NRC·CNRC Real Property Planning and Management

SPECIFICATIONS

SOLICITATION #: 23-58252

BUILDING: SAS01,
110 Gymnasium Place,
Saskatoon, SK S7N 5C2

PROJECT: Modifications at the ACRD Laboratory (Saskatoon)

PROJECT #: 6388

Date: July 2024

National Research Council Canada | Conseil national de recherches Canada

Canada

SPECIFICATION

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National Research Council Canada | Conseil national de recherches Canada

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

Construction Tender Form

Project Identification **Modifications at the ACRD Laboratory (Saskatoon)**

Tender No.: 23-58252

1.2 Business Name and Address of Tenderer

Name_____

Address_____

_____

Contact Person (Print Name)_____

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

1.3 Offer

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

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

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

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

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 His 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

BUY AND SELL NOTICE

Modification at the ACRD Laboratory (Saskatoon)

The National Research Council Canada, 110 Gymnasium Place, at Saskatoon has a requirement for a project that includes:

Supply all labour, equipment, tools and accessories required to modify the ACRD laboratory located at 110 Gymnasium Place, Saskatoon, of the National Research Council of Canada.

MANDATORY CRITERIA

EVALUATION PROCEDURES

The construction tender form (bid) will be evaluated and scored in accordance with specific evaluation criteria as detailed herein. It is imperative that these criteria be addressed in sufficient depth in the tender form to fully describe the Proponent's response.

You are invited to submit one electronic Technical Proposal and one electronic Financial Proposal in two separate attachments to fulfil the following requirement forming part of this Request for Proposal. One attachment must be clearly marked 'Technical Proposal' and the other attachment must be marked 'Financial Proposal'. All financial information must be fully contained in the Financial Proposal, and only in the Financial Proposal. Proponents who provide financial information in the technical proposal will be disqualified.

MANDATORY CRITERIA:

The Construction Tender Form (bid) will be evaluated to determine if all mandatory requirements detailed in this Table "Mandatory Criteria" have been met.

Any Tender Form which fails to meet any of the mandatory requirements will be considered non-compliant and will not be given further consideration.

In the table below, include the page number(s) of your bid form that demonstrates you meet that specific requirement.

MANDATORY CRITERIA

Item	Mandatory Criteria	Bid Form Page # (s) *(Proponent to Insert)*
M1	The Bidder must have a minimum of ten (10) years' experience in the last 10 years as a general contractor providing construction services comparable to this tender. Provide two project examples, including approximate value of work and a client reference. Provide a company profile and relevant history. A total of four pages (letter size) maximum for this criteria.	

M2	The Bidder must supply the CV for the proposed company construction site supervisor. The proposed construction site supervisor must possess a minimum of 5 years' experience in the last 5 years in contract/construction administration, as a site supervisor. Two pages (letter size) maximum for this criteria. The site supervisor and the project manager must not be the same person.	
M3	The Bidder must supply the CV for the proposed company project manager. The proposed project manager must possess a minimum of 5 years' experience in the last 5 years in contract/construction administration, as a Project Manager or similar position. Two pages (letter size) maximum for this criteria. The site supervisor and the project manager must not be the same person.	
M4	The bidder must designate an employee to provide EMCS Project Management. The designated employee could either be the Site Supervisor or the Project Manager and shall be empowered to make technical, scheduling, and related decisions on behalf of the EMCS Contractor. Provide a CV underlining the EMCS experience.	

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 CanadaBuys.ca TMA services provider. Addenda, when issued, will be available from the CanadaBuys.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 August 6th, 2024 and August 7th, 2024 at 9:00am MDT. Meet Camélia Kalakhi at the Lobby, 110 Gymnasium Place, Saskatoon. Bidders who, for any reason, cannot attend one of the specified dates 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.**

- At the site visit, to limit contact and risks:
    - The proponents will sanitize their hands at the hand sanitizing station.
    - The proponents will be asked to sign the Attendance Form. It is the responsibility of all proponents to verify information on the Attendance Form.
    - The site visits could take longer than usual, therefore anticipate a longer meeting duration.

