP shall be protected from input and output power mis-wiring. The VFD shall sense this condition and display an alarm on the keypad. The VFD shall not be damaged by this condition.

.10 OPTIONAL FEATURES – Optional features to be furnished and mounted by the drive manufacturer. All optional features shall be UL Listed by the drive manufacturer as a complete assembly and carry a UL508 label. The bypass enclosure door and VFD enclosure must be interlocked such that input power is turned off before either enclosure can be opened. The VFD and Bypass as a package shall have a UL listed short circuit rating of 100,000 amps and shall be indicated on the data label.

.1 Door interlocked padlockable disconnect switch that will disconnect all input power from the drive and all internally mounted options.

.11 The following operators shall be provided:

Drive mode selector and light

.1 The systems tolerated voltage window shall allow the system to operate from a line of +30%, -35% nominal voltage as a minimum. The system shall incorporate circuitry that will allow the drive or bypass contactor to remain “sealed in” over this voltage tolerance at a minimum.

.2 Serial communications – VFD shall be capable of being monitored and or controlled via serial communications. Provide communications protocols for

ModBus; Johnson Controls N2; Siemens Building Technologies FLN (P1) and BACnet in the bypass controller.

.3 Run permissive circuit - there shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad, time-clock control, or serial communications) the VFD shall provide a dry contact closure that will signal the damper to open (VFD motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD system input and allows motor operation. Two separate safety interlock inputs shall be provided. When either safety is opened, the motor shall be commanded to coast to stop, and the damper shall be commanded to close.

.4 There shall be an adjustable motor current sensing circuit for the VFD mode to provide proof of flow indication. The condition shall be indicated on the keypad display, transmitted over the building automation protocol and on a relay output contact closure.

.5 The digital inputs for the system shall accept 24VAC or 24VDC.

.6 Customer Interlock Terminal Strip – provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. The terminal strip shall allow for independent connection of up to four (4) unique safety inputs.

.7 The user shall be able to select the text to be displayed on the keypad when the safety opens. Example text display indications include “Firestat”, “Freezestat”, “Over pressure” and “Low pressure”. The user shall also be able to determine which of the four (4) safety contacts is open over the serial communications connection.

.8 Class 10, 20, or 30 (selectable) electronic motor overload protection shall be included.

.9 Standard of acceptance:

.1 ABB ACH Series or equivalent approved by NRC departmental representative. **Approval does not relieve supplier of specification requirements.**

Part 3 Execution

3.1 INSTALLATION

.1 Installation shall be the responsibility of the electrical contractor. The contractor shall install the drive in accordance with the requirements of the VFD manufacturer’s installation manual.

.2 The contractor is to verify that the jobsite conditions for installation meet the factory recommendations and code required conditions for the VFD installation prior to installation. These shall include as a minimum:

.1 Clearance spacing.

.2 Compliance with environmental ratings of the VFD system.

.3 Separate conduit installation of the input wiring, the motor wiring, and control wiring. At no time does any of this wiring run in parallel with each other.

.4 All power and control wiring is complete.

.3 The VFD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD system shall not be operated while the unit is covered.

3.2 ON-SITE STARTUP

.1 The manufacturer shall provide start-up and commissioning of the variable frequency drive and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that will provide the factory service and warranty repairs at the customer site. Sales personnel and other agents who are not factory certified technicians for drive repair shall not be acceptable as commissioning agents.

.2 Start-up services shall include checking for verification of proper operation and installation of the VFD, its options and its interface wiring to the building automation system. Included in this service shall be as a minimum:

.1 Verification of contractor wire terminations and conduit runs to and from the VFD.

.2 Up to four hours of customer operator training on the operation and service diagnostics at the time of commissioning. On-site training is to be provided by the same factory trained application engineering and service personnel to demonstrate full programming and operating features and procedures. Date and time for this training is to be coordinated with the NRC Departmental Representative.

.3 Measurement for verification of proper operation of the following:

.1 Motor voltage and frequency. Verification of proper motor operation.

.2 Control input for proper building automation system interface and control calibration.

.3 Calibration check for the following set-points:

.1 minimum speed

.2 maximum speed

.3 acceleration and deceleration rates.

.3 Commissioning agent to verify the programming of the VFD and to provide a written copy of the settings to the engineer.

.4 Commissioning agent to lock out critical frequencies throughout the operating curve of the equipment as identified and required by the engineer. The agent shall record amperages at six (minimum) different frequencies from minimum to maximum speed.

3.3 PRODUCT SUPPORT

.1 Factory trained application engineering and service personnel that are thoroughly familiar with the VFD products offered shall be locally available at both the specifying and installation locations. A toll free 24/365 technical support line shall be available.

.2 A computer based training CD or 8-hour professionally generated video (VCR format) shall be provided to the owner at the time of project closeout. The training shall include installation, programming and operation of the VFD, bypass and serial communication.

3.4 WARRANTY

.1 Warranty shall be 24 months from the date of certified start-up. The warranty shall include all parts, labor, travel time and expenses

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 001000.

.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 A:

.1 l20V, 610mm x 1219mm, LED troffer, suitable for recessed mounting in T-bar ceiling.

.2 5-year warranty.

.3 Removable LED boards and driver for ease of service/replacement.

.4 Rated to deliver L70 performance for 50,000 hours.

.5 3500k colour temperature, 82 CRI, minimum 4000 lumen output.

.6 Standard of acceptance: Lithonia 2GTL-4-40L-LP840, CFI SpecPlus SPS24G-FS-YA-43A-40-U-LAG or equivalent approved by the NRC Departmental Representative.

.2 Type B:

.1 120V, 1134mm long, LED linear strip, suitable for surface mounting.

.2 5-year warranty.

.3 Rated to deliver L70 performance for 50,000 hours.

.4 4000k colour temperature, minimum 3800 lumen output.

.5 Standard of acceptance: Philips Fluxstream EZ LF-4-EZ-38-40-U-LAG or equivalent approved by the NRC Departmental Representative.

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 For suspended ceiling installations support each luminaire, including exit lights and pot lights, independently of the ceiling support system with separate chains at each end. No. 80 steel sash chain minimum.

.2 Unless otherwise specified support fluorescent luminaires mounted in continuous rows once every 3.6 m (12').

3.3 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.

Part 2 Products

2.1 MATERIALS

.1 Raceways: Minimum 19mm (3/4") EMT larger sizes as indicated on drawing.

.2 Tele-Power poles/Jiffy poles: type as indicated on drawings.

.3 Floor mounted outlets: type as indicated on drawings.

Part 3 Execution

3.1 CONDUIT SYSTEM

.1 Run conduit from wall outlets to 150mm (6") above false ceiling or to a point indicated on drawings.

.2 Install nylon pullcords in all empty conduits.

.3 Install additional steel pull boxes where necessary so that throughout the entire system, wires may be pulled in or withdrawn with reasonable ease. Pull boxes shall be installed in straight runs only.

.4 Install nylon bushings at open ends of conduit.

.5 Paint all elbows and pull box covers blue. (This identifies the conduit as conduit dedicated to voice/data wiring.)

.6 Do not run communications cables in the same raceway as power and lighting conductors.

3.2 MOUNTING

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

3.3 WORK BY OTHERS

.1 Cables and terminations.

END OF SECTION

Part 1 General

1.1 RELATED WORK SPECIFIED ELSEWHERE

.1 Common Work Results - Electrical Section 26 05 00

1.2 MATERIALS

.1 Provide only new equipment and materials, without blemish or defect, bearing Canadian Standards Association or Authorized Electrical Inspection Department labels, and subject to the approval of the NRC Departmental Representative.

.2 After a contract is awarded, utilize alternative methods and/or materials only after receiving the NRC Departmental Representative's approval.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 00 10 00.

1.4 SCOPE OF WORK

.1 Supply and install all required material, equipment and labour to provide the fire alarm changes and additions as shown on the drawings and indicated by this section of the specification.

1.5 CONTRACTOR QULIFICATION

.1 The contractor must ensure the supervisor, site foreman and electrician working on site hold valid fire alarm certificate.

1.6 REFERENCES

.1 Government of Canada

.1 TB OSH Chapter 3-03, [latest edition], Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.

.2 TB OSH Chapter 3-04, [latest edition], Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.

.2 Treasury Board: Fire Protection Standard effective April 1, 2010

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.4 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC-S524-[latest edition], Standard for the Installation of Fire Alarm Systems.

.2 CAN/ULC-S525-[latest edition], Audible Signal Device for Fire Alarm Systems.

.3 CAN/ULC-S526-[latest edition], Visual Signal Devices for Fire Alarm Systems.

.4 CAN/ULC-S527-[latest edition], Control Units.

.5 CAN/ULC-S528-[latest edition], Manual Pull Stations for Fire Alarm Systems.

.6 CAN/ULC-S529-[latest edition], Smoke Detectors for Fire Alarm Systems.

.7 CAN/ULC-S530-[latest edition], Heat Actuated Fire Detectors for Fire Alarm Systems.

.8 CAN/ULC-S531-[latest edition], Standard for Smoke Alarms.

.9 CAN/ULC-S536-S537-[latest edition], Burglar and Fire Alarm Systems and Components.

