NRC·CNRC Administrative Services and Property Management

SPECIFICATIONS

SOLICITATION #: 17-22064

BUILDING: M-6
1200 Montreal Road
Ottawa, Ontario

PROJECT: M6- Washrooms Renovation Project

PROJECT #: M6-5122

Date: September 2017

National Research Council Canada | Conseil national de recherches Canada

Canada

SPECIFICATION

TABLE OF CONTENTS

NRC·CNRC

From **Discovery** to **Innovation...**

Directions to the Ottawa Research Facilities — Montreal Road

1200 Montréal Road
Ottawa, Ontario, Canada K1A 0R6

Tel: 613-993-9101

NRC Institutes/Branch/Program	Buildings
Information/Security	M-1
NRC Administrative Services and Property Management (NRC-ASPM)	M-5, M-6, M-15, M-16, M-18A, M-19, M-22, M-26, M-39, M-40A, M-53
NRC Canada Institute for Scientific and Technical Information (NRC-CISTI)	M-50, M-55
NRC Canadian Hydraulics Centre (NRC-CHC)	M-32
NRC Communications and Corporate Relations Branch (NRC-CCRB)	M-58
NRC Design and Fabrication Services (DFS)	M-2, M-4, M-10, M-36
NRC Financial Branch (NRC-FB)	M-58
NRC Human Resources Branch (NRC-HRB)	M-55, M-58
NRC Industrial Research Assistance Program (NRC-IRAP)	M-55
NRC Industry Partnership Facility (NRC-IPF)	M-50
NRC Information Management Services Branch (NRC-IMSB)	M-60
NRC Institute For Aerospace Research (NRC-IAR)	M-2, M-3, M-7, M-10, M-11, M-13, M-14, M-17, M-41, M-42, M-43, M-44, M-46, M-47
NRC Institute For Biological Science (NRC-IBS)	M-54
NRC Institute For Chemical Process and Environmental Technology (NRC-ICPET)	M-8, M-9, M-10, M-12, M-45
NRC Institute For Information Technology (NRC-IIT)	M-2, M-50
NRC Institute For Microstructural Sciences (NRC-IMS)	M-36, M-37, M-50
NRC Institute For National Measurements Standards (NRC-INMS)	M-35, M-36, M-51
NRC Institute For Research In Construction (NRC-IRC)	M-20, M-24, M-25, M-27, M-42, M-48, M-59
NRC Strategy and Development Branch (NRC-SDB)	M-58

By Road, from the OTTAWA International Airport

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

By Road, from MONTRÉAL

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


1 Sussex Facilities
2 Montreal Road Facilities
3 Uplands Facilities
4 NRC-CSTT
N
GATINEAU
OTTAWA
QUÉBEC
ONTARIO
Outaouais
Aylmer
Taché
Rockcliffe
Montréal
Vanier
Aviation
Blair
Sussex
Wellington
Bank
Bronson
Island Park
Ottawa River
Carling
Fisher
Prince of Wales
Walkley
Heron
Hawthorne
Hunt Club
Baseline
Riverside
Conroy
Airport
Uplands
Lester
Davidson
Albion
Hunt Club (W)
Merivale
Woodroffe
Greenbank
Fallowfield
Leitrim
50
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148
19
34
174
417
38
73
31
416
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NRC Institute
Trans Canada HWY
Major HWY
Secondary HWY
Airport
Train Station
Ferry
Bus Station
Metro


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Howlett
Blair
Leggett
2
Montréal
17B
Montréal
Mackenzie
Macallum
Lathe
Ballard
17B
Blair
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Bathgate
St. Laurent
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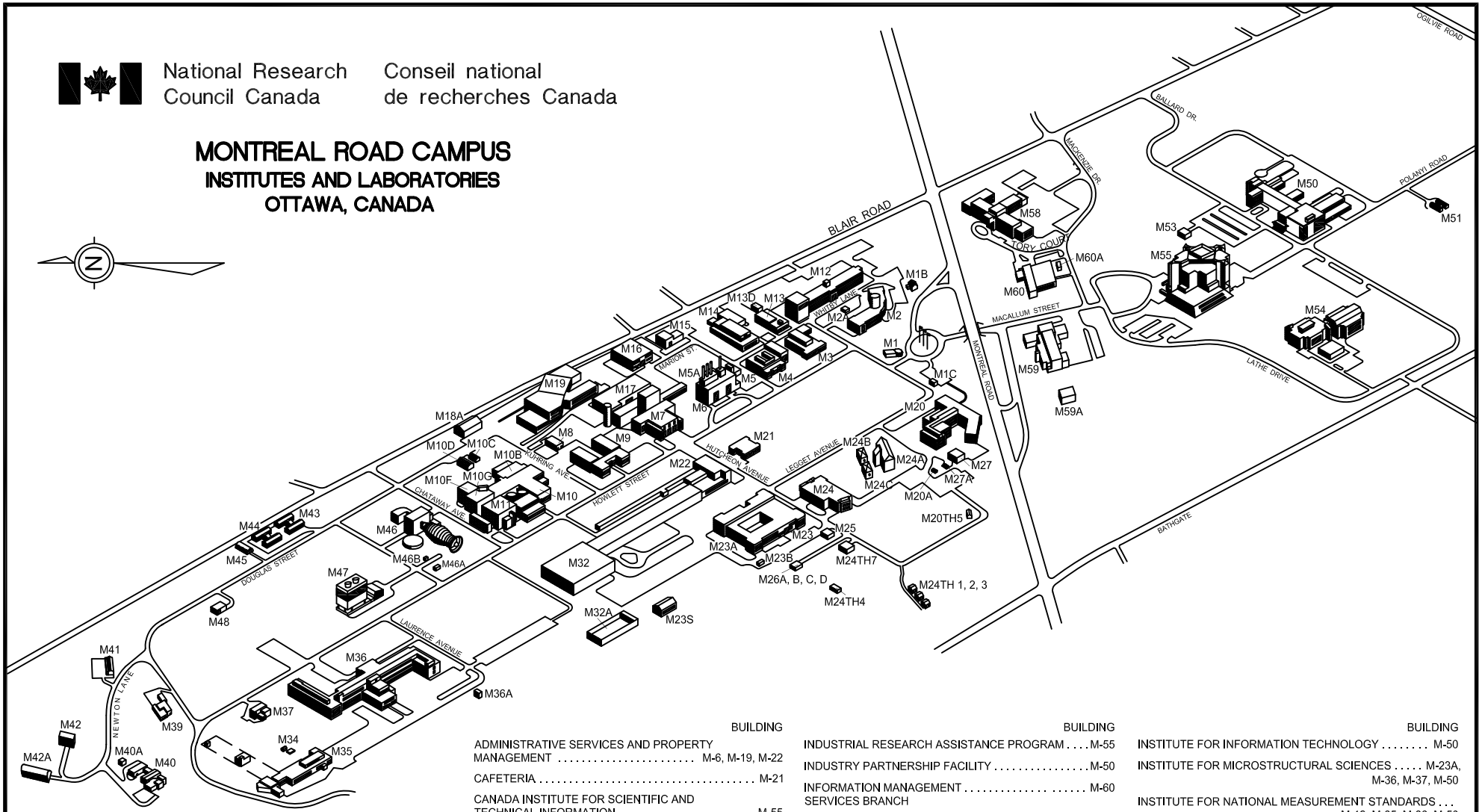
NRC Institute
Major HWY
Airport
Ferry
Metro
Trans Canada HWY
Secondary HWY
Train Station
Bus Station

National Research Council Canada | Conseil national de recherches Canada

MONTREAL ROAD CAMPUS
INSTITUTES AND LABORATORIES
OTTAWA, CANADA



BUILDING	
ADMINISTRATIVE SERVICES AND PROPERTY MANAGEMENT	M-6, M-19, M-22
CAFETERIA	M-21
CANADA INSTITUTE FOR SCIENTIFIC AND TECHNICAL INFORMATION	M-55
CANADIAN HYDRAULICS CENTRE	M-32
CORPORATE SERVICES	M-58
INSTITUTE FOR AEROSPACE RESEARCH	M-2, M-3, M-7, M-10, M-11, M-13, M-14, M-17, M-46

BUILDING	
INDUSTRIAL RESEARCH ASSISTANCE PROGRAM	M-55
INDUSTRY PARTNERSHIP FACILITY	M-50
INFORMATION MANAGEMENT SERVICES BRANCH	M-60
INFORMATION / SECURITY	M-1
INSTITUTE FOR BIOLOGICAL SCIENCES	M-54
INSTITUTE FOR CHEMICAL PROCESS AND ENVIRONMENTAL TECHNOLOGY	M-2, M-9, M-10, M-12

BUILDING	
INSTITUTE FOR INFORMATION TECHNOLOGY	M-50
INSTITUTE FOR MICROSTRUCTURAL SCIENCES	M-23A, M-36, M-37, M-50
INSTITUTE FOR NATIONAL MEASUREMENT STANDARDS	M-12, M-35, M-36, M-50
INSTITUTE FOR RESEARCH IN CONSTRUCTION	M-20, M-23A, M-24, M-27, M-59
RESEARCH PROGRAM SUPPORT OFFICE	M-4

Updated: July 2008

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 **M6- Washrooms Renovation Project**

Tender No.: **17-22064**

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

Project # 5122: M6 Washrooms Renovation Project

Appendix 1 - Additional conditions

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1. Hours of construction work

1.1 Contractors must ensure that all work (all disciplines included) deemed to be noisy, disruptive to the building occupants or that can cause vibration must be done after regular business hours. The remaining portions of the work can be done during the regular business hours.
1.2 Contractors must ensure to estimate adequately the extent of the after-hours work.
1.3 Contractors must carry the after-hours work at his / her expenses.

2. Extent of the work

2.1 Abatement Contractor must include all costs related to the required removal of the concrete slabs and or trenching. All sub trades are to identify the extent of the work in advance for the Abatement Contractor.

End of Appendix 1

BUY AND SELL NOTICE

M6- Washroom Renovation Project

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

This project consists to provide independent controls in 3 offices (ground floor), renovate one washroom / shower room (mezzannine) and create a new washroom / shower room (mezzannine) in building M6 located on the NRC property at 1200, Montreal Road in Ottawa. This project involves the following disciplines which are described below: Architectural, Mechanical, Electrical, Abatement and Structural.

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 September 28th and October 3rd , 2017 at **9:00** . Meet Allan Smith at Building M6, Main Entrance, 1200 Montreal Road Ottawa, ON. Bidders who, for any reason, cannot attend at the specified date and time will not be given an alternative appointment to view the site and their tenders, therefore, will be considered as non-responsive. **NO EXCEPTIONS WILL BE MADE.**

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

3. CLOSING DATE

Closing date is October 24th , 2017 at 14:00.

4. TENDER RESULTS

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

5. SECURITY REQUIREMENT FOR CANADIAN CONTRACTORS

5.1 MANDATORY SECURITY REQUIREMENT:

This procurement contains a mandatory security requirement as follows:

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

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

3 The Contractor must comply with the provisions of the:
   a. Security Requirements Checklist attached at Appendix "D"
   b. Industrial Security Manual (Latest Edition) available at: http://ssi-iss.tpsgc-pwgsc.gc.ca/ssi-iss-services/eso-oss-eng.html

5.2 VERIFICATION OF SECURITY CLEARANCE AT BID CLOSING

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

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

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

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

6.0 WSIB (WORKPLACE SAFETY AND INSURANCE BOARD)

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

7.0 OFFICE OF THE PROCUREMENT OMBUDSMAN

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

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

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

The Departmental Representative or his designate for this project is: **Allan Smith**
Telephone: **613 852-1357.**

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

INSTRUCTIONS TO BIDDERS

Article 1 – Receipt of Tender

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

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

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

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

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

Fax: (613) 991-3297

Article 2 – Tender Form & Qualifications

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

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

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

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

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

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

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

Article 3 - Contract

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

Article 4 – Tender Destination

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

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

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

Article 5 - Security

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

i) a certified cheque payable to the Receiver General for Canada and drawn on a member of the Canadian Payments Association or a local cooperative credit society that is a member of a central cooperative credit society having membership in the Canadian Payments Association; **OR**

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

iii) a bid bond.

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

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

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

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

i) a Security Deposit as described in 1(b) above together with a Labour and Material Payment Bond in the amount of at least 50% of the 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
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

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

These Articles of Agreement made in duplicate this day of .

Between

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

and

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

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

A1 Contract Documents

(23/01/2002)

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

1.1.1 these Articles of Agreement,

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

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

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

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

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

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

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

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

1.1.10

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

1.2 **In the contract**

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

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

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

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

A2 Date of Completion of Work and Description of Work

(23/01/2002)

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

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

A3 Contract Amount

(23/01/2002)

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

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

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

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

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

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

A4 Contractor’s Address

(23/01/2002)

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

A5 Unit Price Table

(23/01/2002)

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

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

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

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

Articles of Agreement

Signed on behalf of Her Majesty by

_____

as Senior Contracting Officer

and_____

as_____

of the **National Research Council Canada**

on the_____

day of _____

Signed, sealed and delivered by

_____

as_____and
Position

by_____

as_____
Position

Seal

of

on the_____

day of_____

NUMBER OF PAGES

DIVISION 00 – PROCUREMENT AND CONTRACTING REQUIREMENTS

DIVISION 02 – EXISTING CONDITIONS

DIVISION 04 – MASONRY

DIVISION 05 - METALS

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

DIVISION 08 - OPENINGS

NUMBER OF PAGES

DIVISION 09 - FINISHES

DIVISION 10 – SPECIALTIES

DIVISION 20 - COMMON MECHANICAL REQUIREMENTS

DIVISION 22 - PLUMBING

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

DIVISION 25 - INTEGRATED AUTOMATION

DIVISION 26 - ELECTRICAL

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY

DESIGNATED SUBSTANCE REPORTS

1. SCOPE OF WORK

.1 Work under this contract covers the washroom renovation in Buildings M-6 (renovation of the existing washroom / shower room on the mezzanine and addition of a new washroom / shower room on the mezzanine) of the National Research Council.

2. DRAWINGS

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

- 5122-CS1
- 5122-A01
- 5122-A02
- 5122-A03
- 5122-A04
- 5122-A05
- 5122-M1
- 5122-M2
- 5122-M3
- 5122-E1
- 5122-E2
- 5122-E3
- 5122-E4
- S01
- S02

3. COMPLETION

.1 Complete all work within 12 weeks after receipt of notification of acceptance of tender.

4. GENERAL

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

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

5. SPECIFIED ACCEPTABLE & ALTERNATIVE EQUIPMENT & MATERIALS

.1 Materials and equipment scheduled and/or specified on the drawings or in the specifications have been selected to establish a performance and quality standard. In most cases, acceptable manufacturers are stated for any material or equipment specified by manufacturer's name and model number. Contractors may base their tender price on

materials and equipment supplied by any of the manufacturers' names as acceptable for the particular material 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 ten (7) seven days before tender closing date or after the tender period, will not be considered.

6. MINIMUM STANDARDS

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

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

7. WORKPLACE HAZARDOUS MATERIAL INFORMATION SYSTEM (WHMIS)

.1 The general contractor shall comply with Federal and Provincial legislation regarding the WHMIS. The contractor's responsibilities include, but are not limited to the following:

.1 To ensure that any controlled product brought on site by the contractor or sub-contractor is labeled;

.2 To make available to the workers and the Departmental Representative, Material Safety Data Sheets (MSDS) for these controlled products;

.3 To train own workers about WHMIS, and about the controlled products that they use on site;

.4 To inform other contractors, sub-contractors, the Departmental Representative, authorized visitors and outside inspection agency personnel about the presence and use of such products on the site.

.5 The site foreman or superintendent must be able to demonstrate, to the satisfaction of the Departmental Representative, that he/she has had WHMIS training and is knowledgeable in its requirements. The Departmental Representative can require

replacement of this person if this condition or implementation of WHMIS is not satisfactory.

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

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

.1 Refer to the Designated Substances Report which is included in the contractual documents for more information in this regard.

.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 The general contractor is advised to take the following precautions when dealing with the above substances:

9. COST BREAKDOWN

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

.2 Use the approved cost breakdown as the basis for submitting all claims.

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

10. SUB-TRADES

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

11. PERSONNEL SECURITY AND IDENTIFICATION

.1 All persons employed by the contractor, or by any subcontractor and present on the site must be security cleared in accordance with the requirements of the Section entitled Special Instructions to Tenderers.

.2 All such persons must wear and keep visible identification badges as issued by the Security Office of NRC.

12. WORKING HOURS AND SECURITY

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

.2 At all other times, special written passes are required for access to the building site.

.3 Before scheduling any work outside normal working hours, obtain permission from the Departmental Representative to perform the specific tasks.

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

13. SCHEDULE

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

.2 Notify Departmental Representative in writing of any changes in the schedule 7 days before the scheduled completion date, arrange to do an interim inspection with the Departmental Representative.

14. PROJECT MEETINGS

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

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

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

15. SHOP DRAWINGS

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

.2 Submit to Departmental Representative for review a complete list of all shop drawings, product data and samples specified and written confirmation of corresponding delivery dates within one (1) week after shop drawings, product data and samples approval date. This list shall be updated on a one (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 electronic copy of all shop drawings and product data and samples for review, unless otherwise specified.

.5 Review of shop drawings and product data by the Departmental Representative does not relieve the contractor of the responsibility for errors and omissions and for the conformity with contract documents.

16. SAMPLES AND MOCK-UPS

.1 Submit samples in sizes and quantities as specified.

.2 Where colour, pattern or texture is criterion, submit full range of samples.

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

.4 Reviewed samples or mock-ups will become standards of workmanship and material against which installed work will be checked on the project.

17. MATERIALS AND WORKMANSHIP

.1 Install only new materials on this project unless specifically noted otherwise.

.2 Only first class workmanship will be accepted, not only with regard to safety, efficiency, durability, but also with regard to neatness of detail and performance.

18. WORK & MATERIALS SUPPLIED BY OWNER

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

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

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

.4 General Contractor's duties:

.1 Unload at site.
.2 Promptly inspect products and report damaged or defective items.
.3 Give written notification to the Departmental Representative for items accepted in good order.
.4 Handle at site, including uncrating and storage.
.5 Repair or replace items damaged on site.
.6 Install, connect finished products as specified.

19. SITE ACCESS

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

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

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

.4 Provide and maintain access to site.

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

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

20. USE OF SITE

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

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

.3 Restrict parking to the designated areas.

21. ACCEPTANCE OF SITE

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

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

22. SITE OFFICE & TELEPHONE

.1 Contractor to erect a temporary site office at his own expense.

.2 Install and maintain a telephone, if necessary.

.3 Use of NRC phones is not permitted unless in the case of an emergency.

23. SANITARY FACILITIES

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

24. TEMPORARY SERVICES

.1 A source of temporary power will be made available in the area. Bear all costs to make connections to the power source and perform distribution on site.

.2 Provide all load centres, breakers, conduit, wiring, disconnects, extension cords, transformers, as required from the source of power.

.3 Power is to be used only for power tools, lighting, controls, motors, and not for space heating.

.4 A source of temporary water will be made available if required.

.5 Bear all costs associated with distributing the water to the required locations.

.6 Comply with NRC requirements when connecting to existing systems in accordance with the articles entitled "Co-operation" and "Service Interruptions" of this section.

25. DOCUMENTS REQUIRED AT WORK SITE

.1 The contractor shall keep on the site, one (1) up-to-date copy of all contract documents, including specifications, drawings, addenda, shop drawings, change notices, schedule and any reports or bulletins pertaining to the work, in good order, available to the Departmental Representative and to his / her representatives at all times.

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

26. CO-OPERATION

.1 Co-operate with NRC staff in order to keep disruption of normal research work to an absolute minimum.

.2 Work out in advance, a schedule for all work which might disrupt normal work in the building.

.3 Have schedule approved by the Departmental Representative.

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

27. PROTECTION AND WARNING NOTICES

.1 Provide all materials required to protect existing equipment.

.2 Erect dust barriers to prevent dust and debris from spreading through the building.

.3 Place dust protection in the form of cover sheets over equipment and furniture and tape these sheets to floors, to ensure no dust infiltration.

.4 Repair or replace any and all damage to Owner's property caused during construction, at no cost to the Owner and to the satisfaction of the Departmental Representative.

.5 Protect the buildings, roads, lawns, services, etc. from damage which might occur as a result of this work.

.6 Plan and co-ordinate the work to protect the buildings from the leakage of water, dust, etc.

.7 Ensure that all doors, windows, etc., that could allow transfer of dust, noise, fumes, etc., to other areas of the building are kept closed.

.8 Be responsible for security of all areas affected by the work under the Contract until acceptance by NRC. Take all necessary precautions to prevent entry to the work area by

unauthorized persons and guard against theft, fire and damage by any cause. Secure working area at the end of each day's work and be responsible for same.

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

.10 Post warnings, in all instances where possible injury could occur such as Work Overhead, Hard Hat Areas, etc. or as required by the Departmental Representative.

.11 Provide temporary protective enclosures over building entrances and exits to protect pedestrians. All enclosures to be structurally sound against weather and falling debris.

28. BILINGUALISM

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

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

29. LAYOUT OF WORK

.1 Location of equipment, fixtures, outlets and openings indicated on drawings or specified are to be considered as approximate.

.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with the manufacturer's recommendations for safety, access and maintenance.

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

30. DISCREPANCIES & INTERFERENCES

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

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

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

.4 Where minor interferences as determined by the Departmental Representative are encountered on the job and they have not been pointed out on the original tender or on the

plans and specifications, provide offsets, bends or reroute the services to suit job conditions at no extra cost.

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

31. MANUFACTURER'S INSTRUCTIONS

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

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

32. TEMPORARY HEATING AND VENTILATING

.1 Bear the costs of temporary heat and ventilation during construction including costs of installation, fuel, operation, maintenance, and removal of equipment.

.2 Use of direct-fired heaters discharging waste products into the work areas will not be permitted unless prior approval is given by the Departmental Representative.

.3 Furnish and install temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate progress of work.

.2 Protect work and products against dampness and cold.

.3 Reduce moisture condensation on surfaces to an acceptable level.

.4 Provide ambient temperature and humidity levels for storage, installation and curing of materials.

.5 Provide adequate ventilation to meet health regulations for a safe working environment.

.4 Maintain minimum temperature of 10 ^{o}C (50 ^{o}F) or higher where specified as soon as finishing work is commenced and maintain until acceptance by the Departmental Representative. Maintain ambient temperature and humidity levels as required for comfort of NRC personnel.

.5 Prevent hazardous or unhealthy accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction including also, storage areas and sanitary facilities.

.1 Dispose of exhaust materials in a manner that will not result in a harmful or unhealthy exposure to persons.

.6 Maintain strict supervision of operation of temporary heating and ventilating equipment.

.1 Enforce conformance with applicable codes and standards.

.2 Comply with instructions of the Departmental Representative including provision of full-time watchman services when directed.

.3 Enforce safe practices.

.4 Vent direct-fired combustion units to outside.

.7 Submit tenders assuming existing or new equipment and systems will not be used for temporary heating and ventilating.

.8 After award of contract, Departmental Representative may permit use of the permanent system providing agreement can be reached on:

.1 Conditions of use, special equipment, protection, maintenance, and replacement of filters.

.2 Methods of ensuring that heating medium will not be wasted and in the case of steam, agreement on what is to be done with the condensate.

.3 Saving on contract price.

.4 Provisions relating to guarantees on equipment.

33. CONNECTIONS TO AND INTERRUPTIONS TO EXISTING SERVICES

.1 Where work involves breaking into or connecting to existing services, carry out work at times and in the manner agreed to by the Departmental Representative and by authorities having jurisdiction, with minimum disruption to NRC Personnel and vehicular traffic and minimum service interruption. Do not operate any NRC equipment or plant.

.2 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.

.3 Submit a schedule to and obtain approval from the Departmental Representative for any shut-down or closure of active service or facility; allow minimum 72 hours notice. Adhere to approved schedule and provide notice to the Departmental Representative.

.4 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

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

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

.7 Remove any abandoned service lines as indicated on the contract documents and as approved by the Departmental Representative; cap or otherwise seal lines at cut-off points. Record and provide a copy to the Departmental Representative of locations of maintained, re-routed and abandoned service lines.

34. CUTTING AND PATCHING

.1 Cut existing surfaces as required to accommodate new work.

.2 Remove all items as shown or specified.

.3 Patch and make good with identical materials, the surfaces that have been disturbed, cut or damaged, to the satisfaction of the Departmental Representative.

.4 Where new pipes pass through existing construction, core drill an opening. Size openings to leave 12mm (1/2") clearance around the pipes or pipe insulation. Do not drill or cut any surface without the approval of the Departmental Representative.

.5 Obtain written approval of the Departmental Representative before cutting openings through existing or new structural members.

.6 Seal all openings where cables, conduits or pipes pass through walls with an acoustic sealant conforming to CAN/CGSB-19.21-M87.

.7 Where cables, conduits and pipes pass through fire rated walls and floors, pack space between with compressed glass fibres and seal with fire stop caulking in accordance with CAN/CGSB-19.13-M87 AND NBC 3.1.7.

35. FASTENING DEVICES

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

.2 Comply with the requirements of CSA A-166 (Safety Code for Explosive Actuated Tools).

.3 Do not use any kind of impact or percussion tool without first obtaining permission from the Departmental Representative.

36. OVERLOADING

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

37. DRAINAGE

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

38. ENCLOSURE OF STRUCTURES

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

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

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

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

.5 Provide keys to NRC security personnel when required.

.6 Lay out the work carefully and accurately and verify all dimensions and be responsible for them. Locate and preserve general reference points.

.7 Throughout the course of construction, keep continuously acquainted with field conditions, and the work being developed by all trades involved in the project. Maintain an awareness of responsibility to avoid space conflict with other trades.

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

39. STORAGE

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

.2 Do not store flammable or explosive materials on site without the authorization of the Departmental Representative.

40. GENERAL REVIEW

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

.2 Inform the Departmental Representative of any impediments to the installation and obtain his / her approval for actual location.

41. INSPECTION OF BURIED OR CONCEALED SERVICES

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

42. TESTING

.1 On completion, or as required by local authority inspectors and/or Departmental Representative during progress of work and before any services are covered up and flushing is complete, test all installations in the presence of the Departmental Representative.

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

43. PARTIAL OCCUPANCY

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

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

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

44. DISPOSAL OF WASTES

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

45. CLEAN-UP DURING CONSTRUCTION

.1 On a daily basis, maintain project site and adjacent area of campus including roofs, free from debris and waste materials.

.2 Provide on-site dump containers for collection of waste materials and rubbish.

46. FINAL CLEAN-UP

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

.2 Clean all new surfaces, lights, existing surfaces affected by this work, replace filters, etc.

.3 Clean all resilient flooring and prepare to receive protective finish. Protective finish applied by NRC

47. WARRANTY AND RECTIFICATION OF DEFECTS IN WORK

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

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

48. MAINTENANCE MANUALS

.1 Provide 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.

END OF SECTION

1. GENERAL CONSTRUCTION SAFETY REQUIREMENTS

.1 The Contractor shall take all necessary steps to protect personnel (workers, visitors, general public, etc.) and property from any harm during the course of the contract.

.2 The Contractor shall be solely responsible for the construction safety of both its employees and those of its sub-contractors at the work site, and for initiating, maintaining and supervising safety precautions, programs and procedures in connection with the performance of the work.

.3 The Contractor shall comply with all Federal, Provincial and Municipal safety codes and regulations and the Occupational Health and Safety Act and the Workplace Safety and Insurance Board. In the event of any conflict between any provisions in legislation or codes, the most stringent provisions shall apply.

.4 Periodic review of the contractor's work by the Departmental Representative, using the criteria of the contract documents, does not relieve the contractor of his safety responsibilities in carrying out the work in accordance with the contract documents. The contractor shall consult with the Departmental Representative to ensure that this responsibility is carried out.

.5 The Contractor shall ensure that only competent personnel are permitted to work on site. Throughout the term of the contract, any person will be removed from the site who is not observing or complying with the safety requirements.

.6 All equipment shall be in safe operating condition and appropriate to the task.

.7 Following a project and site hazard assessment, the Contractor shall develop a Site Specific Safety Plan based on the following minimum requirements:

.1 Provide a safety board mounted in a visible location on the project site, with the following information included thereon:

- .1 Notice of Project
- .2 Site specific Safety Policy
- .3 Copy of Ontario Health and Safety Act
- .4 Building Schematic showing emergency exits
- .5 Building emergency procedures
- .6 Contact list for NRC, Contractor and all involved sub-contractors
- .7 Any related MSDS sheets
- .8 NRC Emergency phone number

.8 The Contractor shall provide competent personnel to implement its safety program and those of any Health and Safety Act legislation applicable at this project location, and to ensure they are being complied with.

.9 The Contractor shall provide safety orientation to all its employees as well as those of any subcontractors under its jurisdiction.

.10 The Departmental Representative will monitor to ensure that safety requirements are met and that safety records are properly kept and maintained. Continued disregard for safety standards can cause the contract to be cancelled and the Contractor or sub-contractors removed from the site.

.11 The Contractor will report to the Departmental Representative and jurisdictional authorities, any accident or incident involving Contractor or NRC personnel or the public and/or property arising from the Contractor's execution of the work.

.12 If entry to a laboratory is required as part of the work of the Contractor, a safety orientation shall be provided to all his employees as well as those of any subcontractors regarding lab safety requirements and procedures, as provided by the Researcher or the Departmental Representative.

2. FIRE SAFETY REQUIREMENTS

.1 Authorities

1. The Fire Commissioner of Canada (FC) is the authority for fire safety at NRC.
2. For the purpose of this document, "Departmental Representative" will be deemed as the NRC person in charge of the project and who will enforce these Fire Safety Requirements.
3. Comply with the following standards as published by the Office of the Fire Commissioner of Canada:
    a. Standard No. 301 - June 1982 "Standard for Construction Operations";
    b. Standard No. 302 - June 1982 "Standard for Welding and Cutting".

.2 Smoking

.1 Smoking is prohibited inside all NRC buildings, as well as roof areas.

.2 Obey all "NO SMOKING" signs on NRC premises.

.3 Hot Work

.1 Prior to commencement of any "Hot Work" involving welding, soldering, burning, heating, use of torches or salamanders or any open flame, obtain a Hot Work Permit from the Departmental Representative.

.2 Prior to commencement of "Hot Work", review the area of hot work with the Departmental Representative to determine the level of fire safety precautions to be taken.

.4 Reporting Fires

.1 Know the exact location of the nearest Fire Alarm Pull Station and telephone, including the emergency phone number.

.2 REPORT immediately, all fire incidents as follows:

.1 Activate nearest fire alarm pull station and;

.2 Telephone the following emergency phone number as appropriate:

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

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

.5 Interior and Exterior Fire protection & Alarm Systems

.1 DO NOT OBSTRUCT OR SHUT OFF FIRE PROTECTION EQUIPMENT OR SYSTEMS, INCLUDING BUT NOT LIMITED TO FIRE ALARM SYSTEMS, SMOKE/HEAT DETECTORS, SPRINKLER SYSTEM, PULL STATIONS, EMERGENCY CALL BUTTONS AND PA SYSTEMS, WITHOUT AUTHORIZATION FROM THE DEPARTMENTAL REPRESENTATIVE.

.2 WHEN ANY FIRE PROTECTION EQUIPMENT IS TEMPORARILY SHUT DOWN, ALTERNATIVE MEASURES AS PRESCRIBED BY THE DEPARTMENTAL REPRESENTATIVE SHALL BE TAKEN TO ENSURE THAT FIRE PROTECTION IS MAINTAINED.

.3 DO NOT LEAVE FIRE PROTECTION OR ALARM SYSTEMS INACTIVE AT THE END OF A WORKING DAY WITHOUT NOTIFICATION AND AUTHORISATION FROM THE DEPARTMENTAL REPRESENTATIVE. THE DEPARTMENTAL REPRESENTATIVE WILL ADVISE THE (FPO) OF THE DETAILS OF ANY SUCH EVENT.

.4 DO NOT USE FIRE HYDRANTS, STANDPIPES AND HOSE SYSTEMS FOR OTHER THAN FIRE FIGHTING PURPOSES UNLESS AUTHORISED BY DEPARTMENTAL REPRESENTATIVE.

.6 Fire Extinguishers

.1 Provide a minimum of 1-20 lb. ABC Dry Chemical Fire Extinguisher at each hot work or open flame location.

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

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

.3 Provide fire extinguishers equipped as below:

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

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

.7 Roofing Operations

.1 Kettles:

.1 Arrange for the location of asphalt kettles and material storage with the Departmental Representative before moving on site. Do not locate kettles on any roof or structure and keep them at least 10m (30 feet) away from a building.

.2 Equip kettles with 2 thermometers or gauges in good working order; a hand held and a kettle-mounted model.

.3 Do not operate kettles at temperatures in excess of 232^{o}C (450 ^{o}F).

.4 Maintain continuous supervision while kettles are in operation and provide metal covers for the kettles to smother any flames in case of fire. Provide fire extinguishers as required in article 2.6.

.5 Demonstrate container capacities to Departmental Representative prior to start of work.

.6 Store materials a minimum of 6m (20 feet) from the kettle.

.2 Mops:

.1 Use only glass fibre roofing mops.

.2 Remove used mops from the roof site at the end of each working day.

.3 Torch Applied Systems:

.1 DO NOT USE TORCHES NEXT TO WALLS.

.2 DO NOT TORCH MEMBRANES TO EXPOSED WOOD OR CAVITY

.3 Provide a Fire Watch as required by article 2.9 of this section.

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

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

.8 Welding / Grinding Operations

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

.9 **Fire Watch**

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

.2 For temporary heating, refer to General Instructions Section 00 010 00.

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

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

.1 Advise the Departmental Representative in advance of any work that would impede the response of Fire Department personnel and their apparatus. This includes violation of minimum overhead clearance, erection of barricades and the digging of trenches.

.2 Building exit routes must not be obstructed in any way without special permission from the Departmental Representative, who will ensure that adequate alternative routes are maintained.

.3 The Departmental Representative will advise the FPO of any obstruction that may warrant advanced planning and communication to ensure the safety of building occupants and the effectiveness of the Fire Department.

.11 Rubbish and Waste Materials

.1 Keep rubbish and waste materials to a minimum and a minimum distance of 6m (20 feet) from any kettle or torches.

.2 Do not burn rubbish on site.

.3 Rubbish Containers

.1 Consult with the Departmental Representative to determine an acceptable safe location for any containers and the arrangement of chutes etc. prior to bringing the containers on site.

.2 Do not overfill the containers and keep area around the perimeter free and clear of any debris.

.4 Storage

.1 Exercise extreme care when storing combustible waste materials in work areas. Ensure maximum possible cleanliness, ventilation and that all safety standards are adhered to when storing any combustible materials.

.2 Deposit greasy or oily rags or materials subject to spontaneous combustion in CSA or ULC approved receptacles and remove at the end of the work day or shift, or as directed.

.12 Flammable Liquids

.1 The handling, storage and use of flammable liquids is governed by the current National Fire Code of Canada.

.2 Flammable Liquids such as gasoline, kerosene and naphtha may be kept for ready use in quantities not exceeding 45 litres (10 imp gal), provided they are stored in approved safety cans bearing the ULC seal of approval and kept away from buildings, stockpiled combustible materials etc. Storage of quantities of flammable liquids exceeding 45 litres (10 imp gal) for work purposes, require the permission of the Departmental Representative.

.3 Flammable liquids are not to be left on any roof areas after normal working hours.

.4 Transfer of flammable liquids is prohibited within buildings.

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

.6 Do not use flammable liquids having a flash point below 38 ^{o}C (100 ^{o}F) such as naphtha or gasoline as solvents or cleaning agents.

.7 Store flammable waste liquids for disposal in approved container located in a safe, ventilated area. Waste flammable liquids are to be removed from the site on a regular basis.

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

3. Questions and/or clarifications

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

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA S350-M1980 – 2003, Code of Practice for Safety in Demolition of Structures.

.2 National Building Code (NBC), 2010.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Inspect building with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies before starting demolition.

3.2 PROTECTION

.1 Prevent movement, damage to adjacent structures, building systems and parts of building to remain in place. Provide bracing and shoring required.

.2 Keep noise, dust, and inconvenience to occupants to minimum.

.3 Protect building systems, services and equipment.

.4 Provide temporary dust screens, covers, railings, supports and other protection as required.

3.3 REMOVALS

.1 Remove items as indicated.

3.4 DEMOLITION

.1 Remove parts of existing building to permit new construction.

.2 Trim edges of partially demolished building elements to tolerances as

defined by Departmental Representative to suit future use.

3.5 DISPOSAL

.1 Dispose of removed materials, to appropriate recycling facilities except where specified otherwise, in accordance with authority having jurisdiction.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 02 82 00.01 – Asbestos Abatement: Minimum Precautions

.2 Section 02 82 00.02 – Asbestos Abatement: Intermediate Precautions

.3 Section 02 82 00.03 – Asbestos Abatement: Maximum Precautions

.4 Section 02 83 20 – Lead Precautionary Measures

.5 Section 02 89 00 – Silica Precautionary Measures

1.2 REFERENCES

.1 Refer to the following documents for details on hazardous materials:

.1 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

.2 Work site may involve contact with the following:

.1 Asbestos
.2 Lead
.3 Mercury
.4 Mould
.5 Silica
.6 Polychlorinated Biphenyls (PCBs)

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

.1 Export and Import of Hazardous Waste Regulations (SOR/2002-300).

.4 Ontario Environmental Protection Act, R.R.O 1990.

.1 General – Waste Management, O. Reg. 347/90, as amended.

.5 Occupational Health and Safety Act

.1 Designated Substances, O.Reg. 490/09, as amended

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

.1 Material Safety Data Sheets (MSDS).

.7 National Fire Code of Canada 2010.

.8 Transportation of Dangerous Goods Act (TDG Act) 1992, (c. 34).

.9 Transportation of Dangerous Goods Regulations.

1.3 DEFINITIONS

.1 Dangerous Goods: product, substance, or organism that is specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.

.2 Hazardous Material: product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

.3 Hazardous Material Waste: any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.

.4 Workplace Hazardous Materials Information System (WHMIS): Canada-wide system designed to give employers and workers information about hazardous materials used in workplace. Under WHMIS, information on hazardous materials is provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by combination of federal and provincial laws.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit to Departmental Representative current Material Safety Data Sheet (MSDS) for each hazardous material required prior to bringing hazardous material on site.

.3 Submit hazardous materials management plan to Departmental Representative that identifies hazardous materials, their use, their location, personal protective equipment requirements, and disposal arrangements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.

.2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

.3 Store and handle flammable and combustible materials in accordance with current National Fire Code of Canada requirements.

.4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.

.1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.

.2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.

.5 Transfer of flammable and combustible liquids is prohibited within buildings.

.6 Do not transfer flammable and combustible liquids in vicinity of open flames or heat-producing devices.

.7 Do not use flammable liquids having flash point below 38 degrees Celsius, such as naphtha or gasoline as solvents or cleaning agents.

.8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.

.9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

.10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

.1 Store hazardous materials and wastes in closed and sealed containers.

.2 Label containers of hazardous materials and wastes in accordance with WHMIS.

.3 Store hazardous materials and wastes in containers compatible with that material or waste.

.4 Segregate incompatible materials and wastes.

.5 Ensure that different hazardous materials or hazardous wastes are not mixed.

.6 Store hazardous materials and wastes in secure storage area with controlled access.

.7 Maintain clear egress from storage area.

.8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.

.9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.

.10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.

.11 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

.12 Report spills or accidents immediately to Departmental Representative, Engineer or Consultant. Submit a written spill report to Departmental Representative within 24 hours of incident.

1.6 TRANSPORTATION

.1 Transport hazardous materials and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

.2 If exporting hazardous waste to another country, ensure compliance with federal Export and Import of Hazardous Waste Regulations.

.3 If hazardous waste is generated on site:

.1 Co-ordinate transportation and disposal with Departmental Representative.

.2 Ensure compliance with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.

.3 Use licensed carrier authorized by provincial authorities to accept subject material.

.4 Prior to shipping material obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material.

.5 Label container[s] with legible, visible safety marks as prescribed by federal and provincial regulations.

.6 Ensure that trained personnel handle, offer for transport, or transport dangerous goods.

.7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.

.8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide a photocopy of completed manifest to Departmental Representative.

.9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.

Part 2 Products

2.1 MATERIALS

.1 Only bring on site quantity of hazardous materials required to perform work.

.2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

Part 3 Execution

3.1 DISPOSAL

.1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.

.2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.

.3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.

.4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.

.5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

.6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.

.7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.

.8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:

.1 Hazardous wastes recycled in manner constituting disposal.

.2 Hazardous waste burned for energy recovery.

.3 Lead-acid battery recycling.

.4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

Part 1 General

1.1 SUMMARY

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

.1 Removal of non-friable asbestos-containing material, if the material is removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.

.2 Removal of non-friable asbestos-containing materials if the material is removed by breaking, cutting, drilling, abrading, grinding or vibrating, if the material is wetted to control the spread of dust and fibres, and the work is only done by non-powered hand-held tools.

.2 Refer to the following document for details on asbestos-containing materials:

.1 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

1.2 RELATED SECTIONS

.1 Section 02 81 01 – Hazardous Materials

.2 Section 02 82 00.02 – Asbestos Abatement: Intermediate Precautions

.3 Section 02 82 00.02 – Asbestos Abatement: Maximum Precautions

.4 Section 02 83 20 – Lead Precautionary Measures

.5 Section 02 89 00 – Silica Precautionary Measures

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.205-03, Sealer for Application of Asbestos-Fibre Releasing Materials.

.2 Department of Justice Canada (Jus).

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

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

.1 Material Safety Data Sheets (MSDS).

.4 Transport Canada (TC).

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

.5 Ontario Environmental Protection Act, R.R.O 1990,

.1 General – Waste Management, O. Reg. 347/90, as amended.

.6 Underwriters' Laboratories of Canada (ULC).

.7 National Joint Council (NJC).

.1 Part XI – Hazardous Substances.

.8 Canada Labour Code Part II, section 124 and 125.

.1 Canada Occupational Health and Safety Regulations

.9 Ontario Ministry of Labour (MoL).

.1 Occupational Health and Safety Act, R.S.O 1990, c. O1 (OSHA)

.1 O.Reg. 278/05 – Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations, as amended

.2 Ontario Occupational Health and Safety Act, R.S.O. 1990, Regulation 490/09 “Designated Substances”, as amended.

.3 O.Reg. 213/91 - “Construction Projects”, as amended.

1.4 DEFINITIONS

.1 HEPA vacuum: DOP tested High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

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

.3 Asbestos-Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight, identified under Existing Conditions including fallen materials and settled dust.

.4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.

.5 Authorized Visitors: Departmental Representative, and representative(s) of regulatory agencies.

.6 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 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.

.7 DOP Test: testing method used to determine integrity of unit using Dispersed Oil Particulate (DOP) HEPA-filter leak test.

.8 Friable material: means material that:

.1 When dry, can be crumbled, pulverized or powdered by hand pressure, or is crumbled, pulverized or powdered.

.9 Hazardous Material Workplan: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport and dispose of them.

.10 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

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

.12 Polyethylene: rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.13 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Sprayer must have appropriate capacity for work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit proof satisfactory to the Departmental Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.

.2 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

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

.4 Submit to the Departmental Representative necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.

.5 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.6 Submit proof satisfactory to Departmental Representative that employees have appropriate respirator fitting and testing (fit test certificates). Workers must be fit-tested (qualitative as a minimum) with respirator that is personally issued.

.7 Asbestos abatement section within Hazardous Material Work Plan.

1.6 QUALITY ASSURANCE

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

.2 Health and Safety:

Safety Requirements: worker protection.

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

.1 As a minimum, air purifying half-mask respirator 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 (high-density polyethylene protective clothing (Tyvek or similar, as approved by Departmental Representative) 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 shall 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 to include suitable footwear, and to be repaired or replaced if torn.

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

.3 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.

.4 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area.

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

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Separate for reuse, and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.

.4 Place materials defined as hazardous or toxic in designated containers. Location and transportation of all on-site waste containers must be approved by Departmental Representative in writing prior to work.

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

.6 Fold up metal banding, flatten and place in designated area for recycling.

.7 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 0.15 mm thick bags or leak proof drums. Label containers with appropriate warning labels.

.8 Provide waste manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial. All waste landfill manifests are to be provided to the Client/Client Representative at the end of the project.

1.8 EXISTING CONDITIONS

.1 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

.2 Notify Departmental Representative of asbestos-containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Departmental Representative.

1.9 SCHEDULING

.1 Hours of Work: perform work involving asbestos abatement located at the Building during hours specified by Departmental Representative. **The work schedule must be approved in writing by the Departmental Representative in advance of work.** Contractor shall be available to work continuously from beginning to end of project.

1.10 PERSONNEL TRAINING

.1 Before beginning Work, provide Departmental Representative with satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.

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

.1 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 a competent, qualified person.

Part 2 Products

2.1 MATERIALS

.1 Drop Sheets:

.1 Polyethylene: 0.15 mm thick.

.2 FR polyethylene: 0.15 mm 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: contain waste in two separate containers.

.1 Inner container: 0.15 mm thick sealable polyethylene waste bag.

.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.

Part 3 Execution

3.1 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required inside the asbestos work areas at all times.

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

3.2 PROCEDURES

.1 Before beginning Work, isolate Asbestos Work Area using, at a minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.

.1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.

.2 Use HEPA vacuum, or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.

.3 Do not use compressed air to clean up or remove dust from any surface.

.2 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained.

.3 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage.

.1 Use garden reservoir type low - velocity fine - mist sprayer.

.2 Perform Work to reduce dust creation to lowest levels practicable.

.3 Work will be subject to visual inspection.

.4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.4 Cutting, shaping, grinding, drilling, abrading or otherwise disturbing non-friable asbestos-containing materials shall be executed using non-powered hand-tools only.

.5 Clean-Up:

.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; wet and fold these items to contain dust, then place in plastic bags.

.3 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.

.4 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial 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 Work areas and adjacent areas affected by Work using HEPA vacuum.

3.3 INSPECTION

.1 Perform inspection of Asbestos Work Area to confirm compliance with specification and governing authority requirements. Deviation(s) from these requirements that have not been approved in writing by Departmental Representative may result in Work stoppage, at no cost to Owner.

.2 Departmental Representative may inspect Work at any time during the project for:

.1 Adherence to specific procedures and materials.

.2 Final cleanliness and completion.

.3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

.3 When asbestos leakage from Asbestos Work Area has occurred or is likely to occur Departmental Representative may order Work shutdown.

.4 No additional costs will be allowed by the Contractor for additional labour or materials required to provide specified performance level.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Comply with requirements of this Section when performing following Work:

.1 Removing non-friable asbestos containing materials by breaking, cutting, drilling, abrading, grounding, sanding or vibrating if the material is not wetted to control the spread of dust or fibres, and the work is done only by means of non-powered hand-held tools.

.2 Removing non-friable asbestos containing materials by breaking, cutting, drilling, abrading, grounding, sanding or vibrating if the work is done by means of power tools that are attached to dust-collecting devices equipped with HEPA filters.

.3 Glove bag and removal of good condition, friable, asbestos containing material.

.2 Refer to the following document for details on asbestos-containing materials:

.1 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

1.2 RELATED SECTIONS

.1 Section 02 81 01 – Hazardous Materials

.2 Section 02 82 00.01 – Asbestos Abatement: Minimum Precautions

.3 Section 02 82 00.03 – Asbestos Abatement: Maximum Precautions

.4 Section 02 83 20 – Lead Precautionary Measures

.5 Section 02 89 00 – Silica Precautionary Measures

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-1.205-03, Sealer for Application of Asbestos-Fibre Releasing Materials.

.2 Department of Justice Canada (Jus).

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

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

.1 Material Safety Data Sheets (MSDS).

.4 Transport Canada (TC).

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

.5 Ontario Environmental Protection Act, R.R.O 1990,

.1 General – Waste Management, O. Reg 347/90, as amended.

.6 Underwriters' Laboratories of Canada (ULC).

.7 National Joint Council (NJC).

.1 Part XI – Hazardous Substances.

.8 Canada Labour Code Part II, section 124 and 125.

.1 Canada Occupational Health and Safety Regulations

.9 Ontario Ministry of Labour (MoL).

.1 Occupational Health and Safety Act, R.S.O 1990, c. O1 (OSHA)

.1 O.Reg. 278/05 – Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations, as amended

.2 Ontario Occupational Health and Safety Act, R.S.O. 1990, Regulation 490/09 “Designated Substances”, as amended.

.3 O.Reg 213/91 - “Construction Projects”, as amended.

1.4 DEFINITIONS

.1 Amended Water: water with non-ionic surfactant wetting agent added to reduce surface tension of water to allow wetting of fibres.

.2 Asbestos-Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight, identified under Existing Conditions Article, including fallen materials and settled dust.

.3 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.

.4 Authorized Visitors: Departmental Representative, and representative(s) of regulatory agencies.

.5 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 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.

.6 Curtained doorway: arrangement of closures to allow ingress or 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 metres on each side.

.7 DOP Test: testing method used to determine integrity of Negative Pressure unit using Dispersed Oil Particulate (DOP) HEPA-filter leak test.

.8 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.

.9 Glove Bag: prefabricated glove bag as follows:

.1 Minimum thickness 0.25 mm (10 mil) polyvinyl chloride bag.

.2 Integral 0.25 mm (10 mil) thick polyvinyl chloride gloves and elastic ports.

.3 Equipped with reversible, double pull, double throw zipper on top and at approximately mid section of the bag.

.4 Straps for sealing ends around pipe.

.5 Must incorporate internal closure strip if it is to be moved or used in more than one specific location.

.10 Hazardous Material Workplan: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport and dispose of them.

.11 HEPA vacuum: DOP tested, High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.

.12 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.13 Polyethylene: polyethylene sheeting or rip proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

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

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

1.5 ACTION AND INFORMATION SUBMITTALS

.1 Submit proof satisfactory to the Departmental Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.

.2 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

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

.4 Submit to the Departmental Representative necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.

.5 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.6 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Departmental Representative. Minimum of one supervisor for every ten workers.

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

.8 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:

.1 encapsulants;

.2 amended water;

.3 slow-drying sealer.

.9 Submit proof satisfactory to Departmental Representative that employees have appropriate respirator fitting and testing (fit test certificates). Workers must be fit tested (qualitative as a minimum for Half-face respirator, quantitative for Full-face respirator) with respirator that is personally issued.

.10 Asbestos abatement section within Hazardous Material Work Plan.

1.6 QUALITY ASSURANCE

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

.2 Health and Safety:

.1 Safety Requirements: worker and visitor protection.

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

.1 As a minimum, air purifying respirator 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 (high-density polyethylene protective clothing (Tyvek or similar, as approved by Client/Client Representative) 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 shall 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 to include suitable footwear, and to be repaired or replaced if torn.

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

.4 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.

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

.7 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 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Separate for reuse, and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.

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

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

.6 Fold up metal banding, flatten and place in designated area for recycling.

.7 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 0.15 mm thick bags or leak proof drums. Label containers with appropriate warning labels.

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

1.8 EXISTING CONDITIONS

.1 Refer to the following document for details of asbestos-containing materials:

.1 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

.2 Notify Departmental Representative of asbestos-containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Departmental Representative.

1.9 SCHEDULING

.1 Hours of Work: perform work involving asbestos abatement located at the Building during hours specified by Departmental Representative. **The work schedule must be approved in writing by the Departmental Representative in advance of work.** Contractor shall be available to work continuously from beginning to end of project.

1.10 PERSONNEL TRAINING

.1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.

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

.1 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.

Part 2 Products

2.1 MATERIALS

.1 Drop and Enclosure Sheets.

.1 Polyethylene: 0.15 mm thick.

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

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

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

.1 Inner container: 0.15 mm thick sealable polyethylene bag

.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.

.4 Glove Bag: prefabricated glove bag as follows:

.1 Minimum thickness 0.25 mm (10 mil) polyvinyl chloride bag.

.2 Integral 0.25 mm (10 mil) thick polyvinyl chloride gloves and elastic ports.

.3 Equipped with reversible, double pull, double throw zipper on top and at approximately mid section of the bag.

.4 Straps for sealing ends around pipe.

.5 Must incorporate internal closure strip if it is to be moved or used in more than one specific location.

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

.6 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.

.1 Sealer: flame spread and smoke developed rating less than 50.

.7 Encapsulant: penetrating type conforming to CAN/CGSB-1.205.

Part 3 Execution

3.1 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required.

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

3.2 PROCEDURES

.1 Before beginning Work, at each access to Asbestos Work Area, 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)'.

.2 Before beginning Work remove visible dust from surfaces in work area where dust is likely to be disturbed during course of work.

.1 Use HEPA vacuum, or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.

.2 Do not use compressed air to clean up or remove dust from any surface.

.3 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.

.1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.

.2 Erect enclosure of polyethylene sheeting around indoor Type 2 work areas, shut off mechanical ventilation system serving work area, and seal ventilation ducts to and from work area. Exterior abatement work areas shall be separated from other areas using visual barriers that prevent members of the public from viewing abatement work operations.

.4 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.

.1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.

.2 Perform Work in a manner to reduce dust creation to lowest levels practicable.

.5 Pipe Insulation Removal Using Glove Bag:

.1 A glove bag not to be used to remove insulation from a pipe, duct or similar structure if:

.1 It may not be possible to maintain a proper seal for any reason including, without limitation:

.2 The condition of the insulation.

.3 The temperature of the pipe, duct or similar structure.

.4 The bag could become damaged for any reason including, without limitation:

.1 The type of jacketing.

.2 The temperature of the pipe, duct or similar Structure.

.2 Upon installation of the glove bag, inspect bag for any damage or defects. If any damage or defects are found, the glove bag is to be repaired or replaced. The glove bag to be inspected at regular intervals for damage and defects, and repair or replaced, as appropriately. The asbestos containing contents of the damaged or defective glove bag found during removal are to be wetted and the glove bag and its contents are to be removed and disposed of in an appropriate waste disposal container. Any damaged or defective glove bags are not be reused.

.3 Place tools necessary to remove insulation in tool pouch. Wrap bag around pipe and close zippers. Seal bag to pipe with cloth straps.

.4 Place hands in gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag.

.5 Insert nozzle of garden reservoir type sprayer into bag through valve and wash down pipe and interior of bag thoroughly. Wet surface of insulation in lower section of bag.

.6 To remove bag after completion of stripping, wash top section and tools thoroughly. Remove air from top section through elasticized valve using a HEPA vacuum. Pull polyethylene waste container over glove bag before removing from pipe. Release one strap and remove freshly washed tools. Place tools in water. Remove second strap and zipper. Fold over into waste container and seal.

.7 After removal of bag ensure that pipe is free of residue. Remove residue using HEPA vacuum or wet cloths. Ensure that surfaces are free of sludge which after drying could release asbestos dust into atmosphere. Seal exposed surfaces of pipe and ends of insulation with slow drying sealer to seal in any residual fibres.

.8 .8 Upon completion of Work shift, cover exposed ends of remaining pipe insulation with polyethylene taped in place.

.6 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 at no additional costs to owners.

.7 Clean-up:

.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.

3.3 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, the Departmental Representative will collect air samples daily inside the Asbestos Work Area enclosures to ensure worker respiratory protection factors are not exceeded, in accordance with Provincial/Federal requirements.

.2 From beginning of Work until completion of cleaning operations, the Departmental Representative will collect air samples on a daily basis in the clean room and outside the enclosures.

.3 If air monitoring shows that areas outside work area enclosures or clean room are contaminated, enclose, maintain, and clean these areas in same manner as that applicable to Asbestos Work Areas:

.1 Stop work and clean areas outside of Asbestos Work Areas when Phased Contrast Microscopy measurements exceed 0.05 fibres per cubic centimetre (f/cc) and correct procedures.

.2 All required cleaning, re-cleaning, additional air testing and/or inspections will be performed at no extra charge to the Client.

.4 The Departmental Representative will collect clearance air samples inside the enclosure following a final visual inspection of the Asbestos Work Area by the Departmental Representative. Samples will be analyzed and compared to applicable regulations.

.1 Final air monitoring results must show fibre levels of less than 0.05 fibres per cubic centimetre (f/cc).

.2 If air monitoring shows that areas inside the Asbestos Work Area enclosures are contaminated; enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area at no additional cost to the client.

.3 Repeat as necessary until fibre levels are less than 0.05 f/cc

.4 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

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

.1 Removal or disturbance of more than one square metre of friable asbestos-containing materials.

.2 Breaking, cutting, drilling, abrading, grinding, sanding or vibrating of asbestos containing materials, if the work is done by means of power tools that are not attached to dust-collecting devices equipped with HEPA filters.

.2 Refer to the following documents for details on asbestos containing materials:

.1 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

1.2 RELATED SECTIONS

.1 Section 02 81 01 – Hazardous Materials

.2 Section 02 82 00.01 – Asbestos Abatement: Minimum Precautions.

.3 Section 02 82 00.02 – Asbestos Abatement: Intermediate Precautions.

.4 Section 02 83 20 – Lead Precautionary Measures

.5 Section 02 89 00 – Silica Precautionary Measures

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.205-03, Sealer for Application to Asbestos-Fibre-Releasing Materials.

.2 Canadian Standards Association (CSA International).

.3 Department of Justice Canada.

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

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

.1 Material Safety Data Sheets (MSDS).

.5 Transport Canada (TC).

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

.6 Ontario Environmental Protection Act, R.R.O 1990,

.1 General – Waste Management, O. Reg 347/90, as amended.

.7 Underwriters' Laboratories of Canada (ULC).

.8 Canada Labour Code Part II, section 124 and 125.

.1 Canada Occupational Health and Safety Regulations

.9 National Joint Council (NJC).

.1 Part XI – Hazardous Substances.

.10 Ontario Ministry of Labour (MoL).

.1 Occupational Health and Safety Act, R.S.O 1990, c. O1 (OSHA)

.1 O.Reg. 278/05 – Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations, as amended.

.2 O.Reg 490/09 – Designated Substances

.3 O.Reg 213/91 - "Construction Projects", as amended

1.4 DEFINITIONS

.1 Airlock: system for permitting ingress or egress without permitting air movement between contaminated area and uncontaminated area, typically consisting of two curtained doorways at least 2 m apart.

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

.3 Asbestos-Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight, identified under Existing Conditions Article, including fallen materials and settled dust.

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

.5 Authorized Visitors: Departmental Representative, and representative(s) of regulatory agencies.

.6 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 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.

.7 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.

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

.9 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.

.10 Hazardous Material Workplan: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport, and dispose of them.

.11 HEPA vacuum: DOP tested, High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.12 Negative pressure: system that extracts air directly from work area, filters such extracted air through High Efficiency Particulate Air filtering system, and discharges this air directly outside work area to exterior of building. Negative pressure systems will require DOP testing on-site, regardless of whether exhausting to interior or outdoors prior to work operations. Include in contract sum costs due to this requirement.

.1 System to maintain minimum pressure differential of 0.02 inches of water relative to adjacent areas outside of work areas, be equipped with alarm to warn of system breakdown, and be equipped with instrument to continuously monitor and automatically record pressure differences.

.13 Non-Friable Materials: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

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

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

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

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 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 every worker involved in a Type 3 operation has successfully completed the Asbestos Abatement Worker Training Program approved by the Ministry of Training, Colleges and Universities and every supervisor of a worker involved in a Type 3 operation has successfully completed the Asbestos Abatement Supervisor Training Program approved by the Ministry of Training, Colleges and Universities as outlined in O. Reg. 278/05, s. 20 (1). Submit proof of attendance in form of certificate.

.3 Submit proof satisfactory to Client and/or Client Representative that every worker who will be entering a Type 3 asbestos work area, who will be

using a respirator, has successfully completed **quantitative respirator fit testing,** for the respirator type personally issued to worker.

.4 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.

.5 Submit layout of proposed enclosures and decontamination facilities to Departmental Representative for review prior to work.

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

.7 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

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

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

.10 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 amended water;

.2 slow-drying sealer.

.11 Asbestos abatement section within Hazardous Material Work Plan.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial 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 Safety Requirements: worker and visitor protection.

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

.1 As a minimum, full-face respirator equipped with HEPA P-100 filter cartridges, 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 (high-density polyethylene protective clothing (Tyvek or similar, as approved by Client/Client Representative) 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 shall 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 to include suitable footwear, and to be repaired or replaced if torn

.2 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 worksuits 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.

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

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

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

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

.7 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 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.3 Separate for reuse, and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.

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

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

.6 Fold up metal banding, flatten and place in designated area for recycling.

.7 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.

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

1.8 EXISTING CONDITIONS

.1 Refer to the following document for details on asbestos containing materials:

.1 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

.2 Notify Departmental Representative of friable or any otherwise suspect asbestos-containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

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 the Specification Section 01 14 25 – Designated Substance Report.

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

.4 Hours of Work: perform work involving asbestos abatement located at the Building during hours specified by Departmental Representative. **The work schedule must be approved in writing by the Departmental Representative in advance of work.** Contractor shall be available to work continuously from beginning to end of project.

1.10 PERSONNEL TRAINING

.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, 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 Cleaning and Disinfecting of equipment.

.4 Limitations of equipment.

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

.4 Every worker involved in a Type 3 operation must have successfully completed the Asbestos Abatement Worker Training Program approved by the Ministry of Training, Colleges and Universities.

.5 Every supervisor of a worker involved in a Type 3 operation must have successfully completed the Asbestos Abatement Supervisor Training Program approved by the Ministry of Training, Colleges and Universities.

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 mixed with water in concentration to provide adequate penetration and wetting of asbestos-containing material.

.5 Asbestos waste containers: Metal or fibre - type acceptable to dump operator with tightly fitting covers and 0.15 mm minimum thickness sealable polyethylene liners.

.1 Inner container: 0.15 mm thick sealable polyethylene waste bag.

.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 Label containers in accordance with applicable Regulations. Label in both official languages.

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

.7 Scaffolding: Of appropriate size and strength to accommodate project in accordance with O.Reg 213/91, with specifications and set-up to be approved and stamped by professional engineer. Include in contract sum costs due to this requirement.

.8 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.

.9 Encapsulant: penetrating type conforming to CAN/CGSB-1.205.

Part 3 Execution

3.1 PREPARATION

.1 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 Pre-clean moveable furniture and carpeting within proposed work area using HEPA vacuum and remove from work area to an appropriate temporary location.

.3 Pre-clean fixed casework, plant, and equipment within proposed work area(s), 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 DOP test negative pressure units within one (1) month prior to work operations. Provide documentation to Client Representative. 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. Vent negative air units to the outdoors.

.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 one layer 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 area(s), or establish alternative exits satisfactory to Fire Commissioner of Canada.

.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.

.2 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(s), with two curtained doorways, one to Shower Room and one to work area(s). 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 one shower for every five workers. Provide hot and cold water or water of a constant temperature that is not less than 40°C or more than 50°C. Provide individual controls inside the room to regulate water flow, and individual controls inside room to regulate temperature. Provide piping and connect to water sources and drains. Pump waste water through 5 micrometre filter system acceptable to Client 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.

.3 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. Pump waste water through 5 micrometre filter system before directing into drains. 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.

.4 Construction of Decontamination Enclosures:

.1 Build suitable framing for enclosures or use existing rooms where convenient, and line with polyethylene sheeting sealed with tape. Use one layer of FR polyethylene on floors, as applicable.

.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.

.5 Separation of Work Areas from Occupied Areas:

.1 Separate parts of building required to remain in use from parts of building or exterior 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.

.6 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.

.7 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(s) 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.

.8 Work area enclosure has been inspected and approved by the Departmental Representative.

.9 Locations for waste bins as designated by the Departmental Representative have been established. Keep bins covered and enclosed while at the site. Bin loading area shall be kept clean at all times.

3.2 SUPERVISION

.1 Minimum of one Supervisor for every ten workers 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 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 or designate, 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.

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

.7 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.

3.4 INSPECTION

.1 Perform inspection of Asbestos Work Area to confirm compliance with specification and governing authority requirements. Deviation(s) from these requirements that have not been approved in writing by the Departmental Representative may result in Work stoppage, at no cost to the Owner.

.2 Departmental Representative will inspect Work for:

.1 Adherence to specific procedures and materials.

.2 Final cleanliness and completion.

.3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

.3 When asbestos leakage from Asbestos Work Area has occurred or is likely to occur, Departmental Representative may order Work shutdown.

.4 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.5 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, the Departmental Representative may collect air samples daily inside the Asbestos Work Area enclosures to ensure worker respiratory protection factors are not exceeded, in accordance with Provincial/Federal requirements.

.2 From beginning of Work until completion of cleaning operations, Departmental Representative will collect air samples on daily basis in the clean room and outside of work area enclosure(s) in accordance with industry standard practice.

.3 If air monitoring shows that areas outside work area are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Areas.

.1 Stop work and clean areas outside of Asbestos Work Areas when Phase Contrast Microscopy measurements exceed 0.05 fibres per cubic centimetre (f/cc) and correct procedures.

.2 All required cleaning, re-cleaning, additional air testing and/or inspections will be at no extra charge to Departmental Representative.

.4 Final air monitoring to be conducted as follows: After Asbestos Work Area has passed visual inspection by Departmental Representative, and acceptable coat of lock-down agent has been applied to surfaces within enclosure, and appropriate setting period has passed, Departmental Representative will perform aggressive air monitoring within Asbestos Work Area.

.1 Final air monitoring results must show fibre levels of less than 0.01 f/cc.

.2 If air monitoring results show fibre levels in excess of 0.01 f/cc, re-clean work area and apply another acceptable coat of lock-down agent to surfaces.

.3 Repeat as necessary until fibre levels are less than 0.01 f/cc.

.4 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.6 FINAL CLEANUP

.1 Following cleaning and air sampling by Departmental Representative shows that asbestos levels inside work area enclosure(s) do not exceed 0.01 fibres/cc, proceed with final cleanup.

.2 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.

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

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

.5 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.

.6 Conduct final check to ensure that no dust or debris remains on surfaces as result of dismantling operations.

.7 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled containers containing asbestos waste and dispose of at 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.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Lead abatement procedures for the removal/disturbance/repair of materials suspected of containing lead, if required to accommodate the project scope of work.

.2 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

1.2 RELATED SECTIONS

.1 Section 02 81 01 – Hazardous Materials

.2 Section 02 82 00.01 – Asbestos Abatement: Minimum Precautions

.3 Section 02 82 00.02 – Asbestos Abatement: Intermediate Precautions

.4 Section 02 82 00.03 – Asbestos Abatement: Maximum Precautions

.5 Section 02 89 00 – Silica Precautionary Measures

1.3 REFERENCES

.1 Department of Justice Canada.

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

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

.1 Material Safety Data Sheets (MSDS).

.3 Transport Canada (TC).

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

.4 Ontario Ministry of Environment (MoE).

.1 R.R.O. 1990, Reg. 347, General – Waste Management, as amended.

.5 Ontario Ministry of Labour (MoL).

.1 Occupational Health and Safety Act, R.S.O. 1990, c. O.1 (OHSA).

.1 O.Reg. 213/91, Construction Projects.

.2 R.R.O. 1990, Regulation 490/09, “Designated Substances”.