- Physical distancing: keeping a distance of at least 2 arms-length (approximately 2 metres) from others may not be possible at all times, therefore the use of NRC issued disposable face coverings to reduce the risk of transmission of COVID-19 is mandatory.

- The proponents shall not impede safe access to and from the facility.

- Proposals submitted by bidders who have not attended the site visit or failed to submit their identification and contact information at the site visit will be deemed non-responsive.

3. CLOSING DATE

Closing date is August 22th, 2024 14:00 EDT

4. TENDER RESULTS

Following the evaluation, the tender results will be sent by email to all Contractors who submitted a tender.

5. SECURITY REQUIREMENT FOR CANADIAN CONTRACTORS

5.1 MANDATORY SECURITY REQUIREMENT:

This procurement contains a mandatory security requirement as follows:

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

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

3. The Contractor must comply with the provisions of the:
    a. Security Requirements Checklist attached at Appendix "D"
    b. Industrial Security Manual (Latest Edition) available at: https://www.tpsgc-pwgsc.gc.ca/esc-src/msi-ism/index-eng.html

5.2 VERIFICATION OF SECURITY CLEARANCE AT BID CLOSING

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

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

3. It is to be noted that any subcontractor required to perform any part of the work during the performance of the subsequent contract must also adhere to the mandatory security

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

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

6. WSIB (WORKPLACE SAFETY AND INSURANCE BOARD)

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

7. OFFICE OF THE PROCUREMENT OMBUDSMAN

1. Clause for solicitation documents and regret letters for unsuccessful bidders

   The Office of the Procurement Ombudsman (OPO) was established by the Government of Canada to provide an independent venue for Canadian bidders to raise complaints regarding the award of federal contracts under $33 400 for goods and under $133 800 for services. Should you have any issues or concerns regarding the award of a federal contract below these dollar amounts, contact OPO by e-mail at boa.opo@boa-opo.gc.ca, by telephone at 1-866-734-5169, or by web at www.opo-boa.gc.ca. For more information about OPO, including the available services, please visit the OPO website.

2. Contract Administration

   The parties understand that the Procurement Ombudsman appointed pursuant to Subsection 22.1 (1) of the Department of Public Works and Government Services Act will review a complaint filed by the complainant respecting the administration of the Contract if the requirements of Subsection 22.2(1) of the Department of Public Works and Government Services Act and Sections 15 and 16 of the Procurement Ombudsman Regulations have been met.

   To file a complaint, the Office of the Procurement Ombudsmai1 may be contacted by e-mail at boa.opo@boa-opo.gc.ca, by telephone at 1-866-734-5169, or by web at www.opo-boa.gc.ca.

3. Dispute Resolution

   The Parties agree to make every reasonable eff01i, in good faith, to settle amicably all disputes or claims relating to or arising from the Contract, through negotiations between the Parties' representatives authorized to settle. If the Parties do not reach a settlement within 10 working days, each party hereby consents to fully participate in ai1d bear the cost of mediation led by the Procurement Ombudsman pt1rsuai1t to Subsection 22.1(3)(d) of the Department of Public Work and Government Services Act and Section 23 of the Procurement Ombudsman Regulations.

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

   The Departmental Representative or his designate for this project is: Camélia Kalakhi
   Camelia.Kalakhi@nrc-cnrc.gc.ca
   Telephone: 343-597-7064

Contracting Authority for this project is: Isabelle Fortin
Isabelle.Fortin@cnrc-nrc.gc.ca

INSTRUCTIONS TO BIDDERS

Article 1 – Receipt of Tender

1a) Tender must be received **by email only** not later than the specified tender closing time. Electronic bids received after the indicated closing time - NRC servers received time - will be irrevocably rejected. Bidders are urged to send their proposal sufficient time in advance of the closing time to prevent any technical issues. NRC will not be held responsible for bids sent before closing time but received by the NRC servers after the closing time. Tenders received after this time are invalid and shall not be considered, regardless of any reason for their late arrival.

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

1c) Bidders may amend their tenders by **email only** provided that such amendments are received not later than the specified tender closing time.