.5 National Fire Protection Agency

.1 NFPA 72-[latest edition], National Fire Alarm Code.

.2 NFPA 90A-[latest edition], Installation of Air Conditioning and Ventilating Systems.

Part 2 Products

2.1 AUTOMATIC ALARM INITIATING DEVICES

.1 Combination Fixed temperature and rate-of-rise thermal fire detector, self-restoring, rated 57°C (135°F) with 9°C (15°F) rate-of-rise and having one normally open contact rated for 3.0 A @ 120VAC and 1.0 A @ 24VDC, Edwards model No. 281B-PL.

2.2 CONDUIT AND WIRING

.1 Raceway to be 16mm 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.

Part 3 Execution

3.1 CONDUIT AND WIRING

.1 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.

.2 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.)

.3 All conduit to include a #16 TW stranded copper green ground wire.

.4 Use only uninsulated ring-type STA-KON lugs on screw connections.

.5 Run conduit tight along underside of ceiling slab or roof deck, unless noted otherwise on drawings.

.6 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.

.7 Use Tee bar electrical box hangers (Caddy #51224 for 610mm T-bar spacing) to mount heat detectors on T-bar ceiling tiles.

.8 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.

.9 Leave 6 inch loops of wire in all junction boxes.

.10 For new installations, no splicing of wires is to be made.

.11 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.

.12 Upon awarding of the contract, the NRC Departmental Representative shall provide the contractor with the standard wiring diagram for detection devices, A-7481.

.13 Prior to installing raceways, submit to the NRC Departmental Representative a proposed method and layout of conduit for approval.

3.2 EQUIPMENT IDENTIFICATION

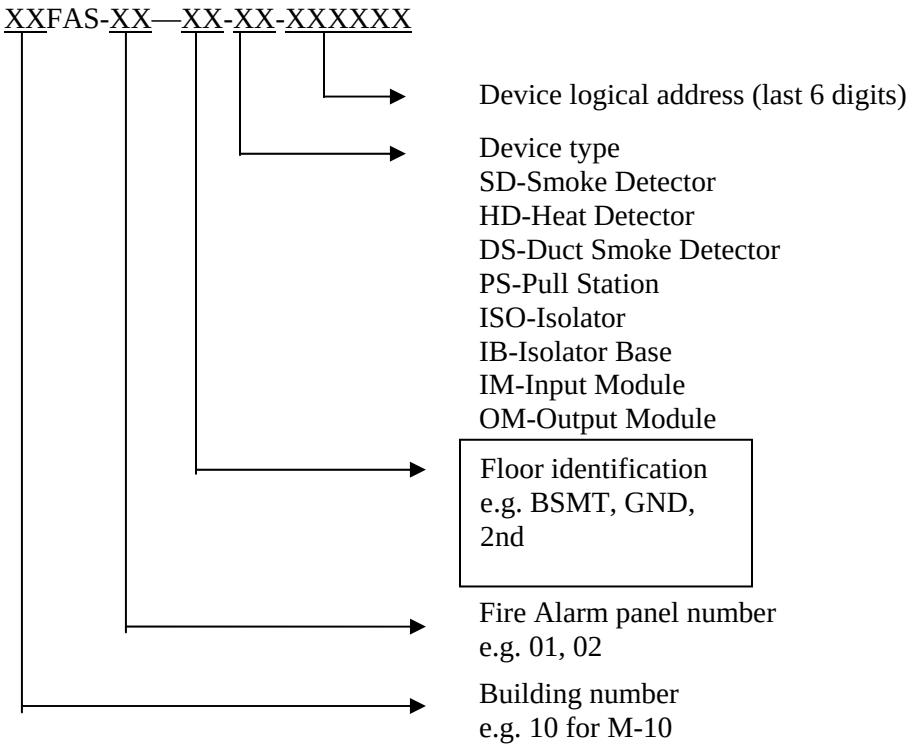
.1 Label each manual alarm station and each audible signal device with its unique identification number as per drawings. Use lamicoid nameplates as per Section 26 05 00.

.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



.4 Apply red paint to the covers of junction boxes and condulets of fire alarm conduit.

.5 Label wires as per drawing and as per Section. 26 05 00.

.6 Update remote annunciator panels and fire alarm panel zone directories if new zones are added to the system.

3.3 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.**

3.4 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 Give the NRC Departmental Representative one set of marked in red prints labelled "As Built".

.6 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.

.7 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.

END OF SECTION

TP1 Amount Payable – General

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

1.1.1 the aggregate of the amounts described in TP2 exceeds

1.1.2 the aggregate of the amounts described in TP3

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

TP2 Amounts Payable to the Contractor

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

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

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

TP3 Amounts Payable to Her Majesty

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

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

TP4 Time of Payment

4.1 In these Terms of Payment

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

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

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

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

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

4.2 The Contractor shall, on the expiration of a payment period, deliver to the Departmental Representative in respect of that payment period a written progress claim that fully describes any part of the work that has been completed, and any material that was delivered to the work site but not incorporated into the work during that payment period.

4.3 The Departmental Representative shall, not later than ten days after receipt by him of a progress claim referred to in TP4.2,

4.3.1 inspect the part of the work and the material described in the progress claim; and

4.3.2 issue a progress report, a copy of which the Departmental Representative will give to the Contractor, that indicates the value of the part of the work and the material described in the progress claim that, in the opinion of the Departmental Representative,

4.3.2.1 is in accordance with the contract, and

4.3.2.2 was not included in any other progress report relating to the contract.

4.4 Subject to TP1 and TP4.5 Her Majesty shall, not later than 30 days after receipt by the Departmental Representative of a progress claim referred to in TP4.2, pay the Contractor

4.4.1 an amount that is equal to 95% of the value that is indicated in the progress report referred to in TP4.3.2 if a labour and material payment bond has been furnished by the Contractor, or

4.4.2 an amount that is equal to 90% of the value that is indicated in the progress report referred to in TP4.3.2 if a labour and material payment bond has not been furnished by the Contractor.

4.5 It is a condition precedent to Her Majesty's obligation under TP4.4 that the Contractor has made and delivered to the Departmental Representative,

4.5.1 a statutory declaration described in TP4.6 in respect of a progress claim referred to in TP4.2,

4.5.2 in the case of the Contractor's first progress claim, a construction schedule in accordance with the relevant sections of the Specifications, and

4.5.3 if the requirement for a schedule is specified, an update of the said schedule at the times identified in the relevant sections of the Specifications.

4.6 A statutory declaration referred to in TP4.5 shall contain a deposition by the Contractor that

4.6.1 up to the date of the Contractor's progress claim, the Contractor has complied with all his lawful obligations with respect to the Labour Conditions; and

4.6.2 up to the date of the Contractor's immediately preceding progress claim, all lawful obligations of the Contractor to subcontractors and suppliers of material in respect of the

work under the contract have been fully discharged.

4.7 Subject to TP1 and TP4.8, Her Majesty shall, not later than 30 days after the date of issue of an Interim Certificate of Completion referred to in GC44.2, pay the Contractor the amount referred to in TP1 less the aggregate of

4.7.1 the sum of all payments that were made pursuant to TP4.4;

4.7.2 an amount that is equal to the Departmental Representative's estimate of the cost to Her Majesty or rectifying defects described in the Interim Certificate of Completion; and

4.7.3 an amount that is equal to the Departmental Representative's estimate of the cost to Her Majesty of completing the parts of the work described in the Interim Certificate of Completion other than the defects referred to in TP4.7.2.

4.8 It is a condition precedent to Her Majesty's obligation under TP4.7 that the Contractor has made and delivered to the Departmental Representative,

4.8.1 a statutory declaration described in TP4.9 in respect of an Interim Certificate of Completion referred to in GC44.2, and

4.8.2 if so specified in the relevant sections of the Specifications, and update of the construction schedule referred to in TP4.5.2 and the updated schedule shall, in addition to the specified requirements, clearly show a detailed timetable that is acceptable to the Departmental Representative for the completion of any unfinished work and the correction of all defects.

4.9 A statutory declaration referred to in TP4.8 shall contain a deposition by the contractor that up to the date of the Interim Certificate of Completion the Contractor has

4.9.1 complied with all of the Contractor's lawful obligations with respect to the Labour Conditions;

4.9.2 discharged all of the Contractor's lawful obligations to the subcontractors and suppliers of material in respect of the work under the contract; and

4.9.3 discharged the Contractor's lawful obligations referred to in GC14.6.

4.10 Subject to TP1 and TP4.11, Her Majesty shall, not later than 60 days after the date of issue of a Final Certificate of Completion referred to in GC44.1, pay the Contractor the amount referred to in TP1 less the aggregate of

4.10.1 the sum of all payments that were made pursuant to TP4.4; and

4.10.2 the sum of all payments that were made pursuant to TP4.7.

4.11 It is a condition precedent to Her Majesty's obligation under TP4.10 that the Contractor has made and delivered a statutory declaration described in TP4.12 to the Departmental Representative.

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

TP5 Progress Report and Payment Thereunder Not Binding on Her Majesty

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

TP6 Delay in Making Payment

6.1 Nothwithstanding GC7 any delay by Her Majesty in making any payment when it is due pursuant to these Terms of Payment shall not be a breach of the contract by Her Majesty.