.2 Guideline: Lead on Construction Projects, September 2004, as revised.

.6 Canada Consumer Product Safety Act Surface Coating Materials Regulations SOR/2005-109, as amended.

1.4 DEFINITIONS

.1 Airlock: system for permitting ingress or egress without permitting air movement between contaminated area and uncontaminated area, typically consisting of two curtained doorways at least 2 m apart unless Site Conditions dictate otherwise.

.2 Authorized Visitors: Departmental Representatives or designated representatives, and representatives of regulatory agencies.

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

typically constructed by placing 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. Reinforce free edges of polyethylene with duct tape and weight bottom edge to ensure proper closing. Overlap each polyethylene sheet at openings not less than 1.5 m on each side unless Site Conditions dictate otherwise.

.4 Hazardous Material Workplan: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport and dispose of them.

.5 Lead-Containing Paint: Paint that contains lead in measurable concentrations, that may result in elevated airborne lead exposure during operations that disturb the paint.

.6 Lead-containing materials: Materials that are assumed to contain varying levels of lead from their historic composition.

.7 Lead-containing equipment: Equipment suspected of containing lead through historic application, or identified as lead containing through labels/tags.

.8 Occupied Area: any area of building or work site that is outside the Lead Work Area.

1.5 ACTION AND INFORMATION SUBMITTALS

.1 One (1) week prior to the start of abatement work, submit proposed methodology for abatement procedures for review by Departmental Representative. The proposed methodology shall include:

- .1 Products to be used complete with MSDS information.
- .2 List of protective equipment to be used by workers.
- .3 Plan identifying area(s) of work for abatement procedures.
- .4 Requirements for engineering controls, ventilation, etc.
- .5 Requirements for access to and egress from the Lead Work Area.

.2 A written Health and Safety Plan specific to work of this Section. As a minimum this document must include:

- .1 Classification of all lead abatement work in accordance with the criteria used in the document Guideline: Lead on Construction Projects issued by the Ontario Ministry of Labour.
- .2 The identity of the “competent person” who will, on behalf of the Contractor, perform regular inspections of the lead abatement activities to prevent dangerous, unhealthy or unsafe conditions. The “competent person” must be on site at all times while lead abatement activities are in progress.
- .3 A description of the equipment and materials, controls, crew size, job responsibilities, and operations and maintenance procedures for each activity involved in the work of this Section.
- .4 A description of the specific control methods to be used in the lead-containing paint and surface coatings abatement processes.
- .5 A strategy to ensure that personnel are not exposed to airborne lead or other contaminants in concentrations that exceed the current Time Weighted Average Exposure Value (TWAEV).

.6 A description of the medical surveillance program in place for lead abatement workers.

.7 Names of products to be used in lead abatement work.

.3 Before beginning work:

.1 Obtain from appropriate agency and submit to Departmental Representative all necessary permits for transportation and disposal of lead-containing waste. Ensure that dump operator is fully aware of hazardous nature of material being dumped, and proper methods of disposal.

.2 Submit proof satisfactory to Departmental Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, use of showers, entry and exit from work areas, and aspects of work procedures and protective measures.

.3 Submit proof in the form of a certificate that supervisory personnel have attended a lead-containing paint abatement course, of not less than 1-day duration.

.4 For each load of waste that leaves the site, submit landfill weigh scale receipts, shipping documents, and lead-containing waste manifests, as applicable based upon waste characterization.

.5 Lead abatement section within Hazardous Material Work Plan.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial 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 Safety Requirements: worker and visitor protection.

.1 Eating, drinking, chewing, and smoking are not permitted in the Lead Work Area.

.2 Washing facilities consisting of a wash basin, water, soap and towels shall be provided by the Contractor. All workers shall use these washing facilities before eating, drinking, smoking or leaving the work site. Washing facility areas are to be designated by Departmental Representative

.3 Protective equipment and clothing to be worn by workers while in the Lead Work Area includes:

.1 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres, consisting of full-body covering including head covering with snug-fitting cuffs at wrists, ankles, and neck.

.2 Respirator, personally issued to worker and marked as to efficiency and purpose, and acceptable to Authority having jurisdiction as suitable for level of lead exposure in the Lead Work Area. If disposable type filters are used, provide sufficient filters so that workers can install new filters following disposal of used filters and before re-entering contaminated areas.

.3 Ensure that no person required to enter the Lead Work Area has facial hair that affects seal between respirator and face.

.4 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 the Lead Work Area.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Representative sampling of lead-containing materials that is representative of the applicable waste stream (i.e. sampling to include substrate material as applicable) shall be performed by a competent person retained by the Contractor prior to disposal of lead-containing materials. Lead-containing waste streams are to be classified for disposal purposes using the Toxicity Characteristic Leachate Procedure at a certified analytical laboratory. All sampling procedures and submissions shall be approved of by the Departmental Representative.

.2 Place materials characterized as hazardous or toxic based upon leachate analysis in designated containers.

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

.4 Disposal of lead waste, including wash and rinse water, generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Label containers with appropriate warning labels.

.5 Provide manifests describing and listing waste created. Transport containers by approved means to licensed facility for disposal.

1.8 EXISTING CONDITIONS

.1 Refer to the following document for details on lead-containing or suspected lead-containing materials:

.1 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

Part 2 Products

2.1 MATERIALS

.1 All materials brought to project site must be in good condition and free of lead dust. Disposable items must be of new materials only.

.2 Lead Waste Container: An impermeable container acceptable to disposal site and Ministry of Environment. Labelled as required. Comprised of one of the following:

.1 A 0.15 mm sealed polyethylene bag, inside a second 0.15 mm sealed polyethylene bag.

.2 A barrel suitable for lead wash water and/or sludge. Container must be acceptable to the waste hauler.

.3 Lead Cleaning Agent: A cleaning agent suitable for lead dust. Acceptable products:

.1 Detergents with a high phosphate content (containing at least 5% trisodium phosphate).

.2 Phosphate-free lead dissolving agent.

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

.5 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions.

2.2 EQUIPMENT

.1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.2 Sprayer: Garden reservoir type, low velocity, capable of producing a mist or fine spray.

Part 3 Execution

3.1 PREPARATION

.1 Scaffolding

.1 Scaffolding in accordance with CAN/CSA-S269.2.

3.2 ABATEMENT WORK AREA PREPERATION

.1 Implement lead precautionary measures appropriate to the work completed in accordance with MOL Guideline: Lead on Construction Projects, as amended.

.2 Type 1 Work Areas:

.1 Install polyethylene drop sheets below lead operations which produce or may produce dust, chips, or debris containing lead.

.3 Type 2 Work Areas:

.1 Install polyethylene drop sheets below lead operations which produce or may produce dust, chips, or debris containing lead.

.2 Post signs in sufficient numbers to warn of the lead hazard. There shall be a sign, at least, at each entrance to the Lead Work Area. The signs shall display the following information in large, clearly visible letters using both official languages:

.1 Lead dust, fume or mist hazard.

.2 Access to the work area is restricted to authorized persons.

.3 Respirators must be worn in the work area.

.4 Type 3 Work Areas:

.1 Post signs in sufficient numbers to warn of the lead hazard. There shall be a sign, at least, at each entrance to the Lead Work Area. The signs

shall display the following information in large, clearly visible letters using both official languages:

.1 Lead dust, fume or mist hazard.

.2 Access to the work area is restricted to authorized persons.

.3 Respirators must be worn in the work area.

.2 Barriers, Partial Enclosures and Full Enclosures: Barriers, partial enclosures, and full enclosures shall be constructed to separate the Lead Work Area from the rest of the project. Barriers shall only be used where full and partial enclosures are not practical.

.1 Barriers:

.1 Ropes or barriers do not prevent the release of contaminated dust or other contaminants into the environment. However, they can be used to restrict access of workers who are not adequately protected with proper PPE, and also prevent the entry of workers not directly involved in the operation. Ropes or barriers shall be placed at a distance far enough from the operation that allows the lead-containing dust to settle. If this is not achievable, warning signs should be posted at the distance where the lead-containing dust settles to warn that access is restricted to persons wearing PPE.

.2 Partial Enclosures:

.1 Partial enclosures allow some emissions to the atmosphere outside of the enclosure. Partial enclosures may consist of vertical tarps and floor tarps so long as the tarps are overlapped and securely fixed together at the seams. A partial enclosure is not a suitable containment system if significant dust is being generated.

.3 Full Enclosures:

.1 Full enclosures are tight enclosures (with tarps that are generally impermeable and fully sealed joints and entryways). Full enclosures allow minimal or no fugitive emissions to reach the environment outside of the Lead Work Area. For full enclosures, the following requirements shall be met:

.1 The enclosure shall be constructed of windproof materials that are impermeable to dust.

.2 The enclosure shall be supported by a secure structure.

.3 All joints in the enclosure shall be fully sealed.

.4 Entrances to the enclosure shall be equipped with air locks.

.5 The escape of abrasive and debris from the enclosure shall be controlled, at air supply points, by the use of baffles, louvers, flap seals and filters.

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

.1 Construct Worker Decontamination Enclosure System as close to the work area as possible in area specified by Departmental Representative. Submit layout of proposed enclosures and decontamination facilities including location to Departmental Representative for review.

.2 Equipment and Access Room: build an Equipment and Access Room between Shower Room and Lead Work Area, with two curtained doorways, one to Shower Room and one to Lead Work Area. Install a waste receptor and storage facilities for workers' shoes and protective clothing to be reworn in Lead Work Area. 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.

.3 Shower Room: build a 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 one shower for every five or fewer workers. Provide constant supply of hot and cold, or warm (between 40°C and 50°C) potable water. Provide piping and connect to water sources and drains. Provide soap, clean towels, and appropriate containers for disposal of used respirator filters.

.4 Clean Room: build a 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 a mirror to permit workers to fit respiratory equipment properly.

.4 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.

.5 Do not begin lead abatement work until:

.1 Arrangements have been made for disposal of lead-containing waste.

.2 Arrangements have been made for containing, filtering, testing and disposal of waste water.

.3 Work areas, decontamination enclosures and parts of project site 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.

.8 Departmental Representative has reviewed preparatory work and provided written approval for lead abatement work to proceed.

3.3 SUPERVISION

.1 Minimum of one Supervisor for every ten or fewer workers is required.

.2 Approved Supervisor must remain within Lead Work Area during disturbance, removal, or other handling of lead-containing paint and other lead contaminated materials.

3.4 LEAD REMOVAL

.1 The removal or disturbance of asbestos-containing materials coated with lead-containing coatings must also be performed using appropriate asbestos and/or silica precautions as outlined in the relevant Section.

.1 Section 02 82 00.01 – Asbestos Abatement, Minimum Precautions.

.2 Section 02 82 00.02 – Asbestos Abatement, Intermediate Precautions.

.3 Section 02 82 00.03 – Asbestos Abatement, Maximum Precautions

.2 Before removing lead-containing paint or disturbing other lead containing or contaminated materials:

.1 Prepare site.

.2 Spray surfaces to be disturbed, that are finished with lead-containing paint, with water using airless spray equipment capable of providing a “mist” application to prevent the release of dust.

.3 Lead-containing paint, and surface coating removal:

.1 Methods of lead-containing paint and surface coating removal/disturbance that may be used, pending approval from the Departmental Representative, include:

.1 Powered tools equipped with HEPA dust collection systems.

.2 Other method(s) at the sole discretion of the Departmental Representative

.4 At completion of lead-containing paint and surface coatings removals, perform the following clean-up:

.1 Wait at least 1-hour after active lead abatement work has ceased to allow airborne lead particles to settle.

.2 HEPA vacuum all surfaces within the Lead Work Area. Start vacuuming at the highest levels furthest from the Decontamination Facilities and work progressively downwards towards the Decontamination Facilities.

.3 Wash all surfaces with Lead Cleaning Agent and rinse with clean water. Start washing and rinsing at the highest levels furthest from the Decontamination Facilities and work progressively downwards towards the Decontamination Facilities.

.4 Repeat HEPA vacuuming, washing and rinsing as required to achieve clearance criteria.

3.5 INSPECTION

.1 Perform inspections of Lead Work Area to confirm compliance with specification and requirements of authorities having jurisdiction. Deviation from these requirements that have not been approved in writing by the Departmental Representative may result in Work stoppage, at no cost to Owner.

.2 Departmental Representative will inspect Work for:

.1 Adherence to specific procedures and materials.

.2 Final cleanliness and completion.

.3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

.3 When a leakage of liquid, dust or fume from the Lead Work Area has occurred or is likely to occur the Departmental Representative Construction Manager may order Work shutdown.

.1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.6 AIR MONITORING AND SURFACE WIPE SAMPLING

.1 From beginning of Work until completion of cleaning operations, the Departmental Representative may be on site to collect air samples either inside or outside of the Lead Work Area in accordance with standard methods for workplace air sampling and analysis.

.1 This air monitoring does not relieve the Contractor of any responsibility for air monitoring inside the Lead Work Area to verify that the respiratory protection in use provides a suitable protection factor.

.2 Use results of air monitoring inside the Lead Work Area to establish type of respirators to be used. Workers may be required to wear sample pumps for up two full-shift periods.

.1 If airborne lead concentrations are above the protection factor of respirators in use, the Contractor shall:

.1 Stop abatement.

.2 Introduce more stringent engineering controls.

.3 Use a higher protection factor in respiratory protection for persons inside the Lead Work Area.

.2 If air monitoring shows that airborne lead concentrations outside the Lead Work Area exceed 0.025 mg/m^3, the Contractor shall maintain and clean these areas, in same manner as applicable to the Lead Work Area, at no additional cost to the Departmental Representative.

.3 Final clearance air monitoring will be performed at the sole discretion of the Departmental Representative.

.1 Final air monitoring results must show airborne lead levels less than 0.005 mg/m^3.

.2 If air monitoring results show airborne lead levels in excess of 0.005 mg/m^3, the Contractor shall re-clean the Lead Work Area at no additional cost to the Departmental Representative or owner.

.3 Repeat as necessary until airborne lead levels are less than 0.005 mg/m^3.

.4 The following criteria shall be used to define an acceptable level of cleanliness after lead abatement activities:

.1 Where removal of paints and other surface coatings has been performed to accommodate the project scope of work:

.1 Visibly free of paint(s), primer(s), and surface coating(s), and/or associated dust.

.2 Residual lead dust concentration less than:

.1 430 micrograms/square metre for interior floor surfaces

.2 2,691 micrograms/square metre for interior windowsills

.3 8,611 micrograms/square metre for exterior surfaces

.4 Repeat cleaning as necessary until lead concentrations are below specified levels, at no additional cost to the Departmental Representative or owner.

3.7 FINAL CLEANUP

.1 Remove polyethylene sheet by rolling it towards the centre of the Lead Work Area. Immediately vacuum any visible paint chips, particles, dust and debris observed during cleanup using HEPA vacuum equipment.

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

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

.4 Include in clean-up sealed waste containers and equipment used in Work and remove from work areas, at appropriate time in cleaning sequence.

.5 A final check may be carried out to ensure that no lead dust or debris remains on surfaces as a result of dismantling operations.

.6 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled waste containers.

.1 Dispose of lead-containing waste in accordance with R.R.O. 1990, Regulation 347, as amended. Ensure that waste hauler and receiver are fully aware of hazardous nature of material to be disposed of and that guidelines and regulations for lead-containing waste disposal are followed.

.2 Ensure that materials removed during the Work of this Section are treated, packaged, transported and disposed of as lead-containing waste.

.3 Clean up waste routes and loading area after each load. Use lead abatement procedures if appropriate or requested by Departmental Representative.

.4 Drop garbage bins at designated locations. Keep bins covered and enclosed while at the site. Bin loading area shall be kept clean at all times.

.5 Transport all waste to a landfill licensed by the Ontario Ministry of Environment (MOE).

.6 Provide Departmental Representative with copies of shipping documents and lead-containing waste manifests for each load of waste. The Contractor is responsible to ensure that written documentation is submitted for each load of waste leaving the site.

.7 Cooperate with MOE inspectors and immediately carry out instructions for remedial work at landfill to maintain environment, at no additional cost to the Departmental Representative.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This section specifies requirements and procedures for silica precautionary measures. This section conforms to the requirements of the Ontario Occupational Health and Safety Act, R.S.O. 1990, Regulation 490/09 “Designated Substances”.

.2 Comply with the requirements of this Section when performing the following work:

.1 Work at site which may involve contact with silica dust generated through such processes as sawing, cutting, grinding, blasting and/or breaking of the silica containing material.

.3 Refer to the following documentation for details on silica-containing materials:

.1 Project-Specific Designated Substances Survey. Washroom Renovation Project Building M-06, 1200 Montreal Road, Ottawa, ON.

1.2 RELATED SECTIONS

.1 Section 02 81 01 – Hazardous Materials

.2 Section 02 82 00.01 – Asbestos Abatement: Minimum Precautions

.3 Section 02 82 00.02 – Asbestos Abatement: Intermediate Precautions

.4 Section 02 82 00.03 – Asbestos Abatement: Maximum Precautions

.5 Section 02 83 20 – Lead Precautionary Measures

1.3 REFERENCES

.1 Comply with current Federal, Provincial, and local requirements pertaining to silica, provided that in case of conflict among these requirements or with these specifications the more stringent requirement applies. Comply with regulations in effect at time work is performed.

.2 Federal Legislation

.1 Canada Labour Code and associated regulations.

.3 Provincial legislation

.1 Ontario Occupational Health and Safety Act, R.S.O. 1990, Regulation 490/09 “Designated Substances”.

1.4 DEFINITIONS

.1 **Dangerous Goods:** product, substance, or organism that is specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.

.2 **Hazardous Material:** product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

.3 **Hazardous Material Workplan**: A brief report identifying the location and quantities of hazardous materials and the methods that will be used to remove, store, transport and dispose of them.

.4 **Workplace Hazardous Materials Information System (WHMIS):** Canada-wide system designed to give employers and workers information about hazardous materials used in workplace. Under WHMIS, information on hazardous materials is provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by combination of federal and provincial laws.

1.5 SUBMITTALS

.1 Silica abatement section within Hazardous Material Work Plan.

1.6 PRECAUTIONARY MEASURES AND PROCEDURES

.1 Execute work by methods to minimize raising silica dust from demolition operations. Where practical, wet methods or a dust collection system should be used to reduce dust.

.2 Adequate ventilation, including local exhaust ventilation, should be maintained to prevent the accumulation and recirculation of harmful concentrations of free crystalline silica in the work area.

.3 As practical, processes that generate silica dust should be completed in enclosed areas wherever possible to prevent the spread of silica dust outside of the work area.

.4 Implement and maintain silica dust control measures during work to ensure that silica levels do not exceed allowable limits.

.5 Departmental Representative may stop work at any time when release of silica dust to adjacent area is suspected. Contractor must discuss procedures that Contractor proposes to resolve problem. Make all necessary changes to operations prior to resuming any demolition activities that may cause release of silica dust at no extra cost to the Departmental Representative.

.6 Silica dust should be cleaned from machinery and work surfaces by wet sweeping, the use of sweeping compounds or vacuum cleaners fitted with a HEPA filter to prevent the recirculation of dusty air. Cleaning methods such as blowing with compressed air or dry sweeping should be avoided. Where exposure to free crystalline silica occurs, protective work clothing should be vacuumed before removal.

.7 Store material containing silica dust in closed containers or use other appropriate means to prevent dust from becoming airborne.

1.7 PERSONAL PROTECTIVE EQUIPMENT

.1 Anticipated minimum levels of personal protection based on work activity involving silica dust are listed below and are in addition to the personal protective equipment required for the completion of the demolition activities. Personal protection is dependent on the work practices and associated silica exposure risks.

.1 Air purifying half-mask respirator equipped with HEPA filter cartridges or supplied-air type, personally issued to the worker and marked as to efficiency and purpose, and acceptable to the Provincial Authority having jurisdiction as suitable for silica and the level of silica exposure in the Work Area. If disposable type filters are used, provide sufficient filters so that workers can install new filters following disposal of used filters and before re-entering contaminated areas.

.2 Eye Protection: Goggles, Safety glasses with side shields, or Face shield.

.3 If requested by a worker,

.1 Hand Protection: Gloves

.2 Clothing: Full body protective clothing

1.8 AIR MONITORING

.1 If air monitoring shows that work areas contain crystalline silica above the specified action levels, these areas shall be cleaned by previously outlined methods at no additional cost to the Departmental Representative.

1.9 PERMITS

.1 Contractor is responsible to obtain all necessary permits, licenses and approvals to conduct the abatement (e.g. Ontario Ministry of the Environment (MOE) waste generating number, etc.).

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 Canadian Standards Association (CSA International)
- .1 CAN3 A165 SERIES-94 (R2000), CSA Standards on Concrete Masonry Units.
- .2 CSA A179-04(R2014), Mortar and Grout for Unit Masonry.
- .3 CSA-A370-94(C1999), Connectors for Masonry.
- .4 CSA-A371-04(R2014), Masonry Construction for Buildings.
- .5 CSA G30.14-M1983(R1998), Deformed Steel Wire For Concrete Reinforcement.
- .6 CAN/CSA G30.18-09(R2014), Billet-Steel Bars for Concrete Reinforcement.
- .7 CSA-S304.1-94(R2001), Masonry Design for Buildings.

1.2 SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 00 10 00.

.2 Shop Drawings :
- .1 Submit shop drawings in accordance with Section 00 10 00.
- .2 Shop drawings consist of bar bending details, lists and placing drawings.
- .3 On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

1.3 STORAGE AND HANDLING

.1 Protect on site stored or installed material from moisture damage in accordance with manufacturer's printed instructions.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

.1 Standard concrete block units: to CAN3-A165 Series (CAN3-A165.1).
- .1 Classification: H / 15 / A / M.
- .2 Size: modular.

2.2 REINFORCEMENT AND CONNECTORS

.1 Bar reinforcement: to CSA-A371 and CAN/CSA G30.18, Grade 400.

.2 Wire reinforcement: to CSA-A371 and CSA G30.14, truss type.

.3 Connectors shall be corrosion resistant: to CSA-A370 and CSA-S304.

2.3 MORTAR AND GROUT

.1 Mortar: to CSA A179.

.1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
.2 Colour: ground coloured natural aggregates or metallic oxide pigments.

.2 Mortar Type: S based on specifications,

.3 Following applies regardless of mortar types and uses specified above:
.1 Mortar for grouted reinforced masonry: type S based on specifications.

2.4 ACCESSORIES

.1 Nailing Inserts: 0.5 mm minimum thickness, galvanized.

.2 Bolts: 12 mm diameter x 150 mm long with ends bent 50 mm at 90 degrees.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Do masonry work in accordance with CSA-A371 except where specified otherwise.
.1 Bond: running stretcher bond with vertical joints in perpendicular alignment and centred on adjacent stretchers above and below.
.2 Coursing height: 200 mm for one block and one joint.
.3 Jointing: tool where exposed or where paint or other finish coating is specified to provide smooth compressed concave surface.

.2 Build masonry plumb, level, and true to line, with vertical joints in alignment.

.3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.2 CONSTRUCTION

.1 Exposed masonry:
.1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.
.2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.

.2 Building-In:
.1 Install masonry connectors and reinforcement where indicated on drawings.
.2 Build in items required to be built into masonry.
.3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.

.3 Interface with other work:
.1 Cut openings in existing work as indicated.
.2 Openings in walls: approved Departmental Representative.
.3 Make good existing work. Use materials to match existing.

3.3 REINFORCING AND CONNECTING

.1 Install masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371 and CSA-S304.1 unless indicated otherwise.

3.4 TYING

.1 Tie new masonry to existing in accordance with NBC, CSA-S304.1, CSA-A371.

3.5 GROUTING

.1 Grout masonry in accordance with CSA-S304.1, CSA-A371 and CSA-A179 and as indicated.

3.6 ANCHORS

.1 Supply and install metal anchors as indicated.

3.7 SITE TOLERANCES

.1 Tolerances in notes to Clause 5.3 of CSA-A371 apply.

3.8 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.9 PROTECTION

.1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 07 92 10 – Joint Sealants

.2 Section 09 91 23 - Interior Painting

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
.1 ASTM A 53/A53M-02, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Steamless.
.2 ASTM A 269-02, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
.3 ASTM A 307-02, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
.2 CAN/CGSB-1.181-92, Ready-Mixed, Organic Zinc-Rich Coating.

.3 Canadian Standards Association (CSA International)
.1 CAN/CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel.
.2 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CAN/CSA-S16.1-01, Limit States Design of Steel Structures.
.4 CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
.5 CSA W59-1989 (R2001),Welded Steel Construction (Metal Arc Welding) (Imperial Version).
.6 CSA W59.2-M1991 (R2009), Welded Aluminum Construction.

.4 Aluminum Association Designation System for Aluminum Finishes-(AA) – 2003 (R2009).

1.3 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 00 10 00.

.2 Shop Drawings
.1 Submit shop drawings in accordance with Section 00 10 00.
.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.3 Shop Drawings submitted shall bear the stamp and signature of a qualified Professional Engineer registered and licensed to practice in the Province of Ontario.

1.4 QUALITY ASSURANCE

.1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

.2 Deliver, store, handle and protect materials in accordance with Section 00 10 00.

.3 Storage and Protection:
.1 Cover exposed stainless steel surfaces with pressure sensitive heavy protection paper or apply strippable plastic coating, before shipping to job site.
.2 Leave protective covering in place until final cleaning of building. Provide instructions for removal of protective covering.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.

.2 Steel pipe: to ASTM A 53/A53M.

.3 Welding materials: to CSA W59-13.

.4 Welding electrodes: to CSA W48 Series.

.5 Bolts and anchor bolts: to ASTM A 307.

.6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

.7 Aluminum extrusions: Aluminum Association Alloy AA6063-T6.

.8 Sheet aluminum: Aluminum Association Alloy AA1100.

.9 Fasteners: stainless steel.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 Shop coat primer: to CAN/CGSB-1.40.

2.4 SHOP PAINTING

.1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.3 Clean surfaces to be field welded; do not paint.

PART 3 - EXECUTION

3.1 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Provide components for building by other sections in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CAN/CSA-S16.1, or weld.

.7 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces

after completion of erection with primer.

.9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

3.2 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 09 22 16 – Non-Structural Metal Framing.

.2 Section 10 28 10 – Toilet and Bath Accessories.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA B111-1974 (R1998), Wire Nails, Spikes and Staples.
- .2 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CSA O121-M1978 (R1998), Douglas Fir Plywood.
- .4 CAN/CSA-O141-91 (R1999), Softwood Lumber.
- .5 CSA O151-M1978 (R1998), Canadian Softwood Plywood.
- .6 CAN/CSA-O325.0-92 (R1998), Construction Sheathing.

.2 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber, 2014.

1.3 QUALITY ASSURANCE

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

.3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Do not dispose of preservative treated wood through incineration.

.2 Do not dispose of preservative treated wood with materials destined for recycling or reuse.

.3 Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill.

.4 Dispose of unused wood preservative material at official hazardous material collections site.

.5 Do not dispose of unused preservative material into sewer system, into streams, lakes, onto ground or in other locations where they will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 LUMBER MATERIAL

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
- .1 CAN/CSA-O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Furring, blocking, nailing strips, grounds, rough bucks:
- .1 Board sizes: "Standard" or better grade.
- .2 Dimension sizes: "Standard" light framing or better grade.
- .3 Post and timbers sizes: "Standard" or better grade.

2.2 PANEL MATERIALS

.1 Douglas fir plywood (DFP): to CSA O121, exterior quality with pressure treated preservative.

2.3 ACCESSORIES

.1 Nails, spikes and staples: to CSA B111.

.2 Nails, spikes and staples:
- .1 Use common spiral nails and spiral spikes except where indicated otherwise.
- .2 Use hot galvanized finish steel for exterior work, interior high humidity areas and for pressure treated lumber except where indicated otherwise.
- .3 Bolt, nut, washer, screw and pin type fasteners: with hot-dip galvanized finish to CSA G164-M92 for exterior work, interior high humidity areas and for pressure treated lumber.
- .4 Use surface fastenings of following types, except where specific type is indicated.
  - .1 To hollow masonry, plaster and panel surfaces use toggle bolt.
  - .2 To solid masonry and concrete use expansion shield with lag screw.
  - .3 To structural steel use bolts through drilled hole, or welded stud-bolts or power driven self-drilling screws.
- .5 Submit alternate fasteners for Departmental Representative's approval.

2.4 FINISHES

.1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work, pressure- preservative, fire-retardant treated lumber.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Treat surfaces of material with wood preservative, before installation.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

.3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

.4 Treat material as follows:
.1 Wood furring for exterior applications.

3.2 INSTALLATION

.1 Comply with requirements of NBC, supplemented by the following paragraphs.

.2 Install furring and blocking as required to space-out and support surface applied materials or other work as indicated.

.3 Align and plumb faces of furring and blocking to tolerance of 1:600.

.4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.5 Install wood cants, nailers, curbs and other wood supports as required and secure using steel fasteners.

3.3 NAILERS

.1 Install wood nailers as indicated.

.2 Except where indicated otherwise, use material at least 40 mm (1 ½") thick secured with 10 mm (3/8") bolts located within 300 mm (12") from ends of members and uniformly spaced at 1200 mm (4'-0") between.

.3 Countersink bolts where necessary to provide clearance for other work.

3.4 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 09 22 16 – Non-Structural Metal Framing.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C 553-13, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
.2 ASTM C 665-12, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
.3 ASTM C 1320-10(R2016), Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

.2 Canadian Gas Association (CGA)
.1 CAN/CGA-B149.1-2015, Natural Gas and Propane Installation Code Handbook.
.2 CAN/CGA-B149.2-05, Propane Storage and Handling Code.

.3 Canadian Standards Association (CSA International)
.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.4 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S604-M1991, Type A Chimneys.
.2 CAN/ULC-S702-09, Standard for Mineral Fibre Insulation.

1.3 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 00 01 00 - Submittal Procedures.

.2 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

PART 2 - PRODUCTS

2.2 INSULATION ,1 Sound attenuation batt insulation: to CAN/ULC S702 – latest edition, Type 1 (without membrane). Thickness to match depth of wall cavity.

.1 Acceptable Materials:

.1 "Safe 'N' Sound" batt insulation and/or "Acoustical Fire Batts – AFB" as manufactured by Roxul Inc.

.2 "Quiet Zone" noise stop blanket – 700 Series as manufactured by Owens Corning Canada Inc.

.3 Eco Touch Pink Quite Zone Pink Fiberglas Acoustic Insulation.

.4 "Noise Reducer" Sound Attenuation Batt by Certain Teed Insulation.

PART 3 - EXECUTION

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

3.2 INSULATION INSTALLATION .1 Install insulation to maintain continuity of insulation to building elements and spaces and to ASTM C 1320.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Do not compress insulation to fit into spaces.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum.

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

3.3 CLEANING .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED WORK

.1 Fire stopping and smoke seals within mechanical assemblies (i.e inside ducts, dampers) and electrical assemblies (i.e. inside cable trays) are specified in Divisions 21, 22, 23, 25, 26 and 28 respectively.

1.2 REFERENCES

.1 Underwriter's Laboratories of Canada (ULC)

.1 ULC-S115-Latest Edition, Fire Tests of Firestop Systems.

1.3 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are Identified within Listed Systems Design to create on site fire stop system.

.4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.

.1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 61 33 - Hazardous Materials.

.3 Shop Drawings:

.1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
.2 Construction details should accurately reflect actual job conditions.

.4 Quality assurance submittals: submit following in accordance with Section 01 45 00

.1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CANULC-S102 for surface burning characteristics.
.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.
.4 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 – FIELD QUALITY CONTROL.

1.5 SAMPLES

.1 Submit samples in accordance with Section 01 10 00

.2 Submit duplicate 300 x 300 mm samples showing actual firestop material proposed for project.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, and ULC markings.

.2 Storage and Protection:

.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

.2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Fire stopping and smoke seal systems: in accordance with ULC-S115.

.1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ULC-S115 and not to exceed opening sizes for which they are intended [and conforming to special requirements specified in Part 3.
.2 Firestop system rating: In accordance with National Building Code (NBC).

.2 Service penetration assemblies: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.

.3 Service penetration firestop components: certified by ULC in accordance with ULC-S115 and listed in ULC Guide No.40 U19.13 and ULC Guide No.40 U19.15 under the Label Service of ULC.

.4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.

.5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.

.6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.

.7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.8 Water: potable, clean and free from injurious amounts of deleterious substances.

.9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.10 Sealants for vertical joints: non-sagging.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interuption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

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

3.2 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Tool or trowel exposed surfaces to a neat finish.

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

3.3 INSPECTION

.1 Notify Consultant when ready for inspection and prior to concealing or enclosing firestopping materials and service penetration assemblies.

3.4 SCHEDULE

.1 Firestop and smoke seal at:

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

partitions.
.4 Intersection of fire-resistance rated masonry and gypsum board partitions.
.5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
.6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
.7 Openings and sleeves installed for future use through fire separations.
.8 Around mechanical and electrical assemblies penetrating fire separations.
.9 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

3.5 MANUFACTURER'S FIELD SERVICES

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 CLEAN UP

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

.2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

67END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.4 Section 09 21 16 – Gypsum Board Assemblies

1.3 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM C 919-12, Standard Practice for use of Sealants in Acoustical Applications.

.2 ASTM C 661 - Standard Test Method for Indentation Hardness of Elastomeric Type Sealants by means of a Durometer.

.3 ASTM C 794 - Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

.4 ASTM C834 - Specification for Latex Sealants.

.5 ASTM C 920 - Specification for Elastomeric Joint Sealants.

.6 ASTM C 1087 - Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

.7 ASTM C 1193 - Guide for Use of Joint Sealants.

.8 ASTM C 1248 - Test Method for Staining of Porous Substrate by Joint Sealants.

.9 ASTM C 1311 - Specification for Solvent Release Sealants.

.10 ASTM C 1330 - Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

.11 ASTM D 412 - Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.

.12 ASTM D 624 - Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

.13 ASTM D 2240 - Test Method for Rubber Property - Durometer Hardness.

.14 ASTM E 283 - Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.15 ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

.16 ASATM C679 – Standard Test Method for Tack-Free Time of Elastomeric Sealants.

.17 ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).

.18 ASTM C1135 – Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants.

.19 ASTM D412 - Standard Test Method for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.

.20 ASTM D2202 – Standard Test Method for Slump of Sealants.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-19.13-M87, Sealing Compound, One-Component, Elastomeric, Chemical Curing.
.2 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.

.3 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act, 1999 (CEPA).

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

.5 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.6 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC S102-07 Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.4 SUBMITTALS

.1 Submit product data in accordance with Section 00 10 00.

.2 Manufacturer's product to describe.
.1 Caulking compound.
.2 Primers.
.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

.3 Submit samples in accordance with Section 00 10 00.

.4 Submit duplicate samples of each type of material and colour.

.5 Cured samples of exposed sealants for each colour where required to match adjacent material.

.6 Submit manufacturer's instructions in accordance with Section 00 10 00.
.1 Instructions to include installation instructions for each product used.

1.6 WARRANTY

.1 Provide a written warranty in the name of the Owner: Original statement on Installer's letterhead in which Installer agrees to repair or replace joint sealants that demonstrate deterioration or failure within warranty period specified.

.1 Warranty Period: Five years from date of Certificate of Substantial Performance.

.2 Special Manufacturer's Warranty: Manufacturer's Standard form in which joint sealant manufacturer agrees to furnish joint sealants to

repair or replace those that demonstrate deterioration or failure under normal use within warranty period specified.

1. Warranty Period for Silicone Sealants: 5 years date of Certificate of Substantial Performance.

.3 Warranty Conditions: Special warranties exclude deterioration or failure of joint sealants in normal use due to structural movement resulting in stresses on joint sealants exceeding sealant manufacturer's written specifications, joint substrate deterioration, mechanical damage, or normal accumulation of dirt or other contaminants.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for recycling in accordance with Section 01 10 00.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

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

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

.6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.7 Divert unused joint sealing material from landfill to official hazardous material collections.

.8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.

1.9 PROJECT CONDITIONS

.1 Environmental Limitations:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:
.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:
.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.10 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

.2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.3 Ventilate area of work by use of approved portable supply and exhaust fans.

PART 2 - PRODUCTS

2.1 SEALANT MATERIALS

.1 Products and manufacturers specified establish performance and quality required and are not intended to restrict submission by other manufacturers.

.2 Acceptance of Products from other manufacturers will be subject to review by the Consultant, for conformity with the Specifications and meeting the physical characteristics of the specified Products. Include compliance with referenced standards. Submittals which do not include adequate data for the product evaluation will not be considered.

.3 If unapproved, substitute products are included in the bid, the specified Products shall be provided without additional compensation.

.4 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.5 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.6 Where sealants are qualified with primers use only these primers.

.7 Compatibility: Provide joint sealants and accessory materials that are compatible with one another, and with materials in close proximity under use conditions, as demonstrated by sealant manufacturer using ASTM C1087 testing and related experience.

.8 Joint Sealant Standard: Comply with ASTM C 920 and other specified requirements for each liquid-applied joint sealant.

.9 Stain Test Characteristics: Where sealants are required to be non-staining, provide sealants tested per ASTM C 1248 as non-staining on porous joint substrates indicated for Project.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Type 1: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T, NT; SWRI validation.

.1 Basis of Design Product: **DOW CORNING® 790 Silicone Building Sealant**.
.2 Hardness, ASTM C 661: 15 durometer Shore A.
.3 Volatile Organic Compound (VOC) Content: 26 g/L maximum.
.4 Staining, ASTM C 1248: None on concrete, granite, limestone, and brick.
.5 Colour: As selected by Architect from manufacturer's full line.

.2 Type 2: Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT, G, A, and O; SWRI validation.

.1 Basis of Design Product: **DOW CORNING® 795 Silicone Building Sealant**.
.2 Hardness, ASTM C 661: 35 - 45 durometer Shore A.
.3 Volatile Organic Compound (VOC) Content: 32 g/L maximum
.4 Staining, ASTM C 1248: None on concrete, granite, limestone, and brick.
.5 Colour: As selected by Architect from manufacturers full line.

2.3 SEALANT SELECTION

.1 Perimeters of interior frames, as detailed and itemized: Sealant Type 2.

.2 Joints at tops of non-load bearing masonry walls at the underside of poured concrete: Sealant Type 1.

2.4 ACCESSORIES

.1 Joint Substrate Primers: Substrate primer recommended by sealant manufacturer for application.

.2 Cylindrical Sealant Backing: ASTM C 1330, Type B non-absorbent, bi-cellular material with surface skin, or Type O open-cell polyurethane, as recommended by sealant manufacturer for application.

2.5 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

.2 Primer: as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PROTECTION

.1 Protect installed Work of other trades from staining or contamination.

3.2 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.6 APPLICATION

.1 Sealant.

.1 Apply sealant in accordance with manufacturer's written

instructions.
.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
.3 Apply sealant in continuous beads.
.4 Apply sealant using gun with proper size nozzle.
.5 Use sufficient pressure to fill voids and joints solid.
.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
.7 Tool exposed surfaces before skinning begins to give slightly concave shape.
.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing.
.1 Cure sealants in accordance with sealant manufacturer's instructions.
.2 Do not cover up sealants until proper curing has taken place.

.3 Cleanup.
.1 Clean adjacent surfaces immediately and leave Work neat and clean.
.2 Remove excess and droppings, using recommended cleaners as work progresses.
.3 Remove masking tape after initial set of sealant.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 07 92 00 - Joint Sealing.

.2 Section 08 71 10 - Door Hardware.

.3 Section 09 22 16 – Non-Structural Metal Framing.

.4 Section 09 91 23 - Interior Painting.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International)
.1 ASTM A 653/A653M-05a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
.2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.

.3 Canadian Standards Association (CSA International)
.1 G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA W59-M1989 (R2001), Welded Steel Construction (Metal Arc Welding) (Metric Version).

.4 Canadian Steel Door Manufacturers' Association, (CSDMA).
.1 CSDMA, Specifications for Commercial Steel Doors and Frames, 2009.
.2 CSDMA, Recommended Selection and Usage Guide for Commercial Steel Doors, 2009.

.5 National Fire Protection Association (NFPA)
.1 NFPA 80-2016, Standard for Fire Doors and Fire Windows.
.2 NFPA 252-2012, Standard Methods of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC)
.1 CAN4-S104-80 2010, Fire Tests of Door Assemblies.
.2 CAN4-S105-85 R1992, Fire Door Frames Meeting the Performance Required by CAN4-S104.

.7 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

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

.9 CAN/ULC-S704, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

.10 National Building Code of Canada, 2010.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 00 10 00

.2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed arrangement of hardware, fire rating and finishes.

.3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, reinforcing fire rating and finishes.

.4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

.5 Submit test and engineering data, and installation instructions.

1.4 WARRANTY

.1 Doors and frames shall be guaranteed against manufacturing defects for a period of three (3) years from the date of Certificate of Substantial Performance. Where defects occur, the Contractor shall be responsible for all costs, including painting, hanging and installing hardware, associated with replacing the defective doors.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Hot dipped galvanized steel sheet: to ASTM A 653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.

.2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.

2.2 DOOR CORE MATERIALS

.1 Stiffened construction: face sheets welded, insulated core.
.1 Fibreglass: to CAN/ULC-S702, semi-rigid density 24 kg/m^3.

2.3 PRIMER

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

2.4 PAINT

.1 Field paint steel doors and frames in accordance with Section 09 91 23 - Interior Painting. Protect weatherstripping from paint. Provide final finish shall be free of scratches or other blemishes.

2.5 ACCESSORIES

.1 Door silencers: single stud rubber/neoprene type.

.2 Door bottom drop seal: refer to Section 08 71 10 – Door Hardware.

.3 Metallic paste filler: to manufacturer's standard.

.4 Sealant: In accordance with Section 07 92 00 – Joint Sealing.

2.6 FRAMES FABRICATION GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Fabricate frames to profiles and maximum face sizes as indicated.

.3 Interior frames: 1.6 mm welded type construction.

.4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.

.5 Protect mortised cutouts with steel guard boxes.

.6 Prepare frame for door silencers, 3 for single door.

.7 Manufacturer's nameplates on frames and screens are not permitted.

.8 Conceal fastenings except where exposed fastenings are indicated.

.9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.10 Insulate frame components with fibreglass insulation.

2.7 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.

.3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm o.c. maximum.

2.8 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Accurately mitre or mechanically joint frame product and securely

weld on inside of profile.

.3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.

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

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

2.9 DOOR FABRICATION GENERAL

.1 Doors: swing type, flush, with provision for louvre openings as indicated.

.2 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish

.3 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware.

.4 Blank, reinforce, drill doors and tap for mortised and templated hardware.

.5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.6 Reinforce doors where required, for surface mounted hardware. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

.7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.

2.10 HOLLOW STEEL CONSTRUCTION

.1 Form each face sheet from 1.6 mm sheet steel.

.2 Reinforce doors with vertical stiffeners, securely welded to each face sheet at 150 mm on centre maximum.

.3 Fill voids between stiffeners of interior doors with fiberglass temperature rise rated core.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Install doors and frames to CSDMA Installation Guide.

3.2 FRAME INSTALLATION

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

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

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

.5 Caulk perimeter of frames between frame and adjacent material.

3.3 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 10 - Door Hardware - General.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.

.2 Latchside and head: 1.5 mm.

.3 Finished floor, top of carpet, noncombustible sill, and thresholds: 13 mm.

.3 Adjust operable parts for correct function.

.4 Install louvres.

3.4 FINISH REPAIRS

.1 Touch up with primer finishes damaged during installation.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.5 GLAZING

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

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 08 11 00 – Metal Doors and Frames.

1.2 REFERENCES

.1 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).
.1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.

.2 Canadian General Standards Board (CGSB).
.1 CAN/CGSB-69.17-M86(R1993), Bored and Preassembled Locks and Latches.
.2 CAN/CGSB-69.18-M90/ANSI/BHMA A156.1-1981, Butts and Hinges.
.3 CAN/CGSB-69.19-93/ANSI/BHMA A156.3-1984, Exit Devices.
.4 CAN/CGSB-69.20-M90/ANSI/BHMA A156.4-1986, Door Controls (Closers).
.5 CAN/CGSB-69.21-[90/ANSI/BHMA A156.5-1984, Auxiliary Locks and Associated Products.
.6 CAN/CGSB-69.22-M90/ANSI/BHMA A156.6-1986, Architectural Door Trim.
.7 CAN/CGSB-69.24-M90/ANSI/BHMA A156.8-2005, Door Controls - Overhead Holders.
.8 CAN/CGSB-69.26-96/ANSI/BHMA A156.10-1999, Power-operated Pedestrian Doors.
.9 CAN/CGSB-69.29-93/ANSI/BHMA A156.13-2012, Mortise Locks and Latches.
.10 CAN/CGSB-69.30-93/ANSI/BHMA.
.11 CAN/CGSB-69.31-M89/ANSI/BHMA A156.15-2011, Closer/Holder Release Device.
.12 CAN/CGSB-69.32-M90/ANSI/BHMA A156.16-2013, Auxiliary Hardware.
.13 CAN/CGSB-69.34-93/ANSI/BHMA A156.18-2012, Materials and Finishes.
.14 CAN/CGSB-69.35-M89/ANSI/BHMA A156.19-2013, Power Assist and Low Energy Power Operated Doors.
.15 CAN/CSA-B651-04.

1.3 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 00 10 00 - Submittal Procedures.

.2 Hardware List:
.1 Submit contract hardware list in accordance with Section

00 10 00 - Submittal Procedures.
.2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

.3 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

.4 Closeout Submittals
.1 Provide operation and maintenance data for door closers, locksets, door holders, electrified hardware for incorporation into manual specified in Section 00 10 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements:
.1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling and Unloading:
.1 Deliver, store, handle and protect materials in accordance with Section 00 10 00.
.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.2 Storage and Protection:
.1 Store finishing hardware in locked, clean and dry area.

1.6 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 00 10 00 - Closeout Submittals.
.2 Supply two sets of wrenches for door closers, locksets.

PART 2 - PRODUCTS

2.1 HARDWARE ITEMS

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

2.2 DOOR HARDWARE

.1 Locks and latches:

.1 Lockset: "Sargent" 10G05LL x 26B.
.2 Latchset: "Sargent" 10U65LL x 26B.
.3 Lever handles: plain design.
.4 Roses: round.
.5 Normal strikes: box type, lip projection not beyond jamb.
.6 Cylinders: key into keying system as noted.
.8 Finished to BHMA 626.

.2 Butts and hinges:
.1 Interior doors: Dorex 114.3mm x 101.6mm x 179 454 NRP X C15.

.3 Door Closers and Accessories:
.1 Door Controls (Closers): to CAN/CGSB-69.20, Designated Letter C.
.1 Acceptable Manufacturer:
.1 Interior doors "Norton" 1600BC-Reg x AL. Parallel arm.
.2 Door controls - overhead holders: to CAN/CGSB-69.24, designated by letter C, finished to C32D.

.4 Architectural door trim: to CAN/CGSB-69.22, designated by letter J and numeral identifiers as listed below, finished to BHMA C26D.
.1 Door protection plates: kick plate type, 1.27 mm thick stainless steel finished to BHMA 630.
.1 Acceptable Manufacturer:
.1 Don-Jo, Commercial Kickplate 90.
.2 Push plates: type 1.27 mm thick size 4" x 16", stainless steel finished to BHMA 630.
.1 Acceptable Manufacturer:
.1 Don-Jo, Push Plate CFK71 and 71.
.3 Pull units: stainless steel, size 4" x 16", finished to BHMA 630.
.1 Acceptable Manufacturer:
.1 Don-Jo, Pull Plate 7137 and CFC7115.

.5 Door bottom seal: heavy duty door seal of extruded aluminum frame and solid closed cell neoprene seal, surface mounted, closed ends, adjustable automatic retract mechanism when door is open, clear anodized finish.
.1 Acceptable Product: "KNC", CT-52, Heavy Duty Surface mounted, clear anodized aluminum & neoprene seal or approved equal.

.6 Thresholds: 150 mm wide x full width of door opening, extruded aluminum, serrated surface.

.7 Door Stops: Floor Mounted Door Stops
.1 Acceptable Manufacturer:
.1 "Hagar" 243F, Light duty dome stop – High, or approved equal.

.8 Weatherstripping:
.1 Head and jamb seal:
.1 Extruded aluminum frame and hollow closed cell neoprene insert, clear anodized finish.
.2 Adhesive backed neoprene material.

2.3 FASTENINGS

.1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.

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

.3 Exposed fastening devices to match finish of hardware.

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

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

2.4 KEYING

.1 Doors, locks to be keyed as directed by Departmental Representative.

.2 Provide keys in duplicate for every lock in this Contract.

.3 Provide three masterkeys for each MK or GMK group.

.4 Stamp keying code numbers on keys and cylinders.

.5 Provide construction cores.

.6 Provide all permanent cores and keys to Departmental Representative.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

.2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.3 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 INSTALLATION

.1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

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

.3 Install key control cabinet.

.4 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

.5 Remove construction cores when directed by Departmental Representative; install permanent cores and check operation of locks.

3.3 ADJUSTING

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

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

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

3.4 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.

.3 Remove protective material from hardware items where present.

.4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1,1 RELATED SECTIONS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 08 11 00 – Metal Doors and Frames

.3 Section 09 03 51 – Historic – Plaster

.4 Section 09 22 16 – Non-Structural Metal Framing

.5 Section 09 30 13 – Ceramic Tiling

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)
.1 ASTM C 36/C36M-01, Specification for Gypsum Wallboard.
.2 ASTM C 79/C79M-01, Standard Specification for Treated Core and Non-treated Core Gypsum Sheathing Board.
.3 ASTM C 442/C442M-01, Specification for Gypsum Backing Board, Gypsum Coreboard, and Gypsum Shaftliner Board.
.4 ASTM C 475-01, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
.5 ASTM C 514-01, Specification for Nails for the Application of Gypsum Board.
.6 ASTM C 630/C630M-01, Specification for Water-Resistant Gypsum Backing Board.
.7 ASTM C 840-01, Specification for Application and Finishing of Gypsum Board.
.9 ASTM C 954-00, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
.10 ASTM C 1002-01, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
.11 ASTM C 1047-99, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
.12 ASTM C 1280-99, Specification for Application of Gypsum Sheathing Board.
.13 ASTM C 1177-01, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
.14 ASTM C 1178/C1178M-01, Specification for Glass Mat Water-Resistant Gypsum Backing Board.

.2 Association of the Wall and Ceilings Industries International (AWEI)

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-51.34-M86 R1988, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.4 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S102-1988 R2000, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.

.3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.4 SITE ENVIRONMENTAL REQUIREMENTS

.1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

.3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

1.5 SAMPLES

.1 Submit samples in accordance with Section 00 10 00.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Standard board: to ASTM C 36/C36M regular, Type X, 16 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges squared.

.2 Glass-mat Moisture Resistant Board:
To ASTM D3273, ASTM C1658, and ASTM C1177, 16 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges squared.

.3 Cement Backer Board:
To ASTM C473, ASTM D3273 and ASTM C627, 16 mm thick, 1200 mm wide x maximum practical length, edges squared.

.4 Insulating strip: rubberized, moisture resistant, closed cell neoprene strip, 50 mm wide.

.5 Casing beads, corner beads, control joints and “J-Trim” edge trim: to ASTM C 1047, zinc-coated zinc-coated by electrolytic process, 0.5 mm base thickness, perforated flanges, one piece length per location.

.6 Joint compound: to ASTM C 475, asbestos-free and as recommended by manufacturer.

.7 Tape: as recommended by manufacturer.

PART 3 - EXECUTION

3.1 ERECTION

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

.2 Do application of gypsum sheathing in accordance with ASTM C 1280.

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

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

.5 Install work level to tolerance of 1:1200.

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

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

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

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

.10 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.11 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.12 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.2 APPLICATION

.1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.

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

.3 Apply single layer gypsum board to concrete or terracotta block surfaces, where indicated, using screw fasteners.

.4 Install gypsum board with face side out.

.5 Do not install damaged or damp boards.

3.3 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated.

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

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

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

.7 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
.1 Level 5 (at all areas not concealed by ceramic tile finish): Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.

.8 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.

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

.10 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

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

.12 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.

.13 Mix joint compound slightly thinner than for joint taping.

.14 At areas not concealed by ceramic tile finishes, apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.

.15 Allow skim coat to dry completely.

.16 Remove ridges by light sanding or wiping with damp cloth.

.17 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 06 10 100 – Rough Carpentry.

.2 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
.1 ASTM C 645-07, Specification for Nonstructural Steel Framing Members.
.2 ASTM C 754-15, Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.2 Canadian General Standards Board (CGSB).
.1 CAN/CGSB-1.40-97, Primer, Structural Steel, Oil Alkyd Type.

1.3 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Non-load bearing channel stud framing: to ASTM C 645, 64 mm, 92 mm, 152 mm stud size, roll formed from 0.91 mm (20 gauge) thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.

.2 Floor and ceiling tracks: to ASTM C 645, in widths to suit stud sizes, 32 mm flange height.

.3 Metal channel stiffener: 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.

.4 Insulating strip: rubberized, moisture resistant 3 mm thick lengths as required.

PART 3 - EXECUTION

3.1 ERECTION

.1 Align partition tracks at floor and ceiling and secure at 300 mm on centre maximum.

.2 Install damp proof course under stud shoe tracks of partitions on slabs on grade.

.3 Place studs vertically at 355 mm (14”) on centre and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

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

.5 Attach studs to bottom and ceiling track using screws.

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

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

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

.9 Install heavy gauge single jamb studs at openings.

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

.11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

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

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

.14 Extend partitions to ceiling height except where noted otherwise on drawings.

.15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use 50 mm leg ceiling tracks.

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

3.2 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Portland Cement plaster repair work.

1.2 RELATED SECTIONS

.1 Section 06 10 11 – Rough Carpentry.

.2 Section 09 91 23 – Interior Painting.

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM International)
- .1 ASTM C206-14, Specification for Finishing Hydrated Lime.
- .2 ASTM C150-15, Standard Specification for Portland Cement.
- .3 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.
- .4 ASTM C897-15, Standard Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters.
- .5 ASTM C926-16, Standard Specification for Application of Portland Cement-Based Plaster.
- .6 ASTM C1059-13, Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- .7 ASTM C1583-13, Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method).

.2 Canadian Standards Association (CSA International)
- .1 CAN/CSA-A3000-98, Cementitious Materials Compendium.

.3 CAN/CSA-A5-98, Portland Cement. CAN/CSA-A82.57-M1977 Inorganic aggregates for use in interior plaster.

.4 Association of Wall and Ceiling Contractors (AWCC):
- .1 Association of Wall and Ceiling Contractors Specification Standards Manual", 2003 Edition, Section 9.3 – Stucco (AWCC Manual).

1.4 QUALITY ASSURANCE

.1 Qualifications: Work to be undertaken by skilled personal with a minimum 5 years' experience, references to be made available upon request.

.2 Mock-up: construct mock-up in accordance with Section 00 10 00.

.3 Before application of plaster, at location designated by Departmental Representative, prepare 1 m^2 representative sample plastering coat.

.4 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with plaster work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle in accordance with the provision of Section 00 10 00.

.2 Ensure bagged materials are delivered to site and stored in original containers.

.3 Ensure loose material is delivered, clean, and stored to prevent contamination by foreign material.

.4 Protect material from damage by moisture and freezing.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Do plaster work when ambient temperature is between 13° C and 21° C under conditions specified in ASTM C 842.

.2 Ventilate to facilitate proper application and curing of plaster.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Metal Lath: Use galvanized, metal lath to ASTM C 841 of type and weight to suit plaster system and support spacing.

.2 Hydrated Lime: to ASTM C 206.

.3 Cement: to CAN/CSA-A3000.

.4 Portland Cement: to CAN/CSA-A3000.

.5 Bonding Adhesive: to ASTM C1059.

.6 Sand: to ASTM C 35. Clean, sharp, free from deleterious matter.

.7 Water: potable, free of substances that would affect set of plaster.

2.2 MIXES

.1 Mix plaster in accordance with CAN/CSA-A82.57-M1977.

.2 Accurately maintain measuring proportions from batch to batch.

.3 Have materials batch mixed.

.4 Keep mixing tools and bins free of hardened residue.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Examine existing plaster surfaces and methods of reproducing finish.

3.2 PROTECTION

.1 Protect any fittings and surfaces adjacent to work by covering or masking.

3.3 PREPARATION

1 Ensure that all existing wall surfaces are sound and solid before beginning repairs. Remove loose, unsound or flaking plaster on walls at windows which has been damaged by water or as a result of construction.

.2 Install wire lath in large holes as required.

.3 Before repairing, coat all existing plaster surfaces with "Plaster-Weld" by Larsen Products Corp or "Plaster Bonder" by United States Gypsum Co to prevent re-hydration of plaster.

.4 Fill all depressions and cracks as noted above to obtain a suitable base for new finishes. Completed installation to be smooth, level or plumb, free from waves and other defects.

.5 Do not repair plaster until adjacent finished work has been masked or protected from damage in a suitable manner.

.6 Ensure ground, screeds, beads and accessories are in place and conduits, pipes, cables and outlets are properly plugged, capped or covered before commencing work.

.7 Where plaster butts exposed masonry walls, insert 1 m (3’-3”) wide strip of polyethylene before applying plaster to protect masonry. Cut polyethylene neatly at junction with plaster when plastering completed.

.8 Apply adhesives to bond new plaster with existing.

3.4 INSTALLATION

.1 Repair of metal lath.
.1 Remove and replace lath, as required, with new metal lath.

.2 Use bonding agents on masonry.

3.5 APPLICATION

.1 Ensure that plaster finish follows surface irregularities to maintain authenticity of original work.

.2 Do plaster work to ASTM C 842, unless otherwise specified.

.3 Base Coat:
.1 Apply first coat, with trowel, using sufficient pressure to force it between gaps of lath. Ensure even surface.
.2 Scratch surface with broom when initial set is obtained (2-4 days).
.3 Keep base coat damp for 3 days.
.4 Cure base coat 10 days in ventilated surroundings.

.4 Intermediate scratch coat:
.1 Wet base coat 2 hours before application of scratch coat.
.2 Apply scratch coat.
.3 Keep scratch coat damp for 2 days.
.4 Cure 6 days.

.5 Finish coat:
.1 Wet intermediate coat thoroughly.
.2 Apply finish coat to 3 mm thickness minimum.
.3 Smooth finish coat with wood trowel to achieve desired texture and appearance.
.4 Trowel patch work to smooth surface, even with adjacent work.

3.6 CLEANING

.1 Remove droppings and splashings, immediately, using clean sponge and water.

3.7 PROTECTION

.1 Protect finished adjoining work, during execution of plaster work, with polyethelene sheets or building paper.

.2 Remove surplus material, tools, equipment and debris from work area on completion of work.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 07 92 10 - Joint Sealing.

.2 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
.1 ANSI A108.1-2013, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
.2 CTI A118.3-2013, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
.3 CTI A118.4-2012, Specification for Latex Portland Cement Mortar (included in ANSI A108.1).
.4 CTI A118.6-2010, Specification for Ceramic Tile Grounts (included in ANSI A108.1).

.2 American Society for Testing and Materials (ASTM International) International
.1 ASTM C 144-2004, Specification for Aggregate for Masonry Mortar.

.3 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.4 Canadian Standards Association (CSA International)
.1 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A5-98, A8-98, A23.5-98, A362-98, A363-98, A456.1-98, A456.2-98, A456.3-98).

.5 Terrazzo Tile and Marble Association of Canada (TTMAC)
.1 Tile Specification Guide 093000, Tile Installation Manual.
.2 Tile Maintenance Guide.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 00 10 00

.2 Include manufacturer's information on:
.1 Ceramic tile, marked to show each type, size, and shape required.
.2 Chemical resistant mortar and epoxy grout.
.3 Transition strip.
.4 Flexible membrane.
.5 Leveling compound.
.6 Adhesives.

1.4 SAMPLES

.1 Submit samples in accordance with Section 00 10 00

.2 Wall tile: submit duplicate sample panels of each colour, size.

.3 Floor tile: submit duplicate sample panels of each colour.

.4 Transition and reducer strips: each type and profile.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in containers with labels legible and intact and grade-seals unbroken.

.2 Store material so as to prevent damage or contamination.

.3 Store materials in a dry area, protected from freezing, staining and damage.

.4 Store cementitious materials on a dry surface.

1.6 ENVIRONMENTAL CONDITIONS

.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 ° C for 48 h before, during, and 48 h after, installation.

.2 Do not install tiles at temperatures less than 12 ° C or above 38 ° C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 ° C or above 25 ° C.

1.7 EXTRA MATERIAL

.1 Provide maintenance materials in accordance with Section 00 10 00.

.2 Provide minimum 5% of each type and colour of tile required for project for maintenance use. Store where directed.

.3 Maintenance material to be of same production run as installed material.

PART 2 - PRODUCTS

2.1 FLOOR TILE

.1 Ceramic mosaic tile: to CAN/CGSB-75.1, Type 2, Class MR 1, 50 x 50 mm size, slip resistant surface, Matching coved base, 150 mm high.

.2 Acceptable Material:

.1 CMT-1: Olympia Quebec Series / “Anthracite” Unglazed.

2.2 WALL TILE

.1 Ceramic tile: to CAN/CGSB-75.1, Type 5, Class MR 1, matt glazed surface.

.2 Acceptable Material:
.1 CT-1: By Olympia Yura New Series – Lead Grey, Size: 300 x 600 mm.

2.3 THIN SET MORTAR AND ADDITIVES

.1 Acceptable Material:
.1 Thin-Set Mortar:
.1 Flextile 51 as manufactured by Flextile Ltd.
.2 Additive:
.1 Flextile 44 as manufactured by Flextile Ltd.

.2 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.4 BOND COAT

.1 Latex Portland Cement mortar: to ANSI A108.1, two-component universal dry-set mortar.

2.5 WATERPROOFING SYSTEM

.1 Flexible, load-bearing waterproofing system which consists of an elastomeric latex compound with a reinforcing fabric.

.2 Acceptable Material:
.1 Flextile WP-980 as manufactured by Flextile Ltd.

2.6 GROUT

.1 Chemical-Resistant Grout:
.1 Epoxy grout: to ANSI A108.1, having quality, colour and characteristics to match epoxy bond coat. Adhesive and grout by same manufacturer.
.2 Colour: Silver Grey.
.3 Acceptable Material:
.1 Two component flex-epoxy 100 as manufactured by Flextile Ltd.

2.7 ACCESSORIES

.1 Transition and Reducer Strips: purpose made metal anodized aluminum type.
.1 At wall or floor tile termination or transition between dissimilar finishes use anodized aluminum profiles manufactured by Schluter Systems Inc.
.1 Floor transition between dissimilar materials: Schluter – Schiene or approved equal
.2 Wall outside corner: Schluter – Quadec.

.3 Wall termination: Schluter – Jolly.
.4 Floor transition between dissimilar materials – Schluter – Reno-TK.
.5 Floor expansion/control joint: Schluter – Dilex – BWS.
.6 Top of ceramic tile base: Schluter – Jolly.

.2 Sealant: in accordance with Section 07 92 10 - Joint Sealing.

.3 Thresholds: marble, 16 mm thick, bevelled one side, honed finish to exposed surfaces, 100 mm wide as indicated.

2.8 MIXES

.1 Portland Cement:
.1 Scratch coat: 1 part portland cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand, 1 part water, [and latex additive where required]. Adjust water volume depending on water content of sand.
.2 Slurry bond coat: portland cement and water mixed to creamy paste. Latex additive may be included.
.3 Mortar bed for floors: 1 part portland cement, 4 parts sand, 1 part water. Adjust water volume depending on water content of sand. Include Latex additive.
.4 Mortar bed for walls: 1 part portland cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand and 1 part water. Adjust water volume depending on water content of sand. Include Latex additive.
.5 Levelling coat: 1 part portland cement, 4 parts sand, minimum 1/10 part latex additive, 1 part water including latex additive.
.6 Bond or setting coat: 1 part portland cement, 1/3 part hydrated lime, 1 part water.
.7 Measure mortar ingredients by volume.

.2 Dry set mortar: mix to manufacturer's instructions.

.3 Organic adhesive: pre-mixed.

.4 Mix bond and levelling coats, and grout to manufacturer's instructions.

.5 Adjust water volumes to suit water content of sand.

2.9 PATCHING AND LEVELING COMPOUND

.1 Polymer modified, cementitious self-levelling underlayment, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
.2 Have not less than the following physical properties:
.1 Compressive strength – 33.1 MPa (@ 28 days).
.2 Density - 1.9 (Wet).

.3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.

.4 Ready for use in 4 hours after application.

.5 Acceptable Material:
.1 59 Flex-Flo self-levelling underlayment as manufactured by Flextile Ltd.
.2 Primer: Flextile 4040 as manufactured by Flextile Ltd.

2.10 CLEANING COMPOUNDS

.1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

.2 Materials containing acid or caustic material are not acceptable.

PART 3 - EXECUTION

3.1 WORKMANSHIP

.1 Do tile work in accordance with TTMAC Tile Installation Manual, "Ceramic Tile", except where specified otherwise.

.2 Apply tile to clean and sound surfaces.

.3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.

.4 Maximum surface tolerance 1:800.

.5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.6 Lay out tiles so perimeter tiles are minimum 1/2 size.

.7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.8 Make internal angles square.

.9 Use transition strip at termination of wall tile panels.

.10 Install transition or reducer strips at junction of tile flooring and dissimilar materials.

.11 Allow minimum 24 h after installation of tiles, before grouting.

.12 Clean installed tile surfaces after installation and grouting cured.

.13 Install waterproofing system under floor tiles and on walls up to 300 mm above top of floor.

.14 Install self-levelling underlayment under floor tiles.

3.2 WALL TILE

.1 In shower stalls and as indicated install CT-1 tiles in full height of all shower walls and to underside of ceiling.

.2 In washrooms as indicated, install CT-2 tiles Wainscot up to 1100 mm above finish floor and full height of walls and to underside of ceiling at urinals and where indicated.

3.3 FLOOR TILES

.1 Install mosaic floor tiles type CMT-1 in all shower rooms.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Related Sections:
.1 Section 09 53 00.01 - Acoustical Suspension.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C 423-09a, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
.2 ASTM E 1264-14, Standard Classification for Acoustical Ceiling Products.
.3 ASTM E 1477-98a(2013), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction and Amendment No. 1 1988.
.2 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.

.3 Canadian Standards Association (CSA International)
.1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.4 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
.2 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

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

.6 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC-S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SUBMITTALS

.1 Submit samples in accordance with Section 00 10 00.

.2 Submit duplicate 6” x 6” samples of each type acoustical units.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Store extra materials required for maintenance, where directed by Departmental Representative.

1.5 ENVIRONMENTAL REQUIREMENTS

.1 Permit wet work to dry before beginning to install.

.2 Maintain uniform minimum temperature of 15 degrees C and humidity of 20 - 40 % before and during installation.

.3 Store materials in work area 48 hours prior to installation.

1.6 EXTRA MATERIALS

.1 Provide extra materials of acoustic units in accordance with Section 00 10 00.

.2 Provide acoustical units amounting to 4% of gross ceiling area for each pattern and type required for project.