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

All such amendments are to be addressed to:
National Research Council of Canada
Isabelle Fortin, Senior Procurement Officer

Isabelle.Fortin@cnrc-nrc.gc.ca

Article 2 – Tender Form & Qualifications

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

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

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

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

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

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

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

5) A proposal submitted by a bidder who's Board of Directors or proprietor (s) are in majority the same as a former vendor who has declared bankruptcy while performing work for NRC over the last 7-years from the date of issuance of this RFP may be rejected and not eligible for award at NRC's sole discretion. In such case, NRC will advise the ineligible proponent(s).

6) A proposal submitted by a bidder who has had a previous contracts cancelled by NRC due to lack of performance within 3 years from the issuance date of this RFP may be rejected and not eligible for award at NRC's sole discretion. In such case, NRC will advise the ineligible proponent (s).

7) If there is discrepancy between the English version and the French version of this document and any of the attachments and amendments, the English version will takes precedence.

Article 3 - Contract

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

Article 4 – Tender Destination

1a) Tenders are to be submitted **by email only**:
National Research Council Canada

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

The NRC has restrictions on incoming e-mail messages. **The maximum e-mail message size including all file attachments must not exceed 10MB.** Zip files or links to bid documents will not be accepted. Incoming e-mail messages exceeding the maximum file size and/or containing zip file attachments will be blocked from entering the NRC e-mail system. A bid transmitted by e-mail that gets blocked by the NRC e-mail system will be considered not received.

Proposals must not be sent directly to the Contracting Authority or the Project Authority.

All submitted proposals become the property NRC.

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

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

Article 5 - Security

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

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

ii) a bid bond.

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

1c) Bid Security shall accompany each tender or, if forwarded separately from the tender, shall be provided not later than the specified tender closing time. Bid bond or E-bond Security must be in the ORIGINAL form. PDF via email is acceptable. FAILURE TO PROVIDE THE REQUIRED BID SECURITY SHALL INVALIDATE THE TENDER.

1d) The successful tenderer is required to provide security within 14 days of receiving notice of tender acceptance. The tenderer must furnish EITHER:

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

1e) Bonds must be in an approved form and from the companies whose

bonds are acceptable to the Government of Canada. Samples of the approved form of Bid Bond, Performance Bond and Labour and Material Payment Bond and a list of acceptable Bonding Companies may be obtained from the Contracting Officer, National Research Council, Building M-58, Montreal Road, Ottawa, Ontario, K1A 0R6.

Article 7 – Sales Tax

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

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

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

Article 8 – Examination of Site

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

Article 9 – Discrepancies, Omissions, Etc.

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

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

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

Article 10 – No additional Payments for Increased Costs

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

Article 11 – Awards

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

1b) A tenderer may be required to furnish to the Contracting Office, National Research Council of Canada, Building M-58, 1200 Montreal Road, Ottawa, Ontario, K1A 0R6, Canada, unsigned copies of the insurance requirements as covered by the Insurance Conditions of the General Specification.

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

Articles of Agreement

These Articles of Agreement made in duplicate this day of .

Between

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

and

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

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

A1 Contract Documents

(23/01/2002)

1.1 Subject to A1.4 and A1.5, the documents forming the contract between 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

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 His Majesty by

_____

as Senior Contracting Officer

and_____

as_____

of the **National Research Council Canada**

on the_____

day of _____

Signed, sealed and delivered by

_____

as_____and
Position

by_____

as_____
Position

of

on the_____

day of_____

Seal

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.

Pages

SPECIFICATION SECTIONS

DRAWING LIST

END OF TABLE

1. SCOPE OF WORK

.1 Work under this contract covers the ACRD (Aquatic Crop and Resource Development) Laboratory Modifications in the Council's Building at 110 Gymnasium Place in Saskatoon of the National Research Council.

2. DRAWINGS

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

.1 C-E01 Level 3 & Level 4 Electrical Plans – Existing and New
.2 C-E02 Level 3 & Level 4 Electrical Plans
.3 C-M01 Level 3 Mechanical Plans
.4 C-M02 Level 3 Mechanical Schedules and Details

3. COMPLETION

.1 Complete all work within 12 week(s) 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 working days before tender closing.