6.2 Her Majesty shall pay, without demand from the Contractor, simple interest at the Bank Rate plus 1 -1/4 per centum on any amount which is overdue pursuant to TP4.1.3, and the interest shall apply from and include the day such amount became overdue until the day prior to the date of payment except that

6.2.1 interest shall not be payable or paid unless the amount referred to in TP6.2 has been overdue for more that 15 days following

6.2.1.1 the date the said amount became due and payable, or

6.2.1.2 the receipt by the Departmental Representative of the Statutory Declaration referred to in TP4.5, TP4.8 or TP4.11,

whichever is the later, and

6.6.2 interest shall not be payable or paid on overdue advance payments if any.

TP7 Right of Set-off

7.1 Without limiting any right of set-off or deduction given or implied by law or elsewhere in the contract, Her Majesty may set off any amount payable to Her Majesty by the Contractor under this contract or under any current contract against any amount payable to the Contractor under this contract.

7.2 For the purposes of TP7.1, "current contract" means a contract between Her Majesty and the Contractor

7.2.1 under which the Contractor has an undischarged obligation to perform or supply work, labour or material, or

7.2.2 in respect of which Her Majesty has, since the date of which the Articles of Agreement were made, exercised any right to take the work that is the subject of the contract out of the Contractor's hands.

TP8 Payment in Event of Termination

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

TP9 Interest on Settled Claims

9.1 Her Majesty shall pay to the Contractor simple interest on the amount of a settled claim at an average Bank Rate plus 1 ¼ per centum from the date the settled claim was outstanding until the day prior to the date of payment.

9.2 For the purposes of TP9.1,

9.2.1 a claim is deemed to have been settled when an agreement in writing is signed by the Departmental Representative and the Contractor setting out the amount of the claim to be paid by Her Majesty and the items or work for which the said amount is to be paid.

9.2.2 an "average Bank Rate" means the discount rate of interest set by the Bank of Canada in effect at the end of each calendar month averaged over the period the settled claim was outstanding.

9.2.3 a settled claim is deemed to be outstanding from the day immediately following the date the said claim would have been due and payable under the contract had it not been disputed.

9.3 For the purposes of TP9 a claim means a disputed amount subject to negotiation between Her Majesty and the Contractor under the contract.

GC1 Interpretation

1.1 In the contract

1.1.1 where reference is made to a part of the contract by means of numbers preceded by letters, the reference shall be construed to be a reference to the particular part of the contract that is identified by that combination of letters and numbers and to any other part of the contract referred to therein;

1.1.2 "contract" means the contract document referred to in the Articles of Agreement;

1.1.3 "contract security" means any security given by the Contractor to Her Majesty in accordance with the contract;

1.1.4 "Departmental Representative" means the officer or employee or Her Majesty who is designated pursuant to the Articles of Agreement and includes a person specially authorized by him to perform, on his behalf, any of his functions under the contract and is so designated in writing to the Contractor;

1.1.5 "material" includes all commodities, articles and things required to be furnished by or for the Contractor under the contract for incorporation into the work;

1.1.6 "Minister" includes a person acting for, or if the office is vacant, in place of the Minister and his successors in the office, and his or their lawful deputy and any of his or their representatives appointed for the purposes of the contract;

1.1.7 "person" includes, unless the context otherwise requires, a partnership, proprietorship, firm, joint venture, consortium and a corporation;

1.1.8 "plant" includes all animals, tools, implements, machinery, vehicles, buildings, structures, equipment and commodities, articles and things other than material, that are necessary for the due performance of the contract;

1.1.9 "subcontractor' means a person to whom the Contractor has, subject to GC4, subcontracted the whole or any part of the work;

1.1.10 "superintendant" means the employee of the Contractor who is designated by the Contractor to act pursuant to GC19;

1.1.11 "work includes, subject only to any express stipulation in the contract to the contrary, everything that is necessary to be done, furnished or delivered by the Contractor to perform the contract.

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

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

1.4 In interpreting the Plans and Specifications, in the event of discrepancies or conflicts between

1.4.1 the Plans and Specifications, the Specifications govern;

1.4.2 the Plans, the Plans drawn with the largest scale govern; and

1.4.3 figured dimensions and scaled dimensions, the figured dimensions govern.

GC2 Successors and Assigns

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

GC3 Assignment of Contract

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

GC4 Subcontracting by Contractor

4.1 Subject to this General Condition, the Contractor may subcontract any part of the work.

4.2 The Contractor shall notify the Departmental Representative in writing of his intention to subcontract.

4.3 A notification referred to in GC4.2 shall identify the part of the work, and the subcontractor with whom it is intended to subcontract.

4.4 The Departmental Representative may object to the intended subcontracting by notifying the Contractor in writing within six days of receipt by the Departmental Representative of a notification referred to in GC4.2.

4.5 If the Departmental Representative objects to a subcontracting pursuant to GC4.4, the Contractor shall not enter into the intended subcontract.

4.6 The contractor shall not, without the written consent of the Departmental Representative, change a subcontractor who has been engaged by him in accordance with this General Condition.

4.7 Every subcontract entered into by the Contractor shall adopt all of the terms and conditions of ths contract that are of general application.

4.8 Neither a subcontracting nor the Departmental Representative's consent to a subcontracting by the Contractor shall be construed to relieve the Contractor from any obligation under the contract or to impose any liability upon Her Majesty.

GC5 Amendments

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

GC6 No Implied Obligations

6.1 No implied terms or obligations of any kind by or on behalf of Her Majesty shall arise from anything in the contract and the express covenants and agreements therein contained and made by Her Majesty are the only covenants and agreements upon which any rights against Her Majesty are to be founded.

6.2 The contract supersedes all communications, negotiations and agreements, either written or oral, relating to the work that were made prior to the date of the contract.

GC7 Time of Essence

7.1 Time is of the essence of the contract.

GC8 Indemnification by Contractor

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

8.2 For the purpose of GC8.1, "activities" includes any act improperly carried out, any omission to carry out an act and any delay in carrying out an act.

GC9 Indemnification by Her Majesty

9.1 Her Majesty shall, subject to the Crown Liability Act, the Patent Act, and any other law that affects Her Majesty's rights, powers, privileges or obligations, indemnify and save the Contractor harmless from and against all claims, demands, losses, costs, damage, actions, suits or proceedings arising out of his activities under the contract that are directly attributable to

9.1.1 lack of or a defect in Her Majesty's title to the work site whether real or alleged; or

9.1.2 an infringement or an alleged infringement by the Contractor of any patent of invention or any other kind of intellectual property occurring while the Contractor was performing any act for the purposes of the contract employing a model, plan or design or any other thing related to the work that was supplied by Her Majesty to the Contractor.

GC10 Members of House of Commons Not to Benefit

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

GC11 Notices

11.1 Any notice, consent, order, decision, direction or other communication, other than a notice referred to in GC11.4, that may be given to the Contractor pursuant to the contract may be given in any manner.

11.2 Any notice, consent, order, decision, direction or other communication required to be given in writing, to any party pursuant to the contract shall, subject to GC11.4, be deemed to have been effectively given

11.2.1 to the Contractor, if delivered personally to the Contractor or the Contractor's superintendent, or forwarded by mail, telex or facsimile to the Contractor at the address set out in A4.1, or

11.2.2 to Her Majesty, if delivered personally to the Departmental Representative, or forwarded by mail, telex or facsimile to the Departmental Representative at the address set out in A1.2.1.

11.3 Any such notice, consent, order, decision, direction or other communication given in accordance with GC11.2 shall be deemed to have been received by either party

11.3.1 if delivered personally, on the day that it was delivered,

11.3.2 if forwarded by mail, on the earlier of the day it was received and the sixth day after it was mailed, and

11.3.3 if forwarded by telex or facsimile, 24 hours after it was transmitted.

11.4 A notice given under GC38.1.1, GC40 and GC41, if delivered personally, shall be delivered to the Contractor if the Contractor is doing business as sole proprietor or, if the Contractor is a partnership or corporation, to an officer thereof.

GC12 Material, Plant and Real Property Supplied by Her Majesty

12.1 Subject to GC12.2, the Contractor is liable to Her Majesty for any loss of or damage to material, plant or real property that is supplied or placed in the care, custody and control of the Contractor by Her Majesty for use in connection with the contract, whether or not that loss or damage is attributable to causes beyond the Contractor's control.

12.2 The Contractor is not liable to Her Majesty for any loss or damage to material, plant or real property referred to in GC12.1 if that loss or damage results from and is directly attributable to reasonable wear and tear.

12.3 The Contractor shall not use any material, plant or real property referred to in GC12.1 except for

the purpose of performing this contract.

12.4 When the Contractor fails to make good any loss or damage for which he is liable under GC12.1 within a reasonable time after being required to do so by the Departmental Representative, the Departmental Representative may cause the loss or damage to be made good at the Contractor's expense, and the Contractor shall thereupon be liable to Her Majesty for the cost thereof and shall, on demand, pay to Her Majesty an amount equal to that cost.

12.5 The Contractor shall keep such records of all material, plant and real property referred to in GC12.1 as the Departmental Representative from time to time requires and shall satisfy the Departmental Representative, when requested, that such material, plant and real property are at the place and in the condition which they ought to be.