.3 Ensure extra materials are from same production run as installed materials.

.4 Clearly identify each type of acoustic unit, including colour and texture.

.5 Deliver to Departmental Representative, upon completion of the work of this section.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Acoustic units for suspended ceiling system]: to CAN/CGSB-92.1, ASTM E 1264.
- .1 Type XX.
- .2 Class A.
- .3 Wet formed ceramic and mineral fiber composite.
- .4 Pattern CE, Class A.
- .5 Textures: fine fissured.
- .6 Flame spread rating of 25 or less in accordance with CAN/ULC-S102.
- .7 Smoke developed 50 or less in accordance with CAN/ULC-S102.
- .8 Noise Reduction Coefficient (NRC) designation of 0.55.
- .9 Ceiling Attenuation Class (CAC) rating 40, in accordance with ASTM E 1264
- .10 Light Reflectance (LR) range of 0.82 to ASTM E 1477.
- .11 Edge type square edge.
- .13 Colour white.
- .14 Size 610 mm x 1220 mm x 16 mm thick.
- .15 Shape flat.
- .16 Sag resistant.
- .17 Anti-mold and mildew.
- .18 Acceptable Material:
  - .1 Ceramaguard – Fine Fissured by Armstrong.

PART 3 - EXECUTION

3.1 EXAMINATION	.1	Do not install acoustical panels and tiles until work above ceiling has been inspected by Departmental Representative.
3.2 INSTALLATION	.1	Install acoustical panels and tiles in ceiling suspension system.
3.3 INTERFACE WITH OTHER WORK	.1	Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.
3.4 EXISTING CEILINGS	.1	Where existing ceilings are affected by new work, remove ceilings as required and reinstall using undamaged existing components. Replace damaged components with new matching components.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 09 51 13 – Acoustical Panel Ceilings

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International)
.1 ASTM C 635-07, Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
.2 ASTM C 636-13, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

1.3 DESIGN REQUIREMENTS

.1 Maximum deflection: 1/360th of span to ASTM C 635 deflection test.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 00 10 00.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Intermediate duty system to ASTM C 635.

.2 Basic materials for suspension system: commercial quality cold rolled steel zinc coated.

.3 Suspension system: non fire rated, made up as follows:
.1 two directional exposed tee bar grid.
.1 Acceptable material:
.1 Bailey Metal Products Ltd.: Exposed two directional Tee Grid System.
.2 Donn DX, Suspension System by CGC Inc.
.3 Prelude XL, Exposed Tee System by Armstrong.

.4 Exposed tee bar grid components: shop painted satin sheen white. Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.

.5 Hanger wire: galvanized soft annealed steel wire.
.1 3.6 mm diameter for access tile ceilings.
.2 to ULC design requirements for fire rated assemblies.
.3 2.6 mm diameter for [other] ceilings.

.6 Hanger inserts: purpose made.

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

.2 Install suspension system to manufacturer's instructions and Certification Organizations tested design requirements.

.3 Do not erect ceiling suspension system until work above ceiling has been inspected by Departmental Representative.

.4 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.

.5 Lay out system according to reflected ceiling plan.

.6 Ensure suspension system is co-ordinated with location of related components.

.7 Install wall moulding to provide correct ceiling height.

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

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

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

.11 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

.12 Finished ceiling system to be square with adjoining walls and level within 1:1000.

3.2 CLEANING

.1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Not Used

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM International)
.1 ASTM F 1913 Standard Specification for Vinyl Sheet Floor Covering Without Backing.
.2 ASTM D 2047, Standard Test Method for State Coefficient of Friction of Polish-Coated Flooring of 0.6 or greater.
.3 ASTM F 970, Standard Test Method for Static Load Limit – 250 PSI.
.4 ASTM E 648, Standard Test Method for Critical Radiant Flux of 0.45 watts/cm^2 or greater, Class I.

.2 Canadian Standards Association (CSA International)
.1 CAN/CSA-ISO 14040-06(r2011), Environmental Management - Life Cycle Assessment - Principles and Framework.

1.3 SAMPLES

.1 Submit samples in accordance with Section 00 10 00

.2 Submit duplicate 300 x 300 mm sample pieces of sheet material, 300 mm long base, edge strips.

1.4 CLOSEOUT SUBMITTALS

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

1.5 EXTRA MATERIALS

.1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 00 10 00

.2 Provide 1 m^2 of each colour, pattern and type flooring material required for project for maintenance use.

.3 Extra materials to be in one piece and from same production run as installed materials.

.4 Clearly identify each roll of sheet flooring and each container of adhesive.

.5 Deliver to Departmental Representative, upon completion of the work of this section.

.6 Store where directed by Departmental Representative.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Maintain air temperature and structural base temperature at flooring installation area above 20° for 48 hours before, during and 48 hours after installation.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Resilient Homogeneous Vinyl Sheet Flooring: to ASTM F 1913, without backing.
- .1 Colour: #864 – Concrete Slab.
- .2 Thickness: 2 mm.
- .3 Acceptable material: Optima as manufactured by Johnsonite Inc.

.2 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate.
- .1 Adhesive
  - .1 Acceptable Material: Johnsonite #975 Two-Part Urethane Adhesive.

.3 Sub-floor filler and leveller: Latex modified Portland Cement based.

.4 Sheet flooring joints to be heat-welded, with welding rods as supplied by manufacturer

.4 Metal edge strips:
- .1 Aluminum extruded, smooth, mill finish with lip to extend under floor finish.

.5 External corner protectors: type recommended by flooring manufacturer.

.6 Edging to floor penetrations: aluminum, type recommended by flooring manufacturer.

.7 Cove Base Filler Strip:
- .1 Acceptable Material: CFS-00-A Cove Filler Strip as manufactured by Johnsonite Inc.

.8 Transition and reducer trims, vinyl, colour to match sheet flooring, size and shape purpose-made. Acceptable Manufacturer: Bengard.

PART 3 - EXECUTION

3.1 SITE VERIFICATION OF CONDITIONS

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

3.2 PREPARATION

.1 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.

.3 Prime sub-floor to resilient flooring manufacturer's printed instructions.

.4 Prepare Substrates according to ASTM F 710 including the following:

.1 Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

.1 Perform anhydrous calcium chloride test, ASTM F 1869. Results must not exceed 5 lbs. Moisture Vapour Emission Rate per 1,000 sq. ft. in 24 hours.

-or-

.2 Perform relative humidity test using in situ probes, ASTM F 2170. Must not exceed 80%.

.2 A pH test for alkalinity must be conducted. Results should range between 7 and 9. If the test results are not within the acceptable range of 7 to 9, the installation must not proceed until the problem has been corrected.

.3 Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

3.3 APPLICATION: FLOORING

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

.2 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.

.3 Lay flooring with seams parallel to building lines to produce a minimum number of seams. Border widths minimum 1/3 width of full material.

.4 Run sheets in direction of traffic. Double cut sheet joints and continuously heat weld according to manufacturer's printed instructions.

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

.6 Cut flooring neatly around fixed objects.

.7 Terminate flooring at centreline of door in openings where adjacent floor finish.

.8 Install metal edge strips at top of cove base and vinyl transition or reducer trim at exposed edges where flooring terminates.

3.4 APPLICATION: BASE

.1 Cove Base: 200 mm high.

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

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

.4 Apply adhesive to back of base.

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

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

.7 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

.8 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.

.9 Use cove type base.

.10 Heat weld base in accordance with manufacturer's printed instructions, using welding rods as supplied by manufacturer.

3.5 CLEANING

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

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

3.6 PROTECTION

.1 Protect new floors from time of final set of adhesive.

.2 Prohibit traffic on floor for 48 hours after installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 05 50 00 – Metal Fabrications

.2 Section 06 10 00 – Rough Carpentry.

.3 Section 07 92 00 – Joint Sealants.

.4 Section 09 03 51 – Historic – Plaster

.5 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

.1 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.2 Environmental Protection Agency (EPA)
.1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 – 1993, (for Surface Coatings).

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

.4 Master Painters Institute (MPI)
.1 MPI Architectural Painting Specifications Manual, 2012.

.5 National Fire Code of Canada – 2010.

.6 Society for Protective Coatings (SSPC)
.1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

.7 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 QUALITY ASSURANCE

.1 Qualifications:
.1 Contractor: minimum of five years proven satisfactory experience. Provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.
.2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.
.3 Apprentices: working under direct supervision of qualified trades person in accordance with trade regulations.

.2 Mock-Ups:
.1 Construct mock-ups in accordance with Section 00 10 00.
.1 Provide 1000 mm x 1000 mm mock-up. Prepare and

paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.

.2 Mock-up will be used:

.1 To judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.

.3 Locate where directed.

.4 Allow 24 hours for inspection of mock-up before proceeding with work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may not remain as part of finished work.

.3 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 15 45.

1.4 SCHEDULING

.1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Paint occupied facilities in accordance with approved schedule. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

.3 Obtain written authorization from Departmental Representative for changes in work schedule.

.4 Schedule painting operations to prevent disruption of occupants.

.5 Painting should occur before absorptive materials/furnishings have been installed in the space.

1.5 WARNING

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

1.6 SUBMITTALS

.1 Submittals in accordance with Section 00 10 00.

.2 Product Data:

.1 Submit product data and instructions for each paint and coating product to be used.

.2 Submit product data for the use and application of paint thinner.

.3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 00 10 00.

.3 Samples:

.1 Submit full range colour sample chips to indicate where colour availability is restricted.

.2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:

.1 3 mm plate steel for finishes over metal surfaces.

.2 13 mm birch plywood for finishes over wood surfaces.

.3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.

.4 Test reports: submit certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.1 Lead, cadmium and chromium: presence of and amounts.

.2 Mercury: presence of and amounts.

.3 Organochlorines and PCBs: presence of and amounts.

.5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Manufacturer's Instructions:

.1 Submit manufacturer's installation and application instructions.

.7 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 00 10 00, include following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour number[s].

.4 MPI Environmentally Friendly classification system rating.

1.7 MAINTENANCE

.1 Extra Materials:

.1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 00 10 00.

.2 Quantity: provide one litre can of each type and colour of primer, stain, finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

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

1.8 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:
.1 Pack, ship, handle and unload materials in accordance with Section 00 10 00.

.2 Acceptance at Site:
.1 Identify products and materials with labels indicating:
.1 Manufacturer's name and address.
.2 Type of paint or coating.
.3 Compliance with applicable standard.
.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Storage and Protection:
.1 Provide and maintain dry, temperature controlled, secure storage.
.2 Store materials and supplies away from heat generating devices.
.3 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.

.5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

.7 Remove paint materials from storage only in quantities required for same day use.

.8 Fire Safety Requirements:
.1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.
.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

.9 Waste Management and Disposal:
.1 Separate waste materials for recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material for recycling in accordance with Waste Management Plan (WMP).
.4 Separate for recycling and place in designated containers waste in accordance with Waste Management Plan (WMP).

.5 Place materials defined as hazardous or toxic in designated containers.
.6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal Regulations.
.7 Ensure emptied containers are sealed and stored safely.
.8 Unused paint materials must be disposed of at official hazardous material collections site.
.9 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
.10 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
.11 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
.12 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
.1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
.4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
.5 Empty paint cans are to be dry prior to disposal or recycling (where available).
.13 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

.14 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by employees, or organizations for verifiable re-use or re-manufacturing.

1.9 SITE CONDITIONS

.1 Surface and Environmental Conditions:
.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
.3 Apply paint when previous coat of paint is dry or adequately cured.

.2 Additional interior application requirements:
.1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
.2 Apply paint in occupied facilities during silent hours only.

Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Provide paint materials for paint systems from single manufacturer.

.3 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.

.4 Conform to latest MPI requirements for interior painting work including preparation and priming.

.5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.

.6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

.7 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.

.8 Use MPI listed materials having minimum E2 rating where indoor air quality (odour) requirements exist.

.9 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
.1 Water-based.
.2 Non-flammable.
.3 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
.4 Manufactured without compounds which contribute to smog in the lower atmosphere.
.5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

.10 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

.11 Flash point: 61.0 degrees C or greater for water-borne surface coatings and recycled water-borne surface coatings.

.12 Ensure manufacture and process of both water-borne surface coatings and recycled water-borne surface coatings does not release:
.1 Matter in undiluted production plant effluent generating 'Biochemical Oxygen Demand' (BOD) in excess of 15mg/L to natural watercourse or sewage treatment facility lacking secondary treatment.
.2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15mg/L to natural watercourse or a sewage treatment facility lacking secondary treatment.

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

.14 Recycled water-borne surface coatings must not contain:
.1 Lead in excess of 600.0 ppm weight/weight total solids.
.2 Mercury in excess of 50.0 ppm weight/weight total product.
.3 Cadmium in excess of 1.0 ppm weight/weight total product.
.4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.
.5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

2.2 MIXING AND TINTING

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

.2 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

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

2.3 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

Gloss Level	Description	Units @ 60 degrees	Units @ 85 degrees
G1	Matte or Flat finish	0 to 5	10 maximum
G2	Velvet finish	0 to 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	35 minimum
G5	Semi-Gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
G7	High-Gloss finish	>85	

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

2.4 INTERIOR PAINTING SYSTEMS

.1 Concrete vertical and horizontal (soffits) surfaces:
.1 INT 3. 1A – Two coats Latex over one coat of Latex primer.
.1 Satin Finish: Horizontal (soffits)
.2 Semi-Gloss Finish: Vertical

.2 Concrete masonry units:
.1 INT 4.2A – Two coats Latex finish over one coat of Latex primer.
.1 Semi-Gloss Finish

.3 Ferrous Metal Surfaces:
.1 INT 5.1B – Two coats Waterborne light industrial coating over one coat of Alkyd primer.
.1 Semi-Gloss Finish.

.4 Galvanized metal:
.1 INT 5.3C – Two coats Alkyd over one coat of galvanized primer.
.1 Semi-Gloss Finish.

.5 Plaster and gypsum board:
.1 INT 9.2A – Two coats Latex over one coat of Latex primer.
.1 Semi-Gloss finish

.6 Interior Unpainted Wood:
.1 INT 6.3B – Two coats alkyd over one coat of alkyd primer.
.1 Semi-Gloss finish

2.5 SOURCE QUALITY CONTROL

.1 Perform following tests on each batch of consolidated post-consumer material before surface coating is reformulated and canned. Testing by laboratory or facility which has been accredited by Standards Council of Canada.
.1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
.2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
.3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

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 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative, damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

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

.3 Maximum moisture content as follows:
.1 Stucco, plaster and gypsum board: 12%
.2 Concrete: 12%
.3 Clay and Concrete Block/Brick: 12%
.4 Wood: 15%

3.4 PREPARATION

.1 Protection:
.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
.2 Protect items that are permanently attached such as Fire Labels on doors and frames.
.3 Protect factory finished products and equipment.
.4 Protect building occupants and general public in and about the building.

.2 Surface Preparation:
.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
.3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in

regard to specific requirements and as follows:
.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths.
.2 Wash surfaces with a biodegradable detergent and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
.4 Allow surfaces to drain completely and allow to dry thoroughly.
.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
.6 Use trigger operated spray nozzles for water hoses.
.7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

.4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
.1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
.2 Apply wood filler to nail holes and cracks.
.3 Tint filler to match stains for stained woodwork.

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

.7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes or vacuum cleaning.

.8 Touch up of shop primers with primer as specified.

3.5 APPLICATION

.1 Apply paint by brush, roller. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:
.1 Apply paint in uniform layer using brush and/or roller type suitable for application.
.2 Work paint into cracks, crevices and corners.
.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
.5 Remove runs, sags and brush marks from finished work and repaint.

.3 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

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

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

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

.7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

3.6 MECHANICAL/ ELECTRICAL EQUIPMENT

.1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.

.2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.3 Do not paint over nameplates.

.4 Keep sprinkler heads free of paint.

.5 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

3.7 SITE TOLERANCES

.1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
.2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.8 CLEAN-UP

.1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

.2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.

.3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

.4 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinner, paint removers/strippers in accordance with the safety requirements of authorities having jurisdiction and as noted herein.

.5 Painting equipment shall be cleaned in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations shall be recycled or disposed of in a manner acceptable to authorities having jurisdiction.

.6 Paint and coatings in excess of repainting requirements shall be recycled as noted herein.

3.9 RESTORATION

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

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

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

.4 Protect freshly completed surfaces from paint droppings and dust. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 10 21 16 - Shower and Dressing Compartments.

.2 Section 10 28 10 - Toilet And Bath Accessories.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
.1 ASTM A 167-R2009, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
.2 ASTM A 240/A240M-R15B, Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
.3 ASTM A 480/A480M-12, Specification for General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.
.4 ASTM A 653/A653M-2015, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB).
.1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
.2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel Air Drying and Baking.
.3 CAN/CGSB-1.104M-91, Semigloss Alkyd, Air Drying and Baking Enamel.

.3 Canadian Standards Association (CSA International).
.1 CAN/CSA-B651-12, Barrier-Free Design.

1.3 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 00 10 00

.2 Shop Drawings:
.1 Submit shop drawings in accordance with Section 00 10 00
.2 Indicate fabrication details, plans, elevations, hardware, and installation details.

.3 Samples:
.1 Submit samples in accordance with Section 00 10 00

.4 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Metal toilet partitions and urinal screens.

.2 Sheet steel: commercial quality to ASTM A653 GR33 designation zinc coating.

.3 Minimum base steel thickness:
- .1 Panels and doors: 0.8 mm.
- .2 Pilasters: 0.9 mm.
- .3 Reinforcement: 3.0 mm.

.4 Toilet Partitions:
- .1 Doors 1460 mm high.
- .2 Stiles 2083 mm high.

.5 Urinal Screens:
- .1 457 mm x 1067 mm high.

.6 Headrails: 25 mm x 41 mm x 1.5 mm thick, clear anodized, extruded aluminum, anti grip design.

.7 Pilaster shoe: 0.8 mm stainless steel 100 mm high.

.8 Attachment: stainless steel tamperproof type screws and bolts.

.9 Acceptable Manufacturer:
- .1 Hadrian Manufacturing Inc.

2.2 COMPONENTS

.1 Hinges:
- .1 Heavy duty,self-lubricating sleeve, fully concealed, mounted on upper and lower pilaster hinge brackets.
- .2 Material/finish: stainless steel.
- .3 Swing: as indicated.
- .4 Return movement: gravity.
- .5 Emergency access feature.

.2 Latch set: surface mounted, combination latch, combination door-stop, keeper and bumper, chrome plated non-ferrous, emergency access feature.

.3 Wall and connecting brackets: chrome plated non-ferrous extrusion or casting.

.4 Coat hook: combination hook and rubber door bumper, chrome plated non-ferrous.

.5 Door pull: Barrier-free type, stainless steel.

2.3 FABRICATION

.1 Doors and screens: 25 mm thick, two steel sheets faces pressure bonded to honeycomb core, 1460 mm high.

.2 Pilasters: 32 mm thick, constructed same as door, 2083 mm high.

.3 Provide formed and closed edges for doors, panels and pilasters. Miter and weld corners and grind smooth.

.4 Provide internal reinforcement at areas of attached hardware and fittings. Temporarily mark location of reinforcement for tissue holders and grab bars.

.5 Provide 0.8 mm thick type 316 stainless steel protective shields on urinal side of toilet partition panels next to urinals and on urinal screens. Make protective shields 1000 mm high with top of shield 1200 mm above finished floor. Make shields to full width of partition or screen panel. Fasten with stainless steel screws.

2.4 FINISHES

.1 Clean, degrease and neutralize steel components with phosphate or chromate treatment.

.2 Spray apply primer to CAN/CGSB-1.81, 1 coat.

.3 Spray apply finish enamel to CAN/CGSB-1.88, type 2 gloss, 2 coats and bake to smooth, hard finish 0.025 mm thick.

.4 Finish: doors and pilaster/panels same colour as selected from manufacturer's standard colours: 535 Light Grey.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Ensure supplementary anchorage, if required, is in place.

.2 Do work in accordance with CAN/CSA-B651.

3.3 ERECTION

.1 Partition erection.

.1 Install partitions secure, plumb and square.

.2 Leave 12 mm space between wall and panel or end pilaster.

.3 Anchor mounting brackets to masonry/concrete surfaces using screws and shields: blocking/backing must be provided, to hollow masonry walls using bolts and toggle type anchors.

.4 Attach panel and pilaster to brackets with through type sleeve bolt and nut.

.5 Provide for adjustment of floor-braced pilasters variations with screw jack through steel saddles made integral with pilaster. Conceal floor fixings with stainless steel shoes.

.6 Equip doors with hinges, latch set, and each stall with coat hook mounted on partition wall, mounting heights 1200 mm. Adjust and align hardware for easy, proper function. Set door open position at 30 degrees to front. Install door bumper door mounting.

.7 Equip outswinging doors with door pulls on inside and outside of door in accordance with CAN/CSA-B651.

.8 Install hardware grab bars in barrier-free stalls..

.2 Floor supported and overhead braced partition erection.

.1 Attach pilasters to floor with pilaster supports and level, plumb, and tighten installation with levelling device.

.1 Secure pilaster shoes in position.

.2 Secure headrail to pilaster face with not less than two fasteners per face.

.3 Set tops of doors parallel with overhead brace when doors are in closed position.

.2 Floor supported partition erection.

.1 Secure pilasters to floor with pilaster supports anchored with minimum 50 mm penetration in structural floor.

.2 Level, plumb and tighten installation with levelling device.

.3 Secure pilaster shoes in position.

.4 Set tops of doors level with tops of pilasters when doors are in closed position.

.3 Screens erection:

.1 Provide urinal stall screens consisting of panel and post.

.2 Anchor wall-hung screen panels to walls with 3 panel brackets and wing brackets and vertical upright consisting of tubular headrail stock and end sockets anchored to floor.

3.4 ADJUSTING

.1 Adjust doors and locks for optimum, smooth operating condition.

.2 Lubricate hardware and other moving parts.

3.5 CLEANING

.1 Perform cleaning after installation to remove construction and

accumulated environmental dirt.

.2 Clean surfaces after installation using manufacturer's recommended cleaning procedures.

.3 Clean aluminum with damp rag and approved non-abrasive cleaner.

.4 Clean and polish hardware and stainless components.

.5 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 05 50 00 - Metal Fabrications.

.2 Section 09 21 16 - Gypsum Board Assemblies.

.3 Section 09 30 13 - Ceramic Tiling.

.4 Section 10 21 13.13 – Metal Toilet Compartments.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).
.1 ASTM A 167-(R2009), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
.2 ASTM A 653/A653M-2015, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.3 ASTM A 924/A924M-14e1, Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB).
.1 CAN/CGSB-1.36-[97], General Purpose Interior Alkyd Varnish.
.2 CAN/CGSB-71.20-[M88], Adhesive Contact Brushable.
.3 CAN/CGSB-1.81-[M90], Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
.4 CAN/CGSB-1.88-[92], Gloss Alkyd Enamel Air Drying and Baking.
.5 CAN/CGSB-1.104-[91], Semigloss Alkyd Air Drying and Baking Enamel.

.3 Canadian Standards Association (CSA International).
.1 CAN/CSA-B651, Barrier-Free Design.

.4 National Electrical Manufacturers' Association (NEMA).
.1 NEMA LD-3.

1.3 SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 00 10 00

.2 Shop Drawings:
.1 Submit shop drawings in accordance with Section 00 10 00
.2 Indicate fabrication details, plans, elevations, hardware, and installation details.

.3 Samples:
.1 Submit samples in accordance with Section 00 10 00
.2 Submit duplicate 300 x 300 mm samples of panel showing finishes, edge and corner construction and core construction.

.4 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Shower and dressing compartments.

.2 Acceptable Manufacturer: Bobrick Duraline Series.

.3 Compact Laminate (Solid Phenolic) Dressing Compartments and Shower Dividers:
.1 Gap-Free interlocking design.
.2 Stiles Mounting Configuration:
.1 Floor-mounted, overhead-braced with satin finish, extruded anodized aluminum headrails, 1.65 mm thick with anti-grip profile.
.1 Stile Height: 2110 mm

.4 Materials: Solidly fused plastic laminate with matte-finish melamine surfaces; integrally bonded coloured face sheets and black phenolic-resin core.

.5 Edges: Black; brown edges not acceptable.

.6 Colour: 949-58 White

.7 Fire Resistance:
.1 Natoinal Fire Protection Association/International Building Code Interior Wall and Ceiling Finish: Class B / Uniform Building Code: Class II.

.8 Finished Thickness:
.1 Stiles 19 mm.
.2 Panels 13 mm.

.9 Stiles: Floor-anchored stiles furnished with expansion shields and threaded rods.
.1 Levelling Devices: 7 gauge, 5 mm thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 10 mm diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.
.2 Stile Shoes: One-piece, 22 gauge (0.8 mm), 18-8, Type 304

stainless steel, 102 mm height; tops with 90 degrees return to stile. One-piece shoe capable of adapting to 19 mm or 1 inch (25 mm) stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

.10 Wall Posts: Pre-drilled for hardware, 18-8, Type 304, 16 gauge (1.6 mm) stainless steel with satin finish; 25 mm x 38 mm.

.11 Anchors: Expansion shields and threaded rods at floor connections as applicable.

.12 Hardware:

.1 Fastening: Hardware secured to door and stile by through-bolted, theft-resistant, pin-in-head Torx stainless steel machine screws into factory installed, threaded brass inserts. Fasteners secured directly into core not acceptable.

.1 Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 680 kg per insert.

.2 Clothes Hooks: Projecting no more than 29 mm from face of door.

.8 Fittings:

.1 Standard, commercial hardware.

.1 Mounting Brackets: Mounted inside compartment; exposed brackets on exterior of compartment not acceptable with the exception of outswing doors.

.2 Institutional Hardware

.1 Mounting Brackets: 16 gauge (1.2 mm) stainless steel and extend full height of panel.

.2 U-Channels: Secure panels to stiles.

.3 Angle Brackets: Secure stiles-to-walls and panels to walls.

2.2 FINISHES

.1 Clean, degrease and neutralize steel components with phosphate or chromate treatment.

.2 Finish: pilaster/panels same colour.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Ensure supplementary anchorage, is in place.

.2 Do work in accordance with Manufacturer's written instructions.

3.3 ERECTION

.1 Partition erection.
.1 Install partitions secure, plumb and square.
.2 Gap-free Installation between wall and panel or end pilaster.
.3 Anchor mounting brackets to masonry-concrete surfaces using screws and shields, to blocking/backing must be provided hollow walls using bolts and toggle type anchors.
.4 Attach panel and pilaster to mounting brackets.
.5 Provide templates, drilling dimensions for locating threaded studs through finished ceilings.

.2 Floor supported and overhead braced partition erection.
.1 Attach pilasters to floor with floor channel and level, plumb, and tighten installation with secure to floor channel.
.2 Secure pilaster shoes in position.
.3 Secure headrail to pilaster face with not less than two fasteners per face.

.3 Floor supported partition erection:
.1 Secure pilasters to floor with pilaster supports anchored with minimum 50 mm penetration in structural floor.
.2 Level, plumb and tighten installation with levelling device.
.3 Secure pilaster shoes in position.
.4 Set tops of doors level with tops of pilasters when doors are in closed position.

3.4 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean surfaces after installation using manufacturer's recommended cleaning procedures.

.3 Clean aluminum with damp rag and approved non-abrasive cleaner.

.4 Clean and polish hardware and stainless components.

.5 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 06 10 00 – Rough Carpentry

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)
.1 ASTM A 167-2009, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
.2 ASTM B 456-03, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
.3 ASTM A 653/A653M-06, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.4 ASTM A 924/A924M-10, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
.2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.
.3 CAN/CGSB-12.5-M86, Mirrors, Silvered.
.4 CGSB 31-GP-107Ma-90, Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.

.3 Canadian Standards Association (CSA)
.2 CAN/CSA-G164-[M92], Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 00 10 00.

.2 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 00 10 00 - Closeout Submittals.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Sheet steel: to ASTM A 653/A653M with ZF001 designation zinc coating.

.2 Stainless steel sheet metal: to ASTM A 167, Type 304, with No. 4 finish.

.3 Stainless steel tubing: Type 304 peened finish..

.4 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 COMPONENTS

.1 Shower curtain: 0.2 mm thick translucent vinyl anti-bacterial shower curtain. Provide curtain hold-back hook and chain at each curtain.
- .1 Acceptable Material:
  - .1 Hold back hook and chain: Frost Code 1144-500.
  - .2 Shower Curtain: Frost Code 1144-502.
  - .3 Stainless steel Curtain Hooks (Pack of 12): Frost Code 1144-501L.

.2 Shower rods: 25 mm dia stainless steel tubing of required length with satin chrome finished flanges. Shower rod material and anchorage to withstand downward pull of 0.9 kN.
- .1 Acceptable material:
  - .1 Shower Rod: Bobrick B-207.

.3 Soap holder: surface mounted, stainless steel dished tray, self draining, concealed fasteners.
- .1 Acceptable material:
  - .1 Frost Code 1136S.

.4 Robe hook: stainless steel with concealed fasteners.
- .1 Acceptable material:
  - .1 Frost Code 1138S.

.5 Waste receptacle: Type surface mounted, size 384 mm x 216 mm x 584 mm high, stainless steel.
- .1 Acceptable Manufacturer: American Specialties Model No. 20826.

.6 Mirror: wall mounted unit, fixed framed mirror 6 mm to CAN/CGSB-12.5, stainless steel frame with shelf.
- .1 Acceptable material:
  - .1 Frost Stock Series Mirror, Fixed: Frost Code 941-1836
  - .2 Heavy Duty Shelf 18” long x 4” deep: Frost Code

950-4.

.7 Corner Shelf surface mounted, 204 x 204 triangle, stainless steel.
.1 Acceptable material:
.1 Frost Code 950-8 x 8.

.8 Utility hook rack, white finish, five (5) double hooks”
.1 Acceptable Manufacturer: Nystrom, Product Number NH02021030

2.3 FABRICATION

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install and secure accessories rigidly in place as follows:
.1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
.2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
.3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
.4 Toilet/shower compartments: use male/female through bolts.

.2 Use tamper proof screws/bolts for fasteners.

.3 Fill units with necessary supplies shortly before final acceptance of building.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 00 10 00 - Submittal Procedures.

1.2 REFERENCES

.1 CAN/CGSB-44.40--2001, Steel Clothing Locker.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 00 10 00 - Submittal Procedures.

.2 Indicate, thicknesses of metal, fabricating and assembly methods, assembled banks of lockers (including reinstated existing lockers), bases, trim, numbering, filler panels, end/back panels, finishes.

1.4 SAMPLES

.1 Submit samples in accordance with Section 00 10 00 - Submittal Procedures.

PART 2 - PRODUCTS

2.1 ACCESSORIES

.1 Filler Panel
.1 No.18 MSG filler panels, size as required to achieve layout as shown on architectural drawings
.2 Pop riveted construction
.3 Top: flat
.4 Finish: To match reinstated existing lockers

.4 Number Plate
.1 Doors shall have a high strength black laminated plastic number plate 64 mm wide x 25 mm high with numbers not less than 11 mm high. Plates shall accommodate up to four digits, be nestled in a recess flush with door surface and shall be fastened to the door with two rivets. Lockers will be numbered by Departmental Representative.

2.2 BENCHES

.1 Seats: Hardwood laminate 32 mm thick x 241 mm wide x 1829 mm long.

.2 Bench Pedestals: 6 mm x 64 mm aluminum with high grade hybrid epoxy polyester powder finish. Colour to be selected by Departmental Representative.

.3 Acceptable Manufacturer: Hadrian

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Assemble and install lockers in accordance with manufacturer's written instructions.

.2 Securely fasten lockers to grounds and nailing strips.

.3 Install wall trim around recessed locker banks.

.4 Install filler panels (false fronts) where required and where obstructions occur. Refer to drawings

.5 Install finished end panels to exposed ends of locker banks.

.6 Install locker numbers.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE 90.1-2016, Energy Standard for Buildings except Low-Rise Residential Buildings.

.2 Ontario Regulation

.1 ONTARIO OBC-2012, 2012 Ontario Building Code Compendium.

.3 National Research Council Canada, 2015

.1 NRC Canadian Building Code, National Building Code of Canada 2015.

.4 National Fire Protection Association (NFPA)

.1 NFPA (Fire) 13, Installation of Sprinkler Systems, 2016 edition.

1.2 GENERAL

.1 This section covers items common to all sections of Divisions 20, 21, 22, 23 & 25.

.2 Coordinate location & installation of all equipment with all trades to ensure the equipment is serviceable.

.3 Contractor shall be responsible to ensure that all requirements of Divisions 20, 21, 22, 23 & 25 are met and comply with all other divisions and contract documents.

.4 The word "provide" shall mean "supply and install".

1.3 EQUIPMENT

.1 General:

.1 Mechanical equipment that is not regulated by the Green Energy Act, shall carry a permanent label installed by the manufacturers stating the equipment complies permanent label installed by the manufacturers stating the equipment complies with the requirement of ASHRAE 90.1.

.2 The minimum equipment efficiency, standard rating and operating conditions shall be as per ASHRAE 90.1, superceded by Ontario Building Code (OBC) Supplementary Standard SB -10, unless indicated otherwise on contract documents. The higher of the energy efficiencies of the listed equipment shall prevail.

.3 Provide new materials and equipment of proven design, quality and of current models with published ratings for which replacement parts are readily available.

.4 Uniformity: Use product of one manufacturer unless otherwise specified, for equipment or material of the same type of classification.

.2 Installation:

.1 Unions, flanges and/or couplings: provide for ease of maintenance and disassembly.

.2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer, Code or as indicated; whichever is the more stringent.

.3 Equipment drains: pipe to floor drains in a manner which is non-obstructing.

.4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.

.5 Unless otherwise specified, follow manufacturer's recommendations for safety, adequate access for inspection, maintenance and repairs.

.6 Permit equipment maintenance and disassembly with minimum disturbance to connecting piping and duct systems without interference with building structure or other equipment.

.7 Lubrication: Provide accessible lubricating means for bearings, including permanent lubrication "Lifetime" bearings. Extended grease nipples to be supplied.

1.4 ANCHOR BOLTS AND TEMPLATES

.1 Supply anchor bolts and templates for installation by other divisions.

1.5 TRIAL USAGE

.1 Engineer may use equipment and systems for test purposes or for continuity of operation prior to acceptance. Supply labour, material, and instruments required for testing & operation.

1.6 PROTECTION OF OPENINGS

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

1.7 ELECTRICAL

.1 Electrical work to conform to Division 26 including the following:

.1 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems. Refer to Division 26 for quality of materials and workmanship.

.2 Any costs associated with deviation of mechanical equipment rating affecting electrical Division 26 shall be carried by the mechanical contractor.

.3 All control wiring & conduit associated with Building Automation System & HVAC controls shall be provided by Divisions 20, 21, 22, 23 & 25 including power wiring to all control panels & other field mounted control devices. Emergency power circuits are provided by Division 26 in the vicinity of the power source.

1.8 PAINTING

.1 To Section 09 91 23 - Interior Painting.

.2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.

.3 Prime and touch up marred finished paintwork to match original. Use primer or enamel to match original. Do not paint over nameplates.

.4 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

.5 Hangers, supports and equipment fabricated from ferrous metals shall be given at least one coat of corrosion resistant primer paint before shipment to job site.

.6 Touch-up damaged surfaces of all mechanical equipment and materials, to the satisfaction of Engineer. Use primer or enamel to match original. Do not paint over nameplates.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Reduction Workplan (WRW):

.1 Perform work in accordance with project's WRW. If one does not exist, provide the following:
- .1 Identify opportunities for reduction, re-use and/or recycling of materials.
- .2 Post workplan or summary where workers on site are able to review its content.

.2 Materials Source Separation Program (MSSP):

.1 Perform all work in accordance with project's MSSP. If one does not exist, provide the following:
- .1 Provide containers for collection of re-usable and/or recyclable materials.
- .2 Transport off-site salvaged materials to authorized recycling facility or to users of material for re-use.

.3 Disposal of Waste:

.1 Disposal of waste, volatile materials, mineral spirits, oil, paint thinner, etc. into waterways, storm or sanitary sewers is prohibited.

.4 Storage, Handling and Protection:

.1 Store materials for re-use in a secure area as directed by project manager, where they will not be damaged. Provide protection of materials as necessary.

.2 Unless otherwise specified, removed materials become the Contractor's property. Contractor shall be responsible for transport & delivery of non-salvageable items to a licensed disposal facility.

1.10 DEMONSTRATION AND OPERAING AND MAINTENANCE INSTRUCTIONS

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

.2 Where specified elsewhere in Divisions 20, 21, 22, 23 & 25, manufacturers to provide demonstrations and instructions.

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

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

.5 Where deemed necessary, Owner may record these demonstrations on video tape for future reference.

.6 Furnish trained instructors to instruct Owner's operating staff in the operation, maintenance and adjustment of all mechanical equipment; and, instruct personnel on any changes to or modifications of any equipment made under terms of the guarantee.

.7 The instructions shall take place during regular working hours before systems are accepted and turned over to Owner's staff.

.8 Ensure that the Owner's operating personnel have received and been given opportunity to review the Operating and Maintenance Manuals prior to commencing instruction. Allow two full days on site for review of these manuals with Owner's personnel and for their instruction in operation and maintenance of all mechanical equipment.

1.11 CLOSEOUT SUBMITTALS

.1 Submit operation and maintenance data for incorporation into manual.

.2 Operation and maintenance manual (O&M) to be approved by, and final copy in electronic format deposited with, Engineer before final inspection.

.3 For all equipment listed in O&M manuals provide a schedule detailing the supplied component, name, address & phone no. of equipment vendor, parts supplier and warranty agent.

.4 Operation data to include:

.1 Control schematics for each system including environmental controls.

.2 Description of each system and its controls.

.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for each system and each component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.5 Maintenance data shall include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.6 Performance data to include:

.1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified elsewhere.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing.

.7 Approvals:

.1 Submit electronic format (pdf) copy of draft Operation and Maintenance Manual to Engineer for approval. Submission of individual data will not be accepted unless so directed by Engineer. PDF file to include tabs to allow navigation to each section of the manual.

.2 Make changes as required and re-submit as directed by Engineer.

.3 Upon acceptance by Engineer submit one (1) electronic format (pdf) and three (3) hardcopies of O&M manuals to Owner.

.8 Additional data:

.1 Prepare and insert additional data into operation and maintenance manual when the need becomes apparent during demonstrations and instructions specified above.

1.12 ACCEPTABLE PRODUCTS

.1 Design is based on first manufacturer's name under acceptable products. Subsequent manufacturer's names indicate that those named are acceptable providing they meet specifications and space limitations and are subject to acceptance by Shop Drawing Review. All other manufacturers must submit request in writing to NRC prior to Tender close in order to be considered acceptable. Notice of acceptable contractors will be provided via Addendum only.

1.13 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit single electronic (pdf) copy of shop drawings and product data along with transmittal, in accordance with project requirements. Hard copy shop drawings shall not be accepted.

.2 Shop drawings and product data shall show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances. e.g. access door swing spaces.

.3 Shop drawings and product data shall be accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on full equipment performance curves.

.4 Manufacturer to certify as to current model production.

.5 Certification of compliance to applicable codes.

.4 The information to be indicated on manufacturers' shop drawings submitted for review shall include the following:

.1 General arrangement drawings showing component parts. Where the equipment proposed, or a component part thereof, includes modifications to a manufacturers' standard to meet the requirements of a specification, a complete assembly drawing must be submitted.

.2 Overall dimensions, roughing-in dimensions and clearance dimensions of all major components.

.3 Mounting details and dimensions.

.4 Complete certified performance data for the specified application with particular reference to rate of flow, operating pressure and temperatures, entering and leaving conditions of air or fluid, operating weights, operating limitation, electrical characteristics and BHP requirements.

.5 Gauge of fabricated material and finish specification.

.6 Vibration isolators and resilient hangers stating locations and weight distribution.

.7 Electrical wiring diagrams, control panel boards, motor test data, motor starters and controls for electrically-operated equipment furnished by mechanical trades.

.5 Review of shop drawings or detail drawings will not relieve the obligation of ensuring that the equipment, materials, or layouts meet the functional requirements of the specifications, and that all necessary mounting space and clearance requirements are met. Thus, the Engineer's review is for assistance only.

.6 No equipment will be accepted on the job site without shop drawings having been reviewed by the Engineer.

1.14 CLEANING

.1 Prior to turnover to client, clean interior and exterior of all new systems. Replace all air & hydronic filters on new & modified systems. Vacuum interior of new and modified ductwork and air handling units.

1.15 AS-BUILT DRAWINGS

.1 Site records:

.1 Mechanical sub-contractor shall mark all changes as work progresses and as changes occur.

.2 On a weekly basis, transfer information to record set of documents, revising to show all work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection at all times.

.2 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 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 electronic copy to Engineer for approval and make corrections as directed.

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

.5 Following approval, submit completed hard copy as-built drawings scanned soft copy with Operating and Maintenance Manuals.

.3 Submit copies of as-built drawings in colour pdf for inclusion in final TAB report.

1.16 CONFLICT/CO-ORDINATION DRAWINGS

.1 For congested areas, prior to installation the contractor shall prepare interference drawings indicating proposed location of all systems & equipment including ductwork, piping, fans, diffusers, VAV boxes, conduits, lighting fixtures, etc. Prior to installation the contractor shall submit the drawings to the Engineer for review.

.2 Architectural, structural and electrical outlines may be shown to assist in coordination of work; confirm final arrangements before layout of mechanical work.

.3 Do not scale.

.4 Except where dimensioned, drawings indicate general mechanical layouts only.

.5 Provide field drawings to show relative positions of various services. Obtain approval before beginning work. As a minimum provide layout/coordination drawings for mechanical rooms & corridor ceilings. Drawings must show coordination between all equipment and systems within the given space. All sub-trades to coordinate their work in conjunction with others.

.6 Within six (6) weeks of Letter of Intent, mechanical & electrical trades to verify that proposed rooms, shafts, chases, reflected ceiling elevations, etc. provide adequate space for the installation of mechanical & electrical systems. This is to identify if there are any spatial shortcomings and to give adequate time for construction manager, consultants and trades to make any dimensional changes and to make clear to all trades where items are to be installed. Installation and layout will not be on a first come first layout basis.

.7 If this procedure is not followed the contractor shall be responsible for all modifications required to integrate the systems & equipment.

.8 When requested by the City, contractor shall provide a single line isometric drawing of the proposed plumbing vent system.

1.17 FEES AND PERMITS

.1 Pay all fees and obtain all permits, taxes relating to the mechanical scope of work.

1.18 WARRANTY

.1 Unless indicated otherwise provide one (1) year warranty starting at substantial completion for all new systems including materials, equipment & labour.

1.19 LOCATION OF MECHANICAL EQUIPMENT

.1 Allow for 1500 mm of adjustment for exact location of air handling units, pumps, ducts, piping, etc. at no extra cost or credit.

1.20 ELECTRONIC DRAWINGS

.1 Goodkey, Weedmark & Associates Limited will agree to supply the mechanical drawings in the form of electronic documents for the project to the User for the convenience of the User in carrying out its work. The User shall sign a License Agreement before drawings will be released.

1.21 CUTTING, PATCHING & CORING

.1 Provide cutting, patching and coring of all walls, ceiling & concrete slabs and other surfaces as required for mechanical work. Check with Owner or Building Management prior to core drilling and cutting of structure regarding building requirements and policies. Provide notification, clearance & protection.

.2 The following procedure shall be followed for cutting & core drilling:

.1 Contractor to coordinate and summarize all new cores and openings in building structure. Contractor to investigate on site and locate any existing available hole which may be re-used for new systems.

.2 Contractor to prepare a layout sketch showing all existing openings & holes and required new openings & holes, with size and locations to the closest grid line in both directions, and submit for review and approval by the architect & structural engineer.

.3 Structural engineer to provide written report outlining acceptance of the openings, as well as specific requirements for reinforcing at each location.

.4 Contractor to proceed with reinforcing tracing as per report and scanning for electrical conduit. Scanning to be completed using ground penetrating Radar (GPR) technology.

.5 Contractor shall identify at each location prior to coring and cutting the location, direction and layer of each reinforcing bar and conduit.

.6 Any core or opening where reinforcing steel was cut during the cutting & coring process must be retained on site, and the Contractor must inform the engineer with the following information: size of the reinforcing bar, reinforcing layer location (top steel or bottom slab steel) and direction of the bar (east - west or north - south).

.3 Patch and make good surfaces cut, damaged or disturbed, to Engineer's approval. Match existing material, colour, finish and texture or as indicated otherwise.

.4 Provide dust tight screens or partitions to localize dust generating activities and for protection of finished areas of work, workers and public.

1.22 MECHANICAL COST BREAKDOWN

.1 Upon award of contract, provide mechanical cost breakdown as per attached schedules for engineer's review and for progress billing purposes.

.2 Costs such as site trailers, mobilization, shop drawings, engineering, etc. to be included as part of material and labour for each piece of equipment.

.3 Controls programming and commissioning to be billed upon completion of commissioning.

.4 Fire protection engineering costs to be included as part of material and labour costs.

.5 Closeout documents including O&M manuals, as-built drawings, approved air & hydronic TAB reports, seismic letters, NFPA letters, etc. shall constitute 5% of the total mechanical construction cost and shall be approved as a single lump sum line item after submission to and final acceptance by Engineer. Contractor to indicate cost as a separate line item in Progress Billing.

.6 Proposed billings to be submitted a minimum of fourteen (14) calendar days prior to submission of first billing, for review and approval by Engineer.

.7 Equipment costs are to be broken down into specific equipment grouping and submitted with proposed billing submittal.

1.23 FINAL INSPECITON

.1 Do not request final inspection until:

.1 Deficiencies are less than 5 items.

.2 All systems have been tested and are ready for operation.

.3 All air & water balancing has been completed as applicable.

.4 The Owner's operating personnel have been instructed in the operation of all systems and equipment.

.5 The complete operation and maintenance data books have been delivered to the Engineer.

.6 All inspection certificates have been furnished including but not limited to seismic certification, NFPA (Fire) 13 certification, City's final plumbing inspection.

.7 All record drawings have been completed and approved.

.8 All fire extinguishers have been installed.

.9 The cleaning up is finished in all respects.

.10 Upon completion of above, contractor to request in writing for final site review with a minimal 72 hour notification.

.2 Final installation shall be subject to the approval of the Engineer.

Project: Date:

HVAC		Total Contract Amount $	% to Date	Total to Date $	Previous Amount Invoiced $	Amount this Claim $	Balance Remaining $
Mobilization – Admin., Site Set-up							
Drafting & Coordinating							
Sleeving	Material						
	Labour						
Sheet Metal	Material						
	Labour						
Grilles, Diffusers	Material						
	Labour						
Silencers	Equipment						
	Labour						
Fans, VAV & FP Boxes	Equipment						
	Labour						
R.T.U.'s, Curbs, A.H.U.'s & Filters	Equipment						
	Labour						
	Start-up						
A/C Units	Equipment						
	Labour						
	Start-up						
Smoke/Fire Dampers	Equipment						
	Labour						

Project: Date:

HVAC		Total Contract Amount $	% to Date	Total to Date $	Previous Amount Invoiced $	Amount this Claim $	Balance Remaining $
VFD's	Equipment						
	Labour						
	Start-up						
Insulation	Material						
	Labour						
Close-out Documentation (5%)							
TOTAL ORIGINAL CONTRACT AMOUNT							
Change Orders							
Architect's CO #	GWA CCO or SI #						
#	#						
#	#						
Total Change Order Amount							
TOTAL CONTRACT AMOUNT							

NOTE: Change Orders that do not reference the Architect's Change Order number and Goodkey, Weedmark's Contemplated Change Order (CCO) or Site Instruction (SI) number will not be reviewed.

Project: Date:

Controls		Total Contract Amount $	% to Date	Total to Date $	Previous Amount Invoiced $	Amount this Claim $	Balance Remaining $
Mobilization – Admin., Site Set-up							
Hardware	Equipment						
	Labour						
Wiring	Material						
	Labour						
Close-out Documentation (5%)							
TOTAL ORIGINAL CONTRACT AMOUNT							
Change Orders							
Architect's CO #	GWA CCO or SI #						
#	#						
#	#						
Total Change Order Amount							
TOTAL CONTRACT AMOUNT							

NOTE: Change Orders that do not reference the Architect's Change Order number and Goodkey, Weedmark's Contemplated Change Order (CCO) or Site Instruction (SI) number will not be reviewed.

Project: Date:

Plumbing		Total Contract Amount $	% to Date	Total to Date $	Previous Amount Invoiced $	Amount this Claim $	Balance Remaining $
Mobilization – Admin., Site Set-up							
San. Storm Underground Piping & Floor Drains	Material						
	Labour						
Sleeving	Material						
	Labour						
San. Storm Above Ground Piping & Roof Drains	Material						
	Labour						
Domestic Water Piping	Material						
	Labour						
Chilled/Condensing Water Piping	Material						
	Labour						
Heating Water Piping	Material						
	Labour						
Gas Piping	Material						
	Labour						
Fuel Oil Piping	Material						
	Labour						
Medical Piping	Material						
	Labour						

Project:

Date:

Plumbing		Total Contract Amount $	% to Date	Total to Date $	Previous Amount Invoiced $	Amount this Claim $	Balance Remaining $
Plumbing Equipment							
Boilers	Equipment						
	Labour						
	Start-up						
Hot Water Tanks	Equipment						
	Labour						
	Start-up						
Pumps, VFD's	Equipment						
	Labour						
	Start-up						
Expansion Tanks, Coils, Heat Exchangers	Equipment						
	Labour						
Chillers	Equipment						
	Labour						
	Start-up						
Unit/Force Flow Heaters	Equipment						
	Labour						
	Start-up						
Plumbing Fixtures	Equipment						
	Labour						

Project: Date:

Plumbing		Total Contract Amount $	% to Date	Total to Date $	Previous Amount Invoiced $	Amount this Claim $	Balance Remaining $
Insulation							
Domestic	Material						
	Labour						
Chilled/Condenser	Material						
	Labour						
Heating	Material						
	Labour						
Close-out Documentation (5%)							
TOTAL ORIGINAL CONTRACT AMOUNT							
Change Orders							
Architect's CO #	GWA CCO or SI #						
#	#						
#	#						
Total Change Order Amount							
TOTAL CONTRACT AMOUNT							

NOTE: Change Orders that do not reference the Architect's Change Order number and Goodkey, Weedmark's Contemplated Change Order (CCO) or Site Instruction (SI) number will not be reviewed.

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 RELATED DOCUMENTS

.1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

1.3 DEFINITIONS

.1 Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, water and hot gases through penetrations in fire rated wall and floor assemblies.

1.4 GENERAL DESCRIPTION OF THE WORK OF THIS SECTION

.1 Only tested firestop systems shall be used in specific locations as follows:

.1 Penetrations for the passage of duct, piping, and other mechanical equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions

.2 Repetitive plumbing penetrations in fire-rated floor assemblies. Penetrations exist for the installation of tubs, showers, aerators and other plumbing fixtures.

.2 All penetrations through walls as a result of this work shall be assumed to be 1 hour rated unless otherwise indicated.

1.5 RELATED WORK OF OTHER SECTIONS

.1 Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

.1 Section 04 04 99 - Masonry for Minor Works

.2 Section 07 84 00 - Firestopping

.3 Section 09 21 16 - Gypsum Board Assemblies

1.6 REFERENCES

.1 Test Requirements: ULC-S115-M or CAN4-S115-M, "Standard Method of Fire Tests of Through Penetration Fire Stops".

.2 International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgements.

.3 Inspection Requirements: ASTM E2174-14b, "Standard Practice for On-site Inspection of Installed Fire Stops.

.4 CAN/ULC-S102-M, Standard Test Method for Surface Burning Characteristics of Building Materials.

.5 All major building codes: NBC, OBC.

.6 NFPA (Fire) 101 - Life Safety Code, 2015 Edition

.7 ASTM G21-15, Standard Practice for Determining Resistance of Synthetic Polymeric

1.7 QUALITY ASSURANCE

.1 Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

.2 Firestop Systems do not re-establish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

.3 For those firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgement derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgement drawings must follow requirements set forth by the International Firestop Council.

1.8 SUBMITTALS

.1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Division 01.

.2 Manufacturer's engineering judgement identification number and drawing details when no ULC or cUL system is available for an application. Engineer judgement must include both project name and contractor's name who will install firestop system as described in drawing.

.3 Submit material safety data sheets provided with product delivered to job-site.

.4 Submit a complete firestopping and smokeseal schedule. Schedule is to include complete details, cut sheets, system descriptions and location of each proposed firestopping & smokeseal application.

1.9 INSTALLER QUALIFICATIONS

.1 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

1.10 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials undamaged in manufacturer's clearly labelled, unopened containers, identified with brand, type, and ULC or cUL label where applicable.

.2 Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

.3 Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

.4 Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

.5 Do not use damaged or expired materials.

1.11 PROJECT CONDITIONS

.1 Do not use materials that contain flammable solvents.

.2 Scheduling:

.1 Schedule installation of CAST IN PLACE firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

.2 Schedule installation of Drop-In firestop devices after placement of concrete but before installation of the pipe penetration. Diameter of sleeved or cored hole to match the listed system for the device.

.3 Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

.3 Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

.4 Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

.5 During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

Part 2 Products

2.1 FIRESTOPPING, GENERAL

.1 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

.2 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

.3 Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post installed." Provide cast-in-place firestop devices prior to concrete placement.

.4 Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with ULC S-115.

.1 L-Rating: Not exceeding 25.4 L/s/sq.m (5.0 cfm/sq.ft.) of penetration opening at both ambient and elevated temperatures.

.5 Mold Resistance: Provide penetration firestoppping with mold and mildew resistance rating of 0 as determined by ASTM G21.

2.2 ACCEPTABLE MATERIALS

.1 Hilti (Canada) Corporation (1-800-363-4458), 3M (1-800-328-1687), or as alternative materials approved by addendum in accordance with Instructions to Tenderers.

2.3 MATERIALS

.1 Use only firestop products that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

.2 Pre-Installed firestop devices for use with non-combustible and combustible pipes (closed and open systems) penetrating concrete floors and/or gypsum walls.

.3 Sealants or caulking materials for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT).

.4 Sealants or caulking materials for use with sheet metal ducts.

.5 Intumescent sealants or caulking materials for use with combustible items (penetrates consumed by high heat and flame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe.

.6 Firestop collar or wrap devices attached to assembly around combustible plastic pipe (closed and open piping systems) tested to 50 Pa. differential.

.7 Materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways.

.8 Non curing, re-penetrable materials used for large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways.

.9 For blank openings made in fire-rated wall or floor assemblies, where future penetration of pipes, conduits, or cables is expected.

.10 For penetrations through a Fire Separation wall provide a firestop system with a "F" Rating as determined by ULC or cUL as indicated below:

Fire Resistance Rating of Separation	Required ULC or cUL "F" Rating of Firestopping Assembly
30 minutes	20 minutes
45 minutes	45 minutes
1 hour	45 minutes
1.5 hours	1 hour

2 hours	1.5 hours
3 hours	2 hours
4 hours	3 hours

For combustible pipe penetrations through a Fire Separation provide a firestop system with a "F" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

.11 For penetrations through a Fire Wall or horizontal Fire Separation provide a firestop system with a "FT" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

Part 3 Execution

3.1 PREPARATION

.1 Verification of Conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

.1 Verify penetrations are properly sized and in suitable condition for application of materials.

.2 Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

.3 Ensure all service lines are in place, tested and acceptable to the authority having jurisdiction, prior to application of fire stopping and smoke seal.

.4 Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

.5 Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

.6 Do not proceed until unsatisfactory conditions have been corrected.

3.2 COORDINATION

.2 Coordinate construction of openings and penetrations to ensure that the fire stop systems are installed according to specified requirements.

.3 Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems.

.4 Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.

3.3 INSTALLATION

.1 Regulatory Requirements: Install firestop materials in accordance with ULC Fire Resistance Directory or UL Products Certified for Canada (cUL) Directory or Omega Point Laboratories Directory.

.2 Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.

.1 Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

.2 Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of ULC or cUL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

.3 Protect materials from damage on surfaces subjected to traffic.

3.4 FIELD QUALITY CONTROL

.1 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

.2 Keep areas of work accessible until inspection by applicable code authorities.

.3 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.

.4 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

3.5 IDENTIFICATION & DOCUMENTATION

.1 The firestop contractor is to supply documentation for each single application addressed. This documentation shall identify each penetration and joint location on the entire project.

.2 The Documentation Form for through penetrations is to include:

.1 A Sequential Location Number

.2 The Project Name

.3 Date of Installation

.4 Detailed description of the penetrations location

.5 Tested System or Engineered Judgement Number

.6 Type of assembly penetrated

.7 A detailed description of the size and type of penetrating item

.8 Size of opening

.9 Number of sides of assemblies addressed

.10 Hourly rating to be achieved

.11 Installers Name

.3 Submit the record document to the Engineer at the completion of the project.

.4 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

.1 The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."

.2 Contractor's Name, address, and phone number.

.3 Through-Penetration firestop system designation of applicable testing and inspecting agency.

.4 Date of Installation.

.5 Through-Penetration firestop system manufacturer's name.

.6 Installer's Name.

3.6 ADJUSTING AND CLEANING

.1 Remove equipment, materials and debris, leaving area in undamaged, clean condition.

.2 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

3.7 WASTE MANAGEMENT

.1 Separate and recycle waste materials in accordance with Waste Management Plan as specified in Section 01 74 19, and place in designated areas for recycling.

.2 Place materials defined as hazardous or toxic waste in designated containers. Before disposing of containers, relieve containers of any remaining foam and pressure. Allow foam to fully cure before disposing. Never dispose of foam in a liquid state.

.3 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.

Part 2 Products

2.1 ACCESS DOORS

.1 Supply and install as necessary to gain access to all concealed mechanical equipment for operating, inspecting, adjusting, servicing.

.2 Sizes: Except as indicated otherwise, to be minimum sizes as follows:

.1 For body entry: 600 x 600 mm (24" x 24").

.2 For hand entry: 300 x 300 mm (12" x 12").

.3 Construction: Rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180°.

.4 Materials

.1 Tiled or marble surfaces and other special areas: Stainless steel with brushed satin or polished finish as directed by Consultant.

.2 All other areas: Prime coated steel.

.5 Fire Rating

.1 Access doors fire rating to match that of wall, ceiling or floor the access door is installed in. Coordinate with architectural drawings.

2.2 EXCLUSIONS

.1 Lay-in tile ceilings. In this instance, use unobtrusive identification locators.

Part 3 Execution

3.1 INSTALLATION

.1 Installation in accordance with Manufacturer's installation instructions for particular surface.

3.2 LOCATION

.1 Location: Ensure that equipment is clearly within view and accessible for operating, inspecting, adjusting, servicing without the need for special tools.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B16.15-2013, Cast Bronze Threaded Fittings, Classes 125 and 250.

.2 ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.

.3 ASME B16.22-2013, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.

.4 ASME B16.24-2016, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 600, 900, 1500 and 2500.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.

.2 ASTM B88M-16, Specification for Seamless Copper Water Tube (Metric).

.3 American Water Works Association (AWWA)

.1 AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Canadian Standards Association (CSA)

.1 CSA B242-05 (R2016), Groove- and Shoulder-Type Mechanical Pipe Couplings.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 20 05 01 - Mechanical General Requirements.

Part 2 Products

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.

.1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

.2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

.2 Piping to be of all North American manufacturers.

2.2 FITTINGS

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

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

.3 Cast copper, solder type: to ASME B16.18.

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

.5 Fittings to be of all North American manufacturers.

2.3 JOINTS

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

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: 95/5 lead free solder. No lead content in excess of 0.2%.

.4 Teflon tape: for threaded joints.

.5 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner. Bronze or brass ball valves are an acceptable dielectric fitting where applicable.

2.4 VALVES

.1 Refer to Section 23 05 23 - Valves.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

.2 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.

.3 Install pipe work in accordance with Section 23 05 05 - Installation of Pipe Work, supplemented as specified herein.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Install DCW piping below and away from DHW and DHWR and other hot piping so as to maintain temperature of cold water as low as possible.

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

.7 Buried tubing:

.1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.

.2 Bend tubing without crimping or constriction. No fittings permitted below grade.

.8 Install isolation valves at all branch take-offs and to isolate each piece of equipment, and as indicated.

3.2 PRESSURE TESTS

.1 Refer to Section 23 05 05 - Installation of Pipework.

.2 Test pressure: greater of 1½ times maximum system operating pressure or 860 kPa.

3.3 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean. Let system flush for additional 2 h, then draw off another sample for testing. Submit test results to Engineer.

3.4 PRE-START-UP INSPECTIONS

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

.2 Verify that system can be completely drained.

.3 Ensure that pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

3.5 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and to the approval of Engineer.

.2 Upon completion, provide laboratory test reports on water quality for Engineer approval.

3.6 START-UP

.1 Timing: Start up after:

.1 Pressure tests have been completed.
.2 Disinfection procedures have been completed.
.3 Certificate of static completion has been issued.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish circulation and ensure that air is eliminated.
.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.4 Rectify start-up deficiencies.

3.7 PERFORMANCE VERIFICATION

.1 Timing:

.1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.

.2 Procedures:

.1 Verify that flow rate and pressure meet Design Criteria.

.2 TAB DHWR in accordance with Section 23 05 93 - Testing Adjusting and Balancing (TAB) of Mechanical Systems.

.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.

.4 Verify performance of temperature controls.

.5 Verify compliance with safety and health requirements.

.6 Check for proper operation of water hammer arrestors. Run 10% of outlets for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.7 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

.3 Reports:

.1 In accordance with Section 20 05 01 - Mechanical General Requirements: Reports, using report forms as specified in Section 20 05 01 - Mechanical General Requirements: Report Forms and Schematics.

.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM B32-08 (R2014), Specification for Solder Metal.

.2 ASTM B306-13, Specification for Copper Drainage Tube (DWV).

.3 ASTM C564-14, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.4 ASTM C1540-15, Standard Specification for Heavy Duty Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA)

.1 CSA B70-12 (R2016), Cast Iron Soil Pipe, Fittings and Means of Joining.

.2 CSA B125-01, Plumbing Fittings.

.3 Cast Iron Soil Pipe Institute (CISPI)

.1 CISPI 310-04, Specification for coupling for use in connection with hubless cast iron soil pipe and fittings for sanitary and storm drain, waste, and vent piping applications.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary, storm and vent Type DWV to: ASTM B306.

.1 Fittings.

.1 Cast brass: to CSA B125.

.2 Wrought copper: to CSA B125.

.2 Solder: 95/5, lead free, to ASTM B32, type 50A.

2.2 CAST IRON PIPING AND FITTINGS

.1 Buried sanitary and vent minimum NPS 3, to: CSA B70.

.1 Mechanical joints.

.1 Provide hubless soil pipe couplings designated as Heavyweight, constructed of extra wide 4 to 6 band corrugated type 304 stainless steel bands, with heavy duty worm drive clamps.

.2 Flanged gasket to be made of neoprene rubber, meeting ASTM C564 and unit to meet CISPI 310 and ASTM C1540 standards.

.3 Tightened to 80 in. lbs. torque.

.4 Acceptable materials: Mission Rubber Company.

.2 Provide proper transition fittings to tie into existing hub and spigot type pipe when found on site.

.2 Above ground sanitary, storm and vent: to CSA B70.

.1 Mechanical joints.

.1 Provide hubless soil pipe couplings designated as Heavyweight, constructed of extra wide 4 to 6 band corrugated type 304 stainless steel bands, with heavy duty worm drive clamps.

.2 Flanged gasket to be made of neoprene rubber, meeting ASTM C564 and unit to meet CISPI 310 and ASTM C1540 standards.

.3 Tightened to 80 in. lbs. torque.

.4 Acceptable materials: Mission Rubber Company.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

.2 Allow for locating of existing buried sanitary piping prior to excavating for connection of new services.

.3 Bedding and backfilling should be in accordance with [City of Ottawa] standards and specifications. Install buried pipe on 150 mm (6") bed of compacted clean Granular A bedding compacted to 95% (min.) dry proctor density, shaped to accommodate hubs and fittings, to line and grade as indicated. The material should be placed in maximum 300 mm thick lifts. (If trench bottom is unstable, bring to Engineers attention before bedding is laid). Limit vertical deflection and increase pipe support by compacting soil in both directions away from the pipe toward trench walls. Initial backfill to begin at springline of pipe to 300 mm (12") above pipe using compacted clean Granular A bedding compacted to 95% (min.) dry proctor density. Final backfill shall be in accordance with Geotechnical Report and as minimum utilize clean Granular A compacted to 95% dry proctor density in 300 mm thick lifts. Bedding and backfill shall be provided by this division and in accordance with Div. 02 - Site Work.

.4 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

.5 Urinal waste pipe & fittings shall be DWV PVC equivalent to IPEX System 15 in accordance with specification Section 22 13 18 - Drainage Waste and Vent - Plastic. Extend plastic piping up to combined waste from adjacent lavatory or other plumbing fixtures allowing dilution of waste.

.6 On pumped discharge, cast iron with mechanical joint shall not be allowed. (Use Type L copper with DWV fittings or galvanized steel above ground only.)

3.2 TESTING

.1 Test in accordance with OBC Part 7 requirements.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.3 PERFORMANCE VERIFICATION

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:

.1 Verify domes are secure.

.2 Ensure weirs are correctly sized and installed correctly.

.3 Verify provisions for movement of roof system.

.4 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM D2564-12, Specification for Solvent Cements for Poly (PVC) (Vinyl-Chloride) Plastic Piping Systems.

.2 Canadian Standards Association (CSA)

.1 CSA B1800-15, Thermoplastic Nonpressure Piping Compendium.

.3 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S102.2-10, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

.2 CAN/ULC S115-11, Standard Method of Fire Tests of Firestop Systems.

Part 2 Products

2.1 PIPING AND FITTINGS

.1 DWV PVC (Polyvinyl Chloride):

.1 Application: below grade sanitary, storm & vent piping & fittings and above grade where combustible piping is permitted excluding OBC 3.2.6 (High-rise) applications and ceiling plenums.

.2 Pipe and Fittings: Drain, waste and vent pipe and fittings shall be certified to CSA B181.2. When combustible pipe and fittings are used in buildings required to be of non-combustible construction, they shall be listed by ULC to the Standard CAN/ULC S102.2 and clearly marked with the certification logo indicating a flame-spread rating not exceeding 25.

.3 Acceptable material: IPEX System 15 DWV.

.2 Fire & smoke resistant coated DWV PVC (Polyvinyl Chloride) piping & fittings:

.1 Application: Above grade sanitary, storm & vent piping & fittings where combustible piping is permitted including OBC 3.2.6 High-rise applications and within ceiling plenums.

.2 Pipe and Fittings: Drain, waste and vent pipe and fittings shall be certified to CSA B181.2 and when used in non-combustible construction, high-rise buildings and air plenums, they shall be tested and listed in accordance with CAN/ULC S102.2 and clearly marked with the certification logo indicating a flame-spread rating not exceeding 25 and a smoke-developed classification not exceeding 50.

.3 Acceptable material: IPEX System XFR 15/50 PVC-DWV.