.3 Certify in writing that the alternative meets all requirements of the specified material or equipment. In addition, it shall be understood that all costs required by or as a result of acceptance or proposed alternatives, will be borne by the Contractor.

.4 Approval of alternatives will be signified by issue of an Addendum to the Tender Documents.

.5 Any alternative manufacturers or materials submitted which are incomplete and cannot be evaluated, or are later than ten (10) working days before tender closing date or after the tender period, will not be considered.

6. MINIMUM STANDARDS

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

.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 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

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

8. DESIGNATED SUBSTANCES

.1 Comply with Provincial legislation if encountering specifically listed designated substances on the work site while performing the work described in these contract documents:

.1 It is the responsibility of the Contractor to ensure that each prospective sub-contractor for this project has received a copy of the listed designated substances which may be present on site.

9. COST BREAKDOWN

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

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

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

.4 Contractor costs associated with compliance with occupational health and safety requirements (Canada Labour Code) related to the Coronavirus/COVID-19 pandemic must be included in the initial bid price. These costs may include, but are not limited to, the provision of additional personal protective equipment (PPE) and social distancing requirements as required to complete the project. Contractor must review and incorporate into initial bid pricing compliance with any Coronavirus/COVID-19 related health and safety guidance issued by the local Medical Officer of Health (applicable in the jurisdiction of the project), the Public Health Agency of Canada, Health Canada and/or the provincial Ministry of Health, as applicable.

10. SUB-TRADES

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

11. PERSONNEL SECURITY AND IDENTIFICATION

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

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

12. WORKING HOURS AND ESCORTING REQUIREMENTS

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

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

~~.3~~ Before scheduling any work outside normal working hours, obtain permission from the 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.

.3 14 day(s) 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 week(s) after contract award.

.2 Submit to Departmental Representative for review a complete list of all shop drawings, product data and samples specified and written confirmation of corresponding delivery dates within one (1) week after shop drawings, product data and samples approval date. This list shall be updated on a 4 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 sample~~s~~ 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 NRC

.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 NRC.

.3 Unless otherwise specified, accept NRC-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 NRC's property caused during construction, at no cost to NRC 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 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°C (50°F) or higher where specified as soon as finishing work is commenced and maintain until acceptance by the Departmental Representative.

.1 Maintain ambient temperature and humidity levels as required for comfort of NRC personnel.

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

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

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

.1 Enforce conformance with applicable codes and standards.

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

.3 Enforce safe practices.

.4 Vent direct-fired combustion units to outside.

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

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

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

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

.3 Saving on contract price.

.4 Provisions relating to guarantees on equipment.

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 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 two (2) bilingual copies of maintenance manuals or two (2) English and two (2) French maintenance manuals and one electronic copy of same immediately upon completion of the work and prior to release of holdbacks.

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

.3 Manuals to include operating and maintenance instructions, 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 all provincial OSH regulations. In the event of any conflict between any provisions in legislation or codes, the most stringent provisions shall apply.

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

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

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

.7 Following a project and site hazard assessment, the Contractor shall develop a Site Specific Safety Plan based on the following minimum requirements. Site Specific Safety Plans must also be robust enough to address any abnormal occurrences, such as, but not limited to: pandemics (COVID-19 or a similar), fire, flooding, inclement weather or other environmental anomalies.

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

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

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

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

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

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

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

2. FIRE SAFETY REQUIREMENTS

.1 Authorities

.1 The Fire Commissioner of Canada (FC) is the authority for fire safety at NRC.

.2 For the purpose of this document, "Departmental Representative" will be deemed as the NRC person in charge of the project and who will enforce these Fire Safety Requirements.

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

1. Standard No. 301 - June 1982 "Standard for Construction Operations"
2. 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 emergency phone numbers which will be provided at the project kick off meeting:
3. When reporting a fire by phone, give the location of fire, building number and be prepared to verify location.

4. The person activating fire alarm pull station must remain at a safe distance from the scene of the fire but readily available to provide information and direction to the Fire Department personnel.