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

13.1 Subject to GC14.7 all material and plant and the interest of the Contractor in all real property, licenses, powers and privileges purchased, used or consumed by the Contractor for the contract shall, after the time of their purchase, use or consumption be the property of Her Majesty for the purposes of the work and they shall continue to be the property of Her Majesty.

13.1.1 in the case of material, until the Departmental Representative indicates that he is satisfied that it will not be required for the work, and

13.1.2 in the case of plant, real property, licenses, powers and privileges, until the Departmental Representative indicates that he is satisfied that the interest vested in Her Majesty therein is no longer required for the purposes of the work.

13.2 Material or plant that is the property of Her Majesty by virtue of GC13.1 shall not be taken away from the work site or used or disposed of except for the purposes of the work without the written consent of the Departmental Representative.

13.3 Her Majesty is not liable for loss of or damage from any cause to the material or plant referred to in GC13.1 and the Contractor is liable for such loss or damage notwithstanding that the material or plant is the property of Her Majesty.

GC14 Permits and Taxes Payable

14.1 The Contractor shall, within 30 days after the date of the contract, tender to a municipal authority an amount equal to all fees and charges that would be lawfully payable to that municipal authority in respect of building permits as if the work were being performed for a person other than Her Majesty.

14.2 Within 10 days of making a tender pursuant to GC14.1, the Contractor shall notify the Departmental Representative of his action and of the amount tendered and whether or not the municipal authority has accepted that amount.

14.3 If the municipal authority does not accept the amount tendered pursuant to GC14.1 the Contractor shall pay that amount to Her Majesty within 6 days after the time stipulated in GC14.2.

14.4 For the purposes of GC14.1 to GC14.3 "municipal authority" means any authority that would have jurisdiction respecting permission to perform the work if the owner were not Her Majesty.

14.5 Notwithstanding the residency of the Contractor, the Contractor shall pay any applicable tax arising from or related to the performance of the work under the contract.

14.6 In accordance with the Statutory Declaration referred to in TP4.9, a Contractor who has neither residence nor place of business in the province in which work under the contract is being performed shall provide Her Majesty with proof of registration with the provincial sales tax authorities in the said province.

14.7 For the purpose of the payment of any applicable tax or the furnishing of security for the payment of any applicable tax arising from or related to the performance of the work under the contract, the Contractor shall, notwithstanding the fact that all material, plant and interest of the Contractor in all real property, licenses, powers and privileges, have become the property of Her Majesty after the time of purchase, be liable, as a user or consumer, for the payment or for the furnishing of security for the payment of any applicable tax payable, at the time of the use or consumption of that material, plant or interest of the Contractor in accordance with the relevant legislation.

GC15 Performance of Work under Direction of Departmental Representative

15.1 The Contractor shall

15.1.1 permit the Departmental Representative to have access to the work and its site at all times during the performance of the contract;

15.1.2 furnish the Departmental Representative with such information respecting the performance of the contract as he may require; and

15.1.3 give the Departmental Representative every possible assistance to enable the Departmental Representative to carry out his duty to see that the work is performed in accordance with the contract and to carry out any other duties and exercise any powers specially imposed or conferred on the Departmental Representative under the contract.

CG16 Cooperation with Other Contractors

16.1 Where, in the opinion of the Departmental Representative, it is necessary that other contractors or workers with or without plant and material, be sent onto the work or its site, the Contractor shall, to the satisfaction of the Departmental Representative, allow them access and cooperate with them in the carrying out of their duties and obligation.

16.2 If

16.2.1 the sending onto the work or its site of other contractors or workers pursuant to GC16.1 could not have been reasonably foreseen or anticipated by the Contractor when entering into the contract, and

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

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

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

GC17 Examination of Work

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

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

GC18 Clearing of Site

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

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

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

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

GC19 Contractor's Superintendent

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

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

19.3 A superintendent designated pursuant to GC19.1 shall be in full charge of the operations of the Contractor in the performance of the work and is authorized to accept any notice, consent, order, direction, decision or other communication on behalf of the Contractor that may be given to the superintendent under the contract.

19.4 The Contractor shall, until the work has been completed, keep a competent superintendent at the work site during working hours.

19.5 The Contractor shall, upon the request of the Departmental Representative, remove any superintendent who, in the opinion of the Departmental Representative, is incompetent or has been conducting himself improperly and shall forthwith designate another superintendent who is acceptable to the Departmental Representative.

19.6 Subject to GC19.5, the Contractor shall not substitute a superintendent without the written consent of the Departmental Representative.

19.7 A breach by the Contractor of GC19.6 entitles the Departmental Representative to refuse to issue any certificate referred to in GC44 until the superintendent has returned to the work site or another superintendent who is acceptable to the Departmental Representative has been substituted.

GC20 National Security

20.1 If the Minister is of the opinion that the work is of a class or kind that involves the national security, he may order the Contractor

20.1.1 to provide him with any information concerning persons employed or to be employed by him for purposes of the contract; and

20.1.2 to remove any person from the work and its site if, in the opinion of the Minister, that person may be a risk to the national security.

20.2 The Contractor shall, in all contracts with persons who are to be employed in the performance of the contract, make provision for his performance of any obligation that may be imposed upon him under GC19 to GC21.

20.3 The Contractor shall comply with an order of the Minister under GC20.1

GC21 Unsuitable Workers

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

GC22 Increased or Decreased Costs

22.1 The amount set out in the Articles of Agreement shall not be increased or decreased by reason of any increase or decrease in the cost of the work that is brought about by an increase or decrease in the cost of labour, plant or material or any wage adjustment arising pursuant to the Labour Conditions.

22.2 Notwithstanding GC22.1 and GC35, an amount set out in the Articles of Agreement shall be adjusted in the manner provided in GC22.3, if any change in a tax imposed under the Excise Act, the Excise Tax Act, the Old Age Security Act, the Customs Act, the Customs Tariff or any provincial sales tax legislation imposing a retail sales tax on the purchase of tangible personal property incorporated into Real Property

22.2.1 occurs after the date of the submission by the Contractor of his tender for the contract,

22.2.2 applies to material, and

22.2.3 affects the cost to the Contractor of that material.

22.3 If a change referred to in GC22.2 occurs, the appropriate amount set out in the Articles of Agreement shall be increased or decreased by an amount equal to the amount that is established by an examination of the relevant records of the Contractor referred to in GC51 to be the increase or decrease in the cost incurred that is directly attributable to that change.

22.4 For the purpose of GC22.2, where a tax is changed after the date of submission of the tender but public notice of the change has been given by the Minister of Finance before that date, the change shall be deemed to have occurred before the date of submission of the tender.

GC23 Canadian Labour and Material

23.1 The Contractor shall use Canadian labour and material in the performance of the work to the full extent to which they are procurable, consistent with proper economy and expeditious carrying out of the work.

23.2 Subject to GC23.1, the Contractor shall, in the performance of the work, employ labour from the locality where the work is being performed to the extent to which it is available, and shall use the offices of the Canada Employment Centres for the recruitment of workers wherever practicable.

23.3 Subject to GC23.1 and GC23.2, the Contractor shall, in the performance of the work, employ a reasonable proportion of persons who have been on active service with the armed forces of Canada and have been honourably discharged therefrom.

GC24 Protection of Work and Documents

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

24.2 If any document or information given or disclosed to the Contractor is assigned a security rating by the person who gave or disclosed it, the Contractor shall take all measures directed by the Departmental Representative to be taken to ensure the maintenance of the degree of security that is ascribed to that rating.

24.3 The Contractor shall provide all facilities necessary for the purpose of maintaining security, and shall assist any person authorized by the Minister to inspect or to take security measures in respect of the work and its site.

24.4 The Departmental Representative may direct the Contractor to do such things and to perform such additional work as the Departmental Representative considers reasonable and necessary to ensure compliance with or to remedy a breach of GC24.1 to GC24.3.

GC25 Public Ceremonies and Signs

25.1 The Contractor shall not permit any public ceremony in connection with the work without the prior consent of the Minister.

25.2 The Contractor shall not erect or permit the erection of any sign or advertising on the work or its site without the prior consent of the Departmental Representative.

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

26.1 The Contractor shall, at his own expense, do whatever is necessary to ensure that

26.1.1 no person, property, right, easement or privilege is injured, damaged or infringed by reasons of the Contractor's activities in performing the contract;

26.1.2 pedestrian and other traffic on any public or private road or waterway is not unduly impeded, interrupted or endangered by the performance or existence of the work or plant;

26.1.3 fire hazards in or about the work or its site are eliminated and, subject to any direction that may be given by the Departmental Representative, any fire is promptly extinguished;

26.1.4 the health and safety of all persons employed in the performance of the work is not endangered by the method or means of its performance;

26.1.5 adequate medical services are available to all persons employed on the work or its site at all times during the performance of the work;

26.1.6 adequate sanitation measures are taken in respect of the work and its site; and

26.1.7 all stakes, buoys and marks placed on the work or its site by or under the authority of the Departmental Representative are protected and are not removed, defaced, altered or destroyed.

26.2 The Departmental Representative may direct the Contractor to do such things and to perform such additional work as the Departmental Representative considers reasonable and necessary to ensure

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

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

GC27 Insurance

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

27.2 The insurance contracts referred to in GC27.1 shall

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

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

GC28 Insurance Proceeds

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

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

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

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

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

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

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

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

creditor.