.3 Firestopping Devices:

.1 All combustible pipe penetrations shall comply with the requirements described in the O.B.C. 3.1.9.4.(1) through (8) and provide a firestop system that has been Tested and Listed to the test Standard CAN/ULC S115 with a pressure differential of 50 Pa. In addition, the manufacturer shall provide a documentation confirming compliance with the listed system.

.4 Solvent Welding:

.1 Solvent cements shall be CSA certified and meet the requirements of ASTM D2564. One-step cement may be used for sizes from NPS 40 to 150. Two-step cement must be used in conjunction with primer on larger pipe sizes. Proper solvent cementing procedures must be followed at all times.

.2 The manufacturer, shall be consulted prior to installation for proper solvent welding procedures and proper solvent cement requirements.

.5 Expansion/Contraction:

.1 Compensation shall be made to accommodate expansion/contraction on the drainage system. It is recommended that there be compensation on every second floor for the vertical piping system. Consult pipe system manufacturer for specific details regarding approved compensation methods.

.6 Compatibility:

.1 To ensure compatibility, performance and material quality, all pipe and fitting drainage system shall be produced by the same manufacturer.

.7 Quality Control:

.1 The manufacturer of the pipe and fitting system shall be contacted prior to the installation to obtain precise installation instructions. Site meetings shall be arranged and include, the Contractor, Manufacturer and Building Inspector.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

.2 Allow for locating of existing buried sanitary piping prior to excavating for connection of new services.

.3 Bedding and backfilling should be in accordance with City of Ottawa standards and specifications. Install buried pipe on 150 mm (6") bed of compacted clean Granular A bedding compacted to 95% (min.) dry proctor density, shaped to accommodate hubs and fittings, to line and grade as indicated. The material should be placed in maximum 300 mm thick lifts. (If trench bottom is unstable, bring to Engineers attention before bedding is laid). Limit vertical deflection and increase pipe support by compacting soil in both directions away from the pipe toward trench walls. Initial backfill to begin at springline of pipe to 300 mm (12") above pipe using compacted clean Granular A bedding compacted to 95% (min.) dry proctor density. Final backfill shall be in accordance with Geotechnical Report (if available) and as minimum utilize clean

Granular A compacted to 95% dry proctor density in 300 mm thick lifts. Bedding and backfill shall be provided by this division.

.4 Plastic pipe shall not be used on pumped sanitary & storm discharge.

3.2 TESTING

.1 Test in accordance with OBC Part 7 requirements.

.2 Pressure test buried systems before backfilling.

.3 Hydraulically test to verify grades and freedom from obstructions.

.4 Video Testing:

.1 Provide video scanning of underground sanitary and storm piping for contractor's review and approval prior to pouring of concrete. Repair deficiencies and re-scan as required. Submit final video to Engineer for record.

.2 Flush & video scan sanitary and storm piping for contractor's review and approval prior to building turnover. Repair deficiencies and re-scan as required. Submit final video to Engineer for record.

3.3 PERFORMANCE VERIFICATION

.1 Cleanouts:

.1 Ensure accessible and that access doors are correctly located.

.2 Open, cover with linseed oil and re-seal.

.3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:

.1 Verify domes are secure.

.2 Ensure weirs are correctly sized and installed correctly.

.3 Verify provisions for movement of roof system.

.4 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society of Sanitary Engineering (ASSE)

.1 ASSE (Plumbing) 1017-2009, Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems.

.2 ASSE (Plumbing) 1018-2001, Performance Requirements for Trap Seal Primer Valves-Potable Water Supplied.

.2 Canadian Standards Association (CSA)

.1 CAN/CSA B64 Series-11 (R2016), Backflow preventers and vacuum breakers (Consists of B64.0, B64.1.1, B64.1.2, B64.1.3,B64.1.4 B64.2, B64.2.1, B64.2.1.1, B64.2.2, B64.3,B64.3.1, B64.4, B64.4.1, B64.5, B64.5.1, B64.6, B64.6.1, B64.7, B64.8 and B64.9).

.2 CSA B79-08 (R2013), Floor, Area and Shower Drains, and Cleanouts for Residential Construction.

.3 Plumbing and Drainage Institute (PDI)

.1 PDI WH201-2010, Water Hammer Arresters Standard.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 For shop drawings, indicate dimensions, construction details and materials.

.3 For product data, indicate dimensions, construction details and materials for items specified herein.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 20 05 01 - Mechanical General Requirements.

.2 Data to include:

.1 Description of plumbing specialities and accessories, giving manufacturers name, type, model, year and capacity.

.2 Details of operation, servicing and maintenance.

.3 Recommended spare parts list.

Part 2 Products

2.1 FLOOR DRAINS

.1 Floor drains: to CSA B79. Refer to schedule on drawings.

2.2 CLEANOUTS

.1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
  .1 Acceptable material: Watts, J.R. Smith & Zurn Z-1449.

.2 Access covers:
  .1 Wall access: face or wall type, stainless steel round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs. Acceptable material: Watts, Zurn ZANB-1463 (wall), ZANB-1460 (floor).
  .2 Floor access: round cast iron body and frame with adjustable secured nickel bronze top, and.
    .1 Plugs: bolted bronze with neoprene gasket.
    .2 Cover for unfinished concrete floors: nickel bronze round, gasket, vandal-proof screws. Acceptable material: Watts, Zurn ZX-1612-BP.
    .3 Cover for terrazzo finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws. Acceptable material: Watts, Zurn ZX-1400-BP-Z.
    .4 Cover for tile and linoleum floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws. Acceptable material: Watts, Zurn ZN-1602-BP-VP light traffic.

2.3 TRAP SEAL PRIMERS

.1 Type 1: for use on urinal or water closet cold water line.

  .1 Pressure drop activated type, all brass construction with "O" ring seals, 12 mm (NPT ½) male inlet & 12 mm (NPT ½) female outlet drip line connection with viewing holes, and removable fitter screen. Trap primer shall have no adjustment. Operating range shall be 138 kPa (20 psi) to 861 kPa (125 psi). Operates on pressure drop of Minimum 20 kPa (3 psi). One (1) to six (6) drain taps per unit.
  .2 Identify on as-built drawings the location of each trap seal primer.
  .3 Ensure all trap seal primers are accessible for maintenance purposes and are connected to urinal or water closet cold water line. Trap line shall be from top of cold water line and include a service valve. All to be serviceable from access doors.
  .4 Acceptable materials: Mifab M-500, Watts, Zurn Z-1022.

.2 Type 2: for use on lavatory cold water line.

  .1 Brass trap seal primer with removable poppet, integral vacuum breaker, gasketted access cover 13 NPT (½") threaded inlet and outlet connections, complete with 13 NPT (½") sweat connection adapters and 13 NPT (½") drip line connection.
  .2 Trap seal primers are listed with I.A.P.M.O. and CSA and are tested and certified to the ASSE 1018.
  .3 Trap seal primers shall be installed minimum 305 mm (12") above the grid of a floor drain or flood level rim of equipment served.

.4 Operating range for trap seal primers is 138 kPa (20 psi) to 861 kPA (125 psi). Operates on pressure drop of Minimum 14 kPA (2 psi).

.5 Acceptable material: PPP Prime-pro, Mifab MI-TSP-3, Watts, Zurn.

2.4 WATER HAMMER ARRESTORS

.1 Copper construction, bellows or piston type: to PDI-WH201.

.2 Acceptable material: Watts, J.R. Smith & Zurn Z-1700.

2.5 VACUUM BREAKERS

.1 To CSA B64.

.2 Atmospheric vacuum breaker:

.1 Acceptable material: Zurn Model 35 (chrome finish), Watts.

.3 Hose connection vacuum breaker:

.1 Acceptable material: Zurn Model BFP-9, Watts.

2.6 HOSE BIBBS AND SEDIMENT FAUCET

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

.2 Acceptable material: Watts.

2.7 STRAINERS

.1 860 kPa (125 psi), Y type with 20 mesh, Monel, bronze or stainless steel removable screen.

.2 NPS 2 and under, bronze body, screwed ends, with brass cap.

.1 Acceptable material: Watts, Wilkins S-XL.

2.8 UNDER SINK THERMOSTATIC MIXING VALVE

.1 Thermostatic Mixing Valve:

.1 The valve shall be ASSE standard 1070 and IAPMO CUPC listed and controls the temperature of the hot water. It shall have a lead free brass 4-port, "H" pattern body. Lead free* under counter thermostatic valves shall comply with codes and standards, where applicable, requiring reduced lead content. The valve shall include integral check valves, integral screens and an adjustment nut with locking feature. The valve shall be provided with 10 mm (3/8"), male compression or quick-connect fittings.

.2 Acceptable material: Watts series LFUSG-B or as scheduled.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.2 FLOOR DRAINS

.1 Floor drains to be installed at lowest point in floor and placed to ensure floor finishing is flush/slightly higher than strainer. Contractor to chip concrete around drains, lower assembly, patch concrete and provide floor finish should the installed elevation be unacceptable to Engineer.

.2 Contractor to provide suitable means of protecting floor drains and cleanouts from damage during construction. Contractor to be responsible for turning over facility to Owner with floor drains and strainers in new condition. Damaged material shall be replaced with new at contractor's expense.

3.3 CLEANOUTS

.1 In addition to those required by code, and as indicated, install at base of soil and waste stacks, and rainwater leaders.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.4 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures.

3.5 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.6 TRAP SEAL PRIMERS

.1 Install for floor drains and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Engineer.

.3 Install soft copper tubing to floor drain.

.4 Identify on as-built drawings the location of each trap seal primer.

.5 Ensure all trap seal primers are accessible for maintenance purposes. Install access doors.

3.7 STRAINERS

.1 Install with sufficient room to remove basket.

3.8 START-UP

.1 Timing: Start-up only after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

3.9 TESTING AND ADJUSTING

.1 Timing:

.1 After start-up deficiencies rectified.

.2 After certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:

.1 Pressure at fixtures: +/- 70 kPa.

.2 Flow rate at fixtures: +/- 20%.

.3 Adjustments:

.1 Verify that flow rate and pressure meet design criteria.

.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.4 Floor drains:

.1 Verify operation of trap seal primer.

.2 Prime, using trap primer. Adjust flow rate to suit site conditions.

.3 Check operations of flushing features.

.4 Check security, accessibility, removability of strainer.

.5 Clean out baskets.

.5 Access doors:

.1 Verify size and location relative to items to be accessed.

.6 Cleanouts:

.1 Verify covers are gas-tight, secure, yet readily removable.

.7 Water hammer arrestors:

.1 Verify proper installation of correct type of water hammer arrester.

.8 Strainers:

.1 Clean out repeatedly until clear.

.2 Verify accessibility of cleanout plug and basket.

.3 Verify that cleanout plug does not leak.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA B45 Series-02 (R2013), Plumbing Fixtures (Consists of B45.0-02, B45.1-02, B45.2-02, B45.3-02, B45.4-02, B45.5-02, B45.6-02, B45.7-02, B45.8-02 and B45.9-02), Includes Updates No. 1, No. 2, No. 3, and No. 4 (2007).

.2 CSA B125-01, Plumbing Fittings.

.3 CSA B651-12, Accessible Design for the Built Environment.

1.3 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Indicate, for all fixtures and trim:

.1 Dimensions, construction details, roughing-in dimensions.

.2 Factory-set water consumption per flush at recommended pressure.

.3 (For water closets, urinals): minimum pressure required for flushing.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 20 05 01 - Mechanical General Requirements.

.2 Include:

.1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.

.2 Details of operation, servicing, maintenance.

.3 List of recommended spare parts.

Part 2 Products

2.1 MANUFACTURED UNITS

.1 Fixture piping.

.1 Hot and cold water supplies to each fixture:

.1 Stops supplies shall be all brass with full turn brass seams and washer replaceable attachment shall be IPS inlet x compression OD outlet to fixture. All fixture stop valves shall be screw driver type.

.2 Chrome plated in all exposed places.

.2 Waste:

.1 Cast brass adjustable style P-trap with cleanout on each fixture not having integral trap.

.2 Chrome plated in all exposed places.

.3 Sink and lavatory heavy gauge P-traps shall be cast brass adjustable style with 17 ga. seamless brass wall bend. Attachment nuts shall be brass, no zinc allowed. P-traps to be removable/union type or to include cleanout.

.4 Lavatory strainers shall be chrome plated cast brass with 17 ga. seamless brass tailpiece.

.5 All barrier-free lavatories and sinks shall have chrome plated offset tail piece in addition to P-trap with cleanout. Insulate P-trap and hot & cold water pipes with pre-formed & finished surface insulation. Armaflex insulation and tape not acceptable.

.2 Fixtures:

.1 Manufacture in accordance with CSA B45.

.2 All products, where applicable, shall be marked with manufacturer's name or product #.

.3 Trim, fittings: manufacture in accordance with CSA B125.

.4 Number, locations: Architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type unless otherwise indicated.

.7 Reference drawing schedule for configuration and type.

2.2 CARRIERS

.1 Provide for all wall mounted plumbing fixtures.

2.3 ROUGHING-IN OF FIXTURES

.1 Rough-in for equipment supplied by other to be complete with valved supplies, wastes and vents, capped and associated fitting piping & reducers.

2.4 PLUMBING FIXTURES

.1 Reference fixture schedule on Drawings.

Part 3 Execution

3.1 INSTALLATION

.1 Mounting heights:

.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

.2 Wall-hung fixtures: as indicated on architectural elevations.

.3 Physically handicapped: to comply with most stringent of either NBCC, OBC or CAN/CSA B651.

3.2 URINALS

.1 Urinal waste pipe & fittings shall be DWV PVC equivalent to IPEX System 15 in accordance with specification Section 22 13 18 - Drainage Waste and Vent - Plastic. Extend plastic piping up to combined waste from adjacent lavatory or other plumbing fixtures allowing dilution of waste.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified in this section.

.2 Adjustments:

.1 Adjust water flow rate to design flow rates and sensors.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Adjust flush valves to suit actual site conditions.

.3 Checks:

.1 Water closets: flushing action.

.2 Aerators: operation, cleanliness.

.3 Vacuum breakers, backflow preventers: operation under all conditions.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.2 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, and components.

3.3 DRAINS

.1 Install piping with grade in direction of flow except as indicated or specified otherwise.

.2 Install drain valve at low points in piping systems, at equipment at section isolating valves and at base of all risers.

.3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.

.4 Drain valves: NPS 3/4 full port ball valves unless indicated otherwise, with hose end male thread, cap and chain.

3.4 AUTOMATIC AIR VENTS

.1 Install automatic air vents at high points of piping systems.

.2 Install full port ball at each automatic air vent.

.3 Air vents must have minimum connection of 13 mm (½").

3.5 DIELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: Isolating flanges.

3.6 PIPEWORK INSTALLATION

.1 Screwed fittings to be jointed with Teflon tape.

.2 Protect openings against entry of foreign material.

.3 Install so that equipment can be isolated and removed without interruption to operation of any other equipment or systems.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Weldolets sockolets Saddle type branch fittings may be used on mains if branch line is no larger than half the size of the main. Hole saw (or drill) and ream main so as to maintain full inside diameter of branch line prior to welding saddle. Provide isolation valves at each branch connection.

.6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.7 Install concealed pipework so as to minimize furring space, maximize headroom, and conserve space.

.8 Except where indicated otherwise, slope piping in direction of flow for positive drainage and venting.

.9 Except where indicated, install so as to permit separate thermal insulation of each pipe.

.10 Group piping wherever possible and as indicated.

.11 Ream pipes, remove scale and other foreign material before assembly.

.12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.13 Provide for thermal expansion as indicated and specified.

.14 Contractor shall carry a structural engineer to design and certify the support system for any piping distribution system exceeding 100 mm (4") or where piping is grouped such that the distributed weight exceeds the building structure limits. (Note: In steel building structure the piping supports shall never be supported by a single joist or off the bottom chord of the joist or truss.

3.7 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.8 FLUSHING OUT OF PIPING SYSTEMS

.1 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

.2 Provide test results upon completion and retain written report on status after complete.

3.9 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Engineer 48 hours minimum prior to performance of pressure tests.

.2 Pipework: Test to 1½ times normal operating pressure to a maximum of the piping systems working pressure including devices (i.e.: valves, fittings, accessories). Minimum test pressure to be 862 kPa (125 psi).

.3 Maintain specified test pressure without loss for four 4 hours minimum. Temperature of system to remain constant during of test.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Engineer.

.6 Bear costs for repairs or replacement, retesting, and making good. Engineer to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Engineer.

3.10 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Engineer.

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

.5 Cleaning & flushing of new piping to be done prior to making final connection to existing system.

.6 Provide full size bypass as required to ensure cleaning of piping.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.0 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers.

.1 ASHRAE 90.1-2016, Energy Code for Buildings Except Low-Rise Residential Buildings.

.2 Electrical Equipment Manufacturers' Advisory Council (EEMAC)

.3 National Electrical Manufacturers Association (NEMA)

.1 NEMA MG 1-2016, Motors and Generators.

.4 Ontario Regulation

.1 ONTARIO OBC-2012, 2012 Ontario Building Code Compendium.

1.3 ELECTRICAL

.1 Electrical work to conform to Division 26 including the following:

.1 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Divisions 20, 21, 22, 23 & 25. Refer to Division 26 for quality of materials and workmanship.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 20 05 01 - Mechanical General Requirements.

1.5 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 20 05 01 - Mechanical General Requirements.

Part 2 Products

2.1 GENERAL

.1 Motors to be premium efficiency, in accordance with NEMA 1 premium motor standards and the requirements of ASHRAE 90.1 unless superceded by Ontario Building Code (OBC) Supplementary Standard SB-10.

2.2 MOTORS

.1 Provide premium efficiency motors for mechanical equipment to NEMA MG 1 Part 31.

.2 Motors efficiency must exceed the following:

Open Drip-Proof (ODP) Type

Motor Size	Speed (RPM) 1200	1800	3600
HP	NEMA Premium Nominal Efficiency		
1 & below	82.5%	85.5%	77.0%
1.5	86.5%	86.5%	84.0%
2	87.5%	86.5%	85.5%
3	88.5%	89.5%	85.5%
5	89.5%	89.5%	86.5%
7.5	91.0%	91.0%	88.5%
10	91.7%	91.7%	89.5%
15	91.7%	93.0%	90.2%
20	92.4%	93.0%	91.0%
25	93.0%	93.6%	91.7%
30	93.6%	94.1%	91.7%
40	94.1%	94.1%	92.4%
50	94.1%	94.5%	93.0%
60	94.5%	95.0%	93.6%
75	94.5%	95.0%	93.6%
100	95.0%	95.4%	93.6%
125	95.0%	95.4%	94.1%
150	95.4%	95.8%	94.1%
200	95.4%	95.8%	95.0%

Totally Enclosed Fan-Cooled (TEFC) Type

Motor Size	Speed (RPM) 1200	1800	3600
HP	NEMA Premium Nominal Efficiency		
1 & below	82.5%	85.5%	77.0%
1.5	87.5%	86.5%	84.0%
2	88.5%	86.5%	85.5%
3	89.5%	89.5%	86.5%
5	89.5%	89.5%	88.5%
7.5	91.0%	91.7%	89.5%
10	91.0%	91.7%	90.2%
15	91.7%	92.4%	91.0%
20	91.7%	93.0%	91.7%
25	93.0%	93.6%	91.7%
30	93.0%	93.6%	91.7%
40	94.1%	94.1%	92.4%
50	94.1%	94.5%	93.0%
60	94.5%	95.0%	93.6%
75	94.5%	95.4%	93.6%
100	95.0%	95.4%	94.1%
125	95.0%	95.4%	95.0%
150	95.8%	95.8%	95.0%
200	95.8%	96.2%	95.4%

.3 Motors under 373 W (½ HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.4 Motors 373 W (½ HP) to 14.92 kW (20 HP): EEMAC Class B/F, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 45°C/60°Cover ambient of 30°C, 3 phase, 600 V, unless otherwise specified or indicated.

.5 Two speed motors shall be double winding type.

.6 Motors coupled with VFD shall be premium efficiency, inverter duty type to NEMA MG 1 Part 31 and shall have as a minimum EEMAC Class F insulation. Inverter ready motors shall not be acceptable.

.7 Motors coupled with VFD's shall include a shaft grounding ring.

.8 Motors located outside to be TEFC type, unless located in insulated weatherproof enclosure.

2.3 TEMPOARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Consultant for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.

.3 For motor under 7.5 kW (10 HP): standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 For motors 7.5 kW (10 HP) and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave to be determined during start-up and commissioning.

.6 Minimum drive rating: 1½ times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

2.5 DRIVE GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives;

.1 Expanded metal screen welded to steel frame.

.2 Minimum 1.6 mm (16 ga.). sheet metal tops and bottoms.

.3 38 mm (1½") dia. holes on both shaft centres for insertion of tachometer.

.4 Removable for servicing.

.5 OSHA approved.

.6 Sized to allow either sheave to be increased by two sizes.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension.

.5 Plenum fan assembly must have an enclosed safety screen as per OSHA standards.

Part 3 Execution

3.1 INSTALLATION

.1 Fasten securely in place.

.2 Ensure motor installation is easily removable for servicing.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM).

.1 ASTM B16/B16M-10(2015), Standard Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.

.2 ASTM B62-15, Specification for Composition Bronze or Ounce Metal Castings.

.2 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).

.1 MSS SP-80-2013, Bronze Gate Globe, Angle and Check Valves.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Submit data for all valves specified in this section.

1.4 CLOSEPIT SUBMITTALS

.1 Submit maintenance data for incorporation into manual specified in Section 20 05 01 - Mechanical General Requirements.

1.5 ACCEPTABLE MANUFACTURERS

.1 Refer to Acceptable Products Table in Part 3 of this section.

Part 2 PRODUCTS

2.1 GENERAL

.1 All valves of the same type to be from one manufacturer.

.2 All valves to have CRN registration numbers.

2.2 CHECK VALVES

.1 NPS 2 and under, bronze swing type, bronze disc:

.1 Standard specification: MSS SP-80.

.2 Connections: with hex. shoulders.

.3 Body: Y-pattern with integral seat at 45°, screw-in cap with hex head.

.4 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

2.3 BALL VALVES

.1 NPS 4 and under:

.1 Body and cap: cast high tensile bronze to ASTM B62 or brass to ASTM B16/B16M C36000.

.2 Stem: tamperproof ball drive.

.3 Stem packing nut: external to body.

.4 Ball and seat: replaceable chrome plated brass solid full port ball and Teflon seats.

.5 Stem seal: TFE with external packing nut.

.6 Operator: removable lever handle.

Part 3 Execution

3.1 ACCEPTABLE PRODUCTS TABLE

.1 Refer to Acceptable Products Table in Part 3 of this section.

3.2 INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Handwheel with chain operators are to be installed on all valves more than 3 metres above floor.

.3 Remove internal parts before soldering or brazing.

.4 Install all valves such that adequate clearance is provided to allow for obstruction free operation.

.5 Install valves at all branch take-offs and to isolate each piece of equipment, and as indicated.

.6 For all threaded valves provide one screwed union beside each valve to allow easy replacement of valve.

.7 Install all valves as per manufacturer's recommendation.

		Class					
System	Valve Type	Bronze	Cast Iron	Cast Steel	End Connection	Miscellaneous	Remarks
Domestic Water	Ball	[400] [600]			Soldered/Threaded		
	Gate	[150] [300]	[125] [250]	[150] [300]	Flanged/Grooved	[OS&Y] [Inside Screw] [Rising Stem] [Non-rising Stem]	
	Butterfly	[150] [300]	[125] [250]	[150] [300]	Flanged/Grooved		
	Check	[150] [300]	[125] [250]	[150] [300]	Soldered/Threaded/Flanged/Grooved		
	Balancing	[150] [300]	[125] [250]	[150] [300]	Soldered/Threaded/Flanged/Grooved		
Chilled Water	Ball	[400] [600]			Soldered/Threaded		
	Gate	[150] [300]	[125] [250]	[150] [300]	Flanged/Grooved	[OS&Y] [Inside Screw] [Rising Stem] [Non-rising Stem]	
	Butterfly	[150] [300]	[125] [250]	[150] [300]	Flanged/Grooved		
	Check	[150] [300]	[125] [250]	[150] [300]	Soldered/Threaded/Flanged/Grooved		
	Balancing	[150] [300]	[125] [250]	[150] [300]	Soldered/Threaded/Flanged/Grooved		
Heating Water / Glycol	Ball	[400] [600]			Soldered/Threaded		
	Gate	[150] [300]	[125] [250]	[150] [300]	Flanged/Grooved	[OS&Y] [Inside Screw] [Rising Stem] [Non-rising Stem]	
	Butterfly	[150] [300]	[125] [250]	[150] [300]	Flanged/Grooved		
	Check	[150] [300]	[125] [250]	[150] [300]	Soldered/Threaded/Flanged/Grooved		
	Balancing	[150] [300]	[125] [250]	[150] [300]	Soldered/Threaded/Flanged/Grooved		
Low Pressure Steam	Gate	[150] [300]	[125] [250]	[150] [300]	Socket Weld/Threaded/Flanged	[OS&Y] [Inside Screw] [Rising Stem] [Non-rising Stem]	Use Cast Steel over NPS 10
High Pressure Steam	Gate	[150] [300]	[125] [250]	[150] [300]	Socket Weld/Threaded/Flanged	[OS&Y] [Inside Screw] [Rising Stem] [Non-rising Stem]	Use Cast Steel over NPS 10
Condensate	Ball	[400] [600]			Socket Weld/Threaded/Flanged		
	Check	[150] [300]	[125] [250]	[150] [300]	Socket Weld/Threaded/Flanged		
Natural Gas	Ball	[400] [600]			Threaded/Flanged		
	Lubricated Plug	[150] [300]	[125] [250]	[150] [300]	Threaded/Flanged		
Oil	Ball	[400] [600]			Socket Weld		
	Gate	[150] [300]	[125] [250]	[150] [300]	Socket Weld	[OS&Y] [Inside Screw] [Rising Stem] [Non-rising Stem]	Disc: Cast Iron
	Check	[150] [300]	[125] [250]	[150] [300]	Socket Weld		Disc: A126 Class B, Seat: Cast Iron
General							
All valves to have CRN registration numbers.							
All fittings 2-1/2" and over to be flanged or grooved were acceptable in above table							
All valves to be rated for the indicated operating pressures for the system they are to be used on.							
Handwheel with chain operators on valves installed more than 2400mm above floor							
Notes:							
Gate valves							
specify if OS&Y							
Use rising stem where visual indication of valve position is required.							
Use non-rising stem where space is limited.							
Cast Steel							
Higher class ratings are available for special applications							

Valve Model # Table

		Kitz			Crane	
		2" & Under		2-1/2" & Over	2" & Under	
System	Valve Type	Solder	Threaded	Flanged	Solder	Threaded
Domestic Water	Ball	59	58	-	9322	9302
Chilled Water	Butterfly	-	-	6122	-	-
Heating Water / Glycol	Check	23	22	78	1342	37

		Tour & Anderson				
		2" & Under		2-1/2" & Over		2" &
	Valve Type	Solder	Threaded	Flanged	Grooved	Solder
	Balancing	STAS	STAD	STAF-SG	STAG	CBV-S

		Kitz			Crane	
		2" & Under		2-1/2" & Over	2" & Under	
	Valve Type	Solder	Threaded	Flanged	Solder	Threaded
Low Pressure Steam	Gate	-	24	72	-	428
High Pressure Steam	Gate	-	42	150SCL	-	431UB
Condensate	Gate	-	24	72	-	428
	Check	23	22	78	1342	37
Natural Gas	Ball	59	58	-	9322	9302
	Lubricated Plug					
Oil	Ball					
	Gate					
	Check					

Jenkins			
2-1/2" & Over	2" & Under		2-1/2" & Over
Flanged	Solder	Threaded	Flanged
-	902BJ	901BJ	-
44BXZ	-	-	2232EJ
373	4093J	4037	587J

Armstrong			Bell & Gossett			
½ Under	2-1/2" & Over		2" & Under		2-1/2" & Over	
Threaded	Flanged	Grooved	Solder	Threaded	Flanged	Grooved
CBV-T	CBV-G	CBV-G	CB-S	CB	CB-F	CB-G

Jenkins			
2-1/2" & Over	2" & Under		2-1/2" & Over
Flanged	Solder	Threaded	Flanged
465-1/2	-	810J	454J
47UF	-	47CUJ	J1009B8F
465-1/2	-	810J	454J
373	4093J	4037	587J
-	902BJ	901BJ	-

Domestic, Chilled & Heating Water/Glycol up to 200 psi							
Valve Type			**Crane**	**Jenkins**	**Toyo**	**Victaulic**	**Kitz**
Ball	NPS 4 & Under	Solder	9202 (up to 3")	202J (up to 3")	5049A	-	59
		Threaded	9201 (up to 4")	201J (up to 4")	5044A	722	58
Check	NPS 2 & Under	Solder	1342	4093J	237	-	23
		Threaded	37	4037	236	-	22
	NPS 2½ & Over	Flanged	373	587J	435	-	78
		Grooved	-	-		716	-
Low Pressure Steam & Condensate (0 to 15 psi)							
Valve Type			**Crane**	**Jenkins**	**Toyo**	**Kitz**	
Gate	NPS 2 & Under	Threaded	428	810J	293	24	
	NPS 2½ & Over	Flanged	465-1/2	454J	421	72	
Check	NPS 2 & Under	Threaded	37	4037J	236	22	
	NPS 2½ & Over	Flanged	373	587J	535	78	
Natural Gas							
Valve Type			**Crane**	**Jenkins**	**Toyo**	**Kitz**	
Ball	2" & Under	Threaded	9201	201J	5044A	58	

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B31.1-2016, Power Piping.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A125-96(2013)e1, Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307-14, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A563-15, Specification for Carbon and Alloy Steel Nuts (Metric).

.3 Factory Mutual (FM)

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)

.1 MSS SP-58-2009, Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

.5 Underwriter's Laboratories of Canada (ULC).

1.3 DESIGN REQUIREMENTS

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.4 DESIGN FOR SEISMIC EVENTS

.1 Design supports, platforms, hangers, racks to withstand seismic events as specified Section 23 05 49.01 - Seismic Restraint Systems (SRS).

1.5 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Submit shop drawings and product data for following items:

.1 All bases, hangers and supports.

.2 Connections to equipment & structure.

.3 Structural assemblies.

1.6 CLOSEOUT SUBMITTALS

.3 Provide maintenance data for incorporation into manual specified in Section 20 05 01 - Mechanical General Requirements.

Part 2 Products

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP-58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

.3 Use oversized hangers to suit insulation thickness. Provide insulation protection shields to protect insulation.

2.2 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized after manufacture.

.2 Use electro-plating galvanizing process or hot dipped galvanizing process.

.3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 Upper attachment structural: Suspension from lower flange of I-Beam.

.1 Cold piping NPS 2 maximum: Malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
.1 Rod: 9 mm UL listed.

.2 Cold piping NPS 2½ or greater, all hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed to MSS SP-58.

.3 Upper attachment structural: Suspension from upper flange of I-Beam.

.1 Cold piping NPS 2 maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed to MSS SP-58.

.2 Cold piping NPS 2½ or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.

.4 Upper attachment to concrete.

.1 Ceiling: Carbon steel welded rod, clevis plate, clevis pin and cotters with weldless forged steel nut.

.2 Concrete wedge anchor with knockout protector plate UL listed to MSS SP-58. Anchor installation to be via concrete pre-drilling. Impact insert type anchor not allowed.

.5 Manufacturer assemblies:

.1 Sway braces for seismic restraint systems: to Section 23 05 49.01 - Seismic Restraint Systems (SRS).

.6 Hanger rods: threaded rod material to MSS SP-58.

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.3 Do not use 22 mm or 28 mm rod.

.7 Pipe attachments: material to MSS SP-58.

.1 Attachments for steel piping: carbon steel black.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for hot pipework.

.4 Oversize pipe hangers and supports.

.8 Adjustable clevis: material to MSS SP-58 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis. Ensure "U" has hole in bottom for riveting to insulation shields.

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP-58.

.10 U-bolts: carbon steel to MSS SP-58 with 2 nuts at each end to ASTM A563.

.1 Finishes for steel pipework: black.

.2 Finishes for copper, glass, brass or aluminum pipework: black, with formed portion epoxy coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP-58, Type 43.

.1 Finish: Hot dipped galvanized steel.

.2 Acceptable material: Tolco or approved equal.

2.3 RISER CLAMPS

.1 Steel or cast iron pipe: black carbon steel to MSS SP-58, type 42, UL listed.

.2 Copper pipe: carbon steel copper plated to MSS SP-58, type 42.

.3 Bolts: to ASTM A307.

.4 Nuts: to ASTM A563.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping: 64 kg/m^3 density insulation plus insulation protection shield to: MSS SP-58, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping: Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP-58.

2.5 CONSTANT SUPPORT SPRING HANG Hangers

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger to be complete with factory calibrated travel stops.

.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel to suit installation location meeting requirements of structural engineer’s design. Submit details and calculations with shop drawings showing proposed fastening to structure.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

.2 For attachment to concrete, provide concrete wedge anchors with knockout protection plate UL listed. Anchor installation to be via concrete pre-drilling. Impact insert type anchor not allowed.

2.9 PIPE, DUCT, CONDUIT PENETRATIONS THROUGH SLABS

.1 Where piping or conduits penetrate through the floor of mechanical room, a 100 mm high housekeeping pad shall be installed with minimum 150 mm between conduit/pipe and the edge of the pad. This pad shall be bonded to the existing slab through which the pipes, ducts or conduit shall pass.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with: manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps and elsewhere as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to be to industry standards.

.3 Steel pipes: Install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: Install below joint.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 Use approved constant support type hangers where:

.1 vertical movement of pipework is 13 mm or more,

.2 transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:

.1 transfer of load to adjacent piping or to connected equipment is not critical.

.2 variation in supporting effect does not exceed 25% of total load.

.8 When attaching to open web steel joists provide additional hangers for pipes with diameters of 75 mm or greater in order to reduce the magnitude of the concentrated load and spread the load to the joists equally. In these cases the allowable spacing of hangers for pipes permitted under ASME / MSS SP-58 will be reduced and additional hangers will be required as directed by steel fabricator and/or structural engineer.

.9 Locate hangers at the top of open web steel joists where the horizontal and diagonal members meet at a joint.

.10 All installations must be in conjunction with Section 23 05 49.01 - Seismic Restraint System.

3.2 HANGER SPACING

.1 Plumbing piping: most stringent requirements of Manufacturer's recommendations, Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.

.2 Fire protection: to applicable fire code.

.3 Gas & fuel piping: to applicable code.

.4 Copper piping: up to NPS ½: every 1.5 m.

.5 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

.6 Within 300 mm of each elbow.

Maximum Pipe Size: NPS	Maximum Spacing Steel	Maximum Spacing Copper	Maximum Spacing XFR
up to 1¼	2.1 m	1.8 m	1.6 m
1½	2.7 m	2.4 m	1.6 m
2	3.0 m	2.7 m	1.8 m
2½	3.6 m	3.0 m	1.8 m
3	3.6 m	3.0 m	2.2 m
4	4.2 m	3.6 m	2.6 m
6	5.1 m		3.1 m
8	5.7 m		3.6 m
10	6.6 m		4.0 m
12	6.9 m		4.4 m

.7 Pipework greater than NPS 12: to MSS SP-58.

3.3 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.4 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4° from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps: Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps: Hammer jaw firmly against underside of beam.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 ASHRAE HVAC Application 2015, Chapter 54 Seismic & Wind Restraint Design. In addition reference ASHRAE "A Practical Guide to Seismic Restraint".

.2 Ontario Regulation

.1 ONTARIO OBC-2012, 2012 Ontario Building Code Compendium.

.3 National Fire Protection Association (NFPA)

.1 NFPA (Fire) 13, Installation of Sprinkler Systems, 2016 edition.

.2 NFPA (Fire) 14, Installation of Standpipe and Hose Systems, 2016 edition.

.3 NFPA (Fire) 20, Installation of Stationary Pumps for Fire Protection, 2016 edition.

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 SMACNA - Seismic Restraint Manual, 3rd Ed.

1.3 DEFINITIONS

.1 SRS: acronym for Seismic Restraint System.

1.4 GENERAL DECRIPTION

.1 This section covers design, supply and installation of complete SRS for all systems, equipment specified for installation on this project. This includes fire protection piping & mechanical equipment and systems, both vibration isolated and statically supported.

.2 SRS to be fully integrated into & compatible with:

.1 Noise and vibration controls specified elsewhere in this project specification.

.2 Structural, mechanical, electrical design of project.

.3 During a seismic event, SRS to prevent systems and equipment from causing personal injury and from moving from normal position.

.4 Specified critical systems as noted below must remain operational during and after an earthquake:

.1 All systems for buildings as listed in OBC Table 4.1.8.17.

.2 Life safety systems for P2 buildings.

.3 Natural gas & fuel oil systems for P2 buildings.

.5 Design to be by Professional Engineer specializing in design of SRS and registered in Province of Ontario. The following shall bear the SRS Design Engineer's seal and signature:

.1 SRS calculations.
.2 SRS shop drawings.
.3 SRS installation inspections.
.4 SRS final certification letter for the project.

Note: The final certification letter shall identify the following with the body of the letter:

.1 The date of the final inspection.
.2 The list of contract documents which were reviewed including but not limited to the mechanical drawings, project change orders, site instructions, etc.
.3 A statement which clearly identified any exclusions of scope of service.
.4 A statement that certifies the installation meets the latest version of OBC & applicable codes & standards.

1.5 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Submittals to include:

.1 Full details of design criteria, calculations for all equipment & associated systems.
.2 Seismic Design Engineer shall provide a spreadsheet identifying all equipment requiring or not requiring seismic restraints and include all calculations.
.3 A copy of the seismic design engineer professional liability insurance coverage.

.3 Submit additional copy of shop drawings and product data to Structural Engineer for review of connection points to building structure.

1.6 MAINTENANCE DATA

.1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 20 05 01 - Mechanical General Requirements.

Part 2 Products

2.1 GENERAL

.1 Definitions

.1 Seismic System: isolation and seismic restraint products supplied by one supplier.
.2 Manufacturer: manufacturer of the isolation and seismic restraint system.
.3 Supplier: manufacturers' and seismic engineer's representative
.4 Seismic Engineer: a Professional Engineer holding a Certificate of Authorization in the Province of Ontario with a minimum of 5 years experience in seismic design, and with a minimum of $1 million Professional Liability Insurance.

.2 Each contactor shall use one Supplier to provide seismic design, isolation, and seismic restraint.

.3 Seismic restraints are to be provided for all operational and functional components of building services in accordance with the current Ontario Building Code, ASHRAE Standard "A Practical Guide to Seismic Restraint", NFPA (Fire) 13, 14 & 20, SMACNA "Seismic Restraint Manual" and good engineering practice.

.4 The contractor shall utilize a Supplier familiar with the design of seismic systems to provide a comprehensive package of isolation and seismic restraint for the project. Provide detailed shop drawings showing the proposed restraint system for all required equipment, piping, and ductwork on the project. The shop drawings shall include calculations certified by the Seismic Engineer.

.1 Acceptable Suppliers: HTS Engineering, Master Group, Walmar, E.H. Price.

.2 Acceptable Manufacturers: Kinetics / Vibron, Tecoustics, Mason, Gripple Seismic.

.3 Alternates to be approved by Addendum only.

.5 Cable restraint systems, rod stiffener clamps and seismic isolator capacities to be verified by an independent test laboratory. Connection materials and site specific designs to be by the Seismic Engineer. The Seismic Engineer may specify material and anchors provided by the contractor where this is appropriate. It is the contractors' responsibility to ensure that the Seismic Engineers' requirements and specification have been met.

.6 At the completion of the project, the Supplier and the Seismic Engineer shall review the installations on site, and shall prepare a written report, with a sealed letter from the Seismic Engineer, certifying that the installations have been completed in accordance with their design and shop drawings.

.7 The Manufacturer shall be a member of VISCMA (Vibration Isolation and Seismic Control Manufacturers Association). They shall have a letter issued to their Supplier confirming that they have reviewed and accepted the engineering practices used by the Seismic Engineer. The letter shall also state that the manufacturer accepts the Supplier to act as their representative for the product.

2.2 SEISMIC FORCE

.1 The Importance Factor for this project is:

.1 I = 1.0 - All other buildings i.e.: Office & General Buildings.
Note: As per OBC.

.2 The site classification for seismic site response and shear wave velocity parameters shall be as indicated on structural documents and as recorded in the geotechnical report.

Part 3 Execution

3.1 INSTALLATION

.1 Install Seismic Restraint Systems in accordance with Seismic Engineer's and manufacturer's recommendations.

.2 Install SRS at least 25 mm from all other equipment, systems, and services.

.3 Co-ordinate connections with all disciplines.

3.2 INSPECTION AND CERTIFICATION

.1 SRS to be inspected and certified by Manufacturer upon completion of installation.

.2 Seismic Design Engineer shall provide written report to Engineer certifying that SRS has been installed in accordance with the SRS drawings. The report shall bear the seal and signature of the SRS Design Engineer.

3.3 COMMISSIONING DOCUMENTATION

.1 Upon completion and acceptance of certification, hand over to Engineer complete set of construction documents, revised to show "as-built" conditions.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-24.3-92, Identification of Piping Systems.

.2 Canadian Standards Association (CSA).

.1 CSA B149.1-15, Natural Gas and Propane Installation Code.

.3 National Fire Protection Association

.1 NFPA (Fire) 13, Installation of Sprinkler Systems, 2016 Edition.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Product data to include paint colour chips, all other products specified in this section.

1.4 SAMPLES

.1 Submit samples in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

Part 2 Products

2.1 GENERAL

.1 Identification systems to be in accordance with existing building NRC standard. If there is no existing building identification system obvious than the following applies.

2.2 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers to be raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: Manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.3 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background.

.2 Construction:

.1 1/8" thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size #	Height Sizes (mm)	No. of Lines	Height of Letters (mm)
1	40	1	20
2	75	1	50

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

.4 Locations:

.1 Terminal cabinets, control panels: Use size #1.

.2 Equipment in Mechanical Rooms: Use size #2.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Natural gas: To CSA B149.1.

.2 Sprinklers: To NFPA (Fire) 13.

2.5 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, legend; direction of flow by arrows. To NRC and CAN/CGSB-24.3 except where specified otherwise.

.2 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.

.3 Arrows showing direction of flow:

.1 Continuous wrap full diameter of pipe at each end of pipe identification markers.

.4 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate full length of legend and arrows.

.5 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 3/4" and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 All other pipes: Pressure sensitive plastic-coated cloth or vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 300°F and intermittent temperature of 400°F.

.6 Colours and Legends:

.1 Where not listed, obtain direction from Engineer.

.2 Colours for legends, arrows: To following table:

Background colour:	Yellow	Legend, arrows:	BLACK
	Green		WHITE
	Red		WHITE

.3 Background colour marking and legends for piping systems:

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

2.6 IDENTIFICATION DUCTWORK SYSTEMS

.1 150 mm (6") high stencilled letters and directional arrows 150 mm (6") long x 50 mm (2") high.

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

2.7 MECHANICAL EQUIPMENT, VALVES CONTROLLERS, PUMPS, BOILERS, FAN COIL ETC.

.1 Lamicoid tag with 13 mm (½") stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

.3 Brass tags with 13 mm (½") stamped identification data filled with black paint.

.4 Brass tags to be stamped with system identification and valve number system as outlined below:

SYSTEM	BRASS TAG STAMP
Domestic Cold Water	DC-1,2, ...
Domestic Hot Water	DH-1,2, ...
Storm	ST-1,2, ...
Sanitary	SA-1,2, ...
Heating Water	HW-1,2, ...

2.8 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.9 LANGUAGE

.1 Identification to be in English.

Part 3 Execution

3.1 TIMING

.1 Provide identification only after all painting specified in Architectural section is complete re: Interior Painting has been completed.

3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and CSA registration plates as required by respective agency.

3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from floor. operating

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection

.1 Do not paint, insulate or cover in any way.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: At not more than 17 m (55 ft.) intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.

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

.10 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

.11 At branch take-offs on both main and branch.

3.5 MECHANICAL EQUIPMENT, VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Engineer. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

.1 ANSI/ASHRAE 110-2016, Method of Testing Performance of Laboratory Fume Hoods.

1.3 GENERAL

.1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do all other work as specified in this section.

1.4 QUALIFICATIONS OF TAB PERSONNEL

.1 Names of all personnel it is proposed to perform TAB to be submitted to and approved by Engineer within 14 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience and certification in good standing with CAABC, NEBB, or NBCTA.

.3 The following are acceptable TAB contractors:

.1 Maxima Technical Services Inc.
.2 Kanata Air Balancing & Engineering
.3 Capital Airflow Ltd.
.4 Brassard Adjustments & Calibrations Inc.
.5 Evenflow Balancing Co.

1.5 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with all other related systems under all normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.6 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

1.7 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

.3 Coordinate TAB with controls, mechanical and electrical contractors.

1.8 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to Engineer adequacy of provisions for TAB and all other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Engineer in writing all proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.

1.9 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Divisions 20, 21, 22, 23 & 25.

1.10 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Engineer for verification of TAB reports.

1.11 START OF TAB

.1 Notify Engineer 7 days prior to start of TAB.

.2 Start TAB only when building is essentially completed, including:

- .1 Installation of ceilings, doors, windows, other construction affecting TAB.
- .2 Application of weatherstripping, sealing, caulking.
- .3 All pressure, leakage, other tests specified elsewhere in Divisions 20, 21, 22, 23 & 25.
- .4 All provisions for TAB installed and operational.

.3 Start-up, verification for proper, normal and safe operation of all mechanical and associated electrical and control systems affecting TAB including but not limited to:

- .1 Proper thermal overload protection in place for electrical equipment.
- .2 Air systems:
  - .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 All outlets installed, volume control dampers open.

1.12 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 All other HVAC systems: plus 5%, minus 5%.

1.13 ACCURACY TOLERANCES

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

1.14 INSTRUMENTS

.1 Prior to TAB, submit to Engineer list of instruments to be 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 Engineer.

1.15 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.16 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Engineer, 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.

1.17 TAB REPORT

.1 Format to be in accordance with Associated Air Balancing Council (AABC/CAABC).

.2 TAB report to show all results in SI units or Imperial (IP), to match drawings and specifications, and to include:

.1 Project record drawings.
.2 System schematics.

.3 Submit pdf electronic copy of TAB Report to Engineer for verification and approval.

1.18 VERIFICATION

.1 All reported results subject to verification by Engineer.

.2 Provide manpower and instrumentation to verify up to 30% of all reported results.

.3 Number and location of verified results to be at discretion of Engineer.

.4 Bear costs to repeat TAB as required to satisfaction of Engineer.

.5 At request of commissioning agent, provide manpower and instrumentation to verify an additional 30% of all reported results.

1.19 SETTINGS

.1 After TAB is completed to satisfaction of Engineer, replace drive guards, close all access doors, lock all devices in set positions, and ensure sensors are at required settings.

.2 Permanently mark all settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.20 COMPLETION OF TAB

.1 TAB to be considered complete only when final TAB Report received and approved by Engineer.

1.21 SYSTEMS

.1 Quality assurance: Perform TAB under direction of supervisor qualified by AABC.

.2 Air Systems: Include both specified and measured data.

.1 Air Handling Equipment:
- .1 Maximum air flow volume.
- .2 Fan total pressure.
- .3 Motor volts, amps and power.
- .4 Fan rotational speed.
- .5 Fan Power, calculate fan efficiency.
- .6 Equipment static pressure profile.

.2 Duct Air Quantities - Mains and Branches:
- .1 Duct size.
- .2 Number of pressure/velocity readings per traverse.
- .3 Sum of velocity measurements.
- .4 Average velocity.
- .5 Duct air flow volume.
- .6 Barometric pressure and duct air temperature.

.3 Air Outlets/Inlets
- .1 Outlet location and designation.
- .2 Manufacturers catalogue identification and type.
- .3 Air outlet flow factors. Use 1.0 when flow hood is used.
- .4 Air flow volumes.

.5 Deflector vane or diffuser cone settings.

1.22 PLUMBING SYSTEMS

.1 Flush valves adjusted to suit project pressure conditions.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 BALANCING AND ADJUSTING PREPARATION

.1 Perform testing, adjusting and balancing work after equipment and systems starting procedures have been properly completed.

.2 Perform balancing during heating and cooling season of first year of operation, and at times when directed by Engineer, to ensure proper settings of controls under both summer and winter peak load conditions.

.3 Vary load to verify operation of system under partial load conditions. Test start-up, shut-down, emergency conditions, safety controls operation and automatic and manual resets and interlocks.

.4 Cap all instrument test ports. Obtain caps from sheet metal contractor and install.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM).

- .1 ASTM C335/C335M-10e1, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .2 ASTM C449-07(2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .3 ASTM C921-10(2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-51.10-92, Mineral Fibre Board Thermal Insulation.
- .2 CAN/CGSB-51.11-92, Mineral Fibre Thermal Insulation Blanket.
- .3 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

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

.4 Underwriters Laboratories of Canada (ULC)

- .1 CAN/ULC S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 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" - will mean "not concealed" as defined herein.
- .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

- .1 CRD: Code Round Ductwork,
- .2 CRF: Code Rectangular Finish.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.5 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with Section 20 05 01 - Mechanical General Requirements, if requested by Engineer.

.2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.6 QUALIFICATIONS

.1 Installer to be specialist in performing work of this section, and have at least 5 years successful experience in this size and type of project, qualified to standards.

1.7 DELIVERY, STORAGE AND HANDLING

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

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions required by manufacturer.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

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

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335/C335M.

.3 TIAC Code C-1: Rigid mineral fibre board to CAN/CGSB-51.10, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

.4 TIAC Code C-2: Mineral fibre blanket to CAN/CGSB-51.11 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/CGSB-51.11.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/CGSB-51.11.

.4 Density: 24 kg/m^3.

2.3 JACKETS

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

.2 Indoor Vapour Retarder Finish: Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

.5 Tape: self-adhesive, aluminum, reinforced, 75 mm (3") wide minimum.

.6 Contact adhesive: quick-setting

.7 Canvas adhesive: washable.

.8 Tie wire: 1.5 mm stainless steel.

.9 Banding: 19 mm (3/4") wide, 0.5 mm thick stainless steel.

.10 Facing: 25 mm (1") galvanized steel hexagonal wire mesh stitched on one face of insulation.

.11 Fasteners: 2 mm diameter pins with 38 mm (1½") diameter clips, length to suit thickness of insulation.

Part 3 Execution

3.1 PRE- INSTALLATION REQUIREMENTS

.1 Pressure testing of ductwork systems to be complete, witnessed and certified.

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

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and this specification.

.3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm (3").

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, Hangers in accordance with Section 23 05 29 - Bases, Hangers and Supports

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: At 300 mm (12") oc in horizontal and vertical directions, minimum two rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: Conform to following table:

	TIAC Code	Vapour Retarder	Thickness mm (in.)
Exhaust ducts within 3 m from roof/exterior wall	C-1	yes	50 (2")

.2 Finishes: Conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed	Canvas	Canvas

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM) (latest edition).

- .1 ASTM B209-14, Specification for Aluminum and Aluminum Alloy Sheet and Plate.
- .2 ASTM C335/C335M-10e1, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .3 ASTM C449-07(2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .4 ASTM C921-10(2015), Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-51.2-95, Thermal Insulation, Calcium Silicate, for Piping, Machinery and Boilers.
- .2 CAN/CGSB-51.9-92 Mineral Fibre Thermal Insulation for Piping and Round Ducting.
- .3 CAN/CGSB-51.11-92, Mineral Fibre Thermal Insulation Blanket.
- .4 CAN/CGSB-51.12-95, Cement, Thermal Insulating and Finishing.
- .5 CAN/CGSB-51.40-95, Thermal Insulation, Flexible, Elastomeric, Unicellular, Sheet and Pipe Covering.
- .6 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.3 Manufacturer's Trade Associations (latest edition).

- .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.4 Underwriters' Laboratories of Canada (ULC)

- .1 CAN/ULC S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

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 defined herein.

.2 TIAC ss:

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

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 20 05 01 - Mechanical General Requirements.

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

1.5 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.6 QUALIFICATIONS

.1 Installer to be specialist in performing work of this section, and have at least 5 years successful experience in this size and type of project, qualified to standards.

1.7 DELIVERY, STORAGE AND HANDLING

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

.2 Protect from weather, construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions required by manufacturer.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC S102:

.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

2.2 INSULATION

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

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335/C335M.

.3 TIAC Code A-1: Rigid moulded mineral fibre without factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/CGSB-51.9.

.2 Maximum "k" factor: to CAN/CGSB-51.9.

.4 TIAC Code A-3: Rigid moulded mineral fibre with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/CGSB-51.9.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/CGSB-51.9.

.5 TIAC Code C-2: Mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).

.1 Mineral fibre: to CAN/CGSB-51.11.

.2 Jacket: to CGSB 51-GP-52Ma.

.3 Maximum "k" factor: to CAN/CGSB-51.11.

.4 Density: 24 kg/m^3.

.6 TIAC Code A-6: Flexible unicellular tubular elastomer.

.1 Insulation: to CAN/CGSB-51.40 with vapour retarder jacket.

.7 TIAC Code A-2: Rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.

.1 Insulation: to CAN/CGSB-51.2.

.2 Maximum "k" factor: to CAN/CGSB-51.2.

.3 Design to permit periodic removal and re-installation.

2.3 INSULATION SECUREMENT

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

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

.1 To CAN/CGSB-51.12.

.2 Hydraulic setting or Air drying on mineral wool, to ASTM C449.

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 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.

.3 Random samples to be taken during installation c/w date & time on sample.

.2 Aluminum:

.1 To ASTM B209.

.2 Thickness: 0.50 mm sheet.

.3 Finish: embossed.

.4 Joining: Longitudinal and circumferential slip joints with 50 mm laps.

.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.

.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

.3 PVC:

.1 Ontario Building Code compliant for 25/50 flame spread and smoke developed.
.2 Minimum thickness 0.015 mil.
.3 Colour white unless otherwise specified.
.4 Non yellowing UV stabilized.
.5 Minimum service temperatures: -20°C.
.6 Maximum service temperature: 65°C.
.7 Moisture vapour transmission: 0.02 perm.
.8 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 PRE- INSTALLATION REQUIREMENT

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

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

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.4 All roof drain bodies shall be thermally insulated with 50 mm thick mineral fibre blanket faced with factory applied vapour retarder jacket.

.5 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Hangers, supports to be outside vapour retarder jacket.

.2 Saddles to have ridges to limit movement while in hanger.

.3 To be edge flared to prevent cutting/damage to insulation coverage.

.6 Supports, Hangers:

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

3.3 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: At expansion joints, valves, primary flow measuring elements flanges and unions at equipment.

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

.3 Insulation:

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

3.4 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry at all times. Overlaps to manufacturer’s instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSUALTION SCHEDULES

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

.2 TIAC Code: A-1.

.1 Securements: Tape at 300 mm oc.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: A-3.

.1 Securements: Tape at 300 mm oc.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.4 TIAC Code: A-6.

.1 Insulation securements: Bands.

.2 Seals: lap seal adhesive, lagging adhesive.

.5 TIAC Code: C-2.

.1 Insulation securements: combination of wire and bands.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.6 TIAC Code: A-2.

.1 Insulation securements: stainless steel bands.

.2 Seals: lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code: 1501-H.

.7 Thickness of insulation to be as listed in following table:

Application	Temp °C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)			
			½ to 1¼	1½ to 3	4 to 6	8 & over
Hot Water Heating	61 - 93	A-1	38	50	50	50
Hot Water Heating	up to 60	A-1	25	38	38	38
Domestic Hot Water		A-1	25	38	38	38
Heating/Cooling with Vapour Barrier		A-3	25	38	38	38
Domestic Cold Water		A-3	25	25	25	25

.8 Finishes:

.1 Exposed indoors: Canvas, except generator exhaust shall be aluminum.

.2 Exposed piping & fittings in mechanical rooms: PVC.

.3 Exposed exterior: Aluminum.

.4 Concealed, indoors: PVC on valves and fittings only. No further finish.

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

.6 Finish attachments: Stainless steel bands at 150 mm oc. Seals: wing or closed.

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

.9 Storm piping & fittings to be insulated from all roof drain bodies to storm piping at grade level.

.10 Domestic hot & cold and recirc piping shall be completely thermally insulated to fixtures, except exposed supply assembly at fixtures.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM A924/A924M-16ae1, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canadian Standards Association (CSA)

.1 CSA B228.1-1968, Pipe, Ducts and Fittings for Residential Type Air Conditioning Systems.

.3 National Fire Protection Association (NFPA)

.1 NFPA (Fire) 90A, Installation of Air Conditioning and Ventilating Systems, 2015 Edition.

.2 NFPA (Fire) 90B, Installation of Warm Air Heating and Air Conditioning Systems, 2015 Edition.

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACA)

.1 SMACNA – Seismic Restraint Manual, 3rd Edition.

.2 SMACNA 016-2012, HVAC Air Duct Leakage Test Manual, 2nd Edition.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Indicate following:

.1 Sealants

.2 Tape

.3 Proprietary Joints

1.4 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum System Total Pressure Pa	SMACNA Seal Class
500	A
250	A
125	A

.2 Seal classification:

.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant.

.3 Application:

.1 All new & existing supply ductwork.

.2 All new return & exhaust ductwork.

2.2 SEALANT

.1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 22°F to plus 200°F.

.1 Acceptable material: Duro Dyne S-2.

2.3 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

2.4 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: standard radius: 1.5 times width of duct.

.2 Round: 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 To 400 mm (16"): with single thickness turning vanes.

.2 Over 400 mm (16"): with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: with 45° entry on branch.

.2 Round main and branch: enter main duct at 45° with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.5 Transitions:

.1 Diverging: 20° maximum included angle.

.2 Converging: 30° maximum included angle.

.6 Offsets:

.1 Full radiused elbows.

.7 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles: as for transitions.

2.5 FIRESTOPPING

.1 Retaining angles all around duct, on both sides of fire separation.

.2 Firestopping material and installation must not distort duct.

2.6 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A924/A924M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA.

2.7 ESCUTCHEON ANGELS

.1 40 mm x 40 mm angle iron frame on both sides of exposed rectangular or round ducts, on both sides of non-rated partitions. Escutcheon angles material & gauge shall be equal to base material.

2.8 HANGERS AND SUPPORTS

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500 mm (20").

.2 Hanger configuration: to SMACNA.

.3 Hangers: black steel angle with black steel rods to SMACNA and following table:

Duct Size (in.)	Angle Size (in.)	Rod Size (in.)
up to 30	1 x 1 x 1/8	¼
31 to 42	1½ x 1½ x 1/8	¼
43 to 60	1½ x 1½ x 1/8	2/5
61 to 84	2 x 2 x 1/8	2/5
85 to 96	2 x 2 x 1/5	
97 and over	2 x 2 x ¼	

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.2 For steel joist: manufactured joist clamp or steel plate washer.

.3 For steel beams: manufactured beam clamps.

.5 Transverse bracing to SMACNA Seismic Restraint Manual when vertical rod length exceeds 1.8m.

Part 3 Execution

3.1 GENERAL

.1 Do work in accordance with NFPA (Fire) 90A, NFPA (Fire) 90B, CSA B228.1 and SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods. Insulate strap hangers 100 mm (4") beyond insulated duct.

.3 Support risers in accordance with ASHRAE and SMACNA.

.4 Install breakaway joints in ductwork on each side of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths to accommodate installation of acoustic duct lining.

.7 Install escutcheon sheet metal angles on both sides of exposed rectangular or round ducts on both sides of non-rated partitions. Seal void with acoustic sealant.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA as follows:

Duct Size mm (in.)	Spacing m (ft.)
to 1500 (60)	3 (10)
1525 (61) and over	2.5 (8)

.4 Provide transverse sway bracing to SMACNA on hangers having a vertical rod length exceeding 1.8 m.

3.3 SEALING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA B228.1-1968, Pipes, Ducts and Fittings for Residential Type Air Conditioning.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Indicate the following:

.1 Flexible connections.

.2 Duct access doors.

.3 Instrument test ports.

1.4 CERTIFIATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 GENERAL

.1 Manufacture in accordance with CSA B228.1.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 0.6 mm thick 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°C to plus 90°C, density of 1.3 kg/m^2.

2.3 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: 2 sash locks complete with safety chain.
.2 301 to 450 mm: 4 sash locks complete with safety chain.
.3 451 to 1000 mm: piano hinge and minimum 2 sash locks.
.4 Doors over 1000 mm: piano hinge and 2 handles operable from both sides.
.5 Hold open devices.

2.4 INSTRUMENT TEST PORTS

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

.5 Acceptable material: Duro Dyne IP1 or IP2.

2.5 SPIN-IN COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to co-responding round duct standards.

Part 3 Execution

3.1 INSTALLATION

.1 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: 100 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 each side of flexible connection to be in alignment.
.2 Ensure slack material in flexible connection.

.2 Access doors and viewing panels:

.1 Size:
.1 450 x 450 mm for person size entry.
.2 450 x 450 mm for servicing entry.

.3 300 x 300 mm for viewing.
.4 As indicated.

.2 Location:
.1 At fire and smoke dampers.
.2 At control dampers.
.3 At devices requiring maintenance.
.4 At locations required by code.
.5 At reheat coils.
.6 Elsewhere as indicated.

.3 Instrument test ports.

.1 General:
.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locate to permit easy manipulation of instruments.

.3 Install insulation port extensions as required.

.4 Locations.
.1 For traverse readings:
.1 At ducted inlets to roof and wall exhausters.
.2 At inlets and outlets of other fan systems.
.3 At main and sub-main ducts.
.4 And as indicated.
.2 For temperature readings:
.1 At outside air intakes.
.2 In mixed air applications in locations as approved by Engineer.
.3 At inlet and outlet of coils.
.4 Downstream of junctions of two converging air streams of different temperatures.
.5 And as indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACA).

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 20 05 01 - Mechanical General Requirements.

Part 2 Products

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

.1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm (4").

.3 For rectangular ducts adjustable lever with shaft extension to accommodate insulation thickness.

.4 For round branch ducts adjustable lever with shaft extension to accommodate insulation thickness.

.5 Inside and outside nylon end bearings.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

Part 3 Execution

3.1 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 For supply, return and exhaust systems, locate balancing dampers in each branch duct.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 All dampers to be vibration free.

.6 Ensure damper operators are observable and accessible.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C177-13, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.10-92, Thermal Insulation, Mineral Fibre, Block or Board, for Ducting, Machinery and Boilers.

.3 National Fire Protection Association (NFPA)

.1 NFPA (Fire) 90A, Installation of Air Conditioning and Ventilating Systems, 2015 Edition.

.2 NFPA (Fire) 90B, Installation of Warm Air Heating and Air Conditioning Systems, 2015 Edition.

.4 Underwriters' Laboratories of Canada

.1 CAN/ULC S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 PRODUCT DATA

.1 Submit product data in accordance with Section 20 05 01 - Mechanical General Requirements.

Part 2 Products

2.1 DUCT LINER

.1 General:

.1 Fibrous glass or "textile" fibrous glass duct liner: air stream side faced with mat facing.

.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102.

.2 Rigid:

.1 Use on flat surfaces where indicated.

.2 25 mm (1") thick, to CAN/CGSB-51.10, fibrous glass rigid board duct liner.

.3 Density: 36 kg/m^3 minimum.

.4 Thermal resistance to be minimum 0.76 m^2.°C/W for 25 mm thickness when tested in accordance with ASTM C177, at 24°C mean temperature.

2.2 FASTENERS

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

2.3 JOINT TAPE

.2 Poly-Vinyl treated open weave fibreglass membrane 50 mm wide.

2.4 **SEALER**

.1 Meet requirements of NFPA (Fire) 90A and NFPA (Fire) 90B.

.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68°C to plus 93°C.

Part 3 Execution

3.1 GENERAL

.1 Do work in accordance with recommendations of SMACNA duct liner standards as indicated in SMACNA HVAC Duct Construction Standards, Metal and Flexible, except as specified otherwise.

.2 Line inside of ducts where indicated.

.3 Duct dimensions, as indicated, are clear inside duct lining.

3.2 DUCT LINER

.1 Install in accordance with manufacturer's recommendations, and as follows:

.1 Fasten to interior sheet metal surface with 100% coverage of adhesive.

.2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425 mm on centres.

3.3 JOINTS

.1 Protect leading and trailing edges of each duct section with sheet metal nosing having 25 mm overlap and fastened to duct.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Air Movement and Control Association (AMCA)

.1 AMCA 201-02 (R2011), Fans and Systems.

.2 AMCA 210-16, Laboratory Methods of Testing Fans for Rating.

.3 AMCA 300-14, Reverberant Room Method for Sound Testing of Fans.

.4 AMCA 301-14, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.5 AMCA 302-73 (R2012), Application of Sone Ratings for Non-Ducted Air Moving Devices.

.6 AMCA 303-79 (R2012), Application of Sound Power Level Ratings for Fans.

.2 ASHRAE/Air Movement and Control Association

.1 ASHRAE/AMCA 51-2016, Laboratory Methods of Testing Fans for Rating.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 20 05 01 - Mechanical General Requirements.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 20 05 01 - Mechanical General Requirements.

1.5 CERTIFICAITON OF RATINGS

.1 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.

Part 2 Products

2.1 FANS GENERAL

.1 Standard of rating:

.1 AMCA 201 for fan application.

.2 AMCA 302 for application of sone loudness ratings for non-ducted air moving devices.

.3 AMCA 303 for application of sound power ratings for ducted air moving devices.

.4 Performance: to AMCA 210 and ASHRAE 51. Unit to bear AMCA certified seal.

.2 Pwl sound ratings to comply with AMCA 303, tested to AMCA 300 Unit to bear AMCA certified sound rating seal.

.3 Maximum loudness: 3.5 sones.

2.2 IN-LINE CABINET EXHAUST

.1 Fan housing construction of corrosion resistant galvanized steel c/w sound absorbing lined insulation.

.2 Removable bottom housing panel allows easy access to the power assembly for inspection or service.

.3 Outlet duct connection with integral backdraft damper can be converted from horizontal to vertical discharge.

.4 Fan scroll is constructed of galvanized steel.

.5 Fan wheels are double width forward curved centrifugal type. All wheels are dynamically balanced for vibration free operation.

.6 Motors 115/60/1. All motors are sized to match fan loads, have thermal overload protection and are mounted on vibration isolators. Power assemblies can be easily unplugged and removed for inspection or service. ECM motor with controller.

.7 Angle mounting brackets can be adjusted to any typical ceiling material thickness.

.8 Acceptable material: Greenheck, PennBarry, Loren Cook, Twin City.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's recommendations.

3.2 ANCHOR BOLTS AND TEMPLATES

.1 Supply for installation by other Divisions.

.2 Size anchor bolts to withstand seismic 4 acceleration and 2 velocity forces.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 PRODUCT DATA

.1 Submit product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Indicate the following:

.1 Capacity.
.2 Throw and terminal velocity.
.3 Noise criteria.
.4 Pressure drop.
.5 Neck velocity.