.5 Interior and Exterior Fire protection & Alarm Systems

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

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

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

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

.6 Fire Extinguishers

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

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

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

.3 Provide fire extinguishers equipped as below:

1. Pinned and sealed;
2. With a pressure gauge; and
3. With an extinguisher tag signed by a fire extinguisher servicing company.

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

.7 Roofing Operations

.1 Kettles:

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

1. Contractor shall identify “Designated Roofing Marshall” for duration of construction activities. “Designated Roofing Marshall” shall be responsible for the following:
   .1 Perform NRC Daily Fire and Smoke Risk Hazard Assessment each day prior to commencement of roofing activities.
   .2 Provide completed NRC Daily Fire and Smoke Risk Hazard Assessment to Departmental Representative every morning by email prior to commencement of roofing activities.
   .3 Follow behind any torch activities with a thermal scanner periodically to identify any hot spots and rectify immediately. Intervals for periodic thermal scanning to be as follows: Open Field installation – every 60 minutes, and for Detail areas (eg: curbs, parapets, pipe enclosures, etc.) – every 20 minutes
2. Any proposed changes to “Designated Roofing Marshall” must be reviewed and approved by Departmental Representative.

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

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

.8 Welding / Grinding Operations

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

.9 Fire Watch

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

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

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

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

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

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

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

.11 Rubbish and Waste Materials

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

.2 Do not burn rubbish on site.

.3 Rubbish Containers:

1. Consult with the Departmental Representative to determine an acceptable safe location for any containers and the arrangement of chutes etc. prior to bringing the containers on site.
2. Do not overfill the containers and keep area around the perimeter free and clear of any debris.

.4 Storage:

1. Exercise extreme care when storing combustible waste materials in work areas. Ensure maximum possible cleanliness, ventilation and that all safety standards are adhered to when storing any combustible materials.
2. Deposit greasy or oily rags or materials subject to spontaneous combustion in CSA or ULC approved receptacles and remove at the end of the work day or shift, or as directed.

.12 Flammable Liquids

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

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

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

.4 Transfer of flammable liquids is prohibited within buildings.

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

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

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

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

END OF SECTION

1. General

1.1 INTENT

.1 This section specifies requirements common to all mechanical sections forming part of this specification.

.2 Include all labour, material and equipment required for the installation, testing and placing into operation complete mechanical systems in accordance with the plans and specifications.

.3 Installation to conform with all applicable codes and standards and to the satisfaction of the authorities having jurisdiction including, but not limited to, those listed in this specification.

.4 Refer to the Front End specifications for information relating to bidding and contract requirements, and general requirements. Provide all bonds and surety as may be called for in the Request for Proposal and/or in the General Conditions of the Contract.

.5 Include all PC sums, separate costs, etc., as requested in the bid documents.

.6 Take out and pay for all mechanical permits.

.7 Contract documents are diagrammatic only. They are to establish scope, material, and quality. They are not detailed installation drawings. Minor details usually not shown or specified, and any incidental accessories required for proper installation of the system, are to be included in the work. Pipes and ductwork shall be installed in such a way as to conserve head room and interfere as little as possible with free use of the space through which they pass. All pipes and ductwork which are to be concealed shall be installed neatly and closely to the building structure so that the necessary furring can be kept as small as possible. Supply all miscellaneous metals, such as anchor bolts, expansion bolts, hanger inserts, angles, bars, plates, brackets that are related to the mechanical system installation.

.8 Obtain clarification of the intended work from the Procurement Officer, if required, before submitting bids. Review the site conditions, mechanical bid documents, (including Electrical bid documents) prior to submitting bids and report any discrepancies to the Procurement Officer.

.9 Follow the recommended installation details and procedures for all equipment as found in suppliers' technical data, supplemented by details given herein by these specifications or the drawings. Provide adequate access space for maintenance and service, and clearances required by code and by the Authority Having Jurisdiction.

.10 Install equipment generally in locations and routes shown, close to building structure with minimum interference with other services or free space. Remove and replace improperly installed equipment to satisfaction of NRC at no extra cost.