28.5 When payment of a deficiency has been made pursuant to GC28.4, all rights and obligations of Her Majesty and the Contractor under the contract shall, with respect only to the part of the work that was the subject of the audit referred to in GC28.3, be deemed to have been expended and discharged.

28.6 If an election is not made pursuant to GC28.1.2 the Contractor shall, subject to GC28.7, clear and clean the work and its site and restore and replace the part of the work that was lost, damaged or destroyed at his own expense as if that part of the work had not yet been performed.

28.7 When the Contractor clears and cleans the work and its site and restores and replaces the work referred to in GC 28.6, Her Majesty shall pay him out of the monies referred to in GC28.1 so far as they will thereunto extend.

28.8 Subject to GC28.7, payment by Her Majesty pursuant to GC28.7 shall be made in accordance with the contract but the amount of each payment shall be 100% of the amount claimed notwithstanding TP4.4.1 and TP4.4.2.

GC29 Contract Security

29.1 The Contractor shall obtain and deliver contract security to the Departmental Representative in accordance with the provisions of the Contract Security Conditions.

29.2 If the whole or a part of the contract security referred to in GC29.1 is in the form of a security deposit, it shall be held and disposed of in accordance with GC43 and GC45.

29.3 If a part of the contract security referred to in GC29.1 is in the form of a labour and material payment bond, the Contractor shall post a copy of that bond on the work site.

GC30 Changes in the Work

30.1 Subject o GC5, the Departmental Representative may, at any time before he issues his Final Certificate of Completion,

30.1.1 order work or material in addition to that provided for in the Plans and Specifications; and

30.1.2 delete or change the dimensions, character, quantity, quality, description, location or position of the whole or any part of the work or material proved for in the Plans and Specifications or in any order made pursuant to GC30.1.1,

if that additional work or material, deletion, or change is, in his opinion, consistent with the general intent of the original contract.

30.2 The Contractor shall perform the work in accordance with such orders, deletions and changes that are made by the Departmental Representative pursuant to GC30.1 from time to time as if they had appeared in and been part of the Plans and Specifications.

30.3 The Departmental Representative shall determine whether or not anything done or omitted by the Contractor pursuant to an order, deletion or change referred to in GC30.1 increased or decreased the cost of the work to the Contractor.

30.4 If the Departmental Representative determines pursuant to GC30.3 that the cost of the work to the Contractor has been increased, Her Majesty shall pay the Contractor the increased cost that the Contractor necessarily incurred for the additional work calculated in accordance with GC49 or GC50.

30.5 If the Departmental Representative determines pursuant to GC303.3 that the cost of the work to the Contractor has been decreased, Her Majesty shall reduce the amount payable to the Contractor under the contract by an amount equal to the decrease in the cost caused by the deletion or change referred to in GC30.1.2 and calculated in accordance with GC49.

30.6 GC30.3 to GC30.5 are applicable only to a contract or a portion of a contract for which a Fixed Price Arrangement is stipulated in the contract.

30.7 An order, deletion or change referred to in GC30.1 shall be in writing, signed by the Departmental Representative and given to the Contractor in accordance with GC11.

GC31 Interpretation of Contract by Departmental Representative

31.1 If, ar any time before the Departmental Representative has issued a Final Certificate of Completion referred to in GC44.1, any question arises between the parties about whether anything has been done as required by the contract or about what the Contractor is required by the contract to do, and, in particular but without limiting the generality of the foregoing, about

31.1.1 the meaning of anything in the Plans and Specification,

31.1.2 the meaning to be given to the Plans and Specifications in case of any error therein, omission therefrom, or obscurity or discrepancy in their working or intention,

31.1.3 whether or not the quality or quantity of any material or workmanship supplied or proposed to be supplied by the Contractor meets the requirements of the contract,

31.1.4 whether or not the labour, plant or material provided by the Contractor for performing the work and carrying out the contract are adequate to ensure that the work will be performed in accordance with the contract and that the contract will be carried out in accordance with its terms,

31.1.5 what quantity of any kind of work has been completed by the Contractor, or

31.1.6 the timing and scheduling of the various phases of the performance of the work,

the question shall be decided by the Departmental Representative whose decision shall be final and conclusive in respect of the work.

31.2 The Contractor shall perform the work in accordance with any decisions of the Departmental

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

GC32 Warranty and Rectification of Defects in Work

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

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

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

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

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

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

GC33 Non-Compliance by Contractor

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

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

GC34 Protesting Departmental Representative's Decisions

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

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

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

34.3 If the Contractor gives a protest pursuant to GC34.2, any compliance by the Contractor with the decision or direction that was protested shall not be construed as an admission by the Contractor of the correctness of that decision or direction, or prevent the Contractor from taking whatever action he considers appropriate in the circumstances.

34.4 The giving of a protest by the Contractor pursuant to GC34.2 shall not relieve him from complying with the decision or direction that is the subject of the protest.

34.5 Subject to GC34.6, the Contractor shall take any action referred to in GC34.3 within three months after the date that a Final Certificate of Completion is issued under GC44.1 and not afterwards.

34.6 The Contractor shall take any action referred to in GC34.3 resulting from a direction under GC32 within three months after the expiry of a warranty or guarantee period and not afterwards.

34.7 Subject to GC34.8, if Her Majesty determines that the Contractor's protest is justified, Her Majesty shall pay the Contractor the cost of the additional labour, plant and material necessarily incurred by the Contractor in carrying out the protested decision or direction.

34.8 Costs referred to in GC34.7 shall be calculated in accordance with GC48 to GC50.

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

35.1 Subject to GC35.2 no payment, other than a payment that is expressly stipulated in the contract, shall be made by Her Majesty to the Contractor for any extra expense or any loss or damage incurred or sustained by the Contractor.

35.2 If the Contractor incurs or sustains any extra expense or any loss or damage that is directly attributable to

35.2.1 a substantial difference between the information relating to soil conditions at the work site that is contained in the Plans and Specifications or other documents supplied to the Contractor for his use in preparing his tender or a reasonable assumption of fact based thereon made by the Contractor, and the actual soil conditions encountered by the Contractor at the work site during the performance of the contract, or

35.2.2 any neglect or delay that occurs after the date of the contract on the part of Her Majesty in providing any information or in doing any act that the contract either expressly requires Her Majesty to do or that would ordinarily be done by an owner in accordance with the usage of the trade,

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

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

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

35.4 A written claim referred to in GC35.3 shall contain a sufficient description of the facts and circumstances of the occurrence that is the subject of the claim to enable the Departmental Representative to determine whether or not the claim is justified and the Contractor shall supply such further and other information for that purpose as the Departmental Representative requires from time to time.

35.5 If the Departmental Representative determines that a claim referred to in GC35.3 is justified, Her Majesty shall make an extra payment to the Contractor in an amount that is calculated in accordance with GC47 to GC50.

35.6 If, in the opinion of the Departmental Representative, an occurrence described in GC35.2.1 results in a savings of expenditure by the Contractor in performing the contract, the amount set out in the Articles of Agreement shall, subject to GC35.7, be reduced by an amount that is equal to the saving.

35.7 The amount of the saving referred to in GC35.6 shall be determined in accordance with GC47 to GC49.

35.8 If the Contractor fails to give a notice referred to in GC35.2 and a claim referred to in GC35.3 within the times stipulated, an extra payment shall not be made to him in respect of the occurrence.

GC36 Extension of Time

36.1 Subject to GC36.2, the Departmental Representative may, on the application of the Contractor made before the day fixed by the Articles of Agreement for completion of the work or before any other date previously fixed under this General Condition, extend the time for its completion by fixing a new date if, in the opinion of the Departmental Representative, causes beyond the control of the Contractor have delayed its completion.

36.2 An application referred to in GC36.1 shall be accompanied by the written consent of the bonding company whose bond forms part of the contract security.

GC37 Assessments and Damages for Late Completion

37.1 For the purposes of this General Condition

37.1.1 the work shall be deemed to be completed on the date that an Interim Certificate of Completion referred to in GC44.2 is issued, and

37.1.2 "period of delay" means the number of days commencing on the day fixed by the Articles of Agreement for completion of the work and ending on the day immediately preceding the day on which the work is completed but does not include any day within a period of extension granted pursuant to GC36.1, and any other day on which, in the opinion of the Departmental Representative, completion of the work was delayed for reasons beyond the control of the Contractor.

37.2 If the Contractor does not complete the work by the day fixed for its completion by the Articles of Agreement but completes it thereafter, the Contractor shall pay Her Majesty an amount equal to the aggregate of

37.2.1 all salaries, wages and travelling expenses incurred by Her Majesty in respect of persons overseeing the performance of the work during the period of delay;

37.2.2 the cost incurred by Her Majesty as a result of the inability to use the completed work for the period of delay; and

37.2.3 all other expenses and damages incurred or sustained by Her Majesty during the period of delay as a result of the work not being completed by the day fixed for its completion.

37.3 The Minister may waive the right of Her Majesty to the whole or any part of the amount payable by the Contractor pursuant to GC37.2 I , in the opinion of the Minister, it is in the public interest to do so.