1.3 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Include:

.1 Keys for volume control adjustment.
.2 Keys for air flow pattern adjustment.

1.4 MANUFACTURED ITEMS

.1 Grilles, registers and diffusers of same generic type to be product of one manufacturer.

1.5 CERTIFICAITON OF RATINGS

.1 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.

Part 2 PRODUCTS

2.1 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Frames:

.1 Full perimeter gaskets.

.2 Plaster frames where set into plaster or gypsum board and as specified.

.3 Concealed fasteners.

.3 Concealed operators.

.4 Acceptable material: E.H Price Ltd., Nailor, Titus, Krueger, Metal-aire.

2.2 SUPPLY DIFFUSERS

.1 Type SD1: steel, square diffuser with adjustable pattern 600 mm x 600 mm, T-bar or drywall mounting as indicated, off-white. Equivalent to E.H. Price Model SCD.

2.3 RETURN AND EXHAUST GRILLES AND REGISTER

.1 Type TG1: aluminum, 13 mm x 13 mm egg crate type face bars, baked white enamel finish, ducted where indicated, drywall mounted. Size 600 mm x 150 mm unless otherwise indicated. Equivalent to E.H. Price Model 80.

.2 Type EG1/RG1: steel construction, 35° deflection, fixed louvres, 20 mm (¾") spacing, off-white baked enamel finish. Size as indicated. Drywall mounted. Equivalent to E.H. Price Model 535.

.3 Type DG1: door grille, frame both sides. Size as indicated. Aluminum. Equivalent to E.H. Price 520.

2.4 STATIONARY LOUVRES (L)

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm for all louvres.

.4 Frame, head, sill and jamb: 100 mm (4") deep. One piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit with additional extended sill or 15 ga. aluminum.

.5 Mullions: at 1500 mm maximum centres.

.6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.7 Screen: 19 mm mesh, 2 mm dia. wire aluminum birdscreen on inside face of louvres in formed U-frame.

.8 Finish:

.1 Finish exposed surfaces of exterior aluminum components with factory applied polyvinylidene fluoride (PVF2) coating meeting performance requirements of AAMA 2605, dry film thickness of 0.025 mm.

.1 Colours to match PPG Duranar colour as approved by Architect.

.2 Gloss: Medium.

.3 Appearance: visibly free of flow.

.9 Size: 300 x 300.

.10 Acceptable Materials: Ventex/Alumavent, McGill, PennBarry, Ruskin, E.H. Price, Greenheck.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Install with flat head cadmium plated screws in countersunk holes where fastenings are visible.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 The word "provide" in this Division shall be interpreted as "supply, install, and connect".

.2 Energy Monitoring and Control System (EMCS) shall include Direct Digital Control (DDC) of mechanical systems as specified for this project.

.3 Building Automation System (BAS) shall include the EMCS as specified for this project.

1.2 DESCRIPTION OF SYSTEM

.1 Extend the existing Networked DDC Control System to meet the requirements specified for this project. The new and extended DDC products and services shall be fully compatible with the existing Schneider Electric system. The extended Control System shall consist of but is not limited to the following:

.1 Software and controllers required to implement a complete and operational system.

.2 Input and output control devices including sensors, actuators, conduit and wiring, as required to provide the operations specified.

1.3 ACCEPTABLE CONTRACTOR

.1 Hire the services of Ainsworth Inc. to complete the work of this section.

1.4 CO-ORDINATION

.1 Contractor shall co-ordinate its work with Mechanical and Electrical. Unless noted otherwise, the Control Contractor shall provide all interface devices, control wiring, and controls as required to provide the control operation specified.

.2 Unless noted in Division 26, Contractor shall provide line voltage and low voltage control wiring for equipment specified in Division 25. Refer to Division 26 for power wiring, starters, disconnect switches, etc., to be provided for mechanical equipment.

.3 Contractor shall provide all necessary power and dedicated circuits as required from local 120 volt branch circuits panel board for all Master Control Units. Install tamper locks on breakers of circuit panel.

.4 Unless noted otherwise, all other installation work required for the complete installation of EMCS, including all interface devices, control and power wiring, controls and controlled devices shall be provided by this Contractor.

1.5 LOCKABLE PANELS

.1 Provide lockable panel for each MCU or LCU. All panels shall be EEMAC rated to environment requirements with hinged doors.

.2 Equip all panels for Master Control Units with standard keyed-alike cabinet locks, keyed to same key.

1.6 NAMEPLATES

.1 Provide nameplates on all control items listed or shown in the submittal and approved control diagrams.

.2 Identify all panels and items mounted on panel face by laminated plastic nameplates 3 mm thick. Lettering shall be accurately aligned and engraved into the white core. Size of nameplates shall be 20 mm by 100 mm minimum. Lettering shall be minimum 5 mm high normal black lettering.

.3 Identify Field Sensors and Controlled Devices by engraved metal plates attached to the device by chain.

.4 Warning signage: provide each motor starter under remote automatic control (DO point on I/O Point Schedules) with signage warning of automatic starting under control of EMCS. (i.e. "Caution - this equipment is under automatic remote control of EMCS").

1.7 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Section 01 33 00. Submit control shop drawings within 15 days of Award of Contract.

.2 Shop drawings shall include:

.1 Description of software programs included.
.2 Specification sheets for each piece of equipment or control devices to be provided.
.3 Equipment and DDC Controllers location drawings.
.4 Mechanical control schematics.
.5 Sequence of operation for each mechanical system.
.6 DDC control point schedules.

1.8 INSTALLATION AND COMPLETION TESTS

.1 Installation and Calibration:

.1 Set control points and calibrate sensors immediately after installing controls.

.2 Completion Tests:

.1 After installation of each part of the system and completion of mechanical and electrical hook-up, perform tests to confirm correct installation and operation of equipment.
.2 Check and calibrate each AI using a calibrated digital thermometer, humidistat, velometer or transducer.
.3 Check each DI to insure proper settings and switching contacts.
.4 Check each AO to insure proper operation of valves and dampers. Verify tight closing, input and output signals.
.5 Check each DO to insure proper operation and lag time.
.6 Check all operating software.
.7 Check all application software. Provide samples of all logs and commands.
.8 Debug all software.

.9 The Contractor shall be responsible for fine tuning and adjusting all control devices and make modifications as required to provide a fully operational EMCS.

.10 Submit test report with checklist showing all input/output control points and all software programs.

.3 All reported results are subject to verification by the Engineer.

1.9 SYSTEM STARTUP VERIFICATION TESTING

.1 The Contractor shall provide technical personnel and instrumentation to conduct start-up verification testing.

.2 Verification:

.1 Perform point-by-point verification of entire system.

.2 Verify the calibration of all AI devices individually.

.3 Verify the calibration of all DI devices individually.

.4 Verify all AO devices are functional, start and span are correct, direction and normal positions are correct.

.5 Verify that all DO devices operate properly and that the normal positions are correct.

.6 Verify the system sequences of operation. Simulate all modes of operation.

.7 Verify the stability of all DDC loops and optimum start/stop routines.

.8 Check each alarm separately.

.9 Verify interlocks and conditional control response.

.10 Simulate alarm conditions to check the initiating value of variable and interlock action.

.3 The Contractor shall complete and submit System Start-up Verification Forms. Each item on the verification forms shall be signed off as verified (yes), or not verified (no) and actual date of verification.

1.10 OPERATION AND MAINTENANCE MANUAL

.1 The manual shall be custom designed for this project and contain only information relevant to this project.

.2 The manual shall provide full and complete coverage of the following subjects:

.1 Operational Requirements: This document shall describe, in concise English terms, all the functional and operational requirements for the system and its functions that have been implemented.

.2 System Operation: Complete step by step procedures for operation of the system, including required actions at each operator station; operation of computer peripherals; input and output formats; and emergency, alarm, and failure recovery. Step-by-step instructions for system start-up, back-up equipment operation, and execution of all system functions and operating modes shall be provided.

.3 Maintenance: Documentation of all maintenance procedures for each and all system component including inspection, periodic preventive maintenance, fault diagnosis, and repair or replacement of defective module.

.4 Test Procedures and Reports: The test implementation shall be recorded with a description of the test exercise script of events and documented as Test Procedures. A provision for the measurement or observation of results, based on the previously published Test Specification, forms the Test Reports.

.5 Configuration Control: Documentation of the basic system design and configuration with provisions and procedures for planning, implementing, and recording any hardware or software modifications required during the installation, test, and operating lifetime of the system.

1.11 TRAINING

.1 Provide the services of competent instructors who will provide instruction to designated personnel in the adjustment, operation and maintenance, including pertinent safety requirements, of the equipment and system specified. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach.

1.12 WARRANTY AND MAINTENANCE

.1 The Contractor shall provide all services; materials and equipment necessary for the maintenance of the Automatic Control Systems for a period of 12 months concurrent with the warranty period.

.2 The Contractor shall provide three minor inspections or as required by the manufacturer and one major inspection per year, and all service for the required maintenance. Major inspection shall be scheduled in April or November. A major inspection shall involve a point by point check and/or calibration. Provide dated database log to indicate executed point to point system check.

.3 Emergency Service: The Owner will initiate service calls when there is indication that the Automatic Control System is not functioning properly. The Contractor shall have qualified personnel available during the contract period to provide service to the "critical" overall control system components whenever required at no additional cost to the owner. The Contractor shall furnish the Departmental Representative with a telephone number where the service personnel can be reached at all times. The service technician shall be on the job ready to service the control system within 4 hours after receiving a request for service. The work shall be performed continuously until the control system is back in reliable operating condition. This service shall be provided on a 24 hours basis 7 days a week.

.4 Upon completion of each inspection or emergency service, submit fully detailed report in writing to Departmental Representative.

Part 2 Products

2.1 BAS DATA COMMUNICATION NETWORK

.1 The Control Manufacturer shall design, supply, install and connect existing data communication network to link all new control units, end devices and accessories to provide seamless integration of new control sequences to building system.

.2 Terminal Control Units (TCUs): Stand-alone DDC Controllers that reside on EMCS-BUS. Terminal Control Unit is not fully user-programmable, but is configured with its hardware and firmware to match a specific application.

2.2 OPERATOR'S COMMANDS AND PROGRAMMING

.1 Provide software to enable non-programmer operator to perform global supervision tasks such as to view, and edit if applicable, the status of any object and property in the system.

.2 Operator shall be able to terminate automatic software control, initiate DO and AO manual commands, and return DO and AO manual commands to automatic software controls.

.3 Provide programming software at OWS to allow operator to create, edit, and download custom application programs to support MCUs and LCUs. On-line programming/configuration shall not interfere with normal system operation and control.

2.3 GRAPHICS SOFTWARE

.1 Provide existing OWS with upgraded graphics software necessary to permit the operator to create, modify, delete, file, and recall all graphics. Operators shall be able to start and stop equipment or change set points from graphical displays.

.2 The Contractor shall utilize the graphics software to generate the custom Building Outline Drawings, Equipment and Sensors Location Diagrams, and Control Schematic Diagrams for this project.

.3 Operator shall be able to build graphic displays that include on-line point data from multiple MCU panels. Data shall be updated every 10 seconds or less.

.4 Windowing: the windowing environment of the OWS shall allow the user to simultaneously view several graphics at the same time.

2.4 ALARM MANAGEMENT

.1 Provide the software to notify the operator of the occurrence of an alarm condition. All alarm messages shall be displayed and printed. Alarm messages shall include as a minimum: location of alarm, time of occurrence, and type of alarm. Each point shall have its own message. Assignment of messages to a point shall be an operator editable function.

2.5 LOCAL CONTROL UNITS (LCU)

.1 The Local Control Unit is to be a standalone DDC controller with the following characteristics:

.1 LCU shall incorporate a programmable microprocessor, non-volatile program memory, random access memory, power supplies and appropriate communication interfaces as required to perform specified functions.

.2 LCU shall incorporate a communication interface port for communication to the Master Control Unit (MCU).

.3 LCU shall execute its logic and control (Direct Digital or Closed Loop Process Control) of associated equipment without interacting with any other Processor.

.4 Basic functional requirements to include scanning of digital/analog inputs, digital change of state (alarm) monitoring, analog input (alarm) monitoring, on-off digital control with configurable logic, analog control using configurable logic

(including PID) with adjustable dead bands and deviation alarms, control of HVAC systems, specified under sequence of operation instructions.

.2 Minimum addressable memory shall be sufficient to support all performance and technical specifications. All operating system, executive, application, subroutine, and other configuration definition software, shall reside in non-volatile memory such as EPROM. All control description logic, applicable functions and operating data shall reside in battery backed RAM 72 hours or EEPROM and hence modifiable on-line through the operator panel or remote operator interface. All operating data must be downline loadable from Operator Workstations.

.3 Each LCU shall have sufficient capacity for its assigned D1, D0, A1, A0 points as indicated on the DDC Input/Output Point Schedules. All points associated with one mechanical system shall be connected directly to the same LCU.

.4 The LCU shall include as a minimum 2 interface ports for connection of MCU controller and local computer terminal.

.5 In the event of loss of communications with, or failure of the MCU, this controller shall continue to perform control of the associated equipment. Controllers that use defaults or fail to open or closed position will not be acceptable.

.6 Unless noted otherwise, LCUs shall not be used to control any major mechanical equipment. LCUs shall be used to control packaged and distributed equipment such as packaged air handling units, radiation, and exhaust fans, and multi-zone VAV boxes.

2.6 LCU SOFTWARE

.1 Software shall include but not be limited to definitions and operating systems executive, communications, control description logic, operator interface.

.2 Control description logic shall be written in general control type or high level language.

.3 Control description logic shall have access to values or status of all points available to the controller including global or common values, allowing cascading and interlocking control.

.4 Software to be generic and configurable from computer terminal or to be downloaded from operator workstations.

2.7 TERMINAL CONTROL UNITS (TCU)

.1 Each Terminal Control Unit (TCU) is to be a microprocessor-based standalone DDC controller with the following characteristics:

.1 Hardware and firmware are configured to control a specific type of terminal equipment such as conventional single zone VAV box or fan powered VAV box.
.2 The controller shall incorporate a communication interface port for communication to the Master Control Unit (MCU).
.3 Each TCU shall have sufficient capacity and memory to support its operating system, data bases and specified functional requirements under sequence of operation instructions.

.2 Each TCU shall support multiple modes of operation including Day/Weekly Schedules, Occupied/Unoccupied Mode, and Override Mode.

.3 Any Operator Workstation (OWS) connected to the communication network shall be able to access all information including sensor values, operating status, setpoints, on/off schedules, alarm limits and other operating parameters of each TCU. Operator at OWS connected to the network shall be able to make setpoint adjustments, assign high and low alarm limits and make programming changes.

.4 Powerfail Protection: all system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration will not require reprogramming the DDC controller.

2.8 AIR SYSTEM STATIC PRESSURE SENSORS AND TRANSMITTERS

.1 Sensors shall meet the following:

.1 Multipoint element with self-averaging manifold.

.2 Maximum pressure loss: 160 Pa at 10 m/s. (air stream manifold).

.3 Accuracy: +1% of actual duct static pressure.

.2 Provide each sensor with a transmitter to meet the following requirements:

.1 Output signal: 4 - 20 mA linear into 500 ohm maximum load.

.2 Calibrated span: not to exceed 150% of duct static pressure at maximum flow.

.3 Accuracy: +1.0% of full scale.

.4 Repeatability: within 0.5% of output.

.5 Linearity: within 1.5% of span.

.6 Deadband or hysteresis: 0.1% of span.

.7 External exposed zero and span adjustment.

.8 Range: 0 to 125 Pa static pressure downstream of VAV boxes and 0 to 373 Pa static pressure upstream of VAV boxes, unless otherwise noted.

2.9 AIR SYSTEM VELOCITY SENSOR/ TRANSMITTER

.1 Sensors shall meet the following requirements:

.1 Multipoint static and total pressure sensing element with self-averaging manifold, and with integral air equalizer and straightener section.

.2 Maximum pressure loss: 37 Pa at 10 m/s.

.3 Accuracy: +1% of actual duct velocity.

.2 Provide each sensor with a transmitter to meet the following requirements:

.1 Output signal: 4 - 20 mA or 0 - 10VDC linear into 500 ohm maximum load.

.2 Calibrated span: not to exceed 25% of duct static pressure at maximum flow.

.3 Accuracy: +0.4% of span.

.4 Repeatability: within 0.1% of output.

.5 Linearity: within 0.5% of span.

.6 Deadband or hysteresis: 0.1% of span.

.7 External exposed zero and span adjustment.

.8 Air velocity range: 1 m/s to 10 m/s at 15°C.

2.10 PRESSURE/ CURRENT TRANSMITTERS

.1 Provide pressure-to-current transmitters having the following minimum specifications:

.1 Internal materials of the transducer suitable for continuous contact with industrial standard instrument air, compressed air, water or steam as applicable.
.2 Output signal of 4-20 mA into a maximum of 500 ohm load.
.3 Output variations of less than 0.2% full scale for supply voltage variations of ±10%.
.4 Combined nonlinearity, repeatability and hysteresis effects not to exceed ±0.5% of full scale output over entire range.
.5 Integral zero and span adjustment.
.6 Temperature effect of ±1.5% full scale/50°C or less.
.7 Output short circuit and open circuit protection.
.8 Over-pressure input protection to a minimum of twice rated input.
.9 Pressure ranges to suit application.

2.11 DIFFERENTIAL PRESSURE TRANSMITTERS

.1 Provide differential pressure transmitters having the following minimum specifications:

.1 Internal materials to be suitable for continuous contact with the process material measured including compressed air, water, glycol, or steam as applicable.
.2 Output signal of 4-20 mA into maximum of 500 ohm load.
.3 Output variation of less than 0.2% full scale for supply voltage variations of ±10%.
.4 Combined nonlinearity repeatability and hysteresis effects not to exceed ±0.5% of full scale output over entire range.
.5 External exposed integral zero and span adjustment.
.6 Temperature effect of ±1.5% full scale/50°C or less.
.7 Output short circuit and open circuit protection.
.8 Over-pressure input protection to a minimum of twice rated input.
.9 Differential Pressure ranges to suit application.

3.2 PRESSURE SWITCHES

.1 Provide pressure or differential pressure switches for ranges as indicated on point schedule.

.2 Pressure sensing elements shall be bourdon tube, bellows or diaphragm type.

.3 Adjustable setpoint and differential.

.4 Pressure switches shall be snap action type rated at 120 volts, 15 amps AC or 24 volts DC.

.5 Sensor assembly shall operate automatically and reset automatically when condition returns to normal.

3.3 CONTROL RELAYS

.1 Contacts rated at 5 amps at 120 V AC.

.2 Relays to be plug in type with termination base.

3.4 CURRENT TRANSDUCER

.1 Provide current transducers with range to match load being metered.

.2 Current transducers shall measure line current and produce a proportional signal in one of the following ranges.

.1 4-20 mA dc.
.2 0-1 V dc.
.3 0-10 V dc.
.4 0-20 V dc.

3.5 CURRENT SENSING RELAY

.1 Provide adjustable current-operated solid-state relays with integral zero leakage LED for switching AC or DC circuits.

.2 The contacts shall close when the current level sensed by the internal current transformer exceeds the trip point set by the multi-turn adjustment.

.3 Range of monitored AC current to suit application and to be submitted with shop drawings.

3.6 CONTROL DAMPERS

.1 Construction: Blades shall not exceed 200 mm wide or 1250 mm long. Modular maximum size 1250 mm wide x 1500 mm high. Multiple sections to have stiffening mullions and jack shafts.

.2 Materials:

.1 Frame: 2.3 mm (13 gauge) galvanized sheet steel.
.2 Blades: two sheets 0.5 mm (22 gauge) or 1.6 mm (16 gauge) galvanized steel.
.3 Bearings: oil impregnated sintered bronze. Provide additional thrust bearings for vertical blades.
.4 Linkage and shafts: zinc plated steel.
.5 Seals: Replaceable neoprene seals or stain-less steel spring on sides, top and bottom of frame and along all blade edges and blade ends.

.3 Performance:

.1 50 L/s/m² maximum allowable leakage against 1000 Pa static pressure.
.2 Temperature range: minus 50°C to 100°C.

3.7 DAMPER OPERATORS ELECTRONIC

.1 Provide direct coupled type electronic proportional damper operators where indicted or required.

.2 Spring return for "fail-safe" in Normally Open or Normally Closed position where required.

.3 Size operators to control dampers against maximum pressure or dynamic closing pressure whichever is greater.

.4 For modulating services, provide feedback circuit to indicate actuator position.

.5 Power Requirements 12 VA maximum at 24 V AC.

.6 Input signal: 2 to 10 VDC or 4 to 20 mA.

3.8 ELECTRONIC VALVE ACTUATORS

.1 Provide Electronic Valve Proportional Actuators with spring return to normal positions indicated.

.2 Construction to be steel , cast iron or cast aluminum.

.3 For modulating services, provide feedback circuit to indicate actuator position.

.4 Control Voltage 0-20 V DC or 24 V AC.

.5 Positioning time - nominal 60 seconds.

3.9 THREE POINT FLOATING ELECTRONIC ACTUATORS

.1 Use of three point floating actuators shall be limited to zone control dampers, radiation or terminal reheat control valves.

.2 Provide tri-state outputs from DDC controllers (two coordinated binary outputs) for control of actuators.

.3 Control algorithms shall run the three point floating actuator to one end of its stroke once every 24 hours for verification of operator tracking.

3.10 EXISTING CONTROLS

.1 Unless noted otherwise or approved by the Engineer in writing, all control devices required for a complete and working EMCS System shall be new and shall be provided by the Contractor. All new controls to be fully compatible with existing EMCS System.

.2 The Contractor shall submit written requests to disconnect any controls and to obtain equipment down time. Only after receiving these requests shall such work be allowed to proceed.

.3 The Contractor shall be held responsible for repair costs due to Contractor negligence or abuse of owner equipment, or failure in reporting defective controls within 30 days of contract award.

.4 Shop drawings shall show all signal levels, pressures, etc., where tying into existing control equipment.

.5 Where existing controls are not to be reused or not required, they shall be removed and placed in storage for future disposition as directed by the Departmental Representative.

3.11 CONDUIT AND WIRE

.1 Use type FT6 plenum rated cable for low voltage EMCS wiring in ceiling return plenum. Support FT6 cables in ceiling return plenum using Thomas & Betts TY-RAP cable straps and clamps screwed on to ceiling slab. Spacing to be 2M maximum. Do not use ceiling suspension wires for fastening cables. Exact routings shall suit site conditions and shall be to the approval of the Departmental Representative.

.2 Use EMT conduit for wiring in mechanical, electrical, janitor rooms or equipment rooms.

.3 Unless noted otherwise, install network cable within building in EMT conduit and install network cable between buildings in buried PVC conduit. The Control Contractor shall provide conduits with spare capacity not less than 50%.

.4 Field wiring for each digital input and output shall be No. 20 AWG, stranded twisted pair. For multi-conductor wire having four or more conductors, wire size shall be not less than No. 22 AWG solid copper. Analog input shall be wired with shielded No. 20 AWG, stranded twisted pair, copper wire. Analog output shall be wired with 3 shielded No. 20 AWG stranded twisted copper wires.

.5 Where conduits pass through fire rated walls or floors, provide schedule 40 steel sleeves filled with fire stopping material and approved sealant around conduits to maintain fire rating integrity.

3.12 RESPONSIBILITY FOR QUANTITIES

.1 Failure to carry the correct lengths or sizes of conduit or correct types of wire or the correct number of DDC panels is the Contractor's responsibility and shall not be basis for additional charges by the Contractor.

3.13 WIRING IDENTIFICATION

.1 Provide numbered tape markings on all branch control wiring, and pneumatic tubing.

.2 At all junction boxes, splitters, cabinets and outlet boxes, maintain identification system.

.3 Use colour coded wires in communication cables, matched throughout system.

.4 Identify all power sources at each panel location.

3.14 CONDUIT IDENTIFICATION

.1 Colour code all Control System conduits to NRC standards.

.2 Coding to be located on all conduits and cables exposed after completion of construction in all locations including suspended accessible ceilings, tunnels and shafts.

.3 Coding to be plastic tape or paint at all points where conduit or cable enters wall, ceiling, or floor, and at 15000 mm intervals.

3.15 MANUFACTURER'S AND CSA LABELS

.1 Manufacturers' nameplates and CSA labels to be visible and legible after equipment is installed.

Part 3 Execution

3.1 GENERAL

.1 All equipment shall be installed in according to manufacturers' published instructions.

.2 Provide programming for the system and adhere to the sequence of operation specified.

3.2 DDC INPUT/ OUTPUT POINT SCHEDULE

.1 DDC Input/Output Point Schedule, as shown on the Mechanical Drawings and required to implement specified control sequence.

.2 Naming convention: PWGSC Standardized Identifiers and Expansions of Building Names, System Names and Point Names shall be used for identification. Identifiers shall be not more than 10 alphanumeric characters, and Expansions shall not more than 40 characters.

.3 The Application Programs shall be assigned with the specified DDC points as indicated on the DDC Input/Output Schedule. In addition, the Application Program shall be assigned with the following point types:

.1 Alarm Program with: all space temperature AI points, all supply air temperature AI points, all supply air and return air humidity AI points, all air filter pressure drop AI points, all supply air static pressure AI points, all AI points of heating water supply and return temperature, all AI points of chilled water supply and return temperature, all DI points of fans and pumps.

.2 Auto Start/Stop Program with: all DO points of fans and pumps.

.3 Run Time Total Program with: all DO points.

.4 Heavy Equipment Delay Program with: all DO points of motors of 15 kW and larger.

.5 PID Control Program with: all AO points of control valves (except terminal heating control valves and radiation control valves) and control dampers (except terminal zone control dampers).

.6 Analog/PI Total Program with all AI or PI points of water meters and energy meters.

.4 All DI or DO points assigned with "alarm" and "run time total" programs shall be provided with "critical" and "maintenance" alarms. All AI or AO points assigned with "alarm" program shall be provided with "critical" and "cautionary" alarms.

3.3 INSTALLATION OF SENSORS

.1 Install sensors in accordance with the manufacturer's recommendations.

.2 Sensors used in mixing plenums shall be the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.

.3 Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m of sensing element for each 1 m^2 of cross section area.

.4 All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.

.5 Outdoor air temperature sensors shall be installed on north wall, complete with sun shield at designated location.

.6 Building static pressure sensors: Pipe the low pressure port of the differential air static pressure sensor to the static pressure port located on the outside of the building through a high volume accumulator. Pipe the high pressure port to a location behind a thermostat cover.

.7 Supply duct static pressure sensor: Pipe the high pressure tap of the differential air static pressure sensor to the duct using a pitot tube. Pipe the low pressure port to a tee in the high pressure tap tubing of the corresponding building static pressure sensor.

3.4 INSTALLATION OF ACTUATORS

.1 Install actuators in accordance with the manufacturer's recommendations.

.2 Electronic dampers: Actuators shall be direct mounted on damper shaft or jackshaft unless shown as a linkage installation. For low leakage dampers with seals, the actuator shall be mounted with a minimum 5 degree available for tightening the damper seals.

.3 Electronic Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.5 SEQUENCE OF OPERATION

.1 Refer to the drawings for sequence of operation

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 lighting switches, recessed and surface mounted receptacles such as those in offices and service rooms and used to plug in office equipment, telecommunication equipment or small portable tools. Indicate only the source of power (Ex. for a receptacle fed from panel L32 circuit #1: "L32-1").

.2 Light fixtures are the only exceptions for electrical equipment identification (except as noted in 7.13 below). They are not to be identified.

.3 Identify with 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.

.16 Identify molded case breaker with lamicoid nameplate.

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 All new conduits to be factory painted, colour-coded EMT, type as follows:

.1 Fire alarm – red conduit

.2 Emergency power circuits – yellow conduit

.3 Voice/data – blue conduit

.4 Gas detection system – purple conduit

.5 Building Automation system – orange conduit

.6 Security system – green conduit

.7 Control system – black conduit

.2 Apply paint to the covers of junction boxes and condulets of existing conduits as follows:

.1 Fire alarm – red

.2 Emergency power circuits – yellow

.3 Voice/data – blue

.4 Gas detection system – purple

.5 Building Automation system – orange

.6 Security system – green

.7 Control system - black

.3 For system running with cable, half-lap wrap with dedicated coloured PVC tape to 100 mm width, tape every 5 m and both sides where cable penetrates a wall.

.4 All other systems need not be coloured.

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 DEFINITIONS

.1 SRS: acronym for Seismic Restraint System.

1.3 GENERAL DESCRIPTION

.1 This section covers design, supply and installation of complete SRS for all systems, equipment specified for installation on this project by Division 26. This includes, but is not limited to, electrical light fixtures, transformers, MCC's, UPS, diesel generators, fire protection, conduit, communications, electrical equipment and systems, both vibration isolated and statically supported.

.2 Cable restraint systems, rod stiffener clamps and seismic isolator capacities to be verified by an independent test laboratory. Connection materials and site specific designs to be by the Seismic Engineer. The Seismic Engineer may specify material and anchors provided by the contractor where this is appropriate. It is the contractors' responsibility to ensure that the Seismic Engineers' requirements and specification have been met

1.4 REFERENCES

.1 Canadian Standards Association (CSA).

.1 CSA S832-14, Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings.

.2 Ontario Regulation

.1 ONTARIO OBC-2012, 2012 Ontario Building Code.

1.5 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 26 05 00 - Electrical General Requirements.

.2 Submit seismic restraint shop drawings, c/w seal of Professional Engineer registered in Province of Ontario, clearly identifying equipment/systems reviewed and the equipment/systems requiring restraint. Shop drawings must clearly show all forces transferred to structure.

.3 Seismic Design Engineer shall provide a spreadsheet identifying all equipment and systems requiring or not requiring seismic restraints and include all circulations.

.4 Submit additional copy of shop drawings and product data to project Structural Engineer for review of connection points to building structure.

1.6 MAINTENANCE DATA

.1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 26 05 00 - Electrical General Requirements.

1.7 SEISMIC FORCE

.1 The Importance Factor for this project is:

.1 I = 1.0 - All other buildings i.e.: Office & General Buildings.

Note: As per OBC.

Part 2 Products

2.1 SRS MANUFACTURER

.1 SRS to be from one manufacturer regularly engaged in production of same, 5 years experience.

.2 Acceptable materials: Korfund-Sampson, Mason Industries, Tecoustics, Vibra-Sonic Control, Vibron.

2.2 GENERAL

.1 Design to be by Professional Engineer specializing in design of SRS and registered in Province of Ontario. Division 26 to include all costs associated with this work as it relates to Division 26 installations.

.2 SRS to be fully integrated into, compatible with:

.1 Noise and vibration controls specified elsewhere in this project specification, telecommunications.

.2 Structural, mechanical, electrical design of project.

.3 During seismic event, SRS to prevent systems and equipment from causing personal injury, interfering with other systems, and from moving from normal position.

.4 Design and installation in accordance with OBC, CSA S832.

.5 SRS to provide gentle and steady cushioning action and avoid high impact loads.

.6 SRS to restrain seismic forces in all directions.

.7 Fasteners and attachment points to resist same load as seismic restraints.

.8 SRS to be fully integrated into, compatible with:

.1 Expansion, anchoring and guiding requirements.

.2 Equipment vibration isolation and equipment SRS.

.9 SRS utilizing cast iron, threaded pipe, other brittle materials not permitted.

.10 Attachments to RC structure:

.1 Use high strength mechanical expansion anchors.

.2 Drilled or power driven anchors not permitted.

.11 Seismic control measures not to interfere with integrity of firestopping.

2.3 SRS FOR STATIC EQUIPMENT, SYSTEMS

.1 Floor-mounted equipment, systems:

.1 Anchor equipment to equipment supports.

.2 Anchor equipment supports to structure.

.3 Use size of bolts scheduled in approved shop drawings.

.2 Suspended equipment, systems:

.1 Use one or combination of following methods:

.1 Install tight to structure.

.2 Cross-brace in all directions.

.3 Brace back to structure.

.4 Slack cable restraint system.

.2 SRS to prevent sway in horizontal plane, "rocking" in vertical plane, sliding and buckling in axial direction.

.3 Hanger rods to withstand compressive loading and buckling.

2.4 SRS FOR VIBRATION ISOLATED EQUIPMENT

.1 Floor-mounted equipment, systems:

.1 Use one or combination of following methods:

.1 Vibration isolators with built-in snubbers.

.2 Vibration isolators and separate snubbers.

.3 Built-up snubber system approved by Engineer, consisting of structural elements and elastomeric layer.

.2 SRS to resist complete isolator unloading.

.3 SRS not to jeopardize noise and vibration isolation systems. Provide 4-8 mm clearance between seismic restraint snubbers and equipment during normal operation of equipment and systems.

.4 Cushioning action to be gentle and steady by utilizing elastomeric material or other means in order to avoid high impact loads.

.2 Suspended equipment, systems:

.1 Use one or combination of following methods:

.1 Slack cable restraint system.

.2 Brace back to structure via vibration isolators and snubbers.

Part 3 Execution

3.1 INSTALLATION

.1 Install Seismic Restraint Systems in accordance with Seismic Engineer's and manufacturer's recommendations.

.2 Install SRS at least 25 mm from all other equipment, systems, services

.3 Co-ordinate connections with all disciplines.

3.2 INSPECTION AND CERTIFICATION

.1 SRS to be inspected and certified by Manufacturer upon completion of installation.

.2 Seismic Design Engineer shall provide written report to Engineer certifying that SRS has been installed in accordance with the SRS drawings. The report shall bear the seal and signature of the SRS Design Engineer.

3.3 COMMISSIONING DOCUMENTATION

.1 Lab Upon completion and acceptance of certification, hand over to Engineer complete set of construction documents, revised to show "as-built" conditions.

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 SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size as indicated.

.3 Rod electrodes: copper clad steel 19 mm dia by 3 m long.

.4 Plate electrodes: galvanized steel, surface area 0.2 m^2, 1.6 mm thick.

.5 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.

.6 Insulated grounding conductors: green, type RW90.

.7 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.8 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. 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 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at one end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.7 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.8 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.2 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary 208 V system.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.4 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:

.1 Telephones: make telephone grounding system in accordance with telephone company's requirements.

.2 Sound, fire alarm, intercommunication systems as indicated.

3.5 FIELD QUALITY CONTROL

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

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of NRC Departmental Representative.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

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 applies to all breakers rated up to 240V and 100A or more.

.4 A delay in the production of the certificate of origin won't justify any extension of the contract and additional compensation.

.5 Any work of manufacturing, assembly or installation should begin only after acceptance of the certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate the manufacturer listed on circuit breakers to authenticate all new circuit breakers under the contract at the Contractor's expense.

.6 In general, the certificate of origin must contain:

.1 The name and address of the manufacturer and the person responsible for authentication. The responsible person must sign and date the certificate;

.2 The name and address of the licensed dealer and the person of the distributor responsible for the Contractor's account.

.3 The name and address of the Contractor and the person responsible for the project.

.4 The name and address of the local manufacturer's representative. The local representative must sign and date the certificate.

.5 The name and address of the building where circuit breakers will be installed:

.1 Project title.

.2 End user's reference number.

.3 The list of circuit breakers.

1.2 IDENTIFICATION

.1 Identification as per Section 26 05 00.

Part 2 Products

2.1 DISCONNECT SWITCHES, FUSED AND NON-FUSED

.1 Fusible and non-fusible disconnect switches in EEMAC Enclosure as indicated.

.2 Provision for padlocking in "OFF" switch position.

.3 Mechanical voidable door interlock in "ON" position.

.4 Fuses: size and type as indicated.

.5 Fuseholders in each switch to be suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 "ON-OFF" switch position indication on switch enclosure cover.

.8 Standard of acceptance: Square D, Cutler-Hammer, Siemens, ABB.

2.2 GROUNDING

.1 Insulated grounding conductors in accordance with Section 26 05 00.

.2 Compression connectors for grounding to equipment provided with lugs.

2.3 DRY TYPE TRANSFORMER

.1 Type ANN, C802.2.

.2 Single or three phase, KVA rating, input and output voltage as indicated.

.3 Class 200, 130°C temperature rise insulation rating for 15kva and 30kva transformer. Class 220, 150°C temperature rise insulation system for other sizes.

.4 Copper windings.

.5 Four 2.5% taps, 2-FCAN and 2-FCBN.

.6 EEMAC 1 enclosure with lifting lugs, removable metal front and side panels.

.7 Drip shield.

.8 Standard of acceptance: Hammond or approved equal.

2.4 PANELBOARDS

.1 600 volt rated power panelboards: bus and breakers rated for 25,000 amp r.m.s. symmetrical interrupting capacity at 600V or as indicated.

.2 250 volt lighting panelboards to have minimum interrupting capacity of 10,000 amp r.m.s. symmetrical.

.3 Panelboards that have a main breaker indicated in plan shall be service entranced approved (i.e. barrier to separate main breaker from remainder of panels).

.4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.5 Panelboards: mains, number of circuits, number and size of branch circuit breakers as indicated.

.6 Two keys for each panelboard and all panelboards to be keyed alike.

.7 Copper bus, neutral and ground bar with neutral of same ampere rating as mains.

.8 Suitable for: plug-in breaker for molded case circuit breaker, bolt-on breakers for miniature circuit breaker

.9 Hinged door, trim finish: baked grey enamel.

.10 Drip shield.

.11 Surface mount with hinge door, unless otherwise indicated on drawing.

.12 Complete circuit directory with typewritten legend showing description of each circuit.

.13 Manufacturer: Square D or approved equal.

2.5 MOLDED CASE CIRCUIT BREAKER

.1 Thermal-magnetic moulded case circuit breakers, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.

.2 Common-trip breakers with single handle for multiple applications.

.3 All new 120V to 600V circuit breakers installed on this project are to include the handle accessory, "Handle Padlock Attachment", which locks breakers on or off.

.4 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches 10 times their setting.

.5 Circuit breaker and panel to be of same manufacturer.

Circuit breakers minimum interrupt rating: 25KA for 600/347V or greater if indicated.

.6 Electronic trip unit as indicated by drawing.

LI: long time and instantaneous

LSI: long time, short time and instantaneous

LSIG: long time, short time , instantaneous and grounding

A: with Ammeter

E: with energy meter

.7 On board control power for trip unit

.8 Standard of acceptance: Square D or approved equal.

2.6 FUSES

.1 250V and 600V time delay, rejection style, HRC-I, Class RK5.

.2 Standard of acceptance: Gould-Shawmut or approved equal.

Part 3 Execution

3.1 DISCONNECT SWITCHES

.1 Install disconnect switches complete with fuses as indicated.

3.2 GROUNDING

.1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including, conductors, compression connectors, accessories, as indicated, to conform to requirements of Engineer, and local authority having jurisdiction over installation. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Soldered joints not permitted.

3.3 DRY TYPE TRANSFORMER

.1 Transformers above 75 kVA mount on floor.

.2 Provide adequate clearance around transformer for ventilation.

.3 Install transformers in level upright position.

.4 Remove shipping supports only after transformer is installed and just before putting into service.

.5 Loosen isolation pad bolts until no compression is visible.

.6 Make primary and secondary connections shown on wiring diagram.

.7 Energize transformers immediately after installation is completed, where practicable.

.8 Provide equipment identification in accordance with Section 26 05 00.

.9 Connect transformer through side of housing.

3.4 PANELBOARDS

.1 Locate panelboards as indicated and mount securely, plumb, and square, to adjoining surfaces.

.2 Mount panels to height specified in section 26 27 26 or as indicated.

.3 Connect loads to circuits as indicated.

.4 Connect neutral conductors to common neutral bus.

3.5 MOLDED CASE CIRCUIT BREAKERS

.1 Install circuit breakers as indicated.

3.6 FUSES

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Install fuses correctly sized to assigned electrical circuits.

.3 Provide 3 spare fuses for each rating supplied.

END OF SECTION

Part 1 General

1.1 RELATED WORK

.1 Motors and controls to Sections 26 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 LED occupancy sensor (ceiling mounted):

- .1 120V, suitable for use with installed light fixture.
- .2 Dual Technology.
- .3 360° coverage pattern.
- .4 No minimum load requirements.
- .5 Adjustable delayed-OFF time.
- .6 No field calibration or sensitivity adjustments required.
- .7 Fire year warranty.
- .8 Standard of acceptance: Diversa WOR or equivalent approved by NRC Departmental Representative.

.3 Receptacles:

.1 Duplex type, CSA type 5-15R, 125 volt, 15A, U ground, specification grade with the following features:

.1 Flush type with parallel blade slots.

.2 Double-wiping contacts.

.3 Double-grounding terminals.

.4 Break-off feature for separate feeds.

.5 One piece body, colour white unless otherwise indicated.

.2 Special receptacles with ampacity and voltage as indicated.

.3 Receptacles of one manufacturer throughout the project.

.4 Cover Plates:

.1 Cover plates for wiring devices.

.2 Smooth white plastic for wiring devices mounted in flush-mounted outlet box.

.3 Sheet metal cover plates for wiring devices mounted in surface-mounted outlet box.

.4 Multi-outlet covers as indicated.

.5 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 1.1m (3'-7") to centreline.

.2 Wall receptacles 400mm (1'-4") to centreline.

.3 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 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 1:

.1 120V 305mm x 1220mm, 40W-47W, suitable for recessed mounting in T-bar ceiling.

.2 Rigid die embossed steel housing, 100mm deep, powder coated housing.

.3 5-year warranty.

.4 Removable LED boards and driver for ease of service/replacement.

.5 Rated to deliver L80 performance for 50,000 hours.

.6 4000k colour temperature, minimum 4000 Lumen output.

.7 Standard of acceptance: Lithonia GTL-4-40L-LP840 or equivalent approved by the NRC Departmental Representative.

.2 Type 3:

.1 120V, 1220mm long, LED linear strip, suitable for surface or suspended mounting.

.2 5-year warranty.

.3 Rated to deliver L70 performance for 100,000 hours.

.4 4000k colour temperature, minimum 3800 lumen output.

.5 Standard of acceptance: Philips Fluxstream LF-4-FR-39-40-U-LAG or equivalent approved by the NRC Departmental Representative.

.2 LED Pot light

.1 Type 2:

.1 l20V, 150mm open LED downlight, suitable for recessed mounting in drywall ceiling.

.2 5-year warranty.

.3 4000k colour temperature, 82 CRI, minimum 1500 lumen output.

.4 Standard of acceptance: Lithonia Reality REAL6C6D-MW-ESL-1500L-35K-.95SC-120 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.

3.5 EXTERIOR FLOODLIGHTS

.1 Install floodlights in accordance with manufacturer's instructions and as indicated.

.2 Aim energized floodlights as indicated during darkness and in the presence of the NRC Departmental Representative.

3.6 PHOTOELECTRIC LIGHTING CONTROL

.1 Install photoelectric controls in accordance with manufacturer's instructions.

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-S524-14, Standard for the Installation of Fire Alarm Systems.

.2 CAN/ULC-S525-16, Audible Signal Device for Fire Alarm Systems.

.3 CAN/ULC-S527-11, Control Units for Fire Alarm Sytems.

.4 CAN/ULC-S536-13, Inspection and Testing of Fire Alarm Systems.

.5 CAN/ULC-S537-13, Verification of Fire Alarm Systems.

.5 National Fire Protection Agency

.1 NFPA 72-[latest edition], National Fire Alarm Code.

.2 NFPA 90A-[latest edition], Installation of Air Conditioning and Ventilating Systems.

Part 2 Products

2.1 AUDIBLE, VISUAL DEVICES

.1 Fire bell DC polarized vibrating type, 150 mm (6") size, red and rated for 24VDC, 0.15 A, 92db at 3 m (10'). Edwards model No. 439D-6AWC.

.2 Conventional system.

.3 Visual Device:

.1 Fire alarm strobe only, red in colour.

.2 Adjustable cd output of 15, 20, 75 & 110.

.3 Red with red trim ring.

.4 Include Synchronization module to synchronize strobes.

.5 Standard of acceptance: Chubb Edwards G1R-VM.

2.2 CONDUIT AND WIRING

.1 Raceway to be 21mm EMT unless indicated otherwise on the drawings. Wiring between junction box on underside of slab and heat detector junction box in T-bar ceiling to be 21mm flexible conduit.

.2 All wiring is to be colour coded to match existing system and is to be of stranded copper.

.3 Zone wiring is to be #16 TEW colour coded stranded copper.

.4 Signal wiring to be sized to take into account voltage drop and is not to be smaller than #12 TW colour coded stranded copper.

.5 Bell All signal circuit wiring to be class "A" using 4#16 TW (or larger) colour coded stranded copper wires. Where series 6 VAC series bells are used, two #12 TW colour coded stranded copper wires are to be used and the bells are to be connected in series.

Part 3 Execution

3.1 MOUNTING OF EQUIPMENT

.1 Recess mount equipment in all areas except where specified in unfinished areas.

.1 Fire alarm bells 2.1m (7'-0") to centreline.

.2 Mounting heights from floor level to centerline of equipment are as follows:

.1 Fire alarm bells, horns, strobes 2.1m (7'-0") to centreline.

3.2 CONDUIT AND WIRING

.1 All conduit to include a #16 TW stranded copper green ground wire.

.2 Use only uninsulated ring-type STA-KON lugs on screw connections.

.3 Run conduit tight along underside of ceiling slab or roof deck, unless noted otherwise on drawings.

.4 In rooms having false ceilings, each fire detection device is to have one junction box secured to the underside of the ceiling slab or roof deck and another firmly supported to the false ceiling tile. The junction box connected to the fire alarm device is not to be used as a raceway for connection to other devices. All splices and routing to other fire alarm devices is to be from the junction box mounted on the underside of the ceiling slab or roof deck.

.5 Use Tee bar electrical box hangers (Caddy #51224 for 610mm T-bar spacing) to mount heat detectors on T-bar ceiling tiles.

.6 Install a maximum of 1.5 m (5'-0") 3/4" (21mm) flexible conduit where a heat detector is installed on T-bar ceiling tiles. This is to allow the ceiling tile, having the device, to be shifted two feet either direction for access above the ceiling.

.7 Leave 6 inch loops of wire in all junction boxes.

.8 For new installations, no splicing of wires is to be made.

.9 For renovations, splices may be made in junction boxes other than those at heat detectors after receiving approval of the NRC Departmental Representative. All splices must be soldered and taped.

.10 Upon awarding of the contract, the NRC Departmental Representative shall provide the contractor with the standard wiring diagram for detection devices, A-7481.

.11 Prior to installing raceways, submit to the NRC Departmental Representative a proposed method and layout of conduit for approval.

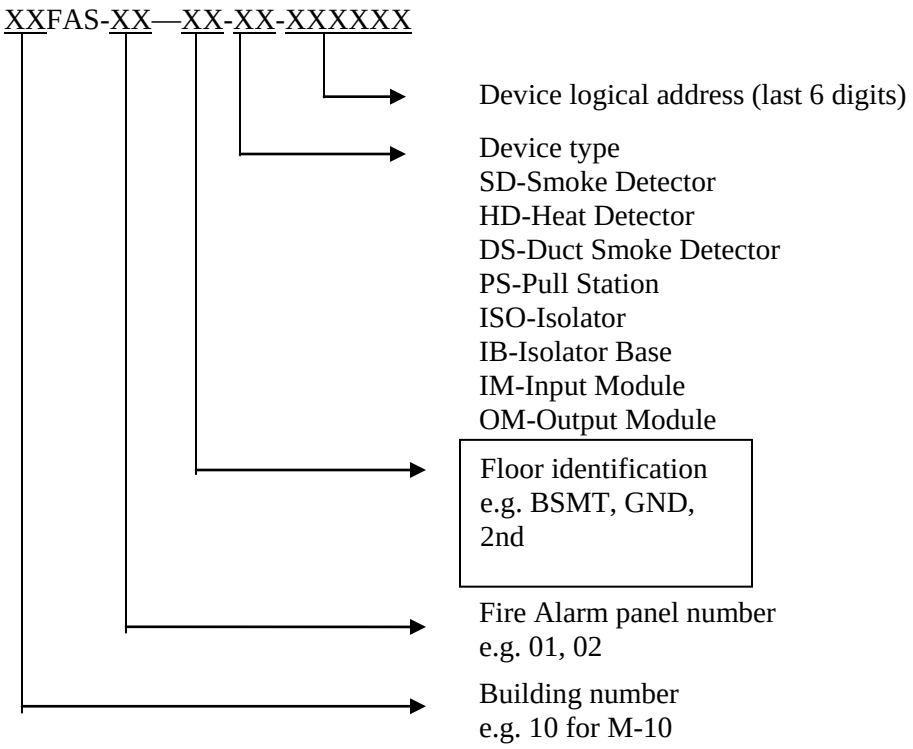
3.3 EQUIPMENT IDENTIFICATION

.1 Label each manual alarm station and each audible signal device with its unique identification number as per drawings. Use lamicoid nameplates as per Section 26 05 00.

.2 Label each initiating device use P-Touch type as per Section 26 05 00. Devices are to be numbered per the format shown below.

Example M-10 fire alarm #1 Heat detector 000001

10FAS-01-GND-HD-000001



.3 Refer to 26 05 00 for fire alarm conduit color coding.

.4 Label wires as per drawing and as per Section. 26 05 00.

.5 Update remote annunciator panels and fire alarm panel zone directories if new zones are added to the system.

3.4 SCHEDULING OF SHUTDOWNS

.1 Make written shutdown request to the NRC Departmental Representative at least 48 hours in advance. Acceptance of shutdown request will be determined by the NRC Departmental Representative based on building user needs. Fire alarm systems are to be shut down by NRC staff only. **Contractor is not to shutdown system on their own.**

3.5 INTEGRATION INTO SYSTEM MONITORING AT BUILDING M-1

Presently all NRC buildings in Ottawa report back their fire alarm status to the M1 building central monitoring station. The monitoring station consists of a computer graphics terminal showing building layouts of each building, and is linked on an internal NRC network. The new fire alarm system under this contract must communicate all

addressable input points to the existing computer graphics monitoring station, Fireworks by Chubb Edwards. All required modifications to the existing Fireworks station are to be included in this tender.

.1 Conventional (non-addressable) devices:

.1 Integrate any new zones installed as part of this project into the monitoring system at building M-1. This is to be done by factory trained technician.

.2 Remove from the monitoring system at building M-1 any zones removed as part of this project.

.3 Make appropriate changes to the monitoring system at building M-1 to reflect any zone location changes as appropriate.

.4 All work on the monitoring system at building M-1 is to be done by factory trained technician.

3.6 ACCEPTANCE TEST

.1 Perform tests in accordance with the latest regulations and in the presence of the NRC Departmental Representative and the representative of the regulating authority.

.2 Test each device and alarm circuit to ensure manual alarm stations, thermal and smoke detectors transmit alarms to control panel and actuate alarm.

.3 Check annunciator panels to ensure that the correct zones are activated.

.4 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of trouble signals.

.5 Record amperage drawn by audible signal device circuits if new audible signal devices have been added to the circuit.

.6 Give the NRC Departmental Representative one set of marked in red prints labelled "As Built".

.7 Provide the NRC Departmental Representative with a letter of verification from the manufacturer of the equipment stating that the equipment supplied under this contract has been installed as per the latest CAN/ULC S537 and CAN/ULC-S524 standards and as per the latest edition of the Ontario Building Code.

.8 For new fire alarm systems provide the NRC Departmental Representative with a certificate of verification stating that the equipment has been installed as per the latest CAN/ULC-S537 and CAN/ULC-S524 standards and as per the latest edition of the National Building Code.

END OF SECTION

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National Research Council Canada
1200 Montreal Road, Building M-19, Room 340
Ottawa Ontario, K1A 0R6

August 11, 2017

Attention: **Isabelle D'Amour-Tanguay, Project Manager**

RE: Project-Specific Designated Substances Survey
Washroom Renovation Project
Building M-06, 1200 Montreal Road, Ottawa, ON

DST File No.: GV-OT-028813

1.0 INTRODUCTION

DST Consulting Engineers Inc. (DST) was retained by the National Research Council (NRC) to conduct a Project-Specific Designated Substances Survey (DSS) for the Washroom Renovation Project at Building M-06, located at the NRC Campus, 1200 Montreal Road, in Ottawa, ON.

The Designated Substances Report is required under the Ontario Occupational Health and Safety Act in order to identify designated substances that may be present within the project area. The Canada Labour Code also stipulates under Part II, Section 124 that every employer shall ensure that the health and safety at work of every person employed by the employer is protected. By having a DSS conducted, NRC will be able to inform his or her employees, contractors, and tenants of any designated substances that may be present and possibly disturbed throughout the planned renovation work.

DST staff completed a visual inspection of building materials for the presence of suspected designated substances and select hazardous materials in the areas of Building M-06 that will be affected by the project on May 24, 2017.

2.0 SCOPE OF WORK

The survey implemented by DST included the 11 designated substances listed in Section 30 of the Occupational Health and Safety Act, R.S.O. 1990, Chapter 0.1. Designated Substances, as identified under the Ontario Occupational Health and Safety Act, are as follows:

- Acrylonitrile;
- Arsenic;
- Asbestos-Containing Materials (ACMs) - both friable and non-friable;
- Benzene;
- Coke Oven Emissions;
- Ethylene Oxide;
- Isocyanates;
- Lead;
- Mercury;
- Silica; and
- Vinyl Chloride.

Other Hazardous Materials which are not classified as Designated Substances, but were included as part of the survey and considered pertinent due to applicable regulations, best practice guidelines and/or potential risks to human health and/or the environment, are:

- Polychlorinated Biphenyls (PCBs);
- Mould;
- Ozone-depleting substances; and
- Other hazardous materials, as deemed pertinent.

3.0 METHODOLOGY

The field program for this survey was completed by DST on May 24, 2017. The survey was non-destructive in nature and limited to areas within Building M-06 that may be affected by washroom renovation project. The project areas are as follows:

- The existing men's washroom located on the 2nd level;
- The area in between Room 207 and the 3rd level staircase where the woman's washroom will be constructed;
- The crawlspace in between the 1st and 2nd levels; and
- The ceiling and ceiling space of Room 108.

Materials suspected of containing designated substances were visually identified, based on the surveyor's knowledge of the historical composition of building products. Visual identification of materials suspected to contain asbestos was supported by the collection and analysis of a limited number of representative samples, where applicable. Materials suspected of containing designated substances other than asbestos and lead in paint were identified by appearance, age, and knowledge of historical applications. Equipment that may contain polychlorinated biphenyls (e.g. electrical transformers and fluorescent light ballasts) can often be identified by examining manufacturer's labels.

In Ontario, a material is defined as an Asbestos-Containing Material (ACM) if the material has a minimum asbestos content of 0.5 per cent (%) by dry weight, as O. Reg. 278/05, as amended. ACMs can be divided into two categories: friable and non-friable material. A friable ACM is a material that can be crumbled, powdered, or pulverized by hand pressure and can readily release fibres when disturbed. Common applications of friable ACMs are sprayed or trowelled surfacing materials (e.g. sprayed fireproofing and textured coatings) as well as mechanical and thermal insulation. Non-friable materials are materials that will generally release fibres only when cut or shaped. Common non-friable ACMs include vinyl floor products, caulking applications, asbestos textile products and asbestos cement products (transite). Some of these products may become friable with time or when disturbed.

Twenty-four (24) representative bulk samples of suspected ACMs were collected by DST during the site investigation. Samples were collected in order to meet the bulk sampling requirements stipulated in O.Reg. 278/05, as amended. The bulk samples were submitted to and analyzed by Paracel Laboratories Ltd. (Paracel). Paracel is an accredited laboratory through the Canadian Association for Laboratory Accreditation (CALA) and the NVLAP. All bulk samples were analyzed using a combination of dispersion staining and polarised light microscopy (PLM). This analytical method complies with the United States Environmental Protection Agency (U.S. EPA) Method 600/R-93/116 dated July 1993, which is the regulatory approved protocol for bulk asbestos analysis in Ontario.

With regards to lead in paint, although the Ontario Ministry of Labour (MoL) has published a guideline for control of lead exposures on construction projects in Ontario, it does not include criteria for the classification of lead-paint. Instead, it uses presumed airborne lead concentrations for specific tasks as criteria for classifying work. However, in regulations set by the United States (U.S.) Department of Housing and Urban Development, lead-based paint is classified as any paint application containing at least 1.0 milligrams of lead per square centimetre of surface area (1.0 mg/cm^2), or at least 0.5% lead content by weight [(5,000 parts per million (ppm)]. This criterion was widely, although not universally, used in Canada. In Canada, the Federal Canada Consumer Product Safety Act's *Surface Coating Materials Regulations SOR/2005-109* has lowered the allowable concentration of lead in paints for new consumer products to 0.009% lead content by weight (90 ppm). For the purposes of the survey and this report, paint applications having detectable concentrations of lead are considered to be lead-containing.

Two (2) paint samples were collected by DST for lead content analysis during the site investigation. All other paints encountered in the project area were in good condition and sampling could not occur without matrix interference (i.e. removing the paint without the substrate material).

Selected photographs are included in Appendix A. Bulk asbestos analytical results are included in Appendix B.

4.0 BACKGROUND INFORMATION REVIEW

Prior to the commencement of field work, DST project personnel reviewed past hazardous materials bulk sampling documentation, as pertinent to the project areas. As part of the project, DST reviewed the following report:

- Designated Substances Survey, Building M-06, Ottawa, ON. Prepared by Oakhill Environmental, March 2007.

DST referenced the identifiable and applicable sampling and analytical results of the above-noted documentation. DST's field program included the sampling of previously identified ACMs when necessary to meet sampling requirements of O. Reg. 278/05, as amended. DST also sampled any additional suspected ACMs identified and the documented any other Designated Substances encountered.

5.0 FINDINGS

5.1. Asbestos

Based on laboratory analysis, the following materials contain regulated concentrations of asbestos in the project area:

- Approximately twenty-four (24) square metres of non-friable fibreboard wall material, in good condition, located on the south wall of Room 207 contains 20% Chrysotile asbestos (DST Sample 28813-06A).
- Less than one half (0.5) metre of friable cardboard wrap pipe insulation debris located on the upper ceiling tile surface in the men's washroom contains 30% Chrysotile asbestos (DST Sample 28813-05A).

- Approximately three (3) linear metres of friable cardboard pipe wrap insulation associated with air handling unit UNH04/06UNH04 located on the top of Office 108 contains 30% Chrysotile asbestos (DST Sample 28813-05A), observed in good condition.
- Eight (8) friable grey cement compound pipe fittings, associated with UNH04/06UNH04 located on the top above Office 108 contain 65% Chrysotile asbestos (DST Samples 28813-09A), observed in good condition.
- Approximately one (1) square metre of non-friable white caulking associated with the asbestos-containing fibreboard on the south wall of Room 207 contains 5% Chrysotile asbestos (DST Sample 28813-07A), observed in good condition.
- Approximately sixteen (16) square metres of non-friable, black mastic applied to concrete associated with 12”x12” vinyl floor tiles beige with white speckles, located in the 2nd level existing men’s washroom contains 5% Chrysotile asbestos (DST Sample 28813-01 A, mastic layer). The vinyl tiles themselves should also be considered asbestos-containing as the mastic layer cannot be effectively separated.
- Cast iron drainpipe joint caulking is suspected to be asbestos-containing. Samples were not collected by DST to avoid compromising the drainpipe waterproof seals.

Bulk sampling and/or onsite visual observations has confirmed that the following materials do not contain regulated concentrations of asbestos in the project area:

- Terra-cotta mortar; (DST Samples 28813-02A-C);
- Drywall joint compound (DST Samples 28813-03A-C)
- Beige marble pattern vinyl sheet located on the wall of the men’s washroom (DST Samples 28813-04A-C));
- Concrete block mortar located in the crawl space between Levels 1 and 2 (DST Samples 28813-08A-C);
- 1’x1’ pressed wood ceiling tiles located in the men’s washroom;
- 2’x4’ pinhole ceiling tiles located in Office 108 (manufacturer date stamp of 2008 post-dates the use of asbestos in building materials); and
- Fibreglass insulation on air handling ducts, piping and fittings in the project area.

5.2. Lead

Based on visual observations and bulk sampling analytical results for samples collected by DST, the following paint contains concentrations of lead greater than the Federal Canada Consumer Product Safety Act’s limit of 90 ppm:

- Grey floor paint, containing 2,890 parts per million (ppm) of lead, located on concrete floors throughout the project areas (DST sample 28813-LP-02).

No other lead paint samples were collected by DST for lead content analysis, as other paints and surface coatings encountered in the project areas were in good condition and sampling without matrix interference (i.e. removing the paint without the substrate material) would have proved difficult. All other paints and surface coatings in the project areas shall be assumed to

contain detectable concentrations of lead, unless specific bulk sampling and laboratory analysis confirms otherwise.

Light blue paint located on the exterior walls of the men's washroom did not contain detectable concentrations of lead (DST Sample 28813-lp-01).

Lead is also suspected to be present in the following materials:

- Ceramic tile glazing;
- Joint filler between terrazzo floor slabs;
- Cast-iron drainpipe joint caulking;
- Solder on the joints of copper piping and eavestroughs; and
- Emergency light batteries.

5.3. Mercury

Mercury is suspected to be present in the following equipment:

- Fluorescent light fixtures containing fluorescent light tubes were observed. Fluorescent light tubes contain mercury in a vapour form and in the phosphor coating on the lamp tube; and
- The tilt switch mechanism in wall-mounted Thermostats.

5.4. Silica

Based on the historical composition of building materials, silica is expected to be present in:

- Mortars,
- Terra cotta block;
- Concrete and cement materials;
- Ceramic tile;
- Vinyl floor tiles;
- Drywall;
- and
- 2'x4' ceiling tiles.

5.5. Polychlorinated Biphenyls (PCBs)

Polychlorinated Biphenyls (PCBs), also known as Chlorobiphenyls, are hazardous chemicals which were used in the manufacturing of a variety of equipment, such as electrical equipment, heat exchangers, hydraulic systems, and for several other specialized applications. PCBs are commonly found within electrical ballasts manufactured prior to 1981, found within fluorescent light fixtures and high intensity discharge lamps.

Light fixtures with T12 lamps are more likely to contain ballasts that were manufactured prior to 1981. T8 lamps are associated with light fixtures that were manufactured after the phase-out of

PCB-containing ballasts. The letter “T” denotes the shape of the light fixture (e.g. tubular) and the number which follows indicates the diameter in eights of an inch.

DST did not disassemble any of the light fixtures in the project areas to identify the presence of ballasts, as the light fixtures were energized at the time of site visit. Based on limited visual observations, DST observed T12 and T8 lamps throughout the project areas. Light fixtures with T12 light ballasts are suspected to contain PCBs, until proven otherwise.

5.6. Mould

Approximately two (2) square metres of suspected mould growth was visually identified above the ceiling space on the ceiling and north wall of Office 108.

5.7. Other Designated Substances and Hazardous Materials

The following Designated Substances and Hazardous Materials were neither observed, nor suspected of being present, in forms or quantities that would impact the renovation work:

- Acrylonitrile;
- Arsenic;
- Benzene;
- Coke Oven Emissions;
- Ethylene Oxide;
- Isocyanates;
- Vinyl Chloride; and
- Ozone-depleting substances (ODSs).

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the site investigation, sampling and analysis, the following Designated Substances and hazardous materials are present in forms and quantities expected to have a measurable impact on the Washroom Renovation Project at the NRC Building M-06:

- Asbestos;
- Lead;
- Mercury;
- Silica;
- PCBs; and
- Mould.

DST’s recommendations for each material, which are based upon both regulatory compliance and best practice guidelines, are included in the following sections below.

6.1. Asbestos

The disturbance of asbestos-containing materials on construction and demolition projects in the province of Ontario is governed by *O. Reg. 278/05, Asbestos on Construction Projects and in Buildings and Repair Operations* enabled under the *Occupational Health and Safety Act (R.S.O. 1990, Chapter 0.1),* as amended. This regulation classifies all asbestos disturbances as either

Low Risk (Type 1), Moderate Risk (Type 2), or High Risk (Type 3), each of which has defined precautionary measures. All asbestos materials are subject to specific handling and disposal precautions, and must be removed prior to demolition or renovation. The Ontario Ministry of Labour (MOL) must be notified of any project involving removal of more than a minor amount (e.g. typically one square metre) of friable asbestos material.

Identified asbestos-containing friable pipe fitting insulation and cardboard wrap insulation require a minimum of Type 2 abatement procedures under Ontario Regulation 278/05, as amended, when disturbing/removing/repairing one (1) square metre or less of this material. Should renovation or disturbance be required of more than one (1) square metre of friable ACM, Type 3 abatement procedures are required. It should also be noted that pipe insulation and/or pipe fitting insulation in good condition can be removed using Type 2 glove-bag procedures, provided the glove-bag seal can be maintained throughout the removal and cleaning process. If these conditions cannot be met, then more stringent procedures will be required.

Asbestos containing friable cardboard pipe wrap insulation was observed above the ceiling tiles in the men's washroom. Removal of all or part of a false ceiling to obtain access to a work area, if asbestos-containing material is likely to be lying on the surface of the false ceiling requires minimum Type 2 work procedures.

The removal or disturbance of non-friable ACMs (fibreboard wall material, vinyl floor tile and associated mastic ((both considered ACM as the mastic layer cannot be separated)), caulkings) can be completed using Type 1 asbestos precautionary measures, provided the material is wetted and only non-powered hand-held tools are used. If these conditions cannot be met, than more stringent (Type 2 or Type 3) procedures are required.

The time weight average exposure limit (TWAEL) for airborne asbestos is prescribed by Ontario Regulation 490/09 *Designated Substances*, as amended. Work procedures and personal protective equipment must be used to ensure that workers are not exposed to airborne asbestos levels that exceed this TWAEL.

The following recommendations apply to ACMs:

1. In general, materials must be maintained in good condition;
2. The condition of material(s) identified in this report must be inspected at least annually, and this record must be updated accordingly;
3. Appropriate work procedures and precautionary measures must be used, as outlined in O. Reg. 278/05, as amended, when performing work that may disturb ACMs or suspected ACMs, including prior to building demolition;
4. If ACMs or suspected ACMs become damaged and worker exposure to the material is likely to occur, the damaged material must be repaired or removed following work procedures outlined in O. Reg. 278/05, as amended; and
5. Disposal of asbestos waste is controlled by the Ontario Environmental Protection Act, R.R.O., 1990, Regulation 347, *General – Waste Management,* as amended. This regulation requires that asbestos waste be sealed in double containers resistant to puncture and tears, and appropriately labelled. The waste must be disposed at a licensed waste disposal site. Proper notification must be issued to the site representative prior to transportation of waste. The transport of the waste to the disposal site is controlled by the federal *Transportation of Dangerous Goods Act*, 1992 (TDGA).

Materials that have not been analyzed, but are visibly similar to other materials identified as asbestos-containing, must be considered asbestos-containing unless proven otherwise by laboratory analysis.

6.2. Lead

The Occupational Health and Safety Branch of the Ontario MoL has published *Guideline: Lead on Construction Projects*. This document classifies all lead disturbances as Type 1, Type 2a, Type 2b, Type 3a or Type 3b work, and assigns different levels of respiratory protection and work procedures for each classification. In the absence of specific legislation for lead on construction projects, this guideline should be followed when disturbing lead-containing materials.