GC38 Taking the Work Out of the Contractor's Hands

38.1 The Minister may, at his sole discretion, by giving a notice in writing to the Contractor in accordance with GC11, take all or any part of the work out of the Contractor's hands, and may employ such means as he sees fit to have the work completed if the Contractor

38.1.1 Has not, within six days of the Minister or the Departmental Representative giving notice to the Contractor in writing in accordance with GC11, remedied any delay in the commencement or any default in the diligent performance of the work to the satisfaction of the Departmental Representative;

38.1.2 has defaulted in the completion of any part of the work within the time fixed for its completion by the contract;

38.1.3 has become insolvent;

38.1.4 has committed an act of bankruptcy;

38.1.5 has abandoned the work;

38.1.6 has made an assignment of the contract without the consent required by GC3.1; or

38.1.7 has otherwise failed to observe or perform any of the provisions of the contract.

38.2 If the whole or any part of the work is taken out of the Contractor's hands pursuant to GC38.1,

38.2.1 the Contractor's right to any further payment that is due or accruing due under the contract is, subject only to GC38.4, extinguished, and

38.2.2 the Contractor is liable to pay Her Majesty, upon demand, an amount that is equal to the amount of all loss and damage incurred or sustained by Her Majesty in respect of the

Contractor's failure to complete the work.

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

38.4 Her Majesty may pay the Contractor the amount determined not to be required pursuant to GC38.3.

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

39.1 The taking of the work or any part thereof out of the Contractor's hands pursuant to GC38 does not operate so as to relieve or discharge him from any obligation under the contract or imposed upon him by law except the obligation to complete the performance of that part of the work that was taken out of his hands.

39.2 If the work or any part thereof is taken out of the Contractor's hands pursuant to GC38, all plant and material and the interest of the Contractor is all real property, licenses, powers and privileges acquired, used or provided by the Contractor under the contract shall continue to be the property of Her Majesty without compensation to the Contractor.

39.3 When the Departmental Representative certifies that any plant, material, or any interest of the Contractor referred to in GC39.2 is no longer required for the purposes of the work, or that it is not in the interest of Her Majesty to retain that plant, material or interest, it shall revert to the Contractor.

G40 Suspension of Work by Minister

40.1 The Minister may, when in his opinion it is in the public interest to do so, require the Contractor to suspend performance of the work either for a specified or an unspecified period by giving a notice of suspension in wiring to the Contractor in accordance with GC11.

40.2 When a notice referred to in GC40.1 is received by the Contractor in accordance with GC11, he shall suspend all operations in respect of the work except those that, in the opinion of the Departmental Representative, are necessary for the care and preservation of the work, plant and material.

40.3 The Contractor shall not, during a period of suspension, remove any part of the work, plant or material from its site without the consent of the Departmental Representative.

40.4 If a period of suspension is 30 days or less, the Contractor shall, upon the expiration of that period, resume the performance of the work and he is entitled to be paid the extra cost, calculated in accordance with GC48 to GC50, of any labour, plant and material necessarily incurred by him as a result of the suspension.

40.5 If, upon the expiration of a period of suspension of more than 30 days, the Minister and the Contractor agree that the performance of the work will be continued by the Contractor, the Contractor shall resume performance of the work subject to any terms and conditions agreed upon by the Minister and the Contractor.

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

GC41 Termination of Contract

41.1 The Minister may terminate the contract at any time by giving a notice of termination in writing to the Contractor in accordance with GC11.

41.2 When a notice referred to in GC41.1 is received by the Contractor in accordance with GC11, he shall, subject to any conditions stipulated in the notice, forthwith cease all operations in performance of the contract.

41.3 If the contract is terminated pursuant to GC41.1, Her Majesty shall pay the Contractor, subject to GC41.4, an amount equal to

41.3.1 the cost to the contractor of all labour, plant and material supplied by him under the contract up to the date of termination in respect of a contract or part thereof for which a Unit Price Arrangement is stipulated in the contract, or

41.3.2 the lesser of

41.3.2.1 an amount, calculated in accordance with the Terms and Payment, that would have been payable to the Contractor had he completed the work, and

41.3.2.2 an amount that is determined to be due to the Contractor pursuant to GC49 in respect of a contract or part thereof for which a Fixed Price Arrangement is stipulated in the contract

less the aggregate of all amounts that were paid to the Contractor by Her Majesty and all amounts that are due to Her Majesty from the Contractor pursuant to the contract.

41.4 If Her Majesty and the Contractor are unable to agree about an amount referred to in GC41.3 that amount shall be determined by the method referred to in GC50.

GC42 Claims Against and Obligations of the Contractor or Subcontractor

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

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

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

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

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

42.2.3 the consent of the Contractor authorizing a payment.

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

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

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

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

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

Majesty to pay the Contractor.

42.7 The Contractor shall, whenever requested to do so by the Departmental Representative, make a statutory declaration deposing to the existence and condition of any obligations and claims referred to in GC42.6.

42.8 GC42.1 shall only apply to claims and obligations

42.8.1 the notification of which has been received by the Departmental Representative in writing before payment is made to the Contractor pursuant to TP4.10 and within 120 days of the date on which the claimant

42.8.1.1 should have been paid in full under the claimant's contract with the Contractor or subcontractor where the claim is for money that was lawfully required to be held back from the claimant; or

42.8.1.2 performed the last of the services, work or labour, or furnished the last of the material pursuant to the claimant's contract with the Contractor or subcontractor where the claim is not for money referred to in GC42.8.1.1, and

42.8.2 the proceedings to determine the right to payment of which, pursuant to GC42.2. shall have commenced within one year from the date that the notice referred to in GC42.8.1 was received by the Departmental Representative, and

the notification required by GC42.8.1 shall set forth the amount claimed to be owing and the person who by contract is primarily liable.

42.9 Her Majesty may, upon receipt of a notice of claim under GC42.8.1, withhold from any amount that is due and payable to the Contractor pursuant to the contract the full amount of the claim or any portion thereof.

42.10 The Departmental Representative shall notify the Contractor in writing of receipt of any claim referred to in GC42.8.1 and of the intention of Her Majesty to withhold funds pursuant to GC42.9 and the Contractor may, at any time thereafter and until payment is made to the claimant, be entitled to post, with Her Majesty, security in a form acceptable to Her Majesty in an amount equal to the value of the claim, the notice of which is received by the Departmental Representative and upon receipt of such security Her Majesty shall release to the Contractor any funds which would be otherwise payable to the Contractor, that were withheld pursuant to the provisions of GC42.9 in respect of the claim of any claimant for whom the security stands.

GC43 Security Deposit – Forfeiture or Return

43.1 If

43.1.1 the work is taken out of the Contractor's hands pursuant to GC38,

43.1.2 the contract is terminated pursuant to GC41, or

43.1.3 the Contractor is in breach of or in default under the contract,

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

43.2 If Her Majesty converts the contract security pursuant to GC43.1, the amount realized shall be deemed to be an amount due from Her Majesty to the Contractor under the contract.

43.3 Any balance of an amount referred to in GC43.2 that remains after payment of all losses, damage and claims of Her Majesty and others shall be paid by Her Majesty to the Contractor if, in the opinion of the Departmental Representative, it is not required for the purposes of the contract.

GC44 Departmental Representative's Certificates

44.1 On the date that

44.1.1 the work has been completed, and

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

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

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

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

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

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

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

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

44.2.1.2.3 -1% of the balance

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

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

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

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

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

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

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

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

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

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

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

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

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

GC45 Return of Security Deposit

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

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

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

GC46 Clarification of Terms in GC47 to GC50

46.1 For the purposes of GC47 to GC50,

46.1.1 "Unit Price Table" means the table set out in the Articles of Agreement, and

46.1.2 "plant" does not include tools customarily provided by a tradesman in practicing his trade.

GC47 Additions or Amendments to Unit Price Table

47.1 Where a Unit Price Arrangement applies to the contract or a part thereof the Departmental Representative and the Contractor may, by an agreement in writing,

47.1.1 add classes of labour or material, and units of measurement, prices per unit and estimated quantities to the Unit Price Table if any labour, plant or material that is to be included in the Final Certificate of Measurement referred to in GC44.8 is not included in any class of labour, plant or material set out in the Unit Price Table; or

47.1.2 subject to GC47.2 and GC47.3, amend a price set out in the Unit Price Table for any class of labour, plant or material included therein if the Final Certificate of Measurement referred to in GC44.8 shows or is expected to show that the total quantity of that class of labour, plant or material actually performed, used or supplied by the Contractor in performing the work is

47.1.2.1 less than 85% of that estimated total quantity, or

47.1.2.2 in excess of 115% of that estimated total quantity.

47.2 In no event shall the total cost of an item set out in the Unit Price Table that has been amended pursuant to GC47.1.2.1 exceed the amount that would have been payable to the Contractor had the estimated total quantity actually been performed, used or supplied.

47.3 An amendment that is made necessary by GC47.1.2.2 shall apply only to the quantities that are in excess of 115%.

47.4 If the Departmental Representative and the Contractor do not agree as contemplated in GC47.1, the Departmental Representative shall determine the class and the unit of measurement of the labour, plant or material and, subject to GC47.2 and GC47.3, the price per unit therefore shall be determined in accordance with GC50.