Paints containing elevated concentrations of lead can pose a health risk to humans if ingested or inhaled. Such lead paints are also a risk to the environment with the potential to contaminate soil and groundwater. Paints with elevated lead content can also pose a health risk to workers while completing renovations within the building.

Although the Federal Canada Consumer Product Safety Act's *Surface Coating Materials Regulations SOR/2005-109*, as amended, has set a limit of 90 ppm for surface coating materials, there may be a potential for exposure to high levels of lead depending on the activities performed that disturb the lead-containing materials, even at low lead concentrations. Conducting a risk assessment to assess the potential for exposure should be performed to determine the need to follow procedures such as those in the MoL guideline referenced above.

The TWAEL for airborne lead is prescribed by Ontario Regulation 490/09 *Designated Substances*, as amended. Work procedures and personal protective equipment must be used to ensure that workers are not exposed to airborne lead levels that exceed this TWAEL.

DST recommends that any future disturbance of lead-containing materials avoid operations that generate high levels of dust (e.g. sanding, grinding) and that should these operations be required, appropriate precautionary measures be implemented for worker exposure.

Prior to or during renovation work, the following additional procedures should be performed with respect to other anticipated lead-containing materials:

- Type 1 lead precautionary measures can be used for the disturbance of ceramic tile glazing and the joint filler materials between terrazzo floor slabs, provided non-powered handtools are used. If this condition cannot be met, more stringent precautionary measures would ne necessary.
- Copper piping and cast iron drain pipe joint caulking can be cut a small distance (e.g. 50 mm) from the joints to avoid direct disturbance of the lead material;
- Emergency light batteries and other batteries should be removed when decommissioned and disposed of as lead-containing waste.

The disposal of construction waste containing lead is governed by O. Reg. 347/90 - General – Waste Management, as amended. The transport of the waste to the disposal site is controlled by the federal Transportation of Dangerous Goods Act (TDGA), 1992.

6.3. Mercury

There are no regulations that specifically govern the disturbance of mercury on construction projects. However, the Occupational Health and Safety Division of the Ontario MoL has published *The Safe Handling of Mercury: A Guide for the Construction Industry*. This document provides advice on how to reduce the risk of mercury exposure, and outlines clean-up methods for spills. In the absence of specific legislation for mercury on construction projects, this guideline would serve as a reasonable, peer reviewed standard for work procedures.

When the removal of fluorescent light tubes is required, the tubes should be removed intact from the fixtures. This prevents worker exposure to mercury vapour, particularly if the tube was energized shortly before removal.

The TWAEL for mercury is prescribed by Ontario Regulation 490/09 *Designated Substances*, as amended. Work procedures and personal protective equipment must be used to ensure that workers are not exposed to airborne mercury levels that exceed this exposure limit.

Liquid mercury is classified as a hazardous waste under O. Reg. 347/90, as amended. The transport of the waste to a disposal site is controlled by O. Reg. 347/90 and by the federal TDGA. It is now common practice to recycle fluorescent light tubes and avoiding the generation of hazardous waste.

6.4. Silica

The Occupational Health and Safety Branch of the Ontario Ministry of Labour have published *Guideline: Silica on Construction Projects*. This document classifies all silica disturbances as Type 1, Type 2 or Type 3 work, and assigns different levels of respiratory protection and work procedures for each classification.

The TWAEL for airborne silica is prescribed by Ontario Regulation 490/09 *Designated Substances*, as amended. Work procedures and personal protective equipment must be used to ensure that workers are not exposed to airborne silica levels that exceed this exposure limit.

As a general rule, it is preferable to use more stringent dust suppression techniques and engineering controls as opposed to relying on respiratory protection to control worker exposure. Respiratory protection should only be relied on as a last resort when dust suppression techniques and engineering controls fail to control worker.

6.5. Polychlorinated Biphenyls (PCBs)

Prior to removal or disposal, the PCB content of equipment and/or liquids should be confirmed to determine proper procedures to be followed, unless conservatively assumed to contain PCBs. When the fluorescent light fixtures are taken out of service, these ballasts, as well as other ballasts, should be examined to determine whether they contain PCBs. This can be done by comparing the manufacturer date codes stamped on the ballasts to information contained in the document titled *Identification of Lamp Ballasts Containing PCBs*, published by Environment Canada. Ballasts that contain PCBs must be packaged, transported and disposed of in accordance with all appropriate provincial and federal regulations..

O. Reg. 347, General – Waste Management, as amended, is regulated under the Environmental Protection Act to regulate the handling, storage and transportation of hazardous substances and

waste dangerous goods. The transport of PCB waste to the disposal site is controlled by the federal Transportation of Dangerous Goods Act, 1992. Proper notification must be issued to the site representative prior to transportation of waste. Use, storage, labelling, and reporting requirements are also outlined within the federal PCB Regulation under the Canadian Environmental Protection Act (CEPA).

6.6. Mould

Any mould remedial activities shall follow appropriate standards/ guidelines appropriate to the scope of work as outlined within the Canadian Construction Association (CCA) document Mould Guidelines for the Canadian Construction Industry, CCA 822004.

7.0 CLOSURE

A Limitations of Report section, which forms an integral part of this report, is attached.

We trust that the information contained herein meets your needs. Should you have any questions or comments, please do not hesitate to contact us.

DST CONSULTING ENGINEERS INC.

Nicolas Strang, C.Tech.
Project Manager
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Matthew DesRoches, CIH, ROH, M.Sc.(A)
Occupational Hygienist
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LIMITATIONS OF REPORT

This report is intended for client use only. Any use of this document by a third party, or any reliance on or decisions made based on the findings described in this report, are the sole responsibility of such third parties, and DST Consulting Engineers Inc. accepts no responsibility for damages, suffered by any third party as a result of decisions made or actions conducted based on this report. No other warranties are implied or expressed.

The data, conclusions and recommendations which are presented in this report, and the quality thereof, are based on a scope of work authorized by the client. The sampling program included asbestos/paint bulk sampling in select representative areas for laboratory analysis. There is a practical limitation on the number of intrusive test cuts that can be made and the number of samples that can be collected in an occupied building. This requires the investigator to extrapolate observations and analytical results between test cut locations. The uncertainty, and inherent risk, associated with this necessity increases with the distance between sampling locations. Note, however, that no scope of work, no matter how exhaustive, can guarantee to identify all contaminants. This report therefore cannot warranty that all building conditions are represented by those identified at specific locations.

Recommendations, when included, are made in good faith and are based on several successful experiences.

Any recommendations and conclusions provided that are based on conditions or assumptions reported herein will inherently include any uncertainty associated with those conditions or assumptions.

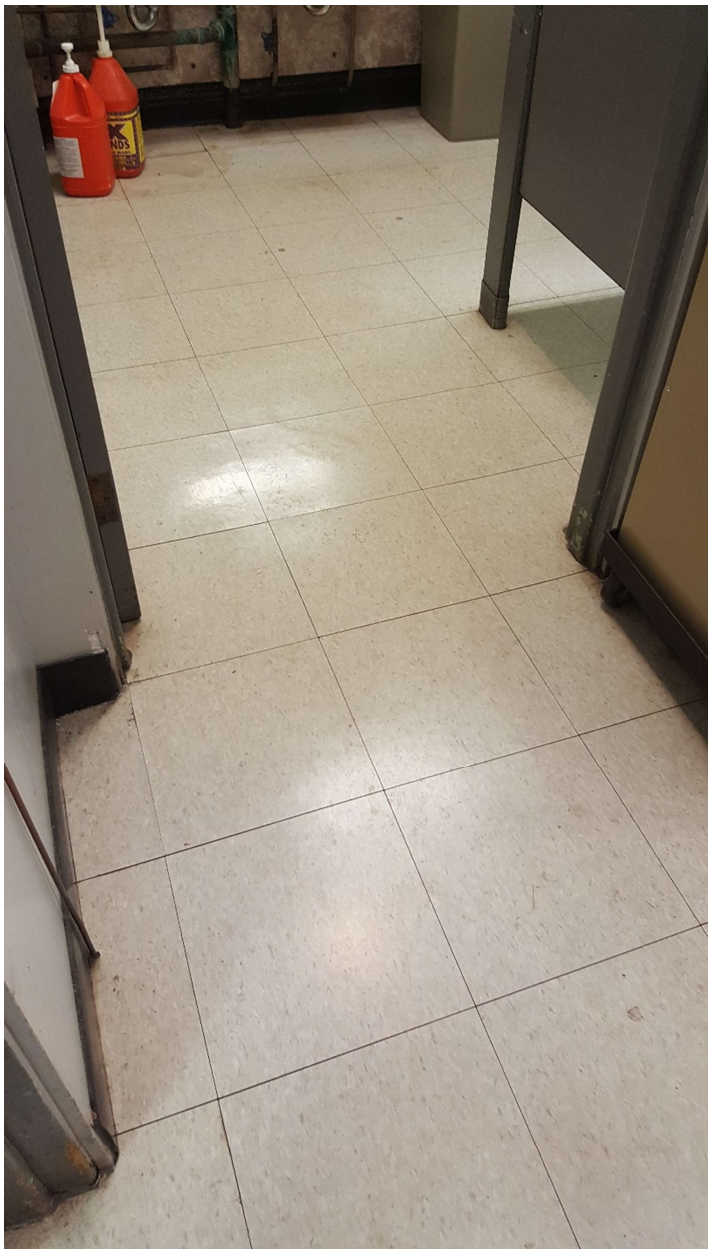
Note also that standards, guidelines and practices related to environmental investigations may change with time. Those which were applied at the time of this investigation may be obsolete or unacceptable at a later date.

Any comments given in this report on potential remediation problems and possible methods are intended only for the guidance of the designer. The scope of work may not be sufficient to determine all of the factors that may affect construction, clean-up methods and/or costs. Contractors bidding on this project or undertaking clean-ups should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the conditions may affect their work.

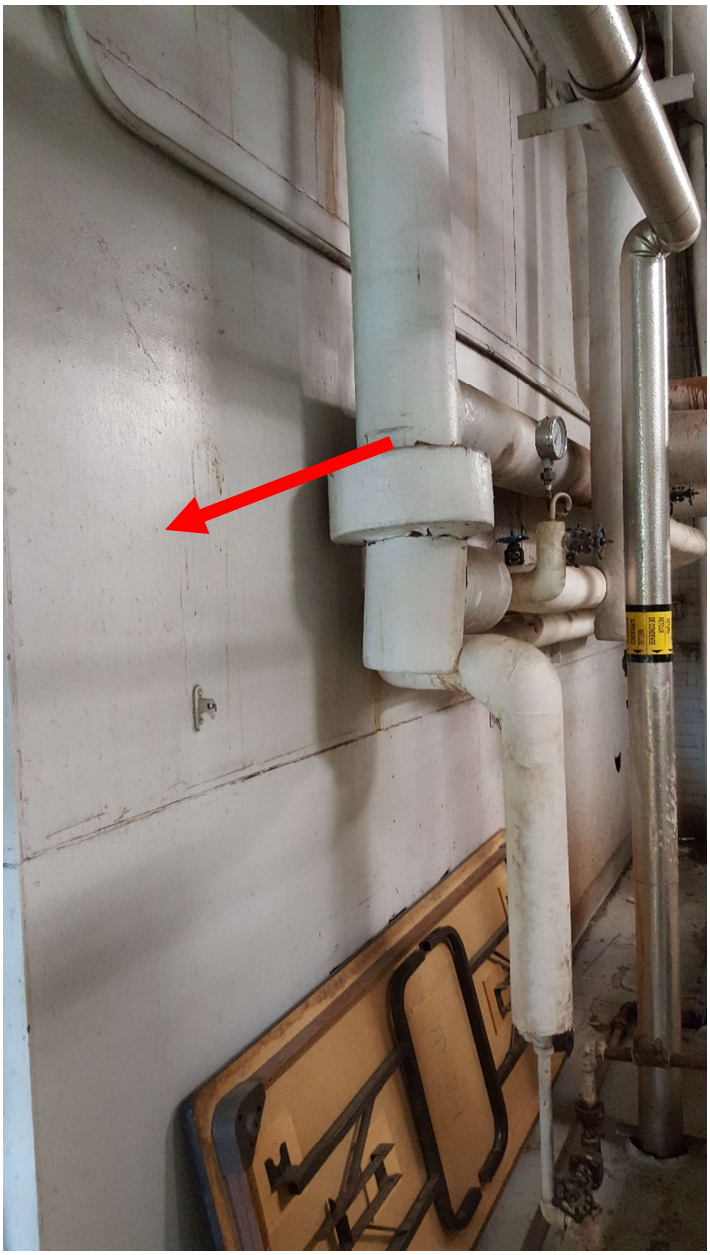
Any results from an analytical laboratory or other subcontractor reported herein have been carried out by others, and DST Consulting Engineers Inc. cannot warranty their accuracy. Similarly, DST cannot warranty the accuracy of information supplied by the client.

APPENDIX A

Select Photographs



Photograph 1: Asbestos-containing black mastic associated with 12”x12” beige vinyl floor tiles, located in the men’s washroom. Since the asbestos-containing mastic cannot be effectively separated form the vinyl tiles, the tiles are also considered asbestos-containing.

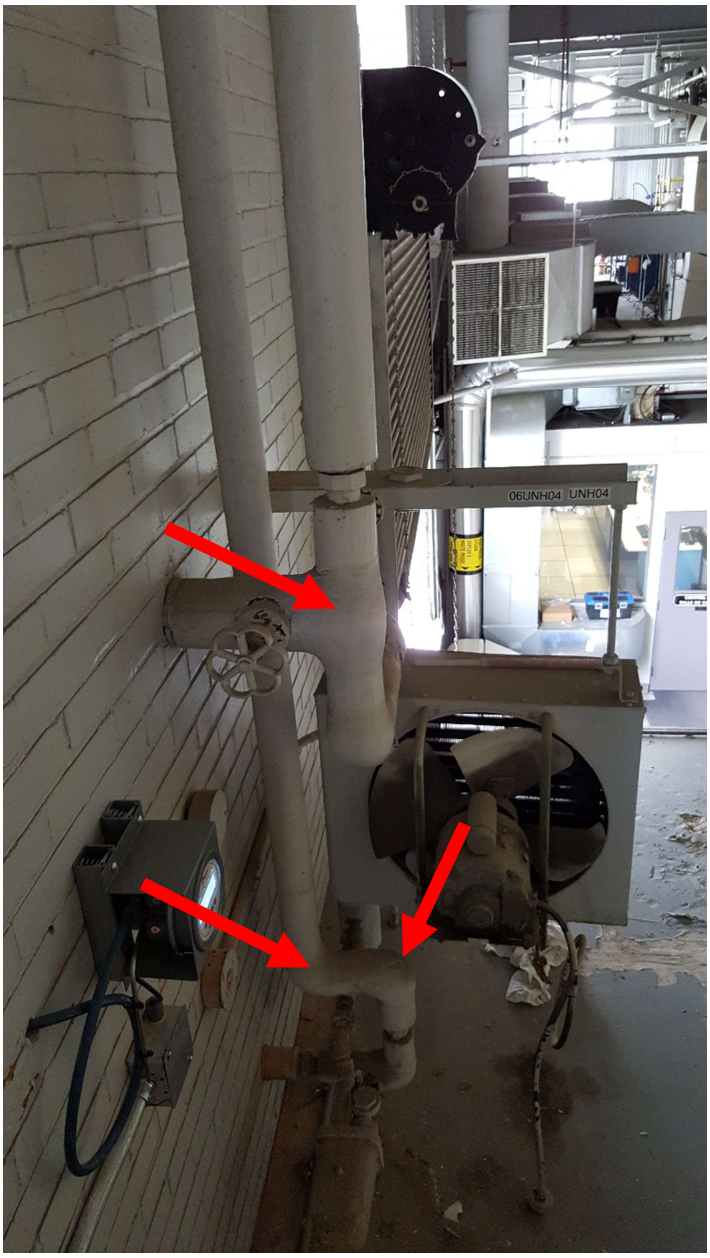


Photograph 2: Asbestos-containing friable fibre board located on the walls of Room 207.

Photograph 3: Asbestos-containing caulking associated with fibre board located on the walls of Room 207.

Photograph 4: Asbestos-containing cardboard pipe wrap insulation observed above the ceiling tiles of the men's washroom.

Photograph 5: Asbestos-containing cardboard pipe wrap insulation associated with UNH04/06UNH04 located on the roof above Office 108



Photograph 6: Asbestos-containing grey cement compound pipe fitting insulation associated with UNH04/06UNH04 located on the roof above Office 108

Photograph 8: Lead containing grey paint located on concrete floors throughout the project areas.

Photograph 8: Suspect mould growth above ceiling tiles of Office 108.

APPENDIX B

Laboratory Certificates of Analysis – Asbestos and Lead

PARACEL LABORATORIES LTD.

TRUSTED.
RESPONSIVE.
RELIABLE.

300 - 2319 St. Laurent Blvd
Ottawa, ON, K1G 4J8
1-800-749-1947
www.paracellabs.com

Certificate of Analysis

DST Consulting Engineers Inc. (Ottawa)

203-2150 Thurston Dr.
Ottawa, ON K1G5T9
Attn: Andrew Cooney

Client PO: NRC-M6
Project: GV OT 028813
Custody:

Report Date: 31-May-2017
Order Date: 25-May-2017

Order #: 1721293

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1721293-01	28813-01A (VFT)
1721293-02	28813-01B (VFT)
1721293-03	28813-01C (VFT)
1721293-04	28813-01A (Mastic)
1721293-05	28813-01B (Mastic)
1721293-06	28813-01C (Mastic)
1721293-07	28813-02A
1721293-08	28813-02B
1721293-09	28813-02C
1721293-10	28813-03A
1721293-11	28813-03B
1721293-12	28813-03C
1721293-13	28813-04A
1721293-14	28813-04B
1721293-15	28813-04C
1721293-16	28813-05A
1721293-17	28813-05B
1721293-18	28813-05C
1721293-19	28813-06A Fibreboard
1721293-20	28813-06B Fibreboard
1721293-21	28813-06C Fibreboard
1721293-22	28813-07A
1721293-23	28813-07B
1721293-24	28813-07C
1721293-25	28813-08A
1721293-26	28813-08B

Approved By:

Heather S.H. McGregor, BSc
Laboratory Director - Microbiology

1721293-27	28813-08C
1721293-28	28813-09A
1721293-29	28813-09B
1721293-30	28813-09C

PARACEL LABORATORIES LTD.

Order #: 1721293

Certificate of Analysis

Client: DST Consulting Engineers Inc. (Ottawa)

Client PO: NRC-M6

Report Date: 31-May-2017

Order Date: 25-May-2017

Project Description: GV OT 028813

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel I.D.	*Sample Date*	*Layers Analyzed*	*Colour*	*Description*	*Asbestos Detected:*	*Material Identification*	*% Content*
1721293-01	24-May-17	sample homogenized	White	Floor Tile	No	Client ID: 28813-01A (VFT)	
						Non-Fibers	100
1721293-02	24-May-17	sample homogenized	White	Floor Tile	No	Client ID: 28813-01B (VFT)	
						Non-Fibers	100
1721293-03	24-May-17	sample homogenized	White	Floor Tile	No	Client ID: 28813-01C (VFT)	
						Non-Fibers	100
1721293-04	24-May-17	sample homogenized	Black	Mastic	**Yes**	Client ID: 28813-01A (Mastic)	
						Chrysotile	5
						Non-Fibers	95
1721293-05	24-May-17					Client ID: 28813-01B (Mastic)	
						not analyzed	
1721293-06	24-May-17					Client ID: 28813-01C (Mastic)	
						not analyzed	
1721293-07	24-May-17	sample homogenized	Grey	Mortar	No	Client ID: 28813-02A	
						Non-Fibers	100
1721293-08	24-May-17	sample homogenized	Grey	Mortar	No	Client ID: 28813-02B	
						Non-Fibers	100
1721293-09	24-May-17	sample homogenized	Grey	Mortar	No	Client ID: 28813-02C	
						Non-Fibers	100
1721293-10	24-May-17	sample homogenized	White	Drywall Joint Compound	No	Client ID: 28813-03A	
						Non-Fibers	100
1721293-11	24-May-17	sample homogenized	White	Drywall Joint Compound	No	Client ID: 28813-03B	
						Non-Fibers	100
1721293-12	24-May-17	sample homogenized	White	Drywall Joint Compound	No	Client ID: 28813-03C	
						Non-Fibers	100
1721293-13	24-May-17	sample homogenized	White	Vinyl Sheet Flooring	No	Client ID: 28813-04A	
						Cellulose	35
						Non-Fibers	65
1721293-14	24-May-17	sample homogenized	White	Vinyl Sheet Flooring	No	Client ID: 28813-04B	
						Cellulose	35
						Non-Fibers	65
1721293-15	24-May-17	sample homogenized	White	Vinyl Sheet Flooring	No	Client ID: 28813-04C	
						Cellulose	35
						Non-Fibers	65

PARACEL LABORATORIES LTD.

Order #: 1721293

Certificate of Analysis

Report Date: 31-May-2017

Client: DST Consulting Engineers Inc. (Ottawa)

Order Date: 25-May-2017

Client PO: NRC-M6

Project Description: GV OT 028813

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel I.D.	*Sample Date*	*Layers Analyzed*	*Colour*	*Description*	*Asbestos Detected:*	*Material Identification*	*% Content*
1721293-16	24-May-17	sample homogenized	Grey	Insulation	**Yes**	Client ID: 28813-05A	
						Chrysotile	30
						Cellulose	20
						MMVF	30
						Non-Fibers	20
1721293-17	24-May-17					Client ID: 28813-05B	
						not analyzed	
1721293-18	24-May-17					Client ID: 28813-05C	
						not analyzed	
1721293-19	24-May-17	sample homogenized	Grey	Fiberboard	**Yes**	Client ID: 28813-06A Fibreboard	
						Chrysotile	20
						Non-Fibers	80
1721293-20	24-May-17					Client ID: 28813-06B Fibreboard	
						not analyzed	
1721293-21	24-May-17					Client ID: 28813-06C Fibreboard	
						not analyzed	
1721293-22	24-May-17	sample homogenized	Brown	Caulking	**Yes**	Client ID: 28813-07A	
						Chrysotile	5
						Non-Fibers	95
1721293-23	24-May-17					Client ID: 28813-07B	
						not analyzed	
1721293-24	24-May-17					Client ID: 28813-07C	
						not analyzed	
1721293-25	24-May-17	sample homogenized	Grey	Mortar	No	Client ID: 28813-08A	
						Non-Fibers	100
1721293-26	24-May-17	sample homogenized	Grey	Mortar	No	Client ID: 28813-08B	
						Non-Fibers	100
1721293-27	24-May-17	sample homogenized	Grey	Mortar	No	Client ID: 28813-08C	
						Non-Fibers	100
1721293-28	24-May-17	sample homogenized	Grey	Insulation	**Yes**	Client ID: 28813-09A	
						Chrysotile	65
						Non-Fibers	35
1721293-29	24-May-17					Client ID: 28813-09B	
						not analyzed	

PARACEL LABORATORIES LTD.

Order #: 1721293

Certificate of Analysis

Report Date: 31-May-2017

Client: DST Consulting Engineers Inc. (Ottawa)

Order Date: 25-May-2017

Client PO: NRC-M6

Project Description: GV OT 028813

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Paracel I.D.	*Sample Date*	*Layers Analyzed*	*Colour*	*Description*	*Asbestos Detected:*	*Material Identification*	*% Content*
1721293-30	24-May-17					Client ID: 28813-09C	
						not analyzed	

** MMVF: Man Made Vitreous Fibers: Fiberglass, Mineral Wool, Rockwool, Glasswool*

**** Analytes in bold indicate asbestos mineral content.**

Analysis Summary Table

Analysis	Method Reference/Description	Lab Location	NVLAP Lab Code *	Analysis Date
Asbestos, PLM Visual Estimation	by EPA 600/R-93/116	2 - Ottawa West Lab	200812-0	30-May-17

** Reference to the NVLAP term does not permit the user of this report to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.*

Work Order Revisions / Comments

None

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Paracel ID: 1721293

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Page 1 of 2

Client Name: DST Consulting Engineers	Project Reference: GVOT-028813	**Turnaround Time:**
Contact Name: Andrew Cooney.	Quote #: 16-117	☐ Immediate ☐ 1 Day
Address: 2150 Thurston Dr. Ottawa, ON	PO #: NRC-M6	☐ 4 Hour ☐ 2 Day
	Email Address: acooney@dstgroup.com nstrang	☐ 8 Hour ☐ 3 Day
Telephone: 613-290-0101, 613-748-1415		☑ Regular
		Date Required:

ASBESTOS & MOLD ANALYSIS

Matrix: ☐ Air ☑ Bulk ☐ Tape Lift ☐ Swab ☐ Other **Regulatory Guideline:** ☑ ON ☐ QC ☐ AB ☐ SK ☐ Other:

Analyses: ☐ Microscopic Mold ☐ Culturable Mold ☐ Bacteria GRAM ☐ PCM Asbestos ☑ PLM Asbestos ☐ Chatfield Asbestos ☐ TEM Asbestos

Paracel Order Number: 1721293	Sample ID	Sampling Date	Air Volume (L)	Analysis Required	Asbestos - Bulk: Identify Distinct Building Materials to Be Analyzed * see below	Combine Identified Materials? **see below	Positive Stop?
1	28813-01 A-C	May 24/17		PLM	VFT + Mastic	☐	☑
2						☐	☐
3	28813-02 A-C				Tan Plaster Mortar	☐	☑
4						☐	☐
5	28813-03 A-C				DJC	☐	☑
6						☐	☐
7	28813-04 A-C				Vinyl Sheeting	☐	☑
8						☐	☐
9	28813-05 A-C				Cardboard Wrap Insulation	☐	☑
10						☐	☐
11	28813-06 A-C				Fibre board	☐	☑
12						☐	☐

* If left blank, Paracel will analyze all materials identified during analysis ** If left blank, Paracel will analyze all materials as individual samples **(at additional cost)** per EPA 600/R -93/116

Comments:

Method of Delivery: Courier

Relinquished By (Sign):	Received at Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Andrew Cooney	Date/Time: May 25, 17 10:20	Date/Time: May 25/17 1:28	Date/Time: May 25/17 1:56
Date/Time: May 25/17			

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Page 2 of 2

Client Name: DST Consulting Engineers	Project Reference: 6UOT-07813
Contact Name: Andrew Cooney	Quote #: 16-117
Address: 2150 Thurston Dr. Ottawa, ON	PO #: NRC-M6
Telephone: 613-290-0101, 613-748-1415	Email Address: acooney@dstgroup.com nstwong

Turnaround Time:
☐ Immediate ☐ 1 Day
☐ 4 Hour ☐ 2 Day
☐ 8 Hour ☐ 3 Day
☑ Regular
Date Required: _____

ASBESTOS & MOLD ANALYSIS

Matrix: ☐ Air ☑ Bulk ☐ Tape Lift ☐ Swab ☐ Other **Regulatory Guideline:** ☑ ON ☐ QC ☐ AB ☐ SK ☐ Other: _____

Analyses: ☐ Microscopic Mold ☐ Culturable Mold ☐ Bacteria GRAM ☐ PCM Asbestos ☑ PLM Asbestos ☐ Chatfield Asbestos ☐ TEM Asbestos

Paracel Order Number: 172293				Asbestos - Bulk		
Sample ID	Sampling Date	Air Volume (L)	Analysis Required	Identify Distinct Building Materials to Be Analyzed * see below	Combine Identified Materials? **see below	Positive Stop?
1 28813-07 A-C	May 24/17		PLM	Caulking	☐	☑
2					☐	☐
3 28813-08 A-C				Concrete Block Mortar	☐	☑
4					☐	☐
5 28813-09 A-C				Grey Cement Compound	☐	☑
6					☐	☐
7					☐	☐
8					☐	☐
9					☐	☐
10					☐	☐
11					☐	☐
12					☐	☐

* If left blank, Paracel will analyze all materials identified during analysis ** If left blank, Paracel will analyze all materials as individual samples **(at additional cost)** per EPA 600/R -93/116

Comments:

Method of Delivery: Courier

Relinquished By (Sign):	Received at Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Andrew Cooney	Date/Time: May 25, 17 10:20	Date/Time: May 25/17 1:28	Date/Time: May 25/17 1:56
Date/Time: May 25/17			

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Certificate of Analysis

DST Consulting Engineers Inc. (Ottawa)

203-2150 Thurston Dr.
Ottawa, ON K1G5T9
Attn: Andrew Cooney

Client PO: NRC-M6
Project: GV OT 028813
Custody:

Report Date: 1-Jun-2017
Order Date: 25-May-2017

Order #: 1721260

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
1721260-01	28813-LP01
1721260-02	28813-LP02

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: DST Consulting Engineers Inc. (Ottawa)
Client PO: NRC-M6

Report Date: 01-Jun-2017
Order Date: 25-May-2017
Project Description: GV OT 028813

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Metals, ICP-OES	based on MOE E3470, ICP-OES	31-May-17	31-May-17

Sample Data Revisions

None

Work Order Revisions/Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Certificate of Analysis
Client: DST Consulting Engineers Inc. (Ottawa)
Client PO: NRC-M6

Report Date: 01-Jun-2017
Order Date: 25-May-2017
Project Description: GV OT 028813

Sample Results

Lead

Matrix: Paint
Sample Date: 24-May-17

Paracel ID	Client ID	Units	MDL	Result
1721260-01	28813-LP01	ug/g	20	<20
1721260-02	28813-LP02	ug/g	20	2890

Laboratory Internal QA/QC

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Matrix Blank									
Lead	**ND**	**20**	**ug/g**						
Matrix Duplicate									
Lead	**36.5**	**20**	**ug/g**	**ND**			**0.0**	**30**	
Matrix Spike									
Lead	269		ug/L	ND	108	70-130			

Paracel ID: 1721260

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p: 1-800-749-1947
e: paracel@paracellabs.com

Chain of Custody
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Page 1 of 1

Client Name: DST Consulting Engineers	Project Reference: 6WOT-078813
Contact Name: Andrew Cooney	Quote #: 16-117
Address: 2150 Thurston Dr Ottawa, ON	PO #: NRC-116
Telephone: 613-290-0101, 613-748-1415	Email Address: acooney@dstgroup.com nstrang

Turnaround Time:
☐ 1 Day ☐ 3 Day
☐ 2 Day ☑ Regular
Date Required: _____

Criteria: ☐ O. Reg. 153/04 (As Amended) Table __ ☐ RSC Filing ☐ O. Reg. 558/00 ☐ PWQO ☐ CCME ☐ SUB (Storm) ☐ SUB (Sanitary) Municipality: _____ ☐ Other: _____

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

Required Analyses

Paracel Order Number: 1721260

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	PHCs F1-F4+BTEX	VOCs	PAHs	Metals by ICP	Hg	CrVI	B (HWS)	Lead
1	28813-LP01	P	/	1	May 24/17	10:00am	☐	☐	☐	☐	☐	☐	☐	☒
2	28813-LP02						☐	☐	☐	☐	☐	☐	☐	☒
3							☐	☐	☐	☐	☐	☐	☐	☐
4							☐	☐	☐	☐	☐	☐	☐	☐
5							☐	☐	☐	☐	☐	☐	☐	☐
6							☐	☐	☐	☐	☐	☐	☐	☐
7							☐	☐	☐	☐	☐	☐	☐	☐
8							☐	☐	☐	☐	☐	☐	☐	☐
9							☐	☐	☐	☐	☐	☐	☐	☐
10							☐	☐	☐	☐	☐	☐	☐	☐

Comments:

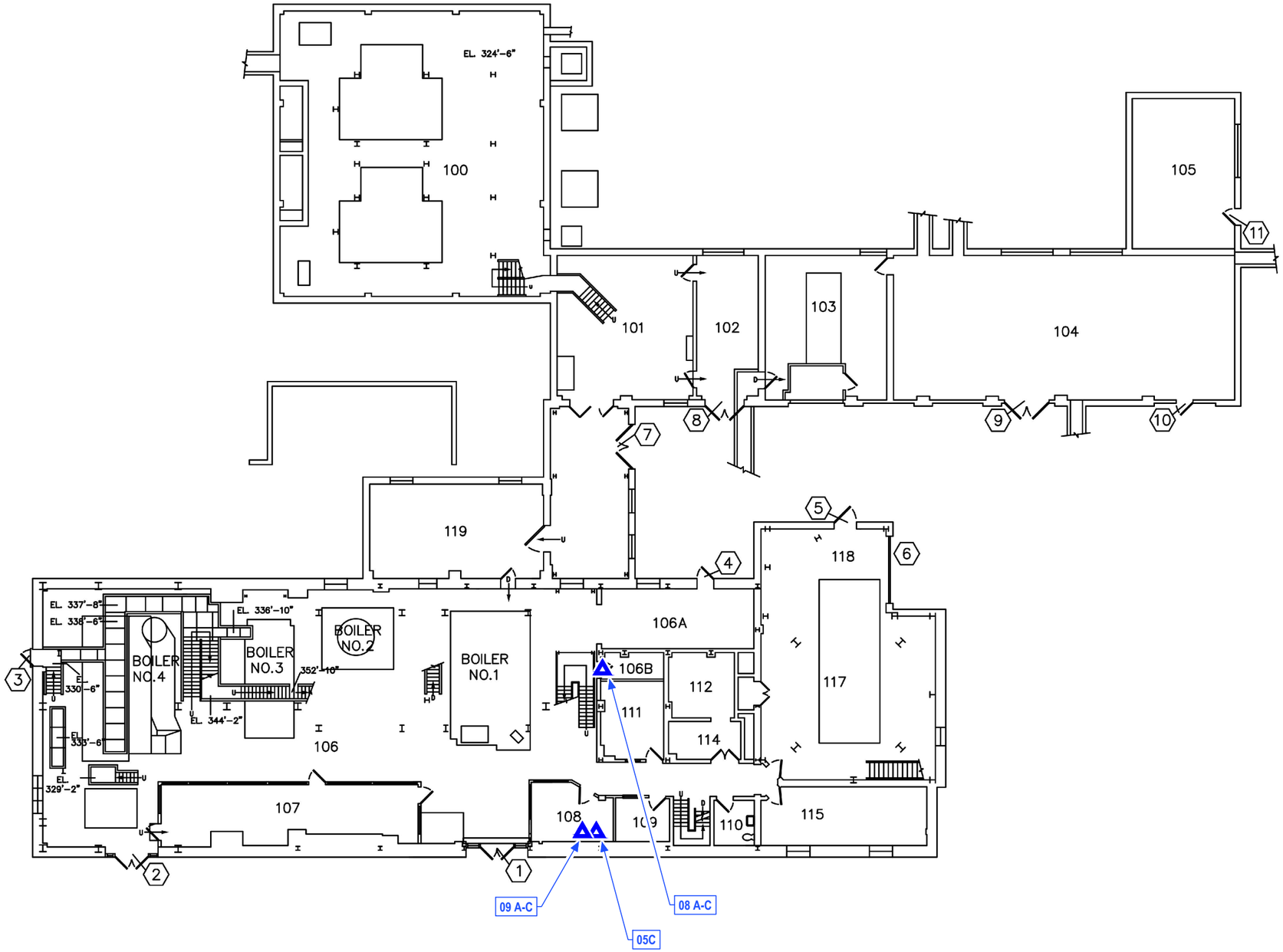
Method of Delivery: Walk-in

Relinquished By (Sign):	Received by Driver/Depot:	Received at Lab:	Verified By:
Relinquished By (Print): Andrew Cooney	Date/Time:	Date/Time: May 25, 17 10:20	Date/Time: May 25/17
Date/Time: May 25/17	Temperature: ____ °C	Temperature: ____ °C	pH Verified [ ] By: N/A

12:07pm

APPENDIX C

Floor Plan



Notes

1. This drawing shall be read in conjunction with the associated technical report.
2. Do not scale drawing.
3. All sample identifiers are prefixed with '28813-' which was excluded for drawing clarity.
4. Base drawings provided by client.

Legend

▲ Approximate asbestos sample location, as applicable

Revision	Date	Issue	Approval
A	11/08/17	Preliminary	B.H.

Client
National Research Council

Site
Building M-06, 1200 Montreal Road, Ottawa, ON

Report Title
Project-Specific Designated Substances Survey
Washroom Renovation Project

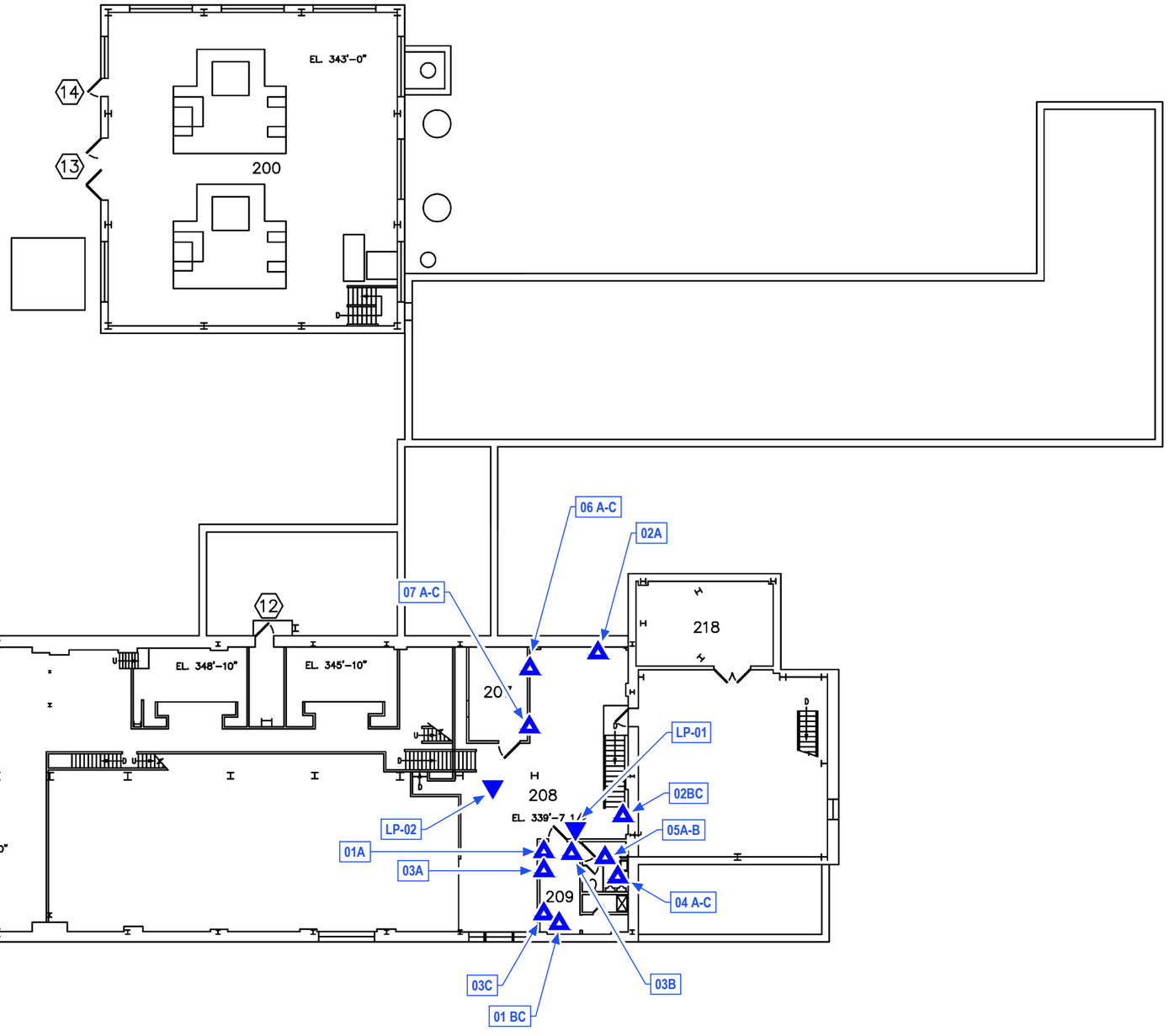
Drawing Title
Sample Location Plan
Building M-06
Ground Floor

Designed By	Scale
A.C.	As shown
Drawn By	**Date**
R.W.	August 2017
Approved By	**Project No.**
B.H.	GV-OT-028813

Figure No.
1

Drawing: 1 ground floor.dwg Folder: L:\TS\CAD\Projects\GV\GV-OT-028813 National Research Council M6\AutoCAD\DWGs\2017 DSR and Abatement Friday, August 11, 2017 @ 14:01 by Rob Wesson

2150 Thurston Drive, Suite 203, Ottawa, Ontario K1G 5T9 Tel: (613) 748-1415 Fax: (613) 748-1356 Website: www.dstgroup.com



Notes

1. This drawing shall be read in conjunction with the associated technical report.
2. Do not scale drawing.
3. All sample identifiers are prefixed with '28813-' which was excluded for drawing clarity.
4. Base drawings provided by client.

Legend

- Approximate asbestos sample location, as applicable
- Approximate paint sample location, lead testing (LP-#), as applicable

Revision	Date	Issue	Approval
A	11/08/17	Preliminary	B.H.

Client: National Research Council

Site: Building M-06, 1200 Montreal Road, Ottawa, ON

Report Title: Project-Specific Designated Substances Survey
Washroom Renovation Project

Drawing Title: Sample Location Plan
Building M-06
First Mezzanine

Designed By	Scale
A.C.	As shown
Drawn By	**Date**
R.W.	August 2017
Approved By	**Project No.**
B.H.	GV-OT-028813

Figure No. 2

Drawing: 2 mezzanine level.dwg Folder: L:\TS\CAD\Projects\GV\GV-OT-028813 National Research Council M6\AutoCAD\DWGs\2017 DSR and Abatement Friday, August 11, 2017 @ 14:01 by Rob Wesson

2150 Thurston Drive, Suite 203, Ottawa, Ontario K1G 5T9 Tel: (613) 748-1415 Fax: (613) 748-1356 Website: www.dstgroup.com

NATIONAL RESEARCH COUNCIL CANADA
1200 MONTREAL ROAD
OTTAWA, ONTARIO
K1A 0R6

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06
OTTAWA, ONTARIO

Prepared by:

OAKHILL ENVIRONMENTAL

Distribution:
2 copies - National Research Council Canada
1 copy - Oakhill Environmental

March 2007 PR-06-039

EXECUTIVE SUMMARY

Oakhill Environmental (Oakhill) was retained by National Research Council Canada (NRC) to conduct a designated substances survey within Building M-06 in Ottawa, Ontario. All site work was completed on January 19th and March 26th, 2007.

All work carried out meets the requirements of the Ontario Occupational Health and Safety Act and WHMIS Regulation (formerly Bill 208). The purpose of the investigation was to identify any potential designated substances and mould.

Based on the visual inspection and laboratory analyses, designated substances were identified to be present in the facility. A summary of the survey recommendations is presented in Table 1.

Table 1 - Summary of Recommendations

Issue	Comments	Recommendations
Asbestos	Two open ends of aircell pipe insulation on the condensate line were identified in the basement of Room B117.	Encapsulate two open ends of aircell pipe insulation on the condensate line.
Lead	Seven paint samples were submitted for lead analysis. Two of the samples submitted were found to contain significant levels of lead (i.e., equal to or greater than 5000 ppm). Lead may also be present in the solder used on copper domestic water lines, as caulking in bell fittings for cast iron drainage pipes, in glazing on the ceramic tiles and in electrical equipment, wiring or fixtures.	The draft Proposed Lead Regulation on Construction Projects, May 5, 1995, (enforced by the Ministry of Labour) does not require removal of lead paint or lead-based materials, unless work on these materials is likely to produce lead fumes or dust, for example during welding, torch cutting, grinding, sanding or sandblasting. Although not in use, the remainder of old metallic lead piping in the finance building should be removed following Reg. 843 and disposed of according to Reg. 558. In the event that such work is conducted at this facility, ensure that lead fumes or dust do not exceed the maximum allowable Time Weighted Average Exposure Value (TWAEV) of 0.15 mg/m^3 as prescribed by the OHSA.
Mercury	Mercury vapour may be present in fluorescent light tubes and thermostats. Mercury may also be present in paints and adhesives.	Mercury, or mercury vapour within light fixtures, pose no risk to workers or occupants, provided the mercury containers remain intact and undisturbed. Where possible, fluorescent lights should be recycled at an approved recycling facility. Mercury must be handled and disposed of in accordance with O. Reg. 390/00 and O. Reg. 558/00.

Issue	Comments	Recommendations
Silica	May be present in concrete, cement mortar and non-fibreglass acoustic ceiling tiles.	Ensure workers performing demolition work are not exposed to airborne silica levels in excess of 0.20 mg/m^3 by providing respiratory protection, and/or wetting down work area, and providing workers with a facility to properly wash prior to exiting the work area as prescribed by O.Reg.845/90.
Mould	Suspect to be present in room B117 on fibreglass pipe insulation; rooms 108 and 109 on fibreglass duct insulation.	Recommend that initially, bulk fungal analysis be performed to the species level. Once the hazard can be qualified, the mouldy insulation can be removed and the source of the moisture can be mitigated.

None of the other designated substances were observed during the course of the survey inspection.

TABLE OF CONTENTS

LIST OF TABLES AND APPENDICES

TABLES

APPENDICES

1.0 INTRODUCTION

Oakhill Environmental (Oakhill) was retained by the National Research Council Canada (NRC) to perform a survey for Designated Substances and mould of Building M-06 in Ottawa, Ontario. Building M-06 was surveyed on January 19th and March 26th, 2007.

The purpose of the investigation was to identify any building materials or equipment containing certain substances termed "Designated Substances" and mould.

This survey will enable NRC to:

1. Manage asbestos containing materials (ACM's) to ensure that these materials are in good condition and provide recommendations for ACM's that are in need of repair,
2. Provide this report to NRC building managers, project managers, contractors and subcontracts enabling them to comply with O. Reg. 278/05, the regulation regarding asbestos on construction projects and in buildings and repair operations, and
3. Provide a comprehensive survey, which will enable NRC to develop a Management Plan to deal with designated substances.

1.1 Limitations

This report details the accessible Designated Substances found within the building and the exterior walls. Representative views were made above accessible suspended ceiling systems. Throughout the process of inspection there were, on numerous occasions, areas that were inaccessible. These areas include but are not limited to: areas above solid ceilings, areas behind solid walls and internal components of machinery or equipment. These areas require intrusive investigative techniques, which may compromise the integrity of that system. An example of an intrusive issue is asphaltic roofing felts (tar paper), which may contain asbestos. However, due to the potential for damages to the building and its contents, as well as safety reasons, no samples were obtained from the roofing systems at the facility. Intrusive investigative techniques are only undertaken at the expressed request of NRC staff where forthcoming renovations projects are known.

Any area that was not inspected and considered inaccessible in this report should be dealt with cautiously in future endeavours before undertaking any form of work, as there may be ACM in this area. In such future situations, samples should be collected and analyzed of all suspect ACM before commencing work. Any area that was not accessible at the time of inspection would be noted within the report.

The report reflects the observations of accessed areas, findings and analysis of materials sampled during the survey. Designated Substances may have been removed from or added to the project area. It is the NRC's responsibility to disclose whether any Designated Substances have been added to or removed from the project area.

The material in it reflects Oakhill's best judgement based on the information discovered at the time of preparation and within the Designated Substance Survey scope of work. There may be materials on-site, which are not represented by these investigations. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Oakhill accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

2.0 SCOPE OF WORK

The purpose of the investigation was to identify any building materials or equipment containing certain substances termed "Designated Substances" and mould. The scope defined for this project is summarized below.

1. To provide assessments for the presence of Designated Substances which include:
   - Acrylonitrile
   - Arsenic
   - Asbestos
   - Benzene
   - Coke Oven Emissions
   - Ethylene Oxide
   - Isocyanates
   - Lead
   - Mercury
   - Silica (free crystalline silica)
   - Vinyl Chloride (vinyl chloride monomer, not PVC)
   - and in addition Mould
2. Assessment will include building materials and components incorporated in the structure and finishes (including exterior finishes). Items not included are building and service tunnels, owner or occupant articles within the building (e.g. process materials or equipment, furniture, etc.), soil contaminants, groundwater, vessels, drums or underground storage tanks)
3. To collect samples of suspect building materials to verify the presence of asbestos and lead
4. To provide testing from a certified laboratory on samples collected of suspect asbestos and lead
5. Provide three hard and electronic (PDF) copies of the final report

3.0 REGULATORY CRITERIA, STANDARDS AND GUIDELINES

The following regulatory criteria, standards, and guidelines were applied for the interpretation and reporting of observations, laboratory data, and on-site monitoring data. The building materials and contents were visually examined to determine the presence of the following designated substances in accordance with the requirements of the Ministry of Labour's (MOL) Occupational Health and Safety Act, Section 30:

Acrylonitrile	O. Reg. 835/90 as amended by O. Reg. 101/04
Arsenic	O. Reg. 836/90 as amended by O. Reg. 102/04
Asbestos	O. Reg. 278/05 and O. Reg. 347/90
Benzene	O. Reg. 839/90 as amended by O. Reg. 105/04
Ethylene Oxide	O. Reg. 841/90 as amended by O. Reg. 107/04
Isocyanates	O. Reg. 842/90 as amended by O. Reg. 108/04
Lead	O. Reg. 843/90 as amended by O. Reg. 109/04
Mercury	O. Reg. 844/90 as amended by O. Reg. 110/04 and the MOL guideline
Silica	O. Reg. 845/90 as amended by O. Reg. 111/04
Vinyl Chloride	O. Reg. 846/90 as amended by O. Reg. 112/04

Asbestos Containing Material (ACM) is defined as "Material that contains 0.5% or more asbestos by dry weight". Friable Material is defined as "material that: (a) when dry, can be crumbled, pulverized or powdered by hand pressure, or (b) is crumbled, pulverized or powdered".

For asbestos, lead and silica the above regulations define exposure guidelines for a worker's time-weighted average exposure of the material in air. Airborne levels should not exceed 0.01 fibres/m^3 of asbestos in air, 0.15 mg/m3 of lead in air, 4.3 mg/m^3 of acrylonitrile in air, 0.2 mg/m^3 of arsenic in air, 3.0 mg/m^3 of benzene in air and 0.2 mg/m^3 of silica in air. The above regulations classify disturbances (Type 1, Type 2, and Type 3), handling requirements, respiratory requirements and monitoring requirements.

The Ministry of Labour published, The Safe Handling of Mercury, A Guideline for the Construction Industry, Jan 1991, outlining the health effects, sources, respiratory protection during the clean up of mercury. From the U.S. Department of Housing and Urban Development, Lead- Based Paint is classified as any paint application containing at least 1.0 milligrams of lead per square centimetre of surface area (1.0 mg/cm2) or at least 0.5% lead content by weight (5,000 ppm) or 5,000 µg/g.

The Provincial Government has issued O. Reg. 558/00 controlled under R.R.O. 1990, Regulation 347 outlining generator, hauler and receiver requirements for wastes dependant on the results of leachate analyses. Provincial and Federal regulations also outline the packaging and transportation of wastes.

4.0 SURVEY METHODOLOGY

4.1 Background Information Review

Reviewing existing reports, interviewing knowledgeable NRC staff, and reviewing as-built drawings allowed Oakhill to obtain a basic understanding of potential issues regarding each building.

4.2 Field Investigation

A detailed visual survey of all accessible areas of the building on a room-by-room basis, including ceiling spaces above removable acoustical ceiling tiles; and wall spaces behind removable panels. Each area or room of the building was assigned a four-digit functional space identification number beginning with 1001. A room-by-room inspection was conducted for Designated Substances in all accessible areas. All suspect ACM and lead were sampled and were categorized with a unique homogeneous material number. Visual assessment of all known and suspect ACM included assessment as to friability, type, quantity, condition, accessibility, appropriate response, as well as comments made on the potential or likelihood of future damage or exposure to ACM by building occupants. Quantification of all ACMs were approximations only, not actual measurements were taken. Square metres or lineal metres were generally used for quantifying ACM. All ACMs are documented through functional space forms and photographs.

In the performance of this Designated Substances survey, Oakhill utilized the project team comprised of the following staff:

Mr. Fil Barillaro, M.A.Sc., P.Eng.	Project Manager
Mr. Kevin Christian, M.Sc., P.Geo.	QA Reviewer
Mr. Bill McGovern	Environmental Analyst
Mr. Raivo Tahiste	Environmental Analyst
Mr. Gino Barillaro	Environmental Analyst
Mr. Sean Bagnulo	Environmental Analyst
Ms. Tanya Fiocca	Administration

4.2.1 Homogenous Materials

Materials were grouped to be homogenous. That is, materials that are uniform in colour and texture were assumed to be similar in content. Regarding asbestos, samples collected of suspect materials adhered to O. Reg. 278/05, Table 1 Bulk Material Samples – Section 3 (3), for minimum sample requirements for respective suspect materials and quantities. Samples were randomly collected to be representative of each suspect ACM and lead material and then assigned a homogenous material number accordingly. A homogenous materials list was generated which consists of suspect ACM sampled, with positive materials highlighted. The Homogenous Materials List is located in Table 3 of this report**.**

4.3 Sample Collection

Collection of bulk samples of suspect materials for submission to AGAT Laboratories Ltd., in Mississauga, Ontario for analysis for asbestos (as percentage asbestos fibre, and type of asbestos fibre) and for lead (ug/g).

4.3.1 Bulk Sample Collection

Oakhill field staff wore half-face respirators with P100 cassettes during bulk sampling events. Building materials were pre-dampened with an application of amended water from a spray bottle to suppress surface and airborne fibres prior to disturbance for sample collection.

The building material sampled was sealed with caulking after sample collection to restore the material to its original condition. Every effort to minimize intrusion of the sampled building materials was always of paramount consideration. Each sample was sealed in a new plastic bag and labeled with a unique sample number and then double bagged. Chain of custody records were completed on-site and submitted with all samples to an approved laboratory.

All bulk materials sampled were randomly collected and are representative of each area of homogenous material. The minimum number of bulk materials to be collected from an area of homogenous material was in accordance with O. Reg. 278/05, Section 3 (3) (Table 1). All analysis of suspect asbestos containing materials was conducted according to O. Reg. 278/05, Section 3 (1) which states that the following standard be used: U.S. Environmental Protection Agency. Test method EPA/600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials. June 1993. Sample locations are depicted in Appendix D.

4.3.2 Sample Analysis

All bulk samples were submitted to AGAT Laboratories Inc. (AGAT) in Mississauga, Ontario, an independent laboratory, for analysis.

AGAT has been evaluated and has been found to comply with the criteria and standards established by the Canadian Association for Environmental Laboratories (CAEAL) for asbestos fibre analysis by phase contrast microscopy. The American Industrial Hygiene Association (AIHA) has accredited AGAT for the Industrial Hygiene Laboratory Accreditation Program for Asbestos using optical microscopy. Suspect bulk

samples were analyzed using polarized light microscopy, and were based on a "test for first positive" approach.

Laboratory results of the asbestos and lead sampling can be found in Appendices B and C respectively.

5.0 FINDINGS

The results of the survey for designated substances and mould at building M-06 are discussed below.

5.1 Asbestos

All potential asbestos-containing materials sampled have been compiled into a homogenous materials list. Each homogenous material is given a homogeneous number, description, analytical result and corresponding sample numbers. The homogeneous materials list for building M-06 is shown in Table 2.

Table 2 – Homogeneous Materials List

Homo Mat. No.	Material Description	Asbestos Type & Conc.	Sample No.
1	**Mud Joint Compound Fitting Insulation**	**20% Chrysotile**	**M6-1**
2	**Aircell Pipe Insulation (high temperature application)**	**15% Chrysotile**	**M6-2**
3	**Aircell Pipe Insulation (low temperature application)**	**20% Chrysotile**	**M6-3**
4	Thermal Patch	<0.5 %	M6-4
5	Boiler Parging	<0.5 %	M6-5, M6-6
6	Plaster	<0.5 %	M6-7
7	**Sweat Wrap (with white paper layer) Pipe Insulation**	**10% Chrysotile**	**M6-8**
8	**Parging Fitting Insulation**	**10% Chrysotile**	**M6-9**
9	**Transite Panel**	**30% Chrysotile**	**M6-10**
10	12"x12" Floor Tile Off White with Grey Specks	<0.5 %	M6-11
11	Concrete on Beams	<0.5 %	M6-12
12	**Mud Joint Compound Fitting Insulation**	**5% Chrysotile**	**M6-13**

Homo. Mat. No. – Homogeneous Material Number Conc. – Concentration

5.1.1 Survey Findings

Suspect ACM building materials on the ceilings, floors, walls, mechanical, and structural systems were sampled throughout the facility. Of the twelve (12) building materials that were sampled and compiled into the homogenous list, seven were found to contain asbestos.

The seven (7) building materials that contain asbestos are as follows:

1) Mud joint compound fitting insulation on the condensate and steam systems.
2) Aircell pipe insulation on the condensate and steam systems.
3) Aircell pipe insulation on the domestic cold and hot water systems.
4) Sweat wrap (with white paper layer) pipe insulation on the domestic cold water and drain systems.
5) Parging fitting insulation on the drain system.
6) Transite panels on the wall and ceiling systems.
7) Mud joint compound fitting insulation on the steam, domestic cold and hot water systems in the Ground Floor Air Compressor Room.

Table 3 provides a summary of all asbestos-containing materials by room. This table can be cross-referenced with the functional space forms in Appendix B to find a complete description of the room where ACM materials were encountered.

Table 3 – Summary of ACM by Room Listing

Functional Space ID#	Location	Homo. Mat. No.	Material Description and Quantity	Response Measure
Basement				
B003	Rm. 114 Flammable Storage	1	Mud joint compound fitting insulation on the condensate system - 11 units	O&M
		2	Aircell pipe insulation on the condensate system - 19 LM	O&M
		3	Aircell pipe insulation on the domestic cold water system – 1 LM	O&M
		1	Mud joint compound fitting insulation on the domestic cold water system - 2 units	O&M
		3	Aircell pipe insulation on the domestic hot water system - 1 LM	O& M
		1	Mud joint compound fitting insulation on the domestic hot water system - 2 units	O&M
B004	Rms. 118A, 118,117	1	Mud joint compound on condensate system - 2 units	O&M
		2	Damaged aircell pipe insulation on condensate system – 0.4 LM	2 Encaps.
		2	Aircell pipe insulation on condensate system – 8 LM	O&M
Ground Level				
G004	Air Compressor Rm.	12	Mud joint compound fitting insulation on the domestic hot water system. – 3 units	O&M
		12	Mud joint compound fitting insulation on the domestic cold water system. – 1 unit	O&M
		12	Mud joint compound fitting insulation on the steam system. – 2 units	O&M
G010	Rm. 110 Men's WC	7	Sweat wrap with white paper layer pipe insulation on the domestic cold water system – 3 LM	O&M
		2	Aircell pipe insulation on the domestic hot water system – 3 LM	O&M
G011	Rm. 115	8	Parging fitting insulation on drain system - 1 unit	O&M

	Lunch Room	7	Sweat wrap with white paper layer pipe insulation on drain system	O&M
First Mezzanine				
FM01	Main Boiler Area	2	Aircell pipe insulation on the steam system - 4 LM	O&M
		2	Aircell pipe insulation on the condensate system - 4 LM	O&M
		1	Mud joint compound fitting insulation on the steam system - 3 units	O&M
		1	Mud joint compound fitting insulation on the condensate system - 5 units	O&M
		09	Transite panel on walls (outside of the electrical room) – 30 m^2	O&M
FM02	Electrical Rm.	09	Transite panel on walls– 30 m^2	O&M
		09	Transite panel on ceiling– 18 m^2	O&M

LM – linear metre O&M – Operations & Maintenance Encap. – Encapsulation Homo. – Homogeneous Mat. - Materials

Asbestos was detected in seven homogeneous building materials sampled from the facility. The ACM was categorized as to whether it was friable or non-friable. Further, the materials were grouped according to their similar composition, system and general appearance. The following sub-sections are the result of which materials were considered friable or non-friable. Photographs are provided along with a brief description of the material.

5.1.2 Friable ACM

Mud Joint Compound
A representative photograph of mud joint compound fitting insulation. This material is a malleable grey insulation that has the appearance of granular mud. It appears smooth, round and hard when it is intact with appropriate exterior jacketing.

Aircell

A representative photograph of aircell pipe insulation. This material is grey and white in colour. Aircell is layers of corrugated paper, which gives it the appearance of a honeycomb pattern when the profile is observed.

Sweat Wrap (with white paper layer)

A representative photograph of sweat wrap with white paper layer pipe insulation. This material has several layers of brown or grey waffle pattern paper layers with the outer layer consisting of a white paper layer that contains asbestos. This type of pipe insulation was used for low temperature applications only.

Parging

A representative photograph of parging fitting insulation. This material is a malleable grey insulation that has the appearance of granular mud. It appears smooth, round and soft. It is similar to mud joint compound (described above) but is softer and can be pulverized by hand pressure much easier.

5.1.3 Non-Friable ACM

Transite Panel
A representative photograph of transite panel. Transite is a composite material made up of asbestos and cement that was a manufactured product at the time of installation. It was generally used in areas as a fire retardant. It is a rigid material that fractures when broken and may appear as other types of non-acm panel.

5.1.4 Survey Recommendations

Under Ontario Regulation (O. Reg.) 278/05 damaged and exposed ACMs are required to be repaired or removed. In building M-06, the damaged/exposed asbestos-containing aircell and mud joint compound materials, found in Table 3 and summarized in Table 1, will require Type 2 asbestos abatement procedures for removal or repair of 1 square meter or less of material and Type 3 asbestos abatement precautions for removal of greater than 1 square meter of material. These issues should be addressed as soon as possible.

The O. Reg. 278/05 also requires the removal of all ACM's that have a potential of being disturbed during renovations or demolition. Should friable ACM's remain in the building, in GOOD condition, the regulation also requires that an Asbestos Management Plan be implemented and kept in place until such time that the ACM's have been removed. The management plan will include periodic assessment and record updating to be performed on the remaining ACM at least every 12 months.

Building staff and contractors should be made aware of the location and hazards associated with the ACM's and instructed to not disturb this material. Any disturbance of this material should be reported immediately to property management and appropriate control measures put into place without delay.

5.2 Lead

5.2.1 Survey Findings

Based on visual observations during Oakhill's room-by-room surveys, potential lead was sampled in seven paint finishes. Samples were collected from the painted interior surfaces of building M-06 and were analysed for lead content.

The analytical results are provided in Appendix C and are summarized below in Table 4.

Table 4 – Results of Lead Investigation

Sample	Location	Colour	Results (ppm Lead)	Considered Lead Based Paint*
M06-L1	Bldg M06 –Paint on duct	White Paint	10.1	No
M06-L2	Bldg M06 – Paint on walls	Peach Paint	906	No
M06-L3	**Bldg M06 – Paint on floor**	**Grey Paint**	**7,700**	**Yes**
M06-L4	**Bldg M06 – Paint on steel beams**	**Pale Green Paint**	**76,200**	**Yes**
M06-L5	Bldg M06 – Paint on steel beam	Silver Paint	316	No
M06-L6	Bldg M06 – Paint on steel beam	Light Grey Paint	1,150	No
M06-L7	Bldg M06 – Paint on walls	Pale Yellow Paint	1,910	No

***Note:** Ontario Ministry of Labour (MOL) considers 5,000ppm lead to be a lead-based paint (LBP).

5.2.2 Survey Recommendations

Based on the analytical results, two of the seven paints sampled contain greater than 5,000 ppm lead and are therefore classified as lead-based paints.

Lead may also be present in the solder used on copper domestic water lines, as caulking in bell fittings for cast- iron drainage pipes and in electrical equipment, wiring or fixtures.

Direct disturbance of the materials can minimize the impact of lead products during removal. Removal of lead materials as an intact unit is the preferred method of removal. Mechanically powered tools increase the airborne concentration of lead dust.

Contractors are responsible to ensure that the workers are not exposed to airborne lead dust levels in excess of 0.15 mg/m3. This can be accomplished by:

- Providing respiratory protection and coveralls
- Suppressing dust levels by wetting with amended water, mops or HEPA vacuums
- Using drop-sheets and polyethylene barriers to control dust
- Ensuring the work areas have adequate ventilation
- Provide workers with the means to practice good hygiene practices when leaving the work area

The removal of metallic lead materials should be carried out in accordance with Ontario Regulation 843/90 and the Ontario Ministry of Labour (MOL) draft Proposed Lead Regulation on Construction Projects, both made under the Occupational Health and Safety Act. Any lead-containing materials should also be disposed of in accordance with Ontario Regulation 558 (formerly O. Reg. 347).

In addition, it is recommended that the United States Department of Housing and Urban Development Guideline, of 0.5 % lead (by weight) or 5,000 parts per million (ppm) lead be used as a guideline for determining whether the use of precautions as outlined in the proposed regulation would be required during the above noted operations. Airborne lead dust or fumes should not exceed the MOL TWAEV of 0.15 milligram per cubic metre (mg/m^3) during the removal of lead based paints and products.

5.3 Mercury

5.3.1 Survey Findings

Mercury vapour is present inside fluorescent light fixtures. Tubes should be removed intact prior to removing the fixtures. Liquid mercury may also be present inside thermostats and manometers in mechanical equipment.

5.3.2 Survey Recommendations

Prior to removal of fluorescent light fixtures, the tubes should be removed from the fixtures intact to prevent the mercury vapour from escaping. As long as the tubes are not broken, workers will not be exposed to hazardous mercury vapour. Prior to demolition of the facility, mercury-containing materials must be removed as per Ontario Regulation 844/90. During demolition, ensure that the maximum concentration of exposure to airborne mercury does not exceed 0.03 mg Hg/m^3 of air.

If applicable, mercury should be collected from thermostats, thermometers, and manometers prior to demolition, however care should be taken to control the release of mercury into the air.

5.4 Silica

5.4.1 Survey Findings

Based on the historic composition of building materials, crystalline silica is present in the following building materials:

- Concrete floor slabs;
- Terra cotta and masonry block walls;

- Mortar; and
- Acoustic ceiling tiles.

5.4.2 Survey Recommendations

Contractors are responsible to ensure workers are not exposed to airborne silica levels in excess of 0.20 mg/m3 when dealing with the above materials. This can be accomplished by:

- Minimize disturbance of the material
- Providing respiratory protection and coveralls
- Suppressing dust levels by wetting with amended water, mops or HEPA vacuums
- Using drop-sheets and polyethylene barriers to control dust
- Ensuring the work areas have adequate ventilation
- Provide workers with the means to practice good hygiene practices when leaving the work area

Use of mechanically powered tools for any demolition work increases the concentration of airborne silica and therefore requires more stringent respiratory protection and controlled work procedures.

5.5 Isocyantes

5.5.1 Survey Findings

At the time of the site inspection, no evidence of isocyantes was noted as part of the structure or finishes.

5.6 Vinyl Chloride Monomer

5.6.1 Survey Findings

At the time of the site inspection, no evidence of vinyl chloride monomer was noted as part of the structure or finishes.

5.7 Benzene

5.7.1 Survey Findings

Benzene may be present in a stable form within roofing materials, paints and adhesives.