GC48 Determination of Cost – Unit Price Table

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

GC49 Determination of Cost – Negotiation

49.1 If the method described in GC48 cannot be used because the labour, plant or material is of a kind or class that is not set out in the Unit Price Table, the cost of that labour, plant or material for the purposes of the contract shall be the amount agreed upon from time to time by the Contractor and the Departmental Representative.

49.2 For the purposes of GC49.1, the Contractor shall submit to the Departmental Representative any necessary cost information requested by the Departmental Representative in respect of the labour, plant and material referred to in GC49.1

GC50 Determination of Cost – Failing Negotiation

50.1 If the methods described in GC47, GC48 or GC49 fail for any reason to achieve a determination of the cost of labour, plant and material for the purposes referred to therein, that cost shall be equal to the aggregate of

50.1.1 all reasonable and proper amounts actually expended or legally payable by the Contractor in respect of the labour, plant and material that falls within one of the classes of expenditure described in GC50.2 that are directly attributable to the performance of the contract,

50.1.2 an allowance for profit and all other expenditures or costs, including overhead, general administration cost, financing and interest charges, and every other cost, charge and expenses, but not including those referred to in GC50.1.1 or GC50.1.3 or a class referred to in GC50.2, in an amount that is equal to 10% of the sum of the expenses referred to in GC50.1.1, and

50.1.3 interest on the cost determined under GC50.1.1 and GC50.1.2, which interest shall be calculated in accordance with TP9,

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

50.2 For purposes of GC50.1.1 the classes of expenditure that may be taken into account in determining the cost of labour, plant and material are,

50.2.1 payments to subcontractors;

50.2.2 wages, salaries and travelling expenses of employees of the Contractor while they are actually and properly engaged on the work, other than wages, salaries, bonuses, living

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

50.2.3 assessments payable under any statutory authority relating to workmen's compensation, unemployment insurance, pension plan or holidays with pay;

50.2.4 rent that is paid for plant or an amount equivalent of the said rent if the plant is owned by the Contractor that is necessary for and used in the performance of the work, if the rent of the equivalent amount is reasonable and use of that plant has been approved by the Departmental Representative;

50.2.5 payments for maintaining and operating plant necessary for and used in the performance of the work, and payments for effecting such repairs thereto as, in the opinion of the Departmental Representative, are necessary to the proper performance of the contract other than payments for any repairs to the plant arising out of defects existing before its allocation to the work;

50.2.6 payments for material that is necessary for and incorporated in the work, or that is necessary for and consumed in the performance of the contract;

50.2.7 payments for preparation, delivery, handling, erection, installation, inspection protection and removal of the plant and material necessary for and used in the performance of the contract; and

50.2.8 any other payments made by the Contractor with the approval of the Departmental Representative that are necessary for the performance of the contract.

GC51 Records to be kept by Contractor

51.1 The Contractor shall

51.1.1 maintain full records of his estimated and actual cost of the work together with all tender calls, quotations, contracts, correspondence, invoices, receipts and vouchers relating thereto.

51.1.2 make all records and material referred to in GC5.1.1 available to audit and inspection by the Minister and the Deputy Receiver General for Canada or by persons acting on behalf of either of both of them, when requested;

51.1.3 allow any of the person referred to in GC51.1.2 to make copies of and to take extracts from any of the records and material referred to in GC51.1.1; and

51.1.4 furnish any person referred to in GC51.1.2 with any information he may require from time to time in connection with such records and material.

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

Minister may direct.

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

GC52 Conflict of Interest

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

GC53 Contractor Status

53.1 The Contractor shall be engaged under the contract as an independent contractor.

53.2 The Contractor and any employee of the said Contractor is not engaged by the contract as an employee, servant or agent of Her Majesty.

53.3 For the purposes of GC53.1 and GC53.2 the Contractor shall be solely responsible for any and all payments and deductions required to be made by law including those required for Canada or Quebec Pension Plans, Unemployment Insurance, Worker's Compensation or Income Tax.

GENERAL CONDITONS

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

GENERAL INSUANCE COVERAGES

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

COMMERCIAL GENERAL LIABILITY

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

BUILDER'S RISK – INSTALLATION FLOATER – ALL RISKS

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

INSURER'S CERTIFICATE OF INSURANCE

General Conditions

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

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

IC 2 Risk Management
(01/10/94)

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

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

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

IC 4 Insurance Coverage
(02/12/03)

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

INSURANCE COVERAGE REQUIREMENTS

PART I
GENERAL INSUANCE COVERAGES (GIC)

GCI 1 Insured
(02/12/03)

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

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

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

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

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

GIC 4 Notification
(01/10/94)

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

PART II
COMMERCIAL GENERAL LIABILITY

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

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

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

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

2.1 Liability arising out of or resulting from the ownership, existence, maintenance or use of premises by the Contractor and operations necessary or incidental to the performance of this contract.

2.2 "Broad Form" Property Damage including the loss of use of property.

2.3 Removal or weakening of support of any building or land whether such support be natural or otherwise.

2.4 Elevator liability (including escalators, hoists and similar devices).

2.5 Contractor's Protective Liability

2.6 Contractual and Assumed Liabilities un this contact.

2.7 Completed Operations Liability – The insurance, including all aspects of this Part II of these Insurance Conditions shall continue for a period of at least one (1) year beyond the date of the Departmental Representative's Final Certificate of Completion for the Completed Operations.

2.8 Cross Liability – The Clause shall be written as follows:

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

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

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

CGL 3 Additional Exposures
(02/12/03)

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

3.1 Blasting

3.2 Pile driving and calsson work

3.3 Underpinning

3.4 Risks associated with the activities of the Contractor on an active airport

3.5 Radioactive contamination resulting from the use of commercial isotopes

3.6 Damage to the portion of an existing building beyond that directly associated with an addition, renovation or installation contract.

3.7 Marine risks associated with the contraction of piers, wharves and docks.

CGL 4 Insurance Proceeds
(01/10/94)

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

CGL 5 Deductible
(02/12/03)

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

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

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

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

BR 2 Property Insured
(01/10/94)

The property insured shall include:

2.1 The Work and all property, equipment and materials intended to become part of the finished Work at the site of the project while awaiting, during and after installation, erection or construction including testing.

2.2 Expenses incurred in the removal from the construction site of debris of the property insured, including demolition of damaged property, de-icing and dewatering, occasioned by loss, destruction or damage to such property and in respect of which insurance is provided by this policy.

BR 3 Insurance Proceeds
(01/10/94)

3.1 Insurance proceeds from this policy are payable in accordance with GC28 of the General Conditions "C" of the contract.

3.2 This policy shall provide that the proceeds thereof are payable to Her Majesty or as the Minister may direct.

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

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

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

BR 5 Deductible
(02/12/03)

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

BR 6 Subrogation
(01/10/94)

The following Clause shall be included in the policy:

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

BR 7 Exclusion Qualifications
(01/10/94)

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

7.1 Faulty materials, workmanship or design may be excluded only to the extent of the cost of making good thereof and shall not apply to loss or damage resulting therefrom.

7.2 Loss or damage caused by contamination by radioactive material may be excluded except for loss or damage resulting from commercial isotopes used for industrial measurements, inspection, quality control radiographic or photographic use.

7.3 Use and occupancy of the project or any part of section thereof shall be permitted where such use and occupancy is for the purpose for which the project is intended upon completion.

INSURER'S CERTIFICATE OF INSURANCE

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

CONTRACT

DESCRIPTION OF WORK	CONTRACT NUMBER	AWARD DATE
LOCATION		

INSURER

NAME
ADDRESS

BROKER

NAME
ADDRESS

INSURED

NAME OF CONTRACTOR
ADDRESS

ADDITIONAL INSURED

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

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

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

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

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

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

CS1 Obligation to provide Contract Security

1.1 The Contractor shall, at the Contractor's own expense, provide one or more of the forms of contract security prescribed in CS2.

1.2 The Contractor shall deliver to the Departmental Representative the contract security referred to in CS1.1 within 14 days after the date that the Contractor receives notice that the Contractor's tender or offer was accepted by Her Majesty.

CS2 Prescribed Types and Amounts of Contract Security

2.1 The Contractor shall deliver to the Departmental Representative pursuant to CS1

2.1.1 a performance bond and a labour and material payment bond each in an amount that is equal to not less than 50% of the contract amount referred to in the Articles of Agreement, or

2.1.2 a labour and material payment bond in an amount that is equal to not less than 50% of the contract amount referred to in the Articles of Agreement, and a security deposit in an amount that is equal to

2.1.2.1 not less than 10% of the contract amount referred to in the Articles of Agreement where that amount does not exceed $250,000, or

2.1.2.2 $25,000 plus 5% of the part of the contract amount referred to in the Articles of Agreement that exceeds $250,000, or

2.1.3 a security deposit in an amount prescribed by CS2.12 plus an additional amount that is equal to 10% of the contract amount referred to in the Articles of Agreement.

2.2 A performance bond and a labour and material payment bond referred to in CS2.1 shall be in a form and be issued by a bonding or surety company that is approved by Her Majesty.

2.3 The amount of a security deposit referred to in CS2.1.2 shall not exceed $250,000 regardless of the contract amount referred to in the Articles of Agreement.