5.7.2 Survey Recommendations

It is not expected that benzene concentrations in air will exceed the maximum allowable TWAEV for a worker to benzene (3.0 mg/m^3). To minimize potential benzene exposure, apply paints and adhesives in well-ventilated areas.

5.8 Acrylonitrile

5.8.1 Survey Findings

At the time of the site inspection, no evidence of acrylonitrile was noted as part of the structure or finishes.

5.9 Coke Oven Emissions

5.9.1 Survey Findings

At the time of the site inspection, no evidence of coke oven emissions was noted as part of the structure or finishes.

5.10 Arsenic

5.10.1 Survey Findings

At the time of the site inspection, no evidence of arsenic was noted as part of the structure or finishes.

5.10.2 Survey Recommendations

Arsenic or arsenic-containing compounds may be present in stable form in paints and adhesives. It is not expected that arsenic concentrations in air will exceed the maximum allowable TWAEV for a worker to arsenic (0.2 mg/m^3). To minimize potential arsenic exposure, apply paints and adhesives in well-ventilated areas.

5.11 Ethylene Oxide

5.11.1 Survey Findings

At the time of the site inspection, no evidence of ethylene oxide was noted in the survey.

5.12 Mould

5.12.1 Survey Findings

At the time of the site inspection, mould was suspected to be present in on the surface of fibreglass duct insulation in rooms 108 and 109. Observations are noted in functional space forms G006 and GOO7.

5.12.2 Survey Recommendations

Oakhill recommend that fungal laboratory sampling be added to the scope of work for this project in the next fiscal year. It is important to identify the type of mould fungus present and mould growth.

Continued diligence is recommended to avoid scenarios, which can support fungi growth specifically: water in the presence of cellulose-based surfaces. There must be moisture (such as leaking pipes, cracked window seals, etc.) as well as an indoor substrate (such as the paper layer of drywall, wood, potted plants, etc.) to support fungal growth. Simply replacing the substrate is not a solution to the problem. The root cause is required to be identified.

6.0 CLOSURE

This report has been prepared for the sole benefit of the National Research Council of Canada.

The conclusions presented represent the best judgement of the assessor based on current environmental standards and on the site conditions observed from January 22nd, 2007. Due to the nature of the investigation and the limitations of the available data, the assessor cannot warrant against undiscovered environmental liabilities. It is possible that additional, concealed designated substances may become evident during demolition activities.

Should additional information become available, Oakhill requests that this information be brought to our attention so that we may re-assess the conclusions presented herein.

We trust that the report meets your current requirements. Should you have any questions or concerns regarding the above, please do not hesitate to contact the undersigned.

Oakhill Environmental Inc.

_____
Fil Barillaro, M.A.S.c., P.Eng.
Project Manager

APPENDIX A

DESIGNATED SUBSTANCES BACKGROUND INFORMATION

Acrylonitrile

Acrylonitrile is regulated in Ontario under Regulation 835/90 of the Occupational Heath and Safety Act. Acrylonitrile is a clear liquid that may be colourless or yellow and that readily reacts with other chemicals to produce long, chain-like molecules (polymers). Acrylonitrile-based polymers are used to produce nitrile rubbers, plastics, acrylic fibres, coatings and adhesives. Workers are typically exposed to acrylonitrile at manufacturing facilities that produce the aforementioned products through inhaling its vapour, direct skin contact, or through ingestion. Although acrylonitrile may be present in some of the building materials, including adhesives and coatings, the chemical will likely be bonded in the polymer form. Therefore, it is not expected that an adverse exposure to acrylonitrile will occur unless the building materials are heated to extreme temperatures. Acrylonitrile vapours may become released from the acrylonitrile-based polymers during a process where high temperatures are applied. Acrylonitrile is classified as *possibly carcinogenic to humans (Group 2b)* as evidence from long-term epidemiological studies since 1980 is conflicting. It is not expected that acrylonitrile concentrations in the air will exceed the maximum allowable time weighted average exposure value (TWAEV) for a worker to acrylonitrile (4.3 mg/m^3).

Arsenic

Arsenic is regulated in Ontario under Regulation 836/90 of the Occupational Heath and Safety Act. The presence of arsenic in the paint coating on interior and exterior finishes is possible. There are no regulated procedures for the removal of paint containing arsenic. If the paint does not contain lead, but does contain arsenic, the comments concerning lead paint, discussed in below, are expected to address the potential arsenic emissions. As the painted surfaces will be handled as per the proposed lead regulation, it is not expected that arsenic concentrations in the air will exceed the maximum allowable TWAEV for a worker to arsenic (0.2 mg/m^3). Human health studies from Argentina and Chile have concluded that arsenic ingestion can result in increased risk of bladder and lung cancer. Non-cancer effects include skin lesions and chronic respiratory disease.

Asbestos

The term "asbestos" describes six naturally occurring fibrous minerals, namely chrysotile, amosite, crocidolite, tremolite, anthophylitte and actinolite. Of the six forms of asbestos, chrysotile (white asbestos), amosite (brown asbestos) and crocidolite (blue asbestos) are the most commonly used. Asbestos has been known to man for centuries and has been used in literally hundreds of products. Asbestos was used because it is strong, insulates well, and resists fire and corrosion.

The Regulation for Asbestos, Ontario Regulation 278/05, made under the Occupational Health and Safety Act defines asbestos as any of the following fibrous silicates:

- Actinolite, Amosite, Anthophyllite, Chrysotile, Crocidolite and Tremolite.

It is important to note that asbestos is defined further as either “friable” or “non-friable”. O. Reg. 278/05 defines friable as:

"friable material" means material that,

- *when dry, can be crumbled, pulverized or powdered by hand pressure, or*
- *is crumbled, pulverized or powdered;*

Non-friable is any material that doesn’t fit the criteria for friable. Essentially, any material that cannot be *crumbled, pulverized or powdered by hand pressure or is not crumbled, pulverized or powdered.*

The distinction between whether an asbestos containing material (ACM) is friable or non-friable is a notable characteristic as the *‘friability’* of the ACM translates the **potential** risk of producing an airborne fibre release. Non-friable ACM’s offer far less potential risk of producing an airborne fibre release. These materials should not be cut or shaped using power tools, because this procedure allows for the release of asbestos fibres.

Materials that contain asbestos are commonly referred to as ACM's. O. Reg. 278/05, defines an ACM as:

- *material that contains 0.5 per cent or more asbestos by dry weight;*

The Revised Regulations of Ontario (1990), Regulation 347 (The General Waste Regulation) requires the disposal of asbestos waste in a double sealed container, properly labelled and free of cuts, tears or punctures. The waste must be disposed of in a licensed waste facility, which has been properly notified of the presence of asbestos waste. The federal "Transportation of Dangerous Goods Act" covers the transport of asbestos waste to the disposal site. Asbestos waste is to be handled by a licensed waste hauler.

Asbestos is typically found in plaster, mechanical insulation, gaskets, thermal insulation on pipes, refractory material, roofing felts, floor tiles, ceiling tiles and parging, heat resistant panels, incandescent light fixture reflector plates, and any other material requiring a high degree of durability or thermal resistance. The common use of potential friable (breakable by hand) ACMs in construction ceased voluntarily in the mid 1970s; however, the spray application of asbestos-containing fireproofing was not prohibited until 1986. The airborne maximum allowable TWAEV for a worker to asbestos depends on the type of asbestos, they include, amosite (0.1 f/cc), crocidolite (0.1 f/cc) and other forms of asbestos (1.0 f/cc). Asbestos fibres cumulate in the lungs. Human health effects are proportional to exposure. Studies show long term or high dose exposure can result in scarring of the lung and restricted breathing. Mesothelioma (cancer of the pleural lining) and other lung cancers are also related to asbestos exposure.

Benzene

Benzene is regulated in Ontario under Regulation 839/90 of the Occupational Heath and Safety Act Historically; benzene has been produced as a by-product of coal gasification and metallurgical coke production in steel making. The light oil product from such processes contains benzene, toluene, ethyl benzene and xylene, and these components are separated by distillation. Today, most benzene is produced from the refining of petroleum.

Benzene has applications as a solvent in synthetic rubber manufacturing and processing, and in paints, varnishes, stains, adhesives, roofing materials and sealants. The use of benzene in tire and other rubber goods manufacturing and as a solvent and component of paints and adhesives has declined considerably as a result of concerns about workplace exposure. Nevertheless, it is often present in trace quantities in petroleum and aromatic solvents, some of which have replaced benzene in many uses. Benzene is also a minor component of gasoline sold in Canada.

The maximum allowable TWAEV for a worker to benzene is 3 mg/m^3. Based on the age of the facility, it is possible that benzene was present in the paints, adhesives and roofing materials used during the original construction of the facilities. However, over time, the benzene component typically volatilizes out of the paints, solvents and roofing bitumens and is released into the ambient air. Therefore, it is likely that only trace levels of benzene presently exist in these building materials. It is not expected that benzene emissions from any existing building materials on site will exceed the allowable TWAEV.

Exposure to benzene can range in severity from nausea to suppression of the immune system and death. Long-term exposure to benzene can potentially result in Acute Myeloid Leukemia, Secondary Aplastic Leukemia and damage to the reproductive system.

Ethylene Oxides

Ethylene Oxides are regulated in Ontario under Regulation 841/90 of the Occupational Heath and Safety Act. Ethylene oxide is a common by-product of fumigation or sterilization procedures. The airborne maximum allowable TWAEV for a worker to Ethylene Oxides is 1.8 mg/m^3. Acute exposure may result in vomiting, shortness of breath and dizziness. Chronic exposure has been associated with the occurrence of cancer, reproductive effects, mutagenic changes and neurotoxicity.

Isocyanates

Isocyanates is regulated in Ontario under Regulation 842/90 of the Occupational Heath and Safety Act Isocyanates are a class of chemicals used in the manufacture of certain types of plastics, foams and roof insulation. The Isocyanate (-CNO) group reacts very readily with certain other types of molecules, a property responsible for the usefulness of Isocyanates in industry. Due to the high reactivity of the Isocyanate group, exposure to Isocyanates can result in primary irritation, sensitization and hypersensitivity reactions. The respiratory system, the eyes and the skin are the main areas affected by exposure. Isocyanates in their initial form are found as a vapour, a mist, or a dust which become airborne and then taken into the body. Once the Isocyanates are chemically bonded to other chemicals during manufacturing processes, the Isocyanates are not readily available to become airborne unless heated. Therefore, Isocyanate exposure is not expected to be a concern as long as the burning of plastics, foams, and insulation is not carried out. The airborne maximum allowable TWAEV for a worker to Isocyanates is 0.005 ppm.

Lead

Lead is regulated in Ontario under Regulation 843/90 of the Occupational Heath and Safety Act. The Ontario Ministry of Labour (MOL) draft Proposed Lead Regulation on Construction Projects, made under the Occupational Health and Safety Act, May 5, 1995, states that the removal of lead paint is not required unless work on these materials are likely to produce airborne lead dust or fumes, for example during welding, torch cutting, sanding and sand blasting. If these operations are likely to occur during building renovations or demolition, it is recommended that the removal of lead paint be carried out in accordance with procedures outlined in the proposed regulation.

Based on conversations with the MOL, it is recommended that the United States Department of Housing and Urban Development Guideline, of 0.5 % lead (by weight) or 5,000 parts per million (ppm) lead be used as a guideline for determining whether the use of precautions as outlined in the proposed regulation would be required during the above noted operations. Airborne lead dust or fumes should not exceed the MOL TWAEV of 0.15 milligram per cubic metre (mg/m^3) during the removal of lead based paints and products.

Lead may be used in its pure metallic form or combined chemically with other elements to form lead compounds. Metallic lead is used to make products such as electric storage batteries, ammunition, lead solder, radiation shields, pipes, and sheaths for electric cables. Metallic lead is sometimes combined with other metals such as copper, tin and antimony as lead alloys for use in the manufacture of a variety of metal products.

Organic lead compounds contain a lead atom covalently bonded to carbon. Common examples of organic lead compounds include lead “soaps” such as lead oleates, high-pressure lubricants, and anti-knock agents in gasoline.

Inorganic lead compounds (or lead salts) result when lead is combined with an element other than carbon. Examples are lead oxide, lead chromate, lead carbonate and lead nitrate. Inorganic lead compounds may occur as solids or in solutions, and are used in insecticides, pigments, paints, frits, glasses, plastics, and rubber compounds.

Lead may affect the health of workers if it is in a form that may be inhaled, ingested or absorbed through the skin. Lead dust consists of small, solid particles of metallic lead or lead compounds that are generated by sanding, grinding, polishing, and sawing operations. Lead fume is produced in significant amounts when solid lead or materials containing lead are heated to temperatures above 500^{o} C, as in welding and flame cutting or burning.

Mercury

Mercury is regulated in Ontario under Regulation 844/90 of the Occupational Heath and Safety Act. Mercury is commonly found in buildings as mercury vapour lighting, in thermometers, thermostats and some electrical switches. Mercury can also be found in minor amounts in fluorescent lamp tubes and in paints and adhesives.

Mercury, or mercury vapour within light fixtures, thermometers, thermostats and electrical switches poses no risk to workers or occupants provided the mercury containers remain intact and undisturbed. Prior to demolition, remove mercury containers and store in a safe location. The airborne maximum allowable TWAEV for a worker to mercury is 0.05 mg/m^3.

Short-term exposure to mercury is a rare occurrence due to the more stringent controls. Historically, short- term exposure to high concentrations of mercury vapour included: harmful effects of the nervous, respiratory and digestive systems and the kidneys.

Silica

Silica is regulated in Ontario under Regulation 845/90 of the Occupational Heath and Safety Act Silica, also referred to as free crystalline silica, is found in concrete, cement, mortar, ceramic wall and floor tiles, stucco finishes and acoustic ceiling tiles. Prolonged exposure to, and inhalation of free crystalline silica, may result in respiratory disease known as silicosis, which is characterised by progressive fibrosis of the inner lung tissue and marked shortness of breath or impaired lung function. The maximum TWAEV for airborne Silica dust is 0.20 mg/m^3.

Precautions should be taken during work on concrete (coring etc.) and ceiling tiles to minimize exposure to free crystalline silica dust. Silica exposure should not exceed the MOL TWAEV of 0.20 milligrams per cubic metre (mg/m^3) during demolition activities. This can be achieved by:

- providing workers with respiratory protection;
- wetting the surface of the materials to prevent dust emissions;
- provide workers with facilities to properly wash prior to exiting the work area.

Vinyl Chloride

Vinyl Chloride is regulated in Ontario under Regulation 846/90 of the Occupational Heath and Safety Act. Vinyl chloride is found in many applications in buildings such as plumbing pipes, protective coatings on insulated pipes and interior finishes (i.e., vinyl baseboard trim). Vinyl chlorides in the above materials are bound in a solid matrix and are unlikely to become airborne such that it would exceed the maximum allowable TWAEV of 5.2 mg/m^3.

Human health effects from long-term exposure include: cancer of the liver, damage to the immune and reproductory systems.

Fungi

There is essentially no fungus-free environment in our daily lives. Fugal spores are abundant in outdoor air and exposure to fungi occurs commonly in indoor environments.

Continued cleaning diligence is recommended to avoid scenarios which can support fungi growth such as water in the presence of cellulose-based surfaces. There must be a moisture or water problem to support fungal growth.

APPENDIX B

ANALYTICAL RESULTS – ASBESTOS

Certificate of Analysis

AGAT WORK ORDER: 07T206731

PROJECT NO: PR-06-039

CLIENT NAME: OAKHILL ENVIRONMENTAL

ATTENTION TO: Fil Barillo

Bulk Asbestos

DATE SAMPLED: January 19 2007 | **DATE RECEIVED: January 25 2007** | **DATE REPORTED: January 30 2007** | **SAMPLE TYPE: Other**

	Unit	G / S	M.D.L	M6 - 1 648377	M6 - 2 648378	M6 - 3 648379	M6 - 4 648380	M6 - 5 648381	M6 - 6 648382	M6 - 7A 648383	M6 - 7B 648384
Asbestos	%		0.5	20	15	20	Trace	<0.5	<0.5	<0.5	<0.5

	Unit	G / S	M.D.L	M6 - 7C 648385	M6 - 7D 648386	M6 - 7E 648387	M6 - 7F 648388	M6 - 7G 648389	M6 - 8A 648390	M6 - 9 648392	M6 - 10 648393
Asbestos	%		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	10	10	<0.5

	Unit	G / S	M.D.L	M6 - 11A 648394	M6 - 11B 648395	M6 - 11C 648396	M6 - 12A 648397	M6 - 12B 648398	M6 - 12C 648399
Asbestos	%		0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Certified By:

Certificate of Analysis

AGAT WORK ORDER: 07T206731

PROJECT NO: PR-06-039

CLIENT NAME: OAKHILL ENVIRONMENTAL

ATTENTION TO: Fil Barillo

Bulk Asbestos

DATE SAMPLED: January 19 2007 | **DATE RECEIVED: January 25 2007** | **DATE REPORTED: January 30 2007** | **SAMPLE TYPE: Other**

Comments: M.D.L - Method Detection Limit; G / S - Guideline / Standard

648377	Condition of sample was satisfactory at time of arrival in laboratory.
	Asbestos containing: chrysotile
648378	Condition of sample was satisfactory at time of arrival in laboratory.
	Asbestos containing: chrysotile
648379	Condition of sample was satisfactory at time of arrival in laboratory.
	Asbestos containing: chrysotile
648380	Condition of sample was satisfactory at time of arrival in laboratory.
648381	Condition of sample was satisfactory at time of arrival in laboratory.
648382	Condition of sample was satisfactory at time of arrival in laboratory.
648383	Condition of sample was satisfactory at time of arrival in laboratory.
648384	Condition of sample was satisfactory at time of arrival in laboratory.
648385	Condition of sample was satisfactory at time of arrival in laboratory.
648386	Condition of sample was satisfactory at time of arrival in laboratory.
648387	Condition of sample was satisfactory at time of arrival in laboratory.
648388	Condition of sample was satisfactory at time of arrival in laboratory.
648389	Condition of sample was satisfactory at time of arrival in laboratory.
648390	Condition of sample was satisfactory at time of arrival in laboratory.
	Asbestos containing: chrysotile
648392	Condition of sample was satisfactory at time of arrival in laboratory.
	Asbestos containing: chrysotile
648393	Condition of sample was satisfactory at time of arrival in laboratory
648394	Condition of sample was satisfactory at time of arrival in laboratory.
648395	Condition of sample was satisfactory at time of arrival in laboratory.
648396	Condition of sample was satisfactory at time of arrival in laboratory.
648397	Condition of sample was satisfactory at time of arrival in laboratory.
648398	Condition of sample was satisfactory at time of arrival in laboratory.
648399	Condition of sample was satisfactory at time of arrival in laboratory.

Certified By:

APPENDIX C

ANALYTICAL RESULTS – LEAD

Certificate of Analysis

AGAT WORK ORDER: 07T206730

PROJECT NO: PR-06-039

CLIENT NAME: OAKHILL ENVIRONMENTAL

ATTENTION TO: Fil Barillo

Lead in Paint

DATE SAMPLED: January 19 2007 | **DATE RECEIVED: January 24 2007** | **DATE REPORTED: February 02 2007** | **SAMPLE TYPE: Paint**

	Unit	G / S	M.D.L	M6-L1 648367	M6-L2 648368	M6-L3 648369	M6-L4 648370	M6-L5 648371	M6-L6 648372	M6-L7 648373
Lead	µg/g		7.0	10.1	906	7700	76200	316	1150	1910

Comments: M.D.L - Method Detection Limit; G / S - Guideline / Standard

Certified By: _____

APPENDIX D

PHOTOGRAPH LOGS

M-06 ASBESTOS PHOTOGRAPH LOG

Photo #	Photograph	Funct. Space #	Comments
01		B004	Aircell open at both ends. 2 encapsulations required in this area on the condensate system.

M-06 MOULD PHOTOGRAPH LOG

Photo #	Photograph	Funct. Space #	Comments
M-1		B004	Mould on fibreglass pipe insulation.
M-2		G006	Mould on fibreglass duct insulation.

M-06 LEAD PHOTOGRAPH LOG

Photo #	Photograph	Funct. Space #	Comments
L-1		B002	Grey paint
L-2		B002	Pale green paint

APPENDIX E

FLOOR PLANS

N

B108
B001
EL. 312'–0"

EL. 315'–0"

B109
B002

EL. 315'–0"

EL. 316'–6"

B107
B002

B106A
B002

EL. 316'–6"

B106
B002

B116

B002

B112
B002

B114

B003

B113
B002

B115

B118A
B004

B118
B004

B117
B004

OAKHILL
ENVIRONMENTAL

LEGEND

1001 FUNCTIONAL SPACE #

ACM PIPE INSULATION: CONDENSATE

ACM PIPE INSULATION: DOMESTIC CW

ACM PIPE INSULATION: DOMESTIC HW

CLIENT

NATIONAL RESEARCH COUNCIL CANADA
ADMINISTRATIVE SERVICES
AND PROPERTY MANAGEMENT
BUILDING M-19
1200 MONTREAL RD,
OTTAWA, ON, K1A 0R6

PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

PROJECT NO.
PR-06-39

DATE
MARCH 2007

SCALE
NTS

TITLE
-BASEMENT-
ASBESTOS
LOCATIONS

SHEET
B-1

N

B109
B002

B106A
B002

B002

B118A
B004

M6-04

B118
B004

B112
B002

M6-01

M6-02

M6-03

B114

B003

B117
B004

P#01

B107
B002

B108
B001
EL. 312'-0"

EL. 315'-0"

EL. 315'-0"

EL. 316'-6"

EL. 316'-6"

B106
B002

B113
B002

B116

B115

LEGEND

1001	FUNCTIONAL SPACE #
	SAMPLE LOCATION: NON-ACM
	SAMPLE LOCATION: ACM
	DAMAGED ACM LOCATION
P#	PHOTOGRAPH #
	ACM PIPE INSULATION: CONDENSATE
	ACM PIPE INSULATION: DOMESTIC CW
	ACM PIPE INSULATION: DOMESTIC HW

OAKHILL
ENVIRONMENTAL

CLIENT

NATIONAL RESEARCH COUNCIL CANADA
ADMINISTRATIVE SERVICES
AND PROPERTY MANAGEMENT
BUILDING M-19
1200 MONTREAL RD,
OTTAWA, ON, K1A 0R6

PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

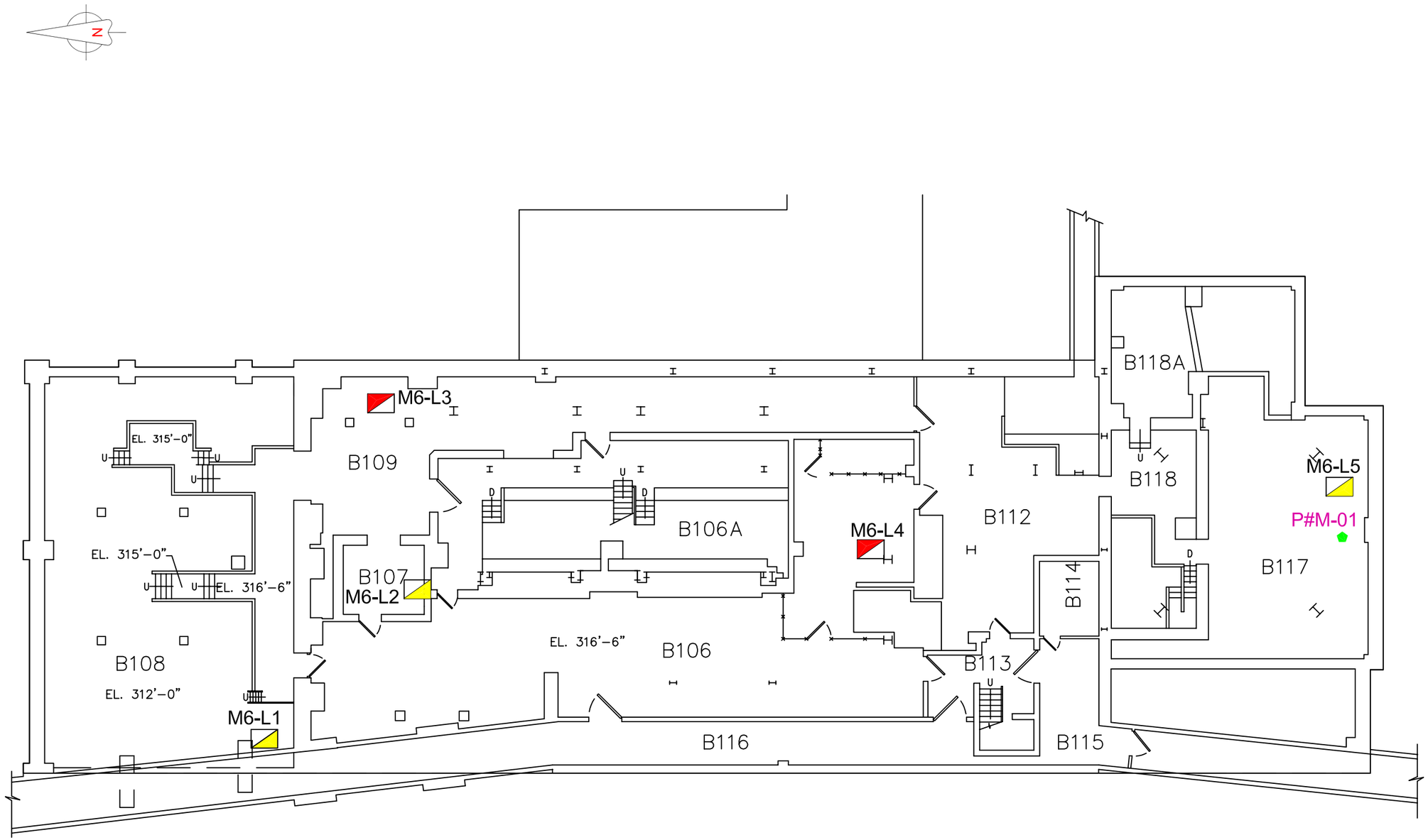
PROJECT NO.
PR-06-39

DATE
MARCH 2007

SCALE
NTS

TITLE
-BASEMENT-
ASBESTOS
SURVEY

SHEET
B-2



OAKHILL ENVIRONMENTAL

LEGEND

- LEAD SAMPLE LOCATION (<5000 ppm)
- LEAD SAMPLE LOCATION (>5000 ppm)
- MOULD LOCATION
- P# PHOTOGRAPH #

CLIENT

NATIONAL RESEARCH COUNCIL CANADA
ADMINISTRATIVE SERVICES
AND PROPERTY MANAGEMENT
BUILDING M-19
1200 MONTREAL RD.
OTTAWA, ON, K1A 0R6

PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

PROJECT NO. PR-06-39

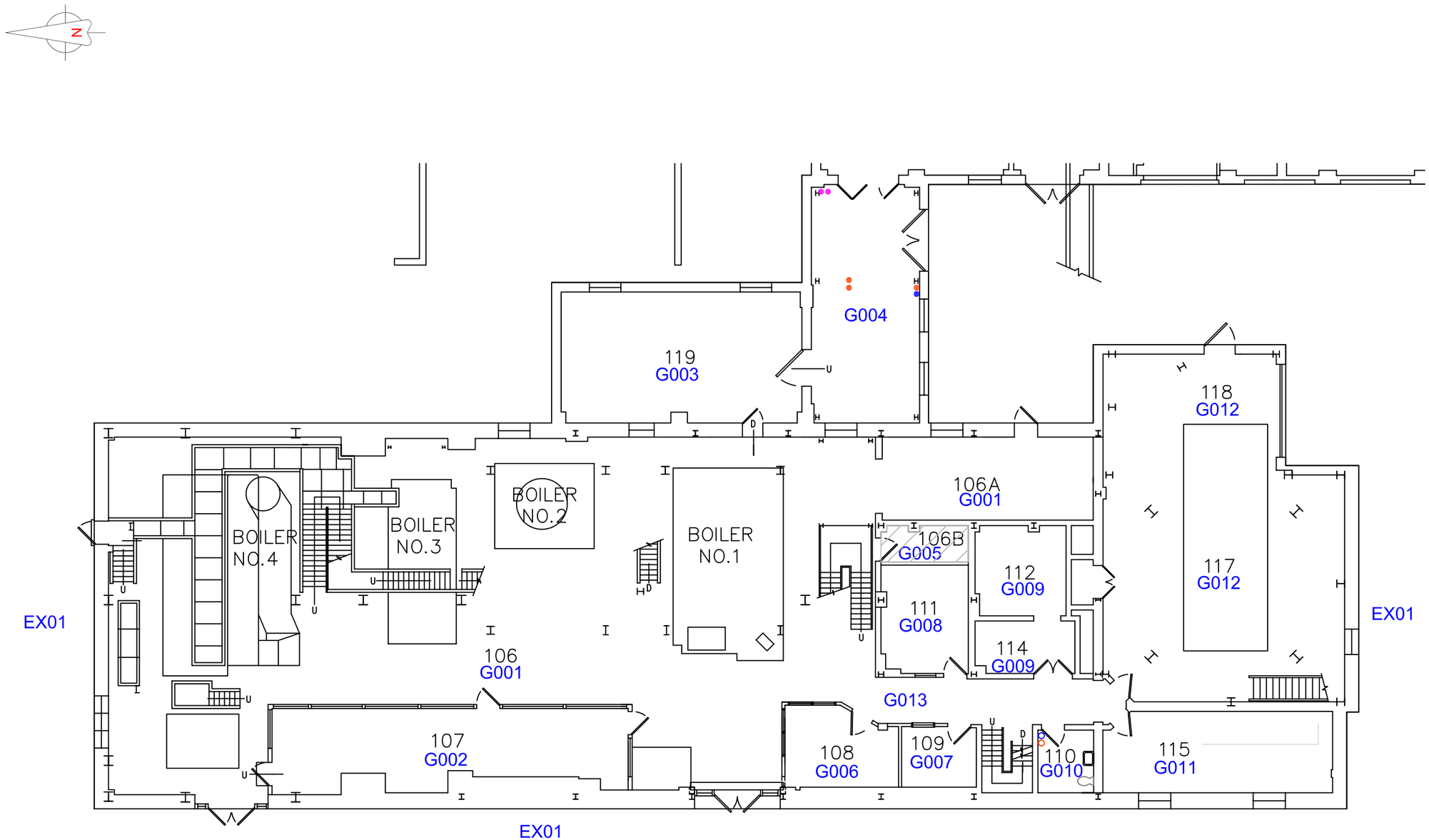
DATE MARCH 2007

SCALE NTS

TITLE

-BASEMENT-
LEAD SAMPLES
&
MOULD
LOCATIONS

SHEET B-3



OAKHILL
ENVIRONMENTAL

LEGEND

1001 FUNCTIONAL SPACE #

AREA NOT INSPECTED (INACCESSIBLE)

ACM PIPE INSULATION: DRAIN

ACM FITTING INSULATION: STEAM

ACM PIPE INSULATION RISER: DCW

ACM PIPE INSULATION RISER: DHW

ACM PIPE INSULATION RISER: DCW

ACM FITTING INSULATION: DHW

NOTE:
ACM fitting insulation locations are shown only on systems where NON-ACM pipe insulation was found. ONLY ACM ELBOWS are shown. These systems may also have ACM on: t's, valves, ends, hangers, etc.

CLIENT

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OTTAWA, ON, K1A 0R6

PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

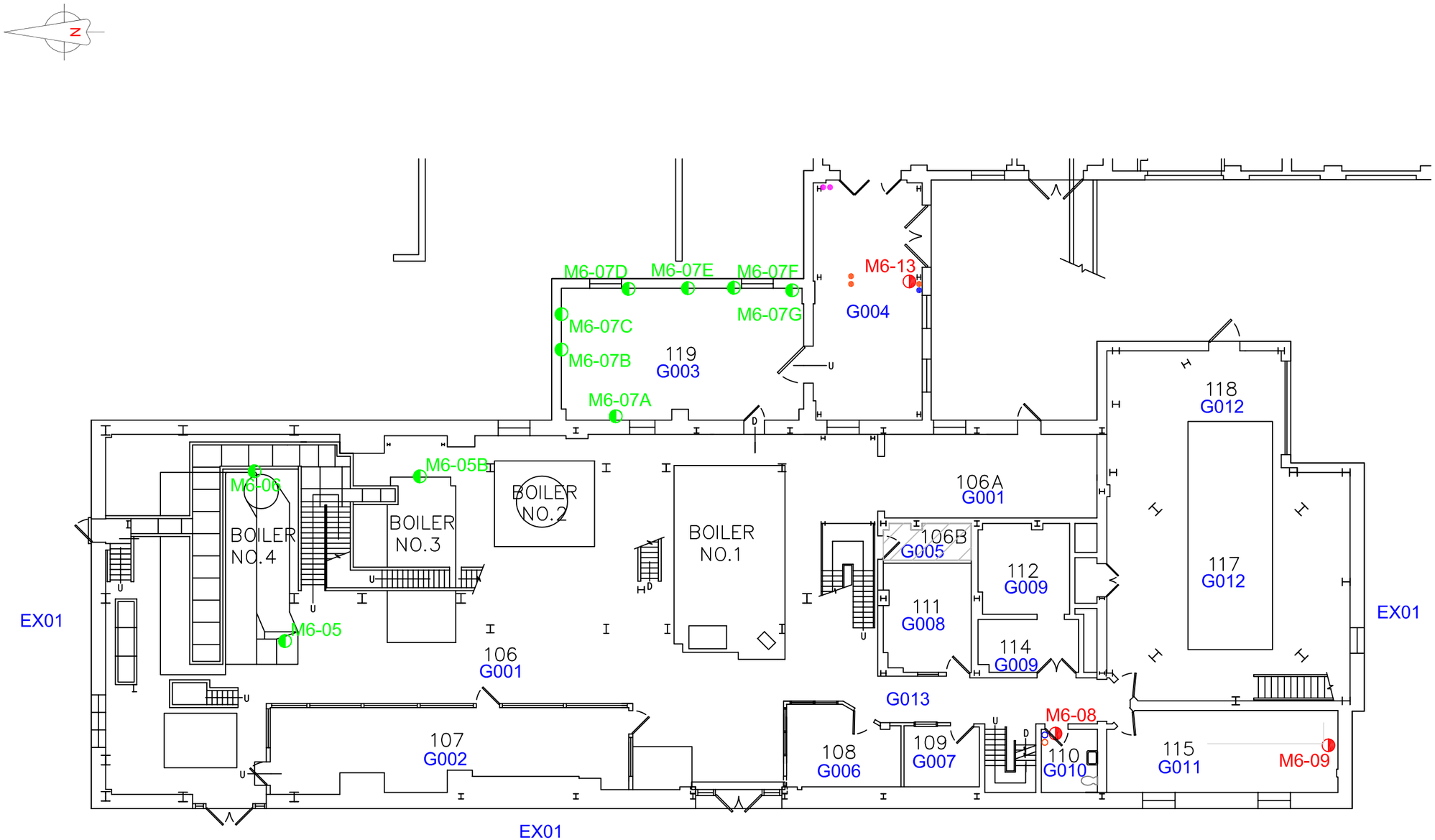
PROJECT NO.
PR-06-39

DATE
MARCH 2007

SCALE
NTS

TITLE
GROUND FLOOR ASBESTOS LOCATIONS

SHEET
G-1



OAKHILL ENVIRONMENTAL

LEGEND

1001 FUNCTIONAL SPACE #

SAMPLE LOCATION: NON-ACM

SAMPLE LOCATION: ACM

AREA NOT INSPECTED (INACCESSIBLE)

ACM PIPE INSULATION: DRAIN

ACM FITTING INSULATION: STEAM

ACM PIPE INSULATION RISER: DCW

ACM PIPE INSULATION RISER: DHW

ACM PIPE INSULATION RISER: DCW

ACM FITTING INSULATION: DHW

NOTE:
ACM fitting insulation locations are shown only on systems where NON-ACM pipe insulation was found. ONLY ACM ELBOWS are shown. These systems may also have ACM on: t's, valves, ends, hangers, etc.

CLIENT

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PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

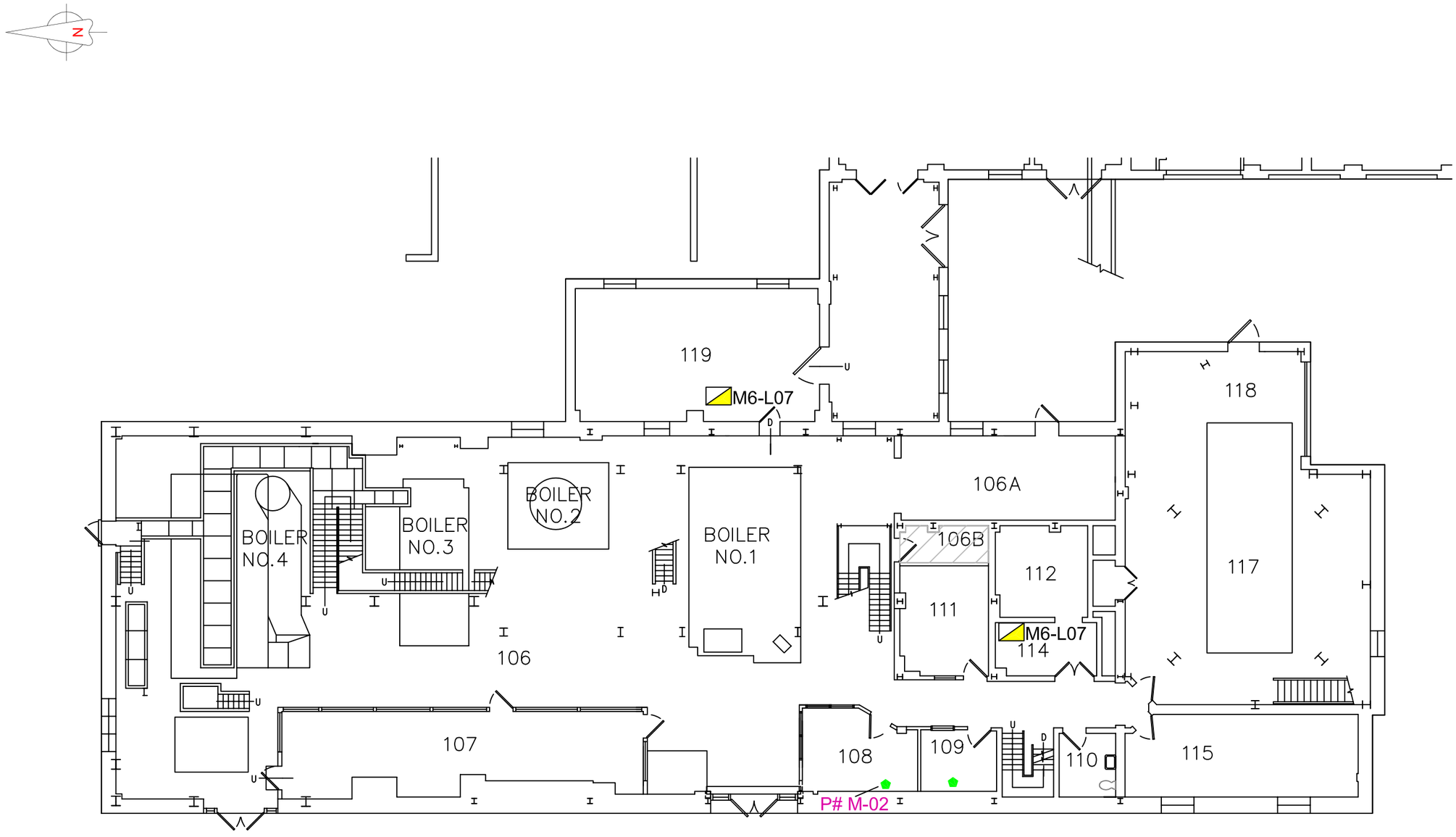
PROJECT NO.
PR-06-39

DATE
MARCH 2007

SCALE
NTS

TITLE
GROUND FLOOR ASBESTOS SURVEY

SHEET
G-2



OAKHILL ENVIRONMENTAL

LEGEND

- LEAD SAMPLE LOCATION (<5000 ppm)
- LEAD SAMPLE LOCATION (>5000 ppm)
- MOULD LOCATION
- AREA NOT INSPECTED (INACCESSIBLE)
- P# PHOTOGRAPH #

CLIENT

NATIONAL RESEARCH COUNCIL CANADA
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BUILDING M-19
1200 MONTREAL RD.
OTTAWA, ON, K1A 0R6

PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

PROJECT NO.
PR-06-39

DATE
MARCH 2007

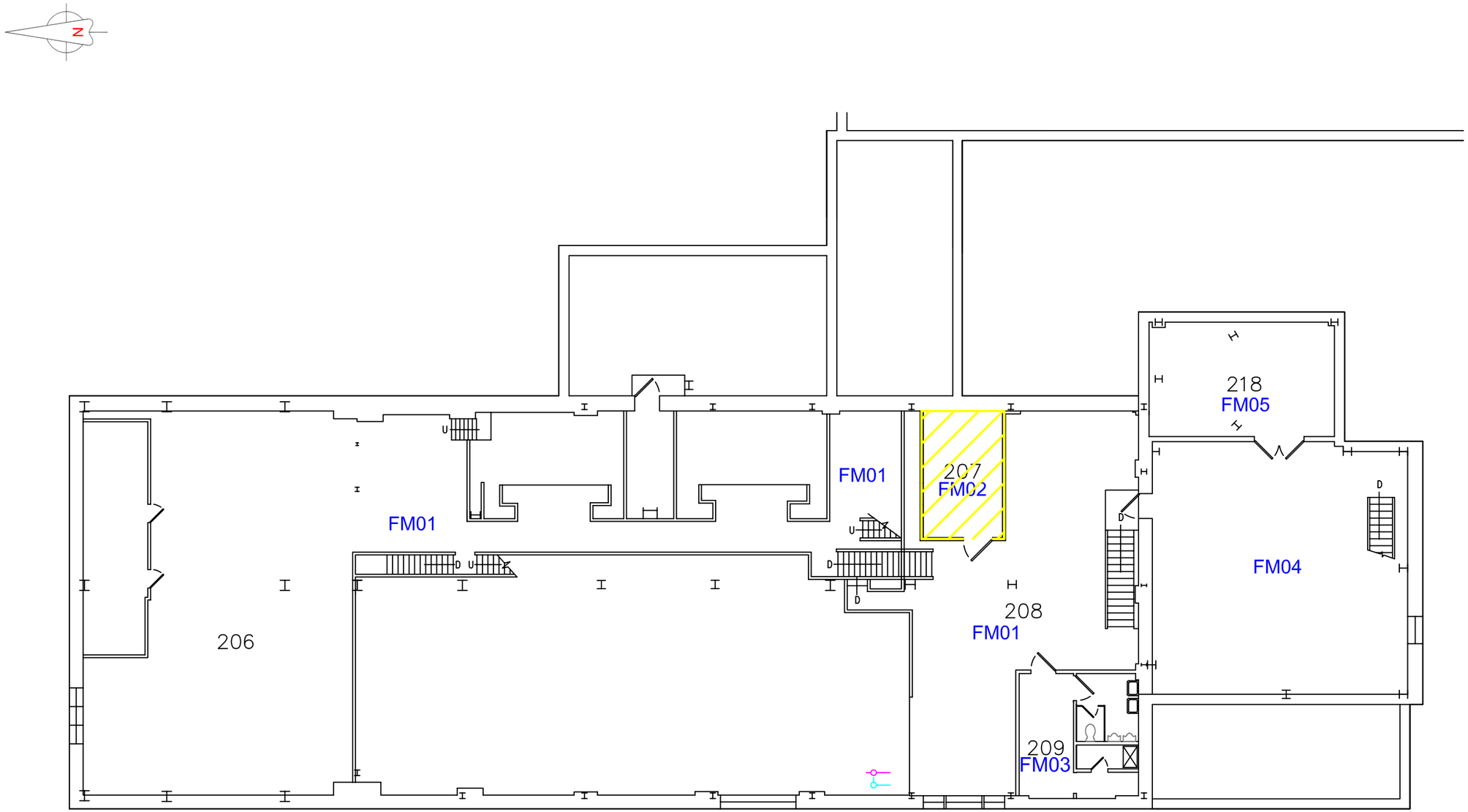
SCALE
NTS

TITLE

GROUND FLOOR LEAD SAMPLES & MOULD LOCATIONS

SHEET

G-3



OAKHILL
ENVIRONMENTAL

LEGEND

1001 FUNCTIONAL SPACE #

ACM PIPE INSULATION: STEAM

ACM PIPE INSULATION: CONDENSATE

ACM TRANSITE WALL PANEL

ACM TRANSITE CEILING TILE

CLIENT

NATIONAL RESEARCH COUNCIL CANADA
ADMINISTRATIVE SERVICES
AND PROPERTY MANAGEMENT
BUILDING M-19
1200 MONTREAL RD.
OTTAWA, ON, K1A 0R6

PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

PROJECT NO.
PR-06-39

DATE
MARCH 2007

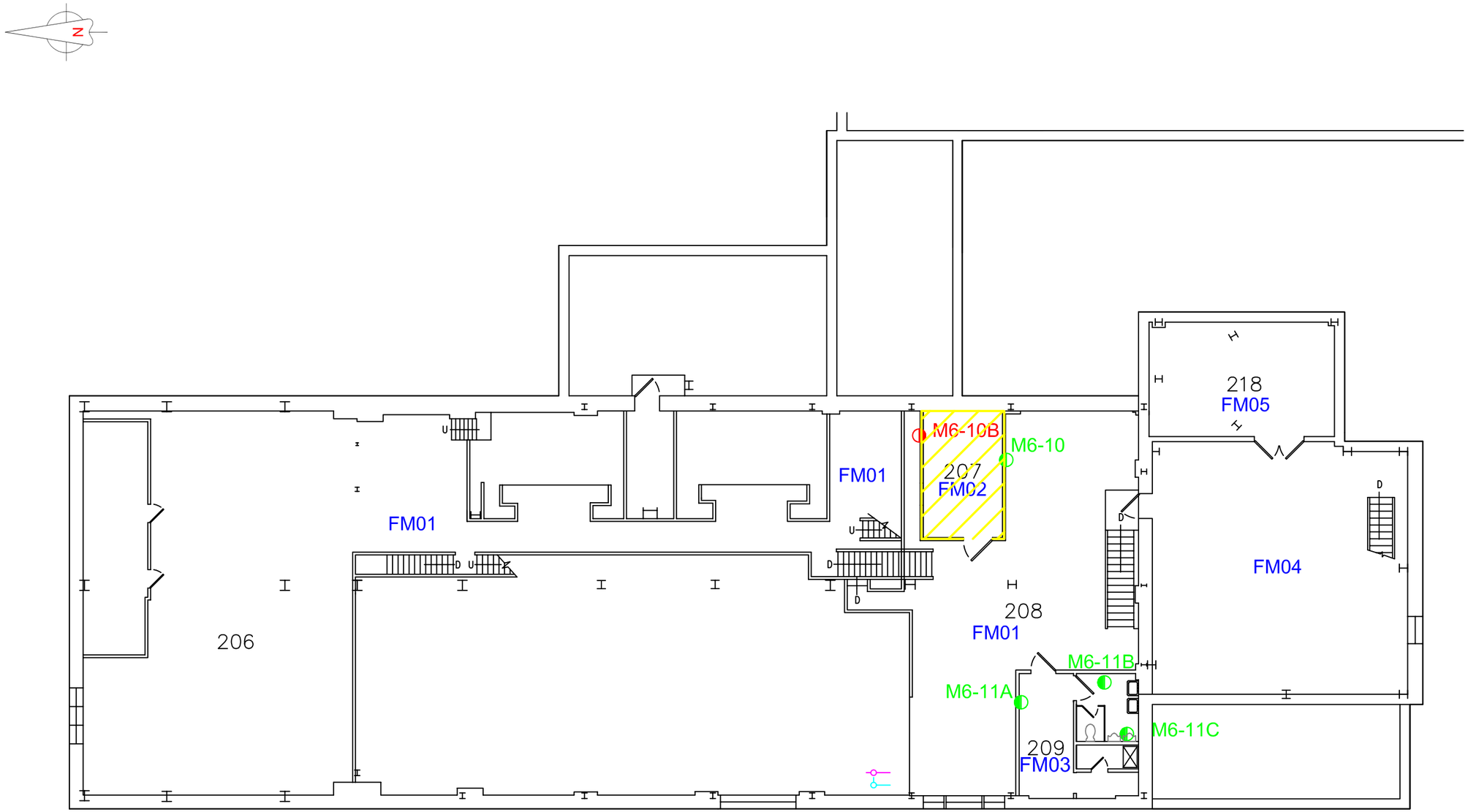
SCALE
NTS

TITLE

FIRST MEZZANINE ASBESTOS LOCATIONS

SHEET

FM-1



OAKHILL
ENVIRONMENTAL

LEGEND

1001 FUNCTIONAL SPACE #

SAMPLE LOCATION: NON-ACM

SAMPLE LOCATION: ACM

ACM PIPE INSULATION: STEAM

ACM PIPE INSULATION: CONDENSATE

ACM TRANSITE WALL PANEL

ACM TRANSITE CEILING TILE

NOTE:
ACM fitting insulation locations are shown only on systems where NON-ACM pipe insulation was found. ONLY ACM ELBOWS are shown. These systems may also have ACM on: t's, valves, ends, hangers, etc.

CLIENT

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1200 MONTREAL RD.
OTTAWA, ON, K1A 0R6

PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

PROJECT NO.
PR-06-39

DATE
MARCH 2007

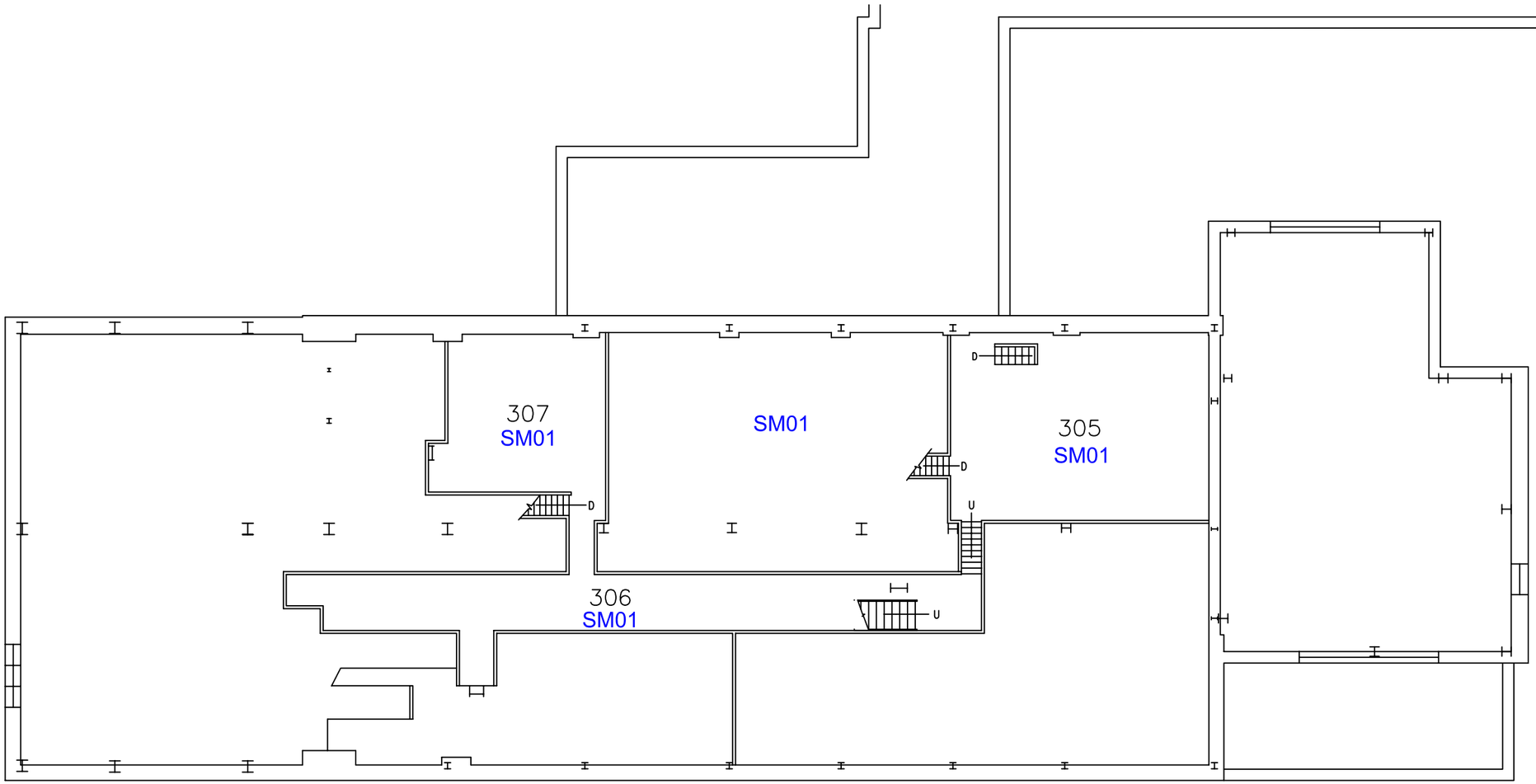
SCALE
NTS

TITLE

FIRST MEZZANINE ASBESTOS SURVEY

SHEET

FM-2



OAKHILL
ENVIRONMENTAL

LEGEND

1001 FUNCTIONAL SPACE #

CLIENT

NATIONAL RESEARCH COUNCIL CANADA
ADMINISTRATIVE SERVICES
AND PROPERTY MANAGEMENT
BUILDING M-19
1200 MONTREAL RD.
OTTAWA, ON, K1A 0R6

PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

PROJECT NO.
PR-06-39

DATE
MARCH 2007

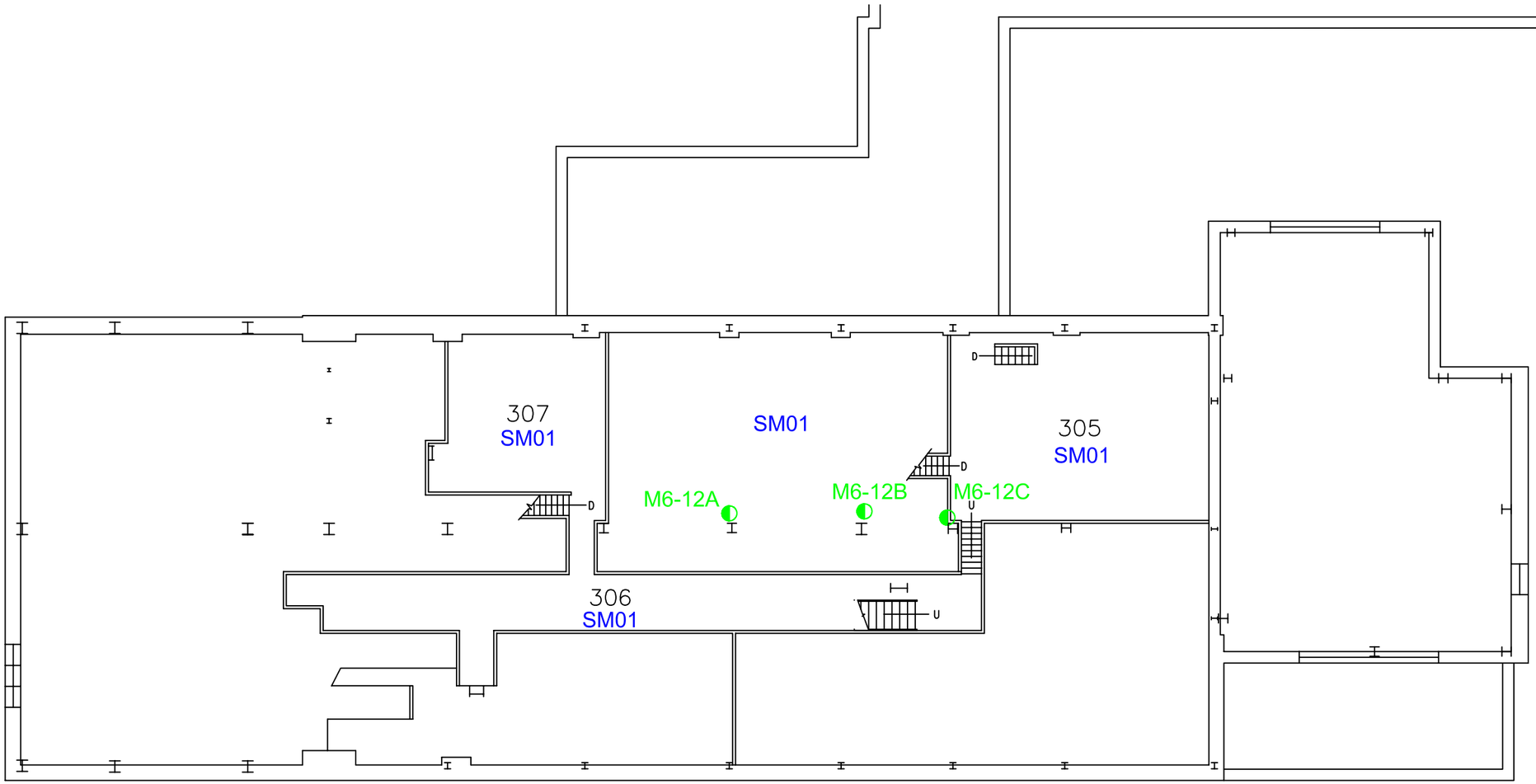
SCALE
NTS

TITLE

SECOND MEZZANINE ASBESTOS LOCATIONS

SHEET

SM-1



OAKHILL ENVIRONMENTAL

LEGEND

1001 FUNCTIONAL SPACE #

SAMPLE LOCATION: NON-ACM

CLIENT

NATIONAL RESEARCH COUNCIL CANADA
ADMINISTRATIVE SERVICES
AND PROPERTY MANAGEMENT
BUILDING M-19
1200 MONTREAL RD.
OTTAWA, ON, K1A 0R6

PROJECT

DESIGNATED SUBSTANCES SURVEY
BUILDING M-06

PROJECT NO.

PR-06-39

DATE

MARCH 2007

SCALE

NTS

TITLE

SECOND MEZZANINE ASBESTOS SURVEY

SHEET

SM-2

APPENDIX F

FUNCTIONAL SPACE FORMS

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) Lead sample M06-L1 collected here. 2) No ACM's were observed in this area. 3) All switches, pressure gauges and fluorescent lights are suspected mercury containing.	**Functional Space (FS) #:** B001 **FS Area:** Basement B108 **Inspector:** BM/RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Metal	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Concrete	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other	n/a	FG FI PI	ALL	N	--	--	--	--	--	--	--	--	--	Recent installation	--	--

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January19, 2007 **Job #:** PR-06-039	**Notes:** 1) Samples M06-L2, M06-L3, M06-L4 were collected here. 2) No ACM's were observed in this area. 3) All switches, pressure gauges and fluorescent lights are suspect mercury containing.	**Functional Space (FS) #:** B002 **FS Area:** 106, 107, 109, 112, 113 Basement **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Metal	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Concrete	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other	n/a	FG PI FI	All	N	--	--	--	--	--	--	--	--	--	Recent installation	--	--

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) Samples M6-1, M6-2, M6-3 were collected here. 2) Mechanical systems are not labelled and are listed below based on assumptions at the time of inspection. 3) All ACM's were observed in good condition.	**Functional Space (FS) #:** B003 **FS Area:** 114 Flammable Storage Room **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Concrete	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other	1	MJC FI	Condensate	Y	Y	20% Chrysotile	11 units	X	--	--	--	X	--	O & M	B-1	--
	2	Aircell PI	Condensate	Y	Y	15% Chrysotile	19 LM	X	--	--	--	X	---	O & M	B-1	--
	3	Aircell PI	DCW	Y	Y	20% Chrysotile	1 LM	X	--	--	--	X	--	O & M	B-1	--
	1	MJC FI	DCW	Y	Y	20% Chrysotile	2 units	X	--	--	--	X	--	O & M	B-1	--
	3	Aircell PI	DHW	Y	Y	20% Chrysotile	1 LM	X	--	--	--	X	--	O & M	B-1	--
	1	MJC FI	DHW	Y	Y	20% Chrysotile	2 units	X	--	--	--	X	--	O & M	B-1	--
	n/a	FG	Condensate	N	--	--	--	--	--	--	--	--	--	Recent installation	--	--

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, & March 26, 2007 **Job #:** PR-06-039	**Notes:** 1) Samples M6-L5 and M6-4 were collected here. 2) Condensate: 2 encapsulations of aircell pipe insulation (open ends) required. 0.2 LM per encapsulation totalling 0.4 LM. 4) Mechanical systems were not labelled and therefore systems identified were based on assumptions during the survey. 5) All other ACM's were observed in good condition.	**Functional Space (FS) #:** B004 **FS Area:** 118A, 118,117. **Inspector:** BM & RT

Building Materials				ACM Assessment											Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Metal grate	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Concrete	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other	1	MJC FI	Condensate	Y	Y	20% Chrysotile	2 units	X	--	--	--	X	--	O&M	B-1	--
	2	Aircell PI	Condensate	Y	Y	15% Chrysotile	8LM	X	--	--	--	X	--	O&M	B-1	--
	2	Aircell PI	Condensate	Y	Y	15% Chrysotile	0.4 LM	--	X	--	--	X	--	2 Encapsulations	B-2	01
	4	Thermal Patch	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Mould on Condensate Line SEE PHOTO	Condensate	N	--	--	--	--	--	--	--	--	--	--	B-3	M-1

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) Sample M6-5 and M6-6 were collected here. 2) All systems have fibreglass pipe insulation and fitting insulation. 3) No ACM's were observed in this area.	**Functional Space (FS) #:** G001 **FS Area:** Main Boiler Area **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Brick	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other	n/a	FG FI PI	ALL	N	--	--	--	--	--	--	--	--	--	Recent installation	--	--
	5	Boiler Parging	Boiler 4	N	--	--	--	--	--	--	--	--	--	--	--	--
	5	Boiler Parging	Boiler 3	N	--	--	--	--	--	--	--	--	--	--	--	--

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) No ACM's were observed in this area.	**Functional Space (FS) #:** G002 **FS Area:** Rm#107 Control Room **Inspector:** BM & RT

Building Materials				ACM Assessment											Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	2' x 2' tile	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Brick	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Drywall	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	2' x 4' CT	Ceiling	N	--	--	--	--	--	--	--	--	--	Post 1996	--	--
Above Ceiling		Not applicable														
Other	n/a	FG PI	All	N	--	--	--	--	--	--	--	--	--	--	--	--

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) Sample M6-07 (A-G) of plaster was collected here. 2) Sample L-06 (light grey paint) was collected here. 3) No ACM's were observed in this area.	**Functional Space (FS) #:** G003 **FS Area:** Rm#119 Air Compressor Rm. **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Metal Plate	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	06	Plaster	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Concrete Block	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other	n/a	FG PI FI	All	N	--	--	--	--	--	--	--	--	--	Recent installation	--	--

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) All ACM's observed in good condition. 2) Sample M6-13(MJC) was collected here.	**Functional Space (FS) #:** G004 **FS Area:** Air Compressor Rm. **Inspector:** BM & RT

Building Materials				ACM Assessment											Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Concrete Block	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Concrete	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete Deck	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other	n/a	FG PI & FI	DCW	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	FG PI & FI	DHW	N	--	--	--	--	--	--	--	--	--	--	--	--
	12	MJC FI	DHW	Y		5% Chrysotile	3 units	X			X			O&M	G-1	
	12	MJC FI	DCW	Y		5% Chrysotile	1 unit	X			X			O&M	G-1	
	12	MJCFI	Steam	Y		5% Chrysotile	2 units	X			X			O&M	G-1	

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) No access to this room was available at the time of inspection.	**Functional Space (FS) #:** G005 **FS Area:** Janitors Closet 106B **Inspector:** BM & RT

Building Materials				ACM Assessment												Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments		Dwg. #	Photo #
								G	F	P	A	B	C				
Floor	n/a																
Walls	n/a																
Ceiling	n/a																
Above Ceiling	n/a																

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) A renovation project was completed in this room in 1996. All materials were replaced. 2) No ACM's observed in this area. 3) Mould was observed on the fibreglass duct insulation.	**Functional Space (FS) #:** G006 **FS Area:** Manager Office 108 **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	12"x12" FT grey	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	06	Plaster	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	2'x4' CT	Ceiling	N	--	--	--	--	--	--	--	--	--	Post 1986	--	--
Above Ceiling	n/a	FG DI	Duct	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Mould	Duct	N	--	--	--	--	--	--	--	--	--	--	G-3	M-2

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) A renovation project was completed in this room in 1996. All materials were replaced. 2) No ACM's were observed in this area. 3) Mould was observed on the fibreglass duct insulation.	**Functional Space (FS) #:** G007 **FS Area:** Assistant Manager Office 109 **Inspector:** BM & RT

Building Materials				ACM Assessment											Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	12"x12" FT grey	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	06	Plaster	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceil.	n/a	2'x4' CT	Ceiling	N	--	--	--	--	--	--	--	--	--	Post 1986	--	--
Above Ceiling	n/a	Brick	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	FG DI	Duct	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Mould	Duct	N	--	--	--	--	--	--	--	--	--	--	G-3	M-2

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) A renovation project was completed in this room in 1996. All materials were replaced. 2) No ACM's were observed in this area.	**Functional Space (FS) #:** G008 **FS Area:** Engineer Office 111 **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	12"x12" FT grey	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	06	Plaster	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	2'x4' CT	Ceiling	N	--	--	--	--	--	--	--	--	--	Post 1986	--	--
Above Ceiling	n/a	FG DI	Duct	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	FG PI FI	All	N	--	--	--	--	--	--	--	--	--	--	--	--
	06	Plaster	Ceiling	N	--	--	--	--	--	--	--	--	--	Above suspended ceiling	--	--
Other		Not applicable														

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) Sample M6-L7 pale yellow paint was collected here. 2) No ACM's were observed in this area.	**Functional Space (FS) #:** G009 **FS Area:** Electrical Rm. 114 & 112 **Inspector:** BM & RT

Building Materials				ACM Assessment											Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Brick	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other		Not applicable														

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) No access above solid ceiling. 2) Sample M6-8A was collected here. 3) All ACM's were observed in good condition.	**Functional Space (FS) #:** G010 **FS Area:** Men's WC 110 **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	7"x7"CT	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	4"x4" CT	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Plaster	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	2'x4' CT	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
	06	Plaster	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Other	7	Sweat wrap with white paper PI	DCW	Y	Y	10% Chrysotile	3LM	X	--	--	--	X	--	O&M	G-1	--
	2	Aircell PI	DHW	Y	Y	15% Chrysotile	3LM	X	--	--	--	X	--	O&M	G-1	--
Above Ceiling		Not applicable														

Criteria for Access to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for Condition of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) Samples M6-8B & M6-9 collected here. 3) All ACM's were observed in good condition.	**Functional Space (FS) #:** G011 **FS Area:** Lunch Rm. #115 **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	12"x12" FT white	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	06	Plaster	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	2'x4' CT	Ceiling	N	--	--	--	--	--	--	--	--	--	Post 1986	--	--
Above Ceiling	08	Parging FI	Drain	Y	Y	10% Chrysotile	1 unit	X	--	--	--	--	X	O&M	G-1	--
	07	Sweat wrap with white paper PI	Drain	Y	Y	10% Chrysotile	6 LM	X	--	--	--	--	X	O&M	G-1	--
	n/a	FG Duct Insulation	Duct	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Concrete Deck	Deck	N	--	--	--	--	--	--	--	--	--	--	--	--
Other		Not applicable														

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) No ACM's observed in this area. 2) Area is open to space above, the ceiling is discussed in FS# SM01.	**Functional Space (FS) #:** G012 **FS Area:** Boiler Area #117 #118 **Inspector:** BM & RT

Building Materials				ACM Assessment											Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Metal Panel	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Concrete	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Concrete Block	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Metal Panel	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling		Not applicable														
Above Ceiling		Not applicable														
Other		Not applicable														

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) 1996 Renovation 2) No access above solid ceiling 3) No ACM's observed in this area.	**Functional Space (FS) #:** G013 **FS Area:** Hallway **Inspector:** BM & RT

Building Materials				ACM Assessment											Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	12"x12" FT grey	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Brick	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other		Not applicable														

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19 & March 26, 2007 **Job #:** PR-06-039	**Notes:** 1) Transite outside of electrical. 2) Sample M6-10 was collected here. 3) ACM on steam system above manager's office. 4) All ACM observed in good condition.	**Functional Space (FS) #:** FM01 **FS Area:** Main Boiler Area **Inspector:** BM & RT

Building Materials				ACM Assessment											Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Metal	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Brick	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	09	Transite panel	Wall	Y	N	30% Chrysotile	30 m^2	X	--	--	--	X	--	O&M	--	--
Ceiling		open area														
Other	02	Aircell PI	Steam	Y	Y	15% Chrysotile	4 LM	X	--	--	--	X	--	O&M	FM-01	--
	02	Aircell PI	Condensate	Y	Y	15% Chrysotile	4LM	X	--	--	--	X	--	O&M	FM-01	--
	01	MJC FI	Steam	Y	Y	20% Chrysotile	3 units	X	--	--	--	X	--	O&M	FM-01	--
	01	MJC FI	Condensate	Y	Y	20% Chrysotile	5 units	X	--	--	--	X	--	O&M	FM-01	--
	n/a	FG PI FI	All	N	--	--	--	--	--	--	--	--	--	Re-insulated areas	--	--

Criteria for Access to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for Condition of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) All ACM observed in good condition.	**Functional Space (FS) #:** FM02 **FS Area:** Electrical Rm. **Inspector:** BM & RT

Building Materials				ACM Assessment											Report Reference	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	09	Transite Panel	Wall	Y	N	30% Chrysotile	30 m^2	X	--	--	--	X	--	O&M	FM-1	--
Ceiling	09	Transite Panel	Ceiling	Y	N	30% Chrysotile	18 m^2	X	--	--	--	X	--	O&M	FM-1	--
Above Ceiling		Not applicable														
Other	n/a	FG PI	All	N	--	--	--	--	--	--	--	--	--	Recent Installations	--	--

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) Samples M6-11 A-C of 12”x12” F/T were collected here. 2) No ACM’s were observed in this area.	**Functional Space (FS) #:** FM03 **FS Area:** Locker Rm. **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	10	12”x12” FT off white with grey	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Wood	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Ceramic Tile	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Brick	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Wood	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Plaster	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Other		Not applicable														

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) No ACM's were observed in this area.	**Functional Space (FS) #:** FM04 **FS Area:** Boiler Rm. **Inspector:** BM & RT

Building Materials				**ACM Assessment**												**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments		Dwg. #	Photo #
								G	F	P	A	B	C				
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--		--	--
	n/a	Metal Grate	Floor	N	--	--	--	--	--	--	--	--	--	--		--	--
Walls	n/a	Concrete Block	Wall	N	--	--	--	--	--	--	--	--	--	--		--	--
	n/a	Metal	Wall	N	--	--	--	--	--	--	--	--	--	--		--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--		--	--
	n/a	Metal	Ceiling	N	--	--	--	--	--	--	--	--	--	--		--	--
Above Ceiling		Not applicable															
Other		Not applicable															

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) No ACM's were observed in this area. 2) All switches, pressure gauges and fluorescent lights are suspect mercury containing.	**Functional Space (FS) #:** FM05 **FS Area:** Control Rm. #218 **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Concrete Block	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Metal	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Above Ceiling		Not applicable														
Other		Not applicable														

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) Samples M6-12 (A-C) were collected in this area. 2) No ACM's observed in this area.	**Functional Space (FS) #:** SM01 **FS Area:** Second Mezzanine **Inspector:** BM & RT

Building Materials				**ACM Assessment**											**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments	Dwg. #	Photo #
								G	F	P	A	B	C			
Floor	n/a	Concrete	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
	n/a	Metal	Floor	N	--	--	--	--	--	--	--	--	--	--	--	--
Walls	n/a	Concrete Block	Wall	N	--	--	--	--	--	--	--	--	--	--	--	--
Ceiling	n/a	Concrete	Ceiling	N	--	--	--	--	--	--	--	--	--	--	--	--
Below Ceiling		Not applicable														
Other		Not applicable														

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
FI: Fitting Insulation
FG: Fibreglass
DI: Duct Insulation

Building: M-06 **Date:** January 19, 2007 **Job #:** PR-06-039	**Notes:** 1) Roof area was not inspected.	**Functional Space (FS) #:** EX01 **FS Area:** Exterior **Inspector:** BM & RT

Building Materials				**ACM Assessment**												**Report Reference**	
Location	Homg. Material #	Material Description	System	ACM Y/N	Fri-able Y/N	ACM Type	Qty.	Condition			Access			Response / Comments		Dwg. #	Photo #
								G	F	P	A	B	C				
Floor		Not applicable															
Exterior Walls	n/a	Metal	Exterior Finish	N	--	--	--	--	--	--	--	--	--	--		--	--
Ceiling		Not applicable															
Below Ceiling		Not applicable															
Other		Not applicable															

Criteria for <u>Access</u> to an area containing ACM:
***A**: All building occupants may have access to this area*
***B**: Restricted to building staff only*
***C**: Areas of the building behind walls or ceiling system*

Criteria for <u>Condition</u> of an ACM:
G: ACM is in GOOD condition; No damage
F: ACM is in FAIR condition; Less than 2% damage
P: ACM is in POOR condition; Greater than 2% damage

MJC: Mud Joint Compound
PI: Pipe Insulation
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DI: Duct Insulation

Functional Space Forms

The functional space form provides a general guide of information collected in each room or area of the facility and is considerate of but is not limited to the following:

(a) ***Building Materials*** - Each building material is given a description as to the location, homogenous material number, location and system;
(b) ***ACM Assessment*** - Each building material that is found to contain ACM is assessed as to friability, ACM type, quantity, condition, access and appropriate response;
(c) ***Report Reference*** - Report references to building materials with respect to drawings and photographs numbers is made available for convenience. Drawings and photographs are located in the Appendices section of this report.

Each functional space is assigned a four digit number beginning with 1001 for the first floor, 2001 for the second floor, 3001 for the third floor, and so on. Functional spaces are determined on a room-to-room or area-to-area basis Also, included on each form is: building, date, Oakhill job number, functional space area name, inspector and notes. In the notes section important additional comments are made regarding ACM found in this area, samples collected and any areas within this functional space that were considered inaccessible at the time of inspection.

The functional space form is a useful tool for the collection of survey data and communication of such data for your record keeping purposes.

Criteria for Assessing Condition of ACM

The following criteria were used for evaluating the condition of ACM:

GOOD (G): The building material has no evidence of exposed ACM and exhibits no signs of damage or deterioration

FAIR (F)**:** The building material has minor damage (less than 2%) and the potential for an airborne release of asbestos is low to moderate.

POOR (P): The building material has moderate to major damage (greater than 2%) and the potential for an airborne release of asbestos is moderate to moderate to high.

The evaluation of the potential for an airborne release of asbestos from an ACM is also considerate of fibre generating mechanisms. This involves any form of action that can cause deterioration of the ACM resulting in the generation of airborne asbestos fibres. Typical fibre generating mechanisms may include: water damage, grinding, vibration, air movement, etc. This determination is made based on the best professional judgement of the experienced inspector.

Criteria for Assessing Access to ACM

The accessibility of ACM identified was rated as:
Access A: All building occupants may have access to this area.

Access B**:** Restricted to building staff only.

Access C: Areas of the building located behind walls or ceiling systems.

Response

Each ACM material, after all considerations, is given an appropriate response. The following is an explanation of each response that may be given:

Removal: For extensively damaged materials that cannot sustain encapsulation or materials that pose a significant potential for an airborne release and exposure to building occupants (i.e. debris). Requires immediate attention and encapsulation is not an option.

Encapsulation: Encapsulation involves the repair of damaged materials (i.e. canvas and lagging of damaged ACM pipe insulation). Materials that require encapsulation pose a potential risk of an airborne release ranging from low to high but restoration of the ACM is still a viable option. Encapsulation is not applicable if the material is severely deteriorated.

O & M Operations & Maintenance: These materials were found in good condition and should be periodically inspected.

TP1 Amount Payable – General

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

1.1.1 the aggregate of the amounts described in TP2 exceeds

1.1.2 the aggregate of the amounts described in TP3

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

TP2 Amounts Payable to the Contractor

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

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

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

TP3 Amounts Payable to Her Majesty

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

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

TP4 Time of Payment

4.1 In these Terms of Payment

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

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

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

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

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

4.2 The Contractor shall, on the expiration of a payment period, deliver to the Departmental Representative in respect of that payment period a written progress claim that fully describes any part of the work that has been completed, and any material that was delivered to the work site but not incorporated into the work during that payment period.

4.3 The Departmental Representative shall, not later than ten days after receipt by him of a progress claim referred to in TP4.2,

4.3.1 inspect the part of the work and the material described in the progress claim; and

4.3.2 issue a progress report, a copy of which the Departmental Representative will give to the Contractor, that indicates the value of the part of the work and the material described in the progress claim that, in the opinion of the Departmental Representative,

4.3.2.1 is in accordance with the contract, and

4.3.2.2 was not included in any other progress report relating to the contract.

4.4 Subject to TP1 and TP4.5 Her Majesty shall, not later than 30 days after receipt by the Departmental Representative of a progress claim referred to in TP4.2, pay the Contractor

4.4.1 an amount that is equal to 95% of the value that is indicated in the progress report referred to in TP4.3.2 if a labour and material payment bond has been furnished by the Contractor, or

4.4.2 an amount that is equal to 90% of the value that is indicated in the progress report referred to in TP4.3.2 if a labour and material payment bond has not been furnished by the Contractor.

4.5 It is a condition precedent to Her Majesty's obligation under TP4.4 that the Contractor has made and delivered to the Departmental Representative,

4.5.1 a statutory declaration described in TP4.6 in respect of a progress claim referred to in TP4.2,

4.5.2 in the case of the Contractor's first progress claim, a construction schedule in accordance with the relevant sections of the Specifications, and

4.5.3 if the requirement for a schedule is specified, an update of the said schedule at the times identified in the relevant sections of the Specifications.

4.6 A statutory declaration referred to in TP4.5 shall contain a deposition by the Contractor that

4.6.1 up to the date of the Contractor's progress claim, the Contractor has complied with all his lawful obligations with respect to the Labour Conditions; and

4.6.2 up to the date of the Contractor's immediately preceding progress claim, all lawful obligations of the Contractor to subcontractors and suppliers of material in respect of the

work under the contract have been fully discharged.

4.7 Subject to TP1 and TP4.8, Her Majesty shall, not later than 30 days after the date of issue of an Interim Certificate of Completion referred to in GC44.2, pay the Contractor the amount referred to in TP1 less the aggregate of

4.7.1 the sum of all payments that were made pursuant to TP4.4;

4.7.2 an amount that is equal to the Departmental Representative's estimate of the cost to Her Majesty or rectifying defects described in the Interim Certificate of Completion; and

4.7.3 an amount that is equal to the Departmental Representative's estimate of the cost to Her Majesty of completing the parts of the work described in the Interim Certificate of Completion other than the defects referred to in TP4.7.2.

4.8 It is a condition precedent to Her Majesty's obligation under TP4.7 that the Contractor has made and delivered to the Departmental Representative,

4.8.1 a statutory declaration described in TP4.9 in respect of an Interim Certificate of Completion referred to in GC44.2, and

4.8.2 if so specified in the relevant sections of the Specifications, and update of the construction schedule referred to in TP4.5.2 and the updated schedule shall, in addition to the specified requirements, clearly show a detailed timetable that is acceptable to the Departmental Representative for the completion of any unfinished work and the correction of all defects.

4.9 A statutory declaration referred to in TP4.8 shall contain a deposition by the contractor that up to the date of the Interim Certificate of Completion the Contractor has

4.9.1 complied with all of the Contractor's lawful obligations with respect to the Labour Conditions;

4.9.2 discharged all of the Contractor's lawful obligations to the subcontractors and suppliers of material in respect of the work under the contract; and

4.9.3 discharged the Contractor's lawful obligations referred to in GC14.6.

4.10 Subject to TP1 and TP4.11, Her Majesty shall, not later than 60 days after the date of issue of a Final Certificate of Completion referred to in GC44.1, pay the Contractor the amount referred to in TP1 less the aggregate of

4.10.1 the sum of all payments that were made pursuant to TP4.4; and

4.10.2 the sum of all payments that were made pursuant to TP4.7.

4.11 It is a condition precedent to Her Majesty's obligation under TP4.10 that the Contractor has made and delivered a statutory declaration described in TP4.12 to the Departmental Representative.

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

TP5 Progress Report and Payment Thereunder Not Binding on Her Majesty

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

TP6 Delay in Making Payment

6.1 Nothwithstanding GC7 any delay by Her Majesty in making any payment when it is due pursuant to these Terms of Payment shall not be a breach of the contract by Her Majesty.

6.2 Her Majesty shall pay, without demand from the Contractor, simple interest at the Bank Rate plus 1 -1/4 per centum on any amount which is overdue pursuant to TP4.1.3, and the interest shall apply from and include the day such amount became overdue until the day prior to the date of payment except that

6.2.1 interest shall not be payable or paid unless the amount referred to in TP6.2 has been overdue for more that 15 days following

6.2.1.1 the date the said amount became due and payable, or

6.2.1.2 the receipt by the Departmental Representative of the Statutory Declaration referred to in TP4.5, TP4.8 or TP4.11,

whichever is the later, and

6.6.2 interest shall not be payable or paid on overdue advance payments if any.

TP7 Right of Set-off

7.1 Without limiting any right of set-off or deduction given or implied by law or elsewhere in the contract, Her Majesty may set off any amount payable to Her Majesty by the Contractor under this contract or under any current contract against any amount payable to the Contractor under this contract.

7.2 For the purposes of TP7.1, "current contract" means a contract between Her Majesty and the Contractor

7.2.1 under which the Contractor has an undischarged obligation to perform or supply work, labour or material, or

7.2.2 in respect of which Her Majesty has, since the date of which the Articles of Agreement were made, exercised any right to take the work that is the subject of the contract out of the Contractor's hands.

TP8 Payment in Event of Termination

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

TP9 Interest on Settled Claims

9.1 Her Majesty shall pay to the Contractor simple interest on the amount of a settled claim at an average Bank Rate plus 1 ¼ per centum from the date the settled claim was outstanding until the day prior to the date of payment.

9.2 For the purposes of TP9.1,

9.2.1 a claim is deemed to have been settled when an agreement in writing is signed by the Departmental Representative and the Contractor setting out the amount of the claim to be paid by Her Majesty and the items or work for which the said amount is to be paid.

9.2.2 an "average Bank Rate" means the discount rate of interest set by the Bank of Canada in effect at the end of each calendar month averaged over the period the settled claim was outstanding.

9.2.3 a settled claim is deemed to be outstanding from the day immediately following the date the said claim would have been due and payable under the contract had it not been disputed.

9.3 For the purposes of TP9 a claim means a disputed amount subject to negotiation between Her Majesty and the Contractor under the contract.

GC1 Interpretation

1.1 In the contract

1.1.1 where reference is made to a part of the contract by means of numbers preceded by letters, the reference shall be construed to be a reference to the particular part of the contract that is identified by that combination of letters and numbers and to any other part of the contract referred to therein;

1.1.2 "contract" means the contract document referred to in the Articles of Agreement;

1.1.3 "contract security" means any security given by the Contractor to Her Majesty in accordance with the contract;

1.1.4 "Departmental Representative" means the officer or employee or Her Majesty who is designated pursuant to the Articles of Agreement and includes a person specially authorized by him to perform, on his behalf, any of his functions under the contract and is so designated in writing to the Contractor;

1.1.5 "material" includes all commodities, articles and things required to be furnished by or for the Contractor under the contract for incorporation into the work;

1.1.6 "Minister" includes a person acting for, or if the office is vacant, in place of the Minister and his successors in the office, and his or their lawful deputy and any of his or their representatives appointed for the purposes of the contract;

1.1.7 "person" includes, unless the context otherwise requires, a partnership, proprietorship, firm, joint venture, consortium and a corporation;

1.1.8 "plant" includes all animals, tools, implements, machinery, vehicles, buildings, structures, equipment and commodities, articles and things other than material, that are necessary for the due performance of the contract;

1.1.9 "subcontractor' means a person to whom the Contractor has, subject to GC4, subcontracted the whole or any part of the work;

1.1.10 "superintendant" means the employee of the Contractor who is designated by the Contractor to act pursuant to GC19;

1.1.11 "work includes, subject only to any express stipulation in the contract to the contrary, everything that is necessary to be done, furnished or delivered by the Contractor to perform the contract.

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

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

1.4 In interpreting the Plans and Specifications, in the event of discrepancies or conflicts between

1.4.1 the Plans and Specifications, the Specifications govern;

1.4.2 the Plans, the Plans drawn with the largest scale govern; and

1.4.3 figured dimensions and scaled dimensions, the figured dimensions govern.

GC2 Successors and Assigns

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

GC3 Assignment of Contract

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

GC4 Subcontracting by Contractor

4.1 Subject to this General Condition, the Contractor may subcontract any part of the work.

4.2 The Contractor shall notify the Departmental Representative in writing of his intention to subcontract.

4.3 A notification referred to in GC4.2 shall identify the part of the work, and the subcontractor with whom it is intended to subcontract.

4.4 The Departmental Representative may object to the intended subcontracting by notifying the Contractor in writing within six days of receipt by the Departmental Representative of a notification referred to in GC4.2.

4.5 If the Departmental Representative objects to a subcontracting pursuant to GC4.4, the Contractor shall not enter into the intended subcontract.

4.6 The contractor shall not, without the written consent of the Departmental Representative, change a subcontractor who has been engaged by him in accordance with this General Condition.

4.7 Every subcontract entered into by the Contractor shall adopt all of the terms and conditions of ths contract that are of general application.

4.8 Neither a subcontracting nor the Departmental Representative's consent to a subcontracting by the Contractor shall be construed to relieve the Contractor from any obligation under the contract or to impose any liability upon Her Majesty.

GC5 Amendments

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

GC6 No Implied Obligations

6.1 No implied terms or obligations of any kind by or on behalf of Her Majesty shall arise from anything in the contract and the express covenants and agreements therein contained and made by Her Majesty are the only covenants and agreements upon which any rights against Her Majesty are to be founded.

6.2 The contract supersedes all communications, negotiations and agreements, either written or oral, relating to the work that were made prior to the date of the contract.

GC7 Time of Essence

7.1 Time is of the essence of the contract.

GC8 Indemnification by Contractor

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

8.2 For the purpose of GC8.1, "activities" includes any act improperly carried out, any omission to carry out an act and any delay in carrying out an act.

GC9 Indemnification by Her Majesty

9.1 Her Majesty shall, subject to the Crown Liability Act, the Patent Act, and any other law that affects Her Majesty's rights, powers, privileges or obligations, indemnify and save the Contractor harmless from and against all claims, demands, losses, costs, damage, actions, suits or proceedings arising out of his activities under the contract that are directly attributable to

9.1.1 lack of or a defect in Her Majesty's title to the work site whether real or alleged; or

9.1.2 an infringement or an alleged infringement by the Contractor of any patent of invention or any other kind of intellectual property occurring while the Contractor was performing any act for the purposes of the contract employing a model, plan or design or any other thing related to the work that was supplied by Her Majesty to the Contractor.

GC10 Members of House of Commons Not to Benefit

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

GC11 Notices

11.1 Any notice, consent, order, decision, direction or other communication, other than a notice referred to in GC11.4, that may be given to the Contractor pursuant to the contract may be given in any manner.

11.2 Any notice, consent, order, decision, direction or other communication required to be given in writing, to any party pursuant to the contract shall, subject to GC11.4, be deemed to have been effectively given

11.2.1 to the Contractor, if delivered personally to the Contractor or the Contractor's superintendent, or forwarded by mail, telex or facsimile to the Contractor at the address set out in A4.1, or

11.2.2 to Her Majesty, if delivered personally to the Departmental Representative, or forwarded by mail, telex or facsimile to the Departmental Representative at the address set out in A1.2.1.

11.3 Any such notice, consent, order, decision, direction or other communication given in accordance with GC11.2 shall be deemed to have been received by either party

11.3.1 if delivered personally, on the day that it was delivered,

11.3.2 if forwarded by mail, on the earlier of the day it was received and the sixth day after it was mailed, and

11.3.3 if forwarded by telex or facsimile, 24 hours after it was transmitted.

11.4 A notice given under GC38.1.1, GC40 and GC41, if delivered personally, shall be delivered to the Contractor if the Contractor is doing business as sole proprietor or, if the Contractor is a partnership or corporation, to an officer thereof.

GC12 Material, Plant and Real Property Supplied by Her Majesty

12.1 Subject to GC12.2, the Contractor is liable to Her Majesty for any loss of or damage to material, plant or real property that is supplied or placed in the care, custody and control of the Contractor by Her Majesty for use in connection with the contract, whether or not that loss or damage is attributable to causes beyond the Contractor's control.

12.2 The Contractor is not liable to Her Majesty for any loss or damage to material, plant or real property referred to in GC12.1 if that loss or damage results from and is directly attributable to reasonable wear and tear.

12.3 The Contractor shall not use any material, plant or real property referred to in GC12.1 except for

the purpose of performing this contract.

12.4 When the Contractor fails to make good any loss or damage for which he is liable under GC12.1 within a reasonable time after being required to do so by the Departmental Representative, the Departmental Representative may cause the loss or damage to be made good at the Contractor's expense, and the Contractor shall thereupon be liable to Her Majesty for the cost thereof and shall, on demand, pay to Her Majesty an amount equal to that cost.

12.5 The Contractor shall keep such records of all material, plant and real property referred to in GC12.1 as the Departmental Representative from time to time requires and shall satisfy the Departmental Representative, when requested, that such material, plant and real property are at the place and in the condition which they ought to be.

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

13.1 Subject to GC14.7 all material and plant and the interest of the Contractor in all real property, licenses, powers and privileges purchased, used or consumed by the Contractor for the contract shall, after the time of their purchase, use or consumption be the property of Her Majesty for the purposes of the work and they shall continue to be the property of Her Majesty.

13.1.1 in the case of material, until the Departmental Representative indicates that he is satisfied that it will not be required for the work, and

13.1.2 in the case of plant, real property, licenses, powers and privileges, until the Departmental Representative indicates that he is satisfied that the interest vested in Her Majesty therein is no longer required for the purposes of the work.

13.2 Material or plant that is the property of Her Majesty by virtue of GC13.1 shall not be taken away from the work site or used or disposed of except for the purposes of the work without the written consent of the Departmental Representative.

13.3 Her Majesty is not liable for loss of or damage from any cause to the material or plant referred to in GC13.1 and the Contractor is liable for such loss or damage notwithstanding that the material or plant is the property of Her Majesty.

GC14 Permits and Taxes Payable

14.1 The Contractor shall, within 30 days after the date of the contract, tender to a municipal authority an amount equal to all fees and charges that would be lawfully payable to that municipal authority in respect of building permits as if the work were being performed for a person other than Her Majesty.

14.2 Within 10 days of making a tender pursuant to GC14.1, the Contractor shall notify the Departmental Representative of his action and of the amount tendered and whether or not the municipal authority has accepted that amount.

14.3 If the municipal authority does not accept the amount tendered pursuant to GC14.1 the Contractor shall pay that amount to Her Majesty within 6 days after the time stipulated in GC14.2.

14.4 For the purposes of GC14.1 to GC14.3 "municipal authority" means any authority that would have jurisdiction respecting permission to perform the work if the owner were not Her Majesty.

14.5 Notwithstanding the residency of the Contractor, the Contractor shall pay any applicable tax arising from or related to the performance of the work under the contract.

14.6 In accordance with the Statutory Declaration referred to in TP4.9, a Contractor who has neither residence nor place of business in the province in which work under the contract is being performed shall provide Her Majesty with proof of registration with the provincial sales tax authorities in the said province.

14.7 For the purpose of the payment of any applicable tax or the furnishing of security for the payment of any applicable tax arising from or related to the performance of the work under the contract, the Contractor shall, notwithstanding the fact that all material, plant and interest of the Contractor in all real property, licenses, powers and privileges, have become the property of Her Majesty after the time of purchase, be liable, as a user or consumer, for the payment or for the furnishing of security for the payment of any applicable tax payable, at the time of the use or consumption of that material, plant or interest of the Contractor in accordance with the relevant legislation.

GC15 Performance of Work under Direction of Departmental Representative

15.1 The Contractor shall

15.1.1 permit the Departmental Representative to have access to the work and its site at all times during the performance of the contract;

15.1.2 furnish the Departmental Representative with such information respecting the performance of the contract as he may require; and

15.1.3 give the Departmental Representative every possible assistance to enable the Departmental Representative to carry out his duty to see that the work is performed in accordance with the contract and to carry out any other duties and exercise any powers specially imposed or conferred on the Departmental Representative under the contract.

CG16 Cooperation with Other Contractors

16.1 Where, in the opinion of the Departmental Representative, it is necessary that other contractors or workers with or without plant and material, be sent onto the work or its site, the Contractor shall, to the satisfaction of the Departmental Representative, allow them access and cooperate with them in the carrying out of their duties and obligation.

16.2 If

16.2.1 the sending onto the work or its site of other contractors or workers pursuant to GC16.1 could not have been reasonably foreseen or anticipated by the Contractor when entering into the contract, and

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

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

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

GC17 Examination of Work

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

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

GC18 Clearing of Site

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

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

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

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

GC19 Contractor's Superintendent

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

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

19.3 A superintendent designated pursuant to GC19.1 shall be in full charge of the operations of the Contractor in the performance of the work and is authorized to accept any notice, consent, order, direction, decision or other communication on behalf of the Contractor that may be given to the superintendent under the contract.

19.4 The Contractor shall, until the work has been completed, keep a competent superintendent at the work site during working hours.

19.5 The Contractor shall, upon the request of the Departmental Representative, remove any superintendent who, in the opinion of the Departmental Representative, is incompetent or has been conducting himself improperly and shall forthwith designate another superintendent who is acceptable to the Departmental Representative.

19.6 Subject to GC19.5, the Contractor shall not substitute a superintendent without the written consent of the Departmental Representative.

19.7 A breach by the Contractor of GC19.6 entitles the Departmental Representative to refuse to issue any certificate referred to in GC44 until the superintendent has returned to the work site or another superintendent who is acceptable to the Departmental Representative has been substituted.

GC20 National Security

20.1 If the Minister is of the opinion that the work is of a class or kind that involves the national security, he may order the Contractor

20.1.1 to provide him with any information concerning persons employed or to be employed by him for purposes of the contract; and

20.1.2 to remove any person from the work and its site if, in the opinion of the Minister, that person may be a risk to the national security.

20.2 The Contractor shall, in all contracts with persons who are to be employed in the performance of the contract, make provision for his performance of any obligation that may be imposed upon him under GC19 to GC21.

20.3 The Contractor shall comply with an order of the Minister under GC20.1

GC21 Unsuitable Workers

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

GC22 Increased or Decreased Costs

22.1 The amount set out in the Articles of Agreement shall not be increased or decreased by reason of any increase or decrease in the cost of the work that is brought about by an increase or decrease in the cost of labour, plant or material or any wage adjustment arising pursuant to the Labour Conditions.

22.2 Notwithstanding GC22.1 and GC35, an amount set out in the Articles of Agreement shall be adjusted in the manner provided in GC22.3, if any change in a tax imposed under the Excise Act, the Excise Tax Act, the Old Age Security Act, the Customs Act, the Customs Tariff or any provincial sales tax legislation imposing a retail sales tax on the purchase of tangible personal property incorporated into Real Property

22.2.1 occurs after the date of the submission by the Contractor of his tender for the contract,

22.2.2 applies to material, and

22.2.3 affects the cost to the Contractor of that material.

22.3 If a change referred to in GC22.2 occurs, the appropriate amount set out in the Articles of Agreement shall be increased or decreased by an amount equal to the amount that is established by an examination of the relevant records of the Contractor referred to in GC51 to be the increase or decrease in the cost incurred that is directly attributable to that change.

22.4 For the purpose of GC22.2, where a tax is changed after the date of submission of the tender but public notice of the change has been given by the Minister of Finance before that date, the change shall be deemed to have occurred before the date of submission of the tender.

GC23 Canadian Labour and Material

23.1 The Contractor shall use Canadian labour and material in the performance of the work to the full extent to which they are procurable, consistent with proper economy and expeditious carrying out of the work.

23.2 Subject to GC23.1, the Contractor shall, in the performance of the work, employ labour from the locality where the work is being performed to the extent to which it is available, and shall use the offices of the Canada Employment Centres for the recruitment of workers wherever practicable.

23.3 Subject to GC23.1 and GC23.2, the Contractor shall, in the performance of the work, employ a reasonable proportion of persons who have been on active service with the armed forces of Canada and have been honourably discharged therefrom.

GC24 Protection of Work and Documents

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

24.2 If any document or information given or disclosed to the Contractor is assigned a security rating by the person who gave or disclosed it, the Contractor shall take all measures directed by the Departmental Representative to be taken to ensure the maintenance of the degree of security that is ascribed to that rating.

24.3 The Contractor shall provide all facilities necessary for the purpose of maintaining security, and shall assist any person authorized by the Minister to inspect or to take security measures in respect of the work and its site.

24.4 The Departmental Representative may direct the Contractor to do such things and to perform such additional work as the Departmental Representative considers reasonable and necessary to ensure compliance with or to remedy a breach of GC24.1 to GC24.3.

GC25 Public Ceremonies and Signs

25.1 The Contractor shall not permit any public ceremony in connection with the work without the prior consent of the Minister.

25.2 The Contractor shall not erect or permit the erection of any sign or advertising on the work or its site without the prior consent of the Departmental Representative.

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

26.1 The Contractor shall, at his own expense, do whatever is necessary to ensure that

26.1.1 no person, property, right, easement or privilege is injured, damaged or infringed by reasons of the Contractor's activities in performing the contract;

26.1.2 pedestrian and other traffic on any public or private road or waterway is not unduly impeded, interrupted or endangered by the performance or existence of the work or plant;

26.1.3 fire hazards in or about the work or its site are eliminated and, subject to any direction that may be given by the Departmental Representative, any fire is promptly extinguished;

26.1.4 the health and safety of all persons employed in the performance of the work is not endangered by the method or means of its performance;

26.1.5 adequate medical services are available to all persons employed on the work or its site at all times during the performance of the work;

26.1.6 adequate sanitation measures are taken in respect of the work and its site; and

26.1.7 all stakes, buoys and marks placed on the work or its site by or under the authority of the Departmental Representative are protected and are not removed, defaced, altered or destroyed.

26.2 The Departmental Representative may direct the Contractor to do such things and to perform such additional work as the Departmental Representative considers reasonable and necessary to ensure

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

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

GC27 Insurance

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

27.2 The insurance contracts referred to in GC27.1 shall

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

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

GC28 Insurance Proceeds

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

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

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

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

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

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

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

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

creditor.

28.5 When payment of a deficiency has been made pursuant to GC28.4, all rights and obligations of Her Majesty and the Contractor under the contract shall, with respect only to the part of the work that was the subject of the audit referred to in GC28.3, be deemed to have been expended and discharged.

28.6 If an election is not made pursuant to GC28.1.2 the Contractor shall, subject to GC28.7, clear and clean the work and its site and restore and replace the part of the work that was lost, damaged or destroyed at his own expense as if that part of the work had not yet been performed.

28.7 When the Contractor clears and cleans the work and its site and restores and replaces the work referred to in GC 28.6, Her Majesty shall pay him out of the monies referred to in GC28.1 so far as they will thereunto extend.

28.8 Subject to GC28.7, payment by Her Majesty pursuant to GC28.7 shall be made in accordance with the contract but the amount of each payment shall be 100% of the amount claimed notwithstanding TP4.4.1 and TP4.4.2.

GC29 Contract Security

29.1 The Contractor shall obtain and deliver contract security to the Departmental Representative in accordance with the provisions of the Contract Security Conditions.

29.2 If the whole or a part of the contract security referred to in GC29.1 is in the form of a security deposit, it shall be held and disposed of in accordance with GC43 and GC45.

29.3 If a part of the contract security referred to in GC29.1 is in the form of a labour and material payment bond, the Contractor shall post a copy of that bond on the work site.

GC30 Changes in the Work

30.1 Subject o GC5, the Departmental Representative may, at any time before he issues his Final Certificate of Completion,

30.1.1 order work or material in addition to that provided for in the Plans and Specifications; and

30.1.2 delete or change the dimensions, character, quantity, quality, description, location or position of the whole or any part of the work or material proved for in the Plans and Specifications or in any order made pursuant to GC30.1.1,

if that additional work or material, deletion, or change is, in his opinion, consistent with the general intent of the original contract.

30.2 The Contractor shall perform the work in accordance with such orders, deletions and changes that are made by the Departmental Representative pursuant to GC30.1 from time to time as if they had appeared in and been part of the Plans and Specifications.

30.3 The Departmental Representative shall determine whether or not anything done or omitted by the Contractor pursuant to an order, deletion or change referred to in GC30.1 increased or decreased the cost of the work to the Contractor.

30.4 If the Departmental Representative determines pursuant to GC30.3 that the cost of the work to the Contractor has been increased, Her Majesty shall pay the Contractor the increased cost that the Contractor necessarily incurred for the additional work calculated in accordance with GC49 or GC50.

30.5 If the Departmental Representative determines pursuant to GC303.3 that the cost of the work to the Contractor has been decreased, Her Majesty shall reduce the amount payable to the Contractor under the contract by an amount equal to the decrease in the cost caused by the deletion or change referred to in GC30.1.2 and calculated in accordance with GC49.

30.6 GC30.3 to GC30.5 are applicable only to a contract or a portion of a contract for which a Fixed Price Arrangement is stipulated in the contract.

30.7 An order, deletion or change referred to in GC30.1 shall be in writing, signed by the Departmental Representative and given to the Contractor in accordance with GC11.

GC31 Interpretation of Contract by Departmental Representative

31.1 If, ar any time before the Departmental Representative has issued a Final Certificate of Completion referred to in GC44.1, any question arises between the parties about whether anything has been done as required by the contract or about what the Contractor is required by the contract to do, and, in particular but without limiting the generality of the foregoing, about

31.1.1 the meaning of anything in the Plans and Specification,

31.1.2 the meaning to be given to the Plans and Specifications in case of any error therein, omission therefrom, or obscurity or discrepancy in their working or intention,

31.1.3 whether or not the quality or quantity of any material or workmanship supplied or proposed to be supplied by the Contractor meets the requirements of the contract,

31.1.4 whether or not the labour, plant or material provided by the Contractor for performing the work and carrying out the contract are adequate to ensure that the work will be performed in accordance with the contract and that the contract will be carried out in accordance with its terms,

31.1.5 what quantity of any kind of work has been completed by the Contractor, or

31.1.6 the timing and scheduling of the various phases of the performance of the work,

the question shall be decided by the Departmental Representative whose decision shall be final and conclusive in respect of the work.

31.2 The Contractor shall perform the work in accordance with any decisions of the Departmental

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

GC32 Warranty and Rectification of Defects in Work

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

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

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

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

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

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

GC33 Non-Compliance by Contractor

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

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

GC34 Protesting Departmental Representative's Decisions

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

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

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

34.3 If the Contractor gives a protest pursuant to GC34.2, any compliance by the Contractor with the decision or direction that was protested shall not be construed as an admission by the Contractor of the correctness of that decision or direction, or prevent the Contractor from taking whatever action he considers appropriate in the circumstances.

34.4 The giving of a protest by the Contractor pursuant to GC34.2 shall not relieve him from complying with the decision or direction that is the subject of the protest.

34.5 Subject to GC34.6, the Contractor shall take any action referred to in GC34.3 within three months after the date that a Final Certificate of Completion is issued under GC44.1 and not afterwards.

34.6 The Contractor shall take any action referred to in GC34.3 resulting from a direction under GC32 within three months after the expiry of a warranty or guarantee period and not afterwards.

34.7 Subject to GC34.8, if Her Majesty determines that the Contractor's protest is justified, Her Majesty shall pay the Contractor the cost of the additional labour, plant and material necessarily incurred by the Contractor in carrying out the protested decision or direction.

34.8 Costs referred to in GC34.7 shall be calculated in accordance with GC48 to GC50.

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

35.1 Subject to GC35.2 no payment, other than a payment that is expressly stipulated in the contract, shall be made by Her Majesty to the Contractor for any extra expense or any loss or damage incurred or sustained by the Contractor.

35.2 If the Contractor incurs or sustains any extra expense or any loss or damage that is directly attributable to

35.2.1 a substantial difference between the information relating to soil conditions at the work site that is contained in the Plans and Specifications or other documents supplied to the Contractor for his use in preparing his tender or a reasonable assumption of fact based thereon made by the Contractor, and the actual soil conditions encountered by the Contractor at the work site during the performance of the contract, or

35.2.2 any neglect or delay that occurs after the date of the contract on the part of Her Majesty in providing any information or in doing any act that the contract either expressly requires Her Majesty to do or that would ordinarily be done by an owner in accordance with the usage of the trade,

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

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

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

35.4 A written claim referred to in GC35.3 shall contain a sufficient description of the facts and circumstances of the occurrence that is the subject of the claim to enable the Departmental Representative to determine whether or not the claim is justified and the Contractor shall supply such further and other information for that purpose as the Departmental Representative requires from time to time.

35.5 If the Departmental Representative determines that a claim referred to in GC35.3 is justified, Her Majesty shall make an extra payment to the Contractor in an amount that is calculated in accordance with GC47 to GC50.

35.6 If, in the opinion of the Departmental Representative, an occurrence described in GC35.2.1 results in a savings of expenditure by the Contractor in performing the contract, the amount set out in the Articles of Agreement shall, subject to GC35.7, be reduced by an amount that is equal to the saving.

35.7 The amount of the saving referred to in GC35.6 shall be determined in accordance with GC47 to GC49.

35.8 If the Contractor fails to give a notice referred to in GC35.2 and a claim referred to in GC35.3 within the times stipulated, an extra payment shall not be made to him in respect of the occurrence.

GC36 Extension of Time

36.1 Subject to GC36.2, the Departmental Representative may, on the application of the Contractor made before the day fixed by the Articles of Agreement for completion of the work or before any other date previously fixed under this General Condition, extend the time for its completion by fixing a new date if, in the opinion of the Departmental Representative, causes beyond the control of the Contractor have delayed its completion.

36.2 An application referred to in GC36.1 shall be accompanied by the written consent of the bonding company whose bond forms part of the contract security.

GC37 Assessments and Damages for Late Completion

37.1 For the purposes of this General Condition

37.1.1 the work shall be deemed to be completed on the date that an Interim Certificate of Completion referred to in GC44.2 is issued, and

37.1.2 "period of delay" means the number of days commencing on the day fixed by the Articles of Agreement for completion of the work and ending on the day immediately preceding the day on which the work is completed but does not include any day within a period of extension granted pursuant to GC36.1, and any other day on which, in the opinion of the Departmental Representative, completion of the work was delayed for reasons beyond the control of the Contractor.

37.2 If the Contractor does not complete the work by the day fixed for its completion by the Articles of Agreement but completes it thereafter, the Contractor shall pay Her Majesty an amount equal to the aggregate of

37.2.1 all salaries, wages and travelling expenses incurred by Her Majesty in respect of persons overseeing the performance of the work during the period of delay;

37.2.2 the cost incurred by Her Majesty as a result of the inability to use the completed work for the period of delay; and

37.2.3 all other expenses and damages incurred or sustained by Her Majesty during the period of delay as a result of the work not being completed by the day fixed for its completion.

37.3 The Minister may waive the right of Her Majesty to the whole or any part of the amount payable by the Contractor pursuant to GC37.2 I , in the opinion of the Minister, it is in the public interest to do so.

GC38 Taking the Work Out of the Contractor's Hands

38.1 The Minister may, at his sole discretion, by giving a notice in writing to the Contractor in accordance with GC11, take all or any part of the work out of the Contractor's hands, and may employ such means as he sees fit to have the work completed if the Contractor

38.1.1 Has not, within six days of the Minister or the Departmental Representative giving notice to the Contractor in writing in accordance with GC11, remedied any delay in the commencement or any default in the diligent performance of the work to the satisfaction of the Departmental Representative;

38.1.2 has defaulted in the completion of any part of the work within the time fixed for its completion by the contract;

38.1.3 has become insolvent;

38.1.4 has committed an act of bankruptcy;

38.1.5 has abandoned the work;

38.1.6 has made an assignment of the contract without the consent required by GC3.1; or

38.1.7 has otherwise failed to observe or perform any of the provisions of the contract.

38.2 If the whole or any part of the work is taken out of the Contractor's hands pursuant to GC38.1,

38.2.1 the Contractor's right to any further payment that is due or accruing due under the contract is, subject only to GC38.4, extinguished, and

38.2.2 the Contractor is liable to pay Her Majesty, upon demand, an amount that is equal to the amount of all loss and damage incurred or sustained by Her Majesty in respect of the

Contractor's failure to complete the work.

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

38.4 Her Majesty may pay the Contractor the amount determined not to be required pursuant to GC38.3.

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

39.1 The taking of the work or any part thereof out of the Contractor's hands pursuant to GC38 does not operate so as to relieve or discharge him from any obligation under the contract or imposed upon him by law except the obligation to complete the performance of that part of the work that was taken out of his hands.

39.2 If the work or any part thereof is taken out of the Contractor's hands pursuant to GC38, all plant and material and the interest of the Contractor is all real property, licenses, powers and privileges acquired, used or provided by the Contractor under the contract shall continue to be the property of Her Majesty without compensation to the Contractor.

39.3 When the Departmental Representative certifies that any plant, material, or any interest of the Contractor referred to in GC39.2 is no longer required for the purposes of the work, or that it is not in the interest of Her Majesty to retain that plant, material or interest, it shall revert to the Contractor.

G40 Suspension of Work by Minister

40.1 The Minister may, when in his opinion it is in the public interest to do so, require the Contractor to suspend performance of the work either for a specified or an unspecified period by giving a notice of suspension in wiring to the Contractor in accordance with GC11.

40.2 When a notice referred to in GC40.1 is received by the Contractor in accordance with GC11, he shall suspend all operations in respect of the work except those that, in the opinion of the Departmental Representative, are necessary for the care and preservation of the work, plant and material.

40.3 The Contractor shall not, during a period of suspension, remove any part of the work, plant or material from its site without the consent of the Departmental Representative.

40.4 If a period of suspension is 30 days or less, the Contractor shall, upon the expiration of that period, resume the performance of the work and he is entitled to be paid the extra cost, calculated in accordance with GC48 to GC50, of any labour, plant and material necessarily incurred by him as a result of the suspension.

40.5 If, upon the expiration of a period of suspension of more than 30 days, the Minister and the Contractor agree that the performance of the work will be continued by the Contractor, the Contractor shall resume performance of the work subject to any terms and conditions agreed upon by the Minister and the Contractor.

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

GC41 Termination of Contract

41.1 The Minister may terminate the contract at any time by giving a notice of termination in writing to the Contractor in accordance with GC11.

41.2 When a notice referred to in GC41.1 is received by the Contractor in accordance with GC11, he shall, subject to any conditions stipulated in the notice, forthwith cease all operations in performance of the contract.

41.3 If the contract is terminated pursuant to GC41.1, Her Majesty shall pay the Contractor, subject to GC41.4, an amount equal to

41.3.1 the cost to the contractor of all labour, plant and material supplied by him under the contract up to the date of termination in respect of a contract or part thereof for which a Unit Price Arrangement is stipulated in the contract, or

41.3.2 the lesser of

41.3.2.1 an amount, calculated in accordance with the Terms and Payment, that would have been payable to the Contractor had he completed the work, and

41.3.2.2 an amount that is determined to be due to the Contractor pursuant to GC49 in respect of a contract or part thereof for which a Fixed Price Arrangement is stipulated in the contract

less the aggregate of all amounts that were paid to the Contractor by Her Majesty and all amounts that are due to Her Majesty from the Contractor pursuant to the contract.

41.4 If Her Majesty and the Contractor are unable to agree about an amount referred to in GC41.3 that amount shall be determined by the method referred to in GC50.

GC42 Claims Against and Obligations of the Contractor or Subcontractor

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

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

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

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

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

42.2.3 the consent of the Contractor authorizing a payment.

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

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

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

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

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

Majesty to pay the Contractor.

42.7 The Contractor shall, whenever requested to do so by the Departmental Representative, make a statutory declaration deposing to the existence and condition of any obligations and claims referred to in GC42.6.

42.8 GC42.1 shall only apply to claims and obligations

42.8.1 the notification of which has been received by the Departmental Representative in writing before payment is made to the Contractor pursuant to TP4.10 and within 120 days of the date on which the claimant

42.8.1.1 should have been paid in full under the claimant's contract with the Contractor or subcontractor where the claim is for money that was lawfully required to be held back from the claimant; or

42.8.1.2 performed the last of the services, work or labour, or furnished the last of the material pursuant to the claimant's contract with the Contractor or subcontractor where the claim is not for money referred to in GC42.8.1.1, and

42.8.2 the proceedings to determine the right to payment of which, pursuant to GC42.2. shall have commenced within one year from the date that the notice referred to in GC42.8.1 was received by the Departmental Representative, and

the notification required by GC42.8.1 shall set forth the amount claimed to be owing and the person who by contract is primarily liable.

42.9 Her Majesty may, upon receipt of a notice of claim under GC42.8.1, withhold from any amount that is due and payable to the Contractor pursuant to the contract the full amount of the claim or any portion thereof.

42.10 The Departmental Representative shall notify the Contractor in writing of receipt of any claim referred to in GC42.8.1 and of the intention of Her Majesty to withhold funds pursuant to GC42.9 and the Contractor may, at any time thereafter and until payment is made to the claimant, be entitled to post, with Her Majesty, security in a form acceptable to Her Majesty in an amount equal to the value of the claim, the notice of which is received by the Departmental Representative and upon receipt of such security Her Majesty shall release to the Contractor any funds which would be otherwise payable to the Contractor, that were withheld pursuant to the provisions of GC42.9 in respect of the claim of any claimant for whom the security stands.

GC43 Security Deposit – Forfeiture or Return

43.1 If

43.1.1 the work is taken out of the Contractor's hands pursuant to GC38,

43.1.2 the contract is terminated pursuant to GC41, or

43.1.3 the Contractor is in breach of or in default under the contract,

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

43.2 If Her Majesty converts the contract security pursuant to GC43.1, the amount realized shall be deemed to be an amount due from Her Majesty to the Contractor under the contract.

43.3 Any balance of an amount referred to in GC43.2 that remains after payment of all losses, damage and claims of Her Majesty and others shall be paid by Her Majesty to the Contractor if, in the opinion of the Departmental Representative, it is not required for the purposes of the contract.

GC44 Departmental Representative's Certificates

44.1 On the date that

44.1.1 the work has been completed, and

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

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

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

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

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

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

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

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

44.2.1.2.3 -1% of the balance

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

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

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

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

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

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

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

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

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

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

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

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

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

GC45 Return of Security Deposit

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

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

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

GC46 Clarification of Terms in GC47 to GC50

46.1 For the purposes of GC47 to GC50,

46.1.1 "Unit Price Table" means the table set out in the Articles of Agreement, and

46.1.2 "plant" does not include tools customarily provided by a tradesman in practicing his trade.

GC47 Additions or Amendments to Unit Price Table

47.1 Where a Unit Price Arrangement applies to the contract or a part thereof the Departmental Representative and the Contractor may, by an agreement in writing,

47.1.1 add classes of labour or material, and units of measurement, prices per unit and estimated quantities to the Unit Price Table if any labour, plant or material that is to be included in the Final Certificate of Measurement referred to in GC44.8 is not included in any class of labour, plant or material set out in the Unit Price Table; or

47.1.2 subject to GC47.2 and GC47.3, amend a price set out in the Unit Price Table for any class of labour, plant or material included therein if the Final Certificate of Measurement referred to in GC44.8 shows or is expected to show that the total quantity of that class of labour, plant or material actually performed, used or supplied by the Contractor in performing the work is

47.1.2.1 less than 85% of that estimated total quantity, or

47.1.2.2 in excess of 115% of that estimated total quantity.

47.2 In no event shall the total cost of an item set out in the Unit Price Table that has been amended pursuant to GC47.1.2.1 exceed the amount that would have been payable to the Contractor had the estimated total quantity actually been performed, used or supplied.

47.3 An amendment that is made necessary by GC47.1.2.2 shall apply only to the quantities that are in excess of 115%.

47.4 If the Departmental Representative and the Contractor do not agree as contemplated in GC47.1, the Departmental Representative shall determine the class and the unit of measurement of the labour, plant or material and, subject to GC47.2 and GC47.3, the price per unit therefore shall be determined in accordance with GC50.

GC48 Determination of Cost – Unit Price Table

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

GC49 Determination of Cost – Negotiation

49.1 If the method described in GC48 cannot be used because the labour, plant or material is of a kind or class that is not set out in the Unit Price Table, the cost of that labour, plant or material for the purposes of the contract shall be the amount agreed upon from time to time by the Contractor and the Departmental Representative.

49.2 For the purposes of GC49.1, the Contractor shall submit to the Departmental Representative any necessary cost information requested by the Departmental Representative in respect of the labour, plant and material referred to in GC49.1

GC50 Determination of Cost – Failing Negotiation

50.1 If the methods described in GC47, GC48 or GC49 fail for any reason to achieve a determination of the cost of labour, plant and material for the purposes referred to therein, that cost shall be equal to the aggregate of

50.1.1 all reasonable and proper amounts actually expended or legally payable by the Contractor in respect of the labour, plant and material that falls within one of the classes of expenditure described in GC50.2 that are directly attributable to the performance of the contract,

50.1.2 an allowance for profit and all other expenditures or costs, including overhead, general administration cost, financing and interest charges, and every other cost, charge and expenses, but not including those referred to in GC50.1.1 or GC50.1.3 or a class referred to in GC50.2, in an amount that is equal to 10% of the sum of the expenses referred to in GC50.1.1, and

50.1.3 interest on the cost determined under GC50.1.1 and GC50.1.2, which interest shall be calculated in accordance with TP9,

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

50.2 For purposes of GC50.1.1 the classes of expenditure that may be taken into account in determining the cost of labour, plant and material are,

50.2.1 payments to subcontractors;

50.2.2 wages, salaries and travelling expenses of employees of the Contractor while they are actually and properly engaged on the work, other than wages, salaries, bonuses, living

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

50.2.3 assessments payable under any statutory authority relating to workmen's compensation, unemployment insurance, pension plan or holidays with pay;

50.2.4 rent that is paid for plant or an amount equivalent of the said rent if the plant is owned by the Contractor that is necessary for and used in the performance of the work, if the rent of the equivalent amount is reasonable and use of that plant has been approved by the Departmental Representative;

50.2.5 payments for maintaining and operating plant necessary for and used in the performance of the work, and payments for effecting such repairs thereto as, in the opinion of the Departmental Representative, are necessary to the proper performance of the contract other than payments for any repairs to the plant arising out of defects existing before its allocation to the work;

50.2.6 payments for material that is necessary for and incorporated in the work, or that is necessary for and consumed in the performance of the contract;

50.2.7 payments for preparation, delivery, handling, erection, installation, inspection protection and removal of the plant and material necessary for and used in the performance of the contract; and

50.2.8 any other payments made by the Contractor with the approval of the Departmental Representative that are necessary for the performance of the contract.

GC51 Records to be kept by Contractor

51.1 The Contractor shall

51.1.1 maintain full records of his estimated and actual cost of the work together with all tender calls, quotations, contracts, correspondence, invoices, receipts and vouchers relating thereto.

51.1.2 make all records and material referred to in GC5.1.1 available to audit and inspection by the Minister and the Deputy Receiver General for Canada or by persons acting on behalf of either of both of them, when requested;

51.1.3 allow any of the person referred to in GC51.1.2 to make copies of and to take extracts from any of the records and material referred to in GC51.1.1; and

51.1.4 furnish any person referred to in GC51.1.2 with any information he may require from time to time in connection with such records and material.

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

Minister may direct.

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

GC52 Conflict of Interest

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

GC53 Contractor Status

53.1 The Contractor shall be engaged under the contract as an independent contractor.

53.2 The Contractor and any employee of the said Contractor is not engaged by the contract as an employee, servant or agent of Her Majesty.

53.3 For the purposes of GC53.1 and GC53.2 the Contractor shall be solely responsible for any and all payments and deductions required to be made by law including those required for Canada or Quebec Pension Plans, Unemployment Insurance, Worker's Compensation or Income Tax.

GENERAL CONDITONS

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

GENERAL INSUANCE COVERAGES

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

COMMERCIAL GENERAL LIABILITY

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

BUILDER'S RISK – INSTALLATION FLOATER – ALL RISKS

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

INSURER'S CERTIFICATE OF INSURANCE

General Conditions

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

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

IC 2 Risk Management
(01/10/94)

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

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

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

IC 4 Insurance Coverage
(02/12/03)

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

INSURANCE COVERAGE REQUIREMENTS

PART I
GENERAL INSUANCE COVERAGES (GIC)

GCI 1 Insured
(02/12/03)

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

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

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

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

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

GIC 4 Notification
(01/10/94)

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

PART II
COMMERCIAL GENERAL LIABILITY

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

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

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

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

2.1 Liability arising out of or resulting from the ownership, existence, maintenance or use of premises by the Contractor and operations necessary or incidental to the performance of this contract.

2.2 "Broad Form" Property Damage including the loss of use of property.

2.3 Removal or weakening of support of any building or land whether such support be natural or otherwise.

2.4 Elevator liability (including escalators, hoists and similar devices).

2.5 Contractor's Protective Liability

2.6 Contractual and Assumed Liabilities un this contact.

2.7 Completed Operations Liability – The insurance, including all aspects of this Part II of these Insurance Conditions shall continue for a period of at least one (1) year beyond the date of the Departmental Representative's Final Certificate of Completion for the Completed Operations.

2.8 Cross Liability – The Clause shall be written as follows:

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

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

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

CGL 3 Additional Exposures
(02/12/03)

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

3.1 Blasting

3.2 Pile driving and calsson work

3.3 Underpinning

3.4 Risks associated with the activities of the Contractor on an active airport

3.5 Radioactive contamination resulting from the use of commercial isotopes

3.6 Damage to the portion of an existing building beyond that directly associated with an addition, renovation or installation contract.

3.7 Marine risks associated with the contraction of piers, wharves and docks.

CGL 4 Insurance Proceeds
(01/10/94)

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

CGL 5 Deductible
(02/12/03)

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

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

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

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

BR 2 Property Insured
(01/10/94)

The property insured shall include:

2.1 The Work and all property, equipment and materials intended to become part of the finished Work at the site of the project while awaiting, during and after installation, erection or construction including testing.

2.2 Expenses incurred in the removal from the construction site of debris of the property insured, including demolition of damaged property, de-icing and dewatering, occasioned by loss, destruction or damage to such property and in respect of which insurance is provided by this policy.

BR 3 Insurance Proceeds
(01/10/94)

3.1 Insurance proceeds from this policy are payable in accordance with GC28 of the General Conditions "C" of the contract.

3.2 This policy shall provide that the proceeds thereof are payable to Her Majesty or as the Minister may direct.

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

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

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

BR 5 Deductible
(02/12/03)

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

BR 6 Subrogation
(01/10/94)

The following Clause shall be included in the policy:

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

BR 7 Exclusion Qualifications
(01/10/94)

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

7.1 Faulty materials, workmanship or design may be excluded only to the extent of the cost of making good thereof and shall not apply to loss or damage resulting therefrom.

7.2 Loss or damage caused by contamination by radioactive material may be excluded except for loss or damage resulting from commercial isotopes used for industrial measurements, inspection, quality control radiographic or photographic use.

7.3 Use and occupancy of the project or any part of section thereof shall be permitted where such use and occupancy is for the purpose for which the project is intended upon completion.

INSURER'S CERTIFICATE OF INSURANCE

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

CONTRACT

DESCRIPTION OF WORK	CONTRACT NUMBER	AWARD DATE
LOCATION		

INSURER

NAME
ADDRESS

BROKER

NAME
ADDRESS

INSURED

NAME OF CONTRACTOR
ADDRESS

ADDITIONAL INSURED

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

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

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

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

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

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

CS1 Obligation to provide Contract Security

1.1 The Contractor shall, at the Contractor's own expense, provide one or more of the forms of contract security prescribed in CS2.

1.2 The Contractor shall deliver to the Departmental Representative the contract security referred to in CS1.1 within 14 days after the date that the Contractor receives notice that the Contractor's tender or offer was accepted by Her Majesty.

CS2 Prescribed Types and Amounts of Contract Security

2.1 The Contractor shall deliver to the Departmental Representative pursuant to CS1

2.1.1 a performance bond and a labour and material payment bond each in an amount that is equal to not less than 50% of the contract amount referred to in the Articles of Agreement, or

2.1.2 a labour and material payment bond in an amount that is equal to not less than 50% of the contract amount referred to in the Articles of Agreement, and a security deposit in an amount that is equal to

2.1.2.1 not less than 10% of the contract amount referred to in the Articles of Agreement where that amount does not exceed $250,000, or

2.1.2.2 $25,000 plus 5% of the part of the contract amount referred to in the Articles of Agreement that exceeds $250,000, or

2.1.3 a security deposit in an amount prescribed by CS2.12 plus an additional amount that is equal to 10% of the contract amount referred to in the Articles of Agreement.

2.2 A performance bond and a labour and material payment bond referred to in CS2.1 shall be in a form and be issued by a bonding or surety company that is approved by Her Majesty.

2.3 The amount of a security deposit referred to in CS2.1.2 shall not exceed $250,000 regardless of the contract amount referred to in the Articles of Agreement.

2.4 A security deposit referred to in CS2.1.2 and CS2.1.3 shall be in the form of

2.4.1 a bill of exchange made payable to the Receiver General of Canada and certified by an approved financial institution or drawn by an approved financial institution on itself, or

2.4.2 bonds of or unconditionally guaranteed as to principal and interest by the Government of Canada.

2.5 For the purposes of CS2.4

2.5.1 a bill of exchange is an unconditional order in writing signed by the Contractor and addressed to an approved financial institution, requiring the said institution to pay, on demand, at a fixed or determinable future time a sum certain of money to, or to the order

of, the Receiver General for Canada, and

2.5.2 If a bill of exchange is certified by a financial institution other than a chartered bank then it must be accompanied by a letter or stamped certification confirming that the financial institution is in a t least one of the categories referred to in CS2.5.3

2.5.3 an approved financial institution is

2.5.3.1 any corporation or institution that is a member of the Canadian Payments Association,

2.5.3.2 a corporation that accepts deposits that are insured by the Canada Deposit Insurance Corporation or the Régie de l'assurance-dépôts du Québec to the maximum permitted by law,

2.5.3.3 a credit union as defined in paragraph 137(6)(b) of the *Income Tax Act*,

2.5.3.4 a corporation that accepts deposits from the public, if repayment of the deposit is guaranteed by Her Majesty in right of a province, or

2.5.3.5 The Canada Post Corporation.

2.5.4 the bonds referred to in CS2.4.2 shall be

2.5.4.1 made payable to bearer, or

2.5.4.2 accompanied by a duly executed instrument of transfer of the bonds to the Receiver General for Canada in the form prescribed by the Domestic Bonds of Canada Regulations, or

2.5.4.3 registered, as to principal or as to principal and interest in the name of the Receiver General for Canada pursuant to the Domestic Bonds of Canada Regulations, and

2.5.4.4 provided on the basis of their market value current at the date of the contract.

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
For tender
Security Classification / Classification de sécurité UNCLASSIFIED

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

PART A - CONTRACT INFORMATION / PARTIE A - INFORMATION CONTRACTUELLE

1. Originating Government Department or Organization / Ministère ou organisme gouvernemental d'origine	2. Branch or Directorate / Direction générale ou Direction
National Research Council	ASPM / SAGI
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
Project 5122 - M6 Washroom Renovation

5. a) Will the supplier require access to Controlled Goods? Le fournisseur aura-t-il accès à des marchandises contrôlées?	☑ No Non	☐ Yes Oui
5. b) Will the supplier require access to unclassified military technical data subject to the provisions of the Technical Data Control Regulations? Le fournisseur aura-t-il accès à des données techniques militaires non classifiées qui sont assujetties aux dispositions du Règlement sur le contrôle des données techniques?	☑ No Non	☐ Yes Oui
6. Indicate the type of access required / Indiquer le type d'accès requis		
6. a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets? Le fournisseur ainsi que les employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS? (Specify the level of access using the chart in Question 7. c) (Préciser le niveau d'accès en utilisant le tableau qui se trouve à la question 7. c)	☑ No Non	☐ Yes Oui
6. b) Will the supplier and its employees (e.g. cleaners, maintenance personnel) require access to restricted access areas? No access to PROTECTED and/or CLASSIFIED information or assets is permitted. Le fournisseur et ses employés (p. ex. nettoyeurs, personnel d'entretien) auront-ils accès à des zones d'accès restreintes? L'accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS n'est pas autorisé.	☐ No Non	☑ Yes Oui
6. c) Is this a commercial courier or delivery requirement with **no** overnight storage? S'agit-il d'un contrat de messagerie ou de livraison commerciale **sans** entreposage de nuit?	☑ No Non	☐ Yes Oui

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

Canada ☑	NATO / OTAN ☐	Foreign / Étranger ☐
7. b) Release restrictions / Restrictions relatives à la diffusion		
No release restrictions / Aucune restriction relative à la diffusion ☑	All NATO countries / Tous les pays de l'OTAN ☐	No release restrictions / Aucune restriction relative à la diffusion ☐
Not releasable / À ne pas diffuser ☐		
Restricted to: / Limité à : ☐	Restricted to: / Limité à : ☐	Restricted to: / Limité à : ☐
Specify country(ies): / Préciser le(s) pays :	Specify country(ies): / Préciser le(s) pays :	Specify country(ies): / Préciser le(s) pays :

7. c) Level of information / Niveau d'information

PROTECTED A / PROTÉGÉ A ☐	NATO UNCLASSIFIED / NATO NON CLASSIFIÉ ☐	PROTECTED A / PROTÉGÉ A ☐
PROTECTED B / PROTÉGÉ B ☐	NATO RESTRICTED / NATO DIFFUSION RESTREINTE ☐	PROTECTED B / PROTÉGÉ B ☐
PROTECTED C / PROTÉGÉ C ☐	NATO CONFIDENTIAL / NATO CONFIDENTIEL ☐	PROTECTED C / PROTÉGÉ C ☐
CONFIDENTIAL / CONFIDENTIEL ☐	NATO SECRET / NATO SECRET ☐	CONFIDENTIAL / CONFIDENTIEL ☐
SECRET / SECRET ☐	COSMIC TOP SECRET / COSMIC TRÈS SECRET ☐	SECRET / SECRET ☐
TOP SECRET / TRÈS SECRET ☐		TOP SECRET / TRÈS SECRET ☐
TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) ☐		TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) ☐

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat For tender
Security Classification / Classification de sécurité UNCLASSIFIED

PART A *(continued)* / PARTIE A *(suite)*

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets?
Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS?
If Yes, indicate the level of sensitivity:
Dans l'affirmative, indiquer le niveau de sensibilité :
☑ No / Non ☐ Yes / Oui

9. Will the supplier require access to extremely sensitive INFOSEC information or assets?
Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate?
☑ No / Non ☐ Yes / Oui

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

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

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

☑ 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?
Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail?
☑ No / Non ☐ Yes / Oui

If Yes, will unscreened personnel be escorted?
Dans l'affirmative, le personnel en question sera-t-il escorté?
☑ No / Non ☐ Yes / Oui

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

INFORMATION / ASSETS / RENSEIGNEMENTS / BIENS

11. a) Will the supplier be required to receive and store PROTECTED and/or CLASSIFIED information or assets on its site or premises?
Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS?
☑ No / Non ☐ Yes / Oui

11. b) Will the supplier be required to safeguard COMSEC information or assets?
Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC?
☑ No / Non ☐ Yes / Oui

PRODUCTION

11. c) Will the production (manufacture, and/or repair and/or modification) of PROTECTED and/or CLASSIFIED material or equipment occur at the supplier's site or premises?
Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ?
☑ No / Non ☐ Yes / Oui

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

11. d) Will the supplier be required to use its IT systems to electronically process, produce or store PROTECTED and/or CLASSIFIED information or data?
Le fournisseur sera-t-il tenu d'utiliser ses propres systèmes informatiques pour traiter, produire ou stocker électroniquement des renseignements ou des données PROTÉGÉS et/ou CLASSIFIÉS?
☑ No / Non ☐ Yes / Oui

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

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
For tender
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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 / TRÈS SECRET
Information / Assets / Renseignements / Biens																
Production																
IT Media / Support TI																
IT Link / Lien électronique																

12. a) Is the description of the work contained within this SRCL PROTECTED and/or CLASSIFIED?
La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE?

☑ No / Non ☐ Yes / Oui

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

12. b) Will the documentation attached to this SRCL be PROTECTED and/or CLASSIFIED?
La documentation associée à la présente LVERS sera-t-elle PROTÉGÉE et/ou CLASSIFIÉE?

☑ No / Non ☐ Yes / Oui

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

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat For tender
Security Classification / Classification de sécurité UNCLASSIFIED

PART D - AUTHORIZATION / PARTIE D - AUTORISATION

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

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature
Isabelle D'Amour-Tanguay	Project Manager / Gestionnaire de projet	

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
613-990-1152		isabelle.damour-tanguay@nrc-cnrc.gc.ca	Sept. 8, 2017

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

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature
Richard Bramucci	Analyst, Security in Contracting	

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
(613) 991-1093	(613) 990-0946	richard.bramucci@nrc-cnrc.gc.ca	19 SEP 2017

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

☑ No / Non ☐ Yes / Oui

16. Procurement Officer / Agent d'approvisionnement

Name (print) - Nom (en lettres moulées)	Title - Titre	Signature
Alain Leroux	Senior Proc. Offic	

Telephone No. - N° de téléphone	Facsimile No. - N° de télécopieur	E-mail address - Adresse courriel	Date
613 991-9920		alain.leroux@nrc-cnrc.gc.ca	20-9-2017

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