2.4 A security deposit referred to in CS2.1.2 and CS2.1.3 shall be in the form of

2.4.1 a bill of exchange made payable to the Receiver General of Canada and certified by an approved financial institution or drawn by an approved financial institution on itself, or

2.4.2 bonds of or unconditionally guaranteed as to principal and interest by the Government of Canada.

2.5 For the purposes of CS2.4

2.5.1 a bill of exchange is an unconditional order in writing signed by the Contractor and addressed to an approved financial institution, requiring the said institution to pay, on demand, at a fixed or determinable future time a sum certain of money to, or to the order

of, the Receiver General for Canada, and

2.5.2 If a bill of exchange is certified by a financial institution other than a chartered bank then it must be accompanied by a letter or stamped certification confirming that the financial institution is in a t least one of the categories referred to in CS2.5.3

2.5.3 an approved financial institution is

2.5.3.1 any corporation or institution that is a member of the Canadian Payments Association,

2.5.3.2 a corporation that accepts deposits that are insured by the Canada Deposit Insurance Corporation or the Régie de l'assurance-dépôts du Québec to the maximum permitted by law,

2.5.3.3 a credit union as defined in paragraph 137(6)(b) of the *Income Tax Act*,

2.5.3.4 a corporation that accepts deposits from the public, if repayment of the deposit is guaranteed by Her Majesty in right of a province, or

2.5.3.5 The Canada Post Corporation.

2.5.4 the bonds referred to in CS2.4.2 shall be

2.5.4.1 made payable to bearer, or

2.5.4.2 accompanied by a duly executed instrument of transfer of the bonds to the Receiver General for Canada in the form prescribed by the Domestic Bonds of Canada Regulations, or

2.5.4.3 registered, as to principal or as to principal and interest in the name of the Receiver General for Canada pursuant to the Domestic Bonds of Canada Regulations, and

2.5.4.4 provided on the basis of their market value current at the date of the contract.

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

4. Brief Description of Work / Brève description du travail

Renovate the Naolab Laboratles in building M23A, located on the campus of 1200 Montreal Road, Ottawa, Ontario

5. a) Will the supplier require access to Controlled Goods? Le fournisseur aura-t-il accès à des marchandises contrôlées?	☑ No Non	☐ Yes Oui
5. b) Will the supplier require access to unclassified military technical data subject to the provisions of the Technical Data Control Regulations? Le fournisseur aura-t-il accès à des données techniques militaires non classifiées qui sont assujetties aux dispositions du Règlement sur le contrôle des données techniques?	☑ No Non	☐ Yes Oui
6. Indicate the type of access required / Indiquer le type d'accès requis		
6. a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets? Le fournisseur ainsi que les employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS? (Specify the level of access using the chart in Question 7. c) (Préciser le niveau d'accès en utilisant le tableau qui se trouve à la question 7. c)	☑ No Non	☐ Yes Oui
6. b) Will the supplier and its employees (e.g. cleaners, maintenance personnel) require access to restricted access areas? No access to PROTECTED and/or CLASSIFIED information or assets is permitted. Le fournisseur et ses employés (p. ex. nettoyeurs, personnel d'entretien) auront-ils accès à des zones d'accès restreintes? L'accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS n'est pas autorisé.	☐ No Non	☑ Yes Oui
6. c) Is this a commercial courier or delivery requirement with **no** overnight storage? S'agit-il d'un contrat de messagerie ou de livraison commerciale **sans** entreposage de nuit?	☑ No Non	☐ Yes Oui

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

Canada ☑	NATO / OTAN ☐	Foreign / Étranger ☐

7. b) Release restrictions / Restrictions relatives à la diffusion

Canada	NATO / OTAN	Foreign / Étranger
No release restrictions / Aucune restriction relative à la diffusion ☑	All NATO countries / Tous les pays de l'OTAN ☐	No release restrictions / Aucune restriction relative à la diffusion ☐
Not releasable / À ne pas diffuser ☐		
Restricted to: / Limité à : ☐	Restricted to: / Limité à : ☐	Restricted to: / Limité à : ☐
Specify country(ies): / Préciser le(s) pays :	Specify country(ies): / Préciser le(s) pays :	Specify country(ies): / Préciser le(s) pays :

7. c) Level of information / Niveau d'information

Canada	NATO	Foreign / Étranger
PROTECTED A / PROTÉGÉ A ☐	NATO UNCLASSIFIED / NATO NON CLASSIFIÉ ☐	PROTECTED A / PROTÉGÉ A ☐
PROTECTED B / PROTÉGÉ B ☐	NATO RESTRICTED / NATO DIFFUSION RESTREINTE ☐	PROTECTED B / PROTÉGÉ B ☐
PROTECTED C / PROTÉGÉ C ☐	NATO CONFIDENTIAL / NATO CONFIDENTIEL ☐	PROTECTED C / PROTÉGÉ C ☐
CONFIDENTIAL / CONFIDENTIEL ☐	NATO SECRET / NATO SECRET ☐	CONFIDENTIAL / CONFIDENTIEL ☐
SECRET / SECRET ☐	COSMIC TOP SECRET / COSMIC TRÈS SECRET ☐	SECRET / SECRET ☐
TOP SECRET / TRÈS SECRET ☐		TOP SECRET / TRÈS SECRET ☐
TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) ☐		TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) ☐

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PART A *(continued)* / PARTIE A *(suite)*

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets? ☑ No / Non ☐ Yes / Oui
Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS?
If Yes, indicate the level of sensitivity:
Dans l'affirmative, indiquer le niveau de sensibilité :

9. Will the supplier require access to extremely sensitive INFOSEC information or assets? ☑ No / Non ☐ Yes / Oui
Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate?

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

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

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

☑ RELIABILITY STATUS / COTE DE FIABILITÉ	☐ CONFIDENTIAL / CONFIDENTIEL	☐ SECRET / SECRET	☐ TOP SECRET / TRÈS SECRET
☐ TOP SECRET– SIGINT / TRÈS SECRET – SIGINT	☐ NATO CONFIDENTIAL / NATO CONFIDENTIEL	☐ NATO SECRET / NATO SECRET	☐ COSMIC TOP SECRET / COSMIC TRÈS SECRET
☐ SITE ACCESS / ACCÈS AUX EMPLACEMENTS			

Special comments:
Commentaires spéciaux : _____

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

10. b) May unscreened personnel be used for portions of the work? ☑ No / Non ☐ Yes / Oui
Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail?
If Yes, will unscreened personnel be escorted? ☐ No / Non ☐ Yes / Oui
Dans l'affirmative, le personnel en question sera-t-il escorté?

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

INFORMATION / ASSETS / RENSEIGNEMENTS / BIENS

11. a) Will the supplier be required to receive and store PROTECTED and/or CLASSIFIED information or assets on its site or premises? ☑ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS?

11. b) Will the supplier be required to safeguard COMSEC information or assets? ☑ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC?

PRODUCTION

11. c) Will the production (manufacture, and/or repair and/or modification) of PROTECTED and/or CLASSIFIED material or equipment occur at the supplier's site or premises? ☑ No / Non ☐ Yes / Oui
Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ?

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

11. d) Will the supplier be required to use its IT systems to electronically process, produce or store PROTECTED and/or CLASSIFIED information or data? ☑ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu d'utiliser ses propres systèmes informatiques pour traiter, produire ou stocker électroniquement des renseignements ou des données PROTÉGÉS et/ou CLASSIFIÉS?

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

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

For users completing the form **manually** use the summary chart below to indicate the category(ies) and level(s) of safeguarding required at the supplier's site(s) or premises.
Les utilisateurs qui remplissent le formulaire **manuellement** doivent utiliser le tableau récapitulatif ci-dessous pour indiquer, pour chaque catégorie, les niveaux de sauvegarde requis aux installations du fournisseur.

For users completing the form **online** (via the internet), the summary chart is automatically populated by your responses to previous questions.
Dans le cas des utilisateurs qui remplissent le formulaire **en ligne** (par internet), les réponses aux questions précédentes sont automatiquement saisies dans le tableau récapitulatif.

SUMMARY CHART / TABLEAU RÉCAPITULATIF

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

12. a) Is the description of the work contained within this SRCL PROTECTED and/or CLASSIFIED?
La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE?

☑ No / Non ☐ Yes / Oui

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

12. b) Will the documentation attached to this SRCL be PROTECTED and/or CLASSIFIED?
La documentation associée à la présente LVERS sera-t-elle PROTÉGÉE et/ou CLASSIFIÉE?

☑ No / Non ☐ Yes / Oui

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

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PART D - AUTHORIZATION / PARTIE D - AUTORISATION

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

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature
Robin Craig	Construction Project Manager	

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
613-993-6869	613-957-9829	Robin.Craig@nrc-cnrc.gc.ca	17 November 2014

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

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature
Charlotte Carrier	Controlled Goods & Contracts Security C	

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
613-993-8956	613-990-0946	Charlotte.Carrier@nrc-cnrc.gc.ca	18 Nov 2014

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

☑ No / Non ☐ Yes / Oui

16. Procurement Officer / Agent d'approvisionnement

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature
MARC BEDARD	Senior Contracting Officer	

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
613 993-2274			10/12/14

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