.11 Connect to equipment specified in other Sections and to equipment supplied and installed by other Contractors or by NRC. Uncrate equipment, move in place and install complete; start-up and test.

.12 The Contractor shall visit the site prior to bid submission and verify existing conditions for renovation and tenant improvement projects. New piping, ductwork and insulation standards shall at least match the existing installation or be higher if specified herein.

.13 Employ tradesmen who are fully qualified and licensed in accordance with Federal, Provincial, and Municipal regulations. Only first class workmanship will be accepted, not only in regards to safety, efficiency, durability, etc., but also in regard to the neatness of detail.

.14 Be responsible for the establishment of all grades and elevations in connection with mechanical equipment, ductwork, piping, drains, etc.

.15 Contractor is responsible to inform the Departmental Representative of job progress and coordinate times for site reviews. Prior to substantial completion of site review, the Contractor is to provide a form certifying work is complete, including a list of work not complete at the time of the site review. Cost for additional site reviews being required due to failure to comply with this requirement, will be charged to the Contractor.

1.2 REFERENCE DOCUMENTS

.1 Installation materials and equipment shall comply with, but not limited to, all Provincial and Municipal regulations, have CSA approval, where applicable, meet the requirements of the following Standards, and bear the required certification stamps or labels and be registered.

1. National Building Code
2. American National Standards Institute (ANSI)
3. American Society of Mechanical Engineers (ASME)
4. American Society for Testing and Materials (ASTM)
5. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
6. American Welding Society (AWS)
7. Canadian General Standards Board (CGSB)
8. Canadian Standards Association (CSA International)
9. Factory Mutual (FM)
10. Manufacturers Standardization Society (MSS)
11. National Electrical Manufacturers Association (NEMA)
12. Sheet Metal and Air Conditioning Contractor’s National Association (SMACNA)
13. Thermal Insulation Association of Canada (TIAC)
14. Underwriters Laboratories Inc (UL)
15. Underwriters Laboratories Canada (ULC)

.2 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.

1.3 RELATED REQUIREMENTS AND WORK SPECIFIED IN OTHER SECTIONS

.1 Failure to review all related project specifications will not constitute a claim for an extra to the contract.

.2 Division 01 – General Instructions

.3 Division 01 – General Fire and Safety Requirements

1.4 QUALITY ASSURANCE

.1 All equipment shall be a product of a manufacturer regularly engaged in the production of units of type and size specified, who issue complete catalogue data, operational and maintenance instructions.

.2 Factory tests shall be completed at the manufacturers' plant prior to shipment to the site.

.3 Manufacturer Qualifications: Company specializing in manufacturing the products specified in this specification with minimum three years' experience.

.4 Check millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

1.5 MATERIALS

.1 Materials and equipment installed shall be new and free from defects, full weight and of quality specified. Use same brand or manufacturer for each specific application.

.2 Any used or existing material or equipment intended for re-use must be inspected by the Departmental Representative, and restored as to proper function and appearance.

.3 Each major component of equipment shall bear manufacturer's name, address, catalogue, and serial number in a conspicuous place.

.4 Replace materials or workmanship below specified quality and relocate work wrongly placed to satisfaction of the Departmental Representative and at no cost to NRC.

1.6 ALTERNATE MATERIALS AND EQUIPMENT

.1 Comply with requirements in Division 01.

.2 Base bids on the products as specified. Product substitutions and alternates are permissible and shall be itemized with the bid giving reasons for the proposed change. Bidders are responsible to ensure substitutions are equivalent or superior in all respects to the specified product(s). Bidders have the sole responsibility for making this determination during the bidding period. Revisions required to adapt accepted equals and alternatives shall be included in the contract price. No increase in the contract price will be considered to accommodate the use of equipment other than that specified. The Departmental Representative reserves the right to accept or reject substitutions during shop drawing review.

.3 The contract documents establish the quality standard. Alternate materials and equipment, to gain approval, must meet these standards.

.4 The Contractor shall, in his quotation, indicate the degree of approval obtained from the Departmental Representative. In the event that the product has been approved as an "Alternate Only", this shall be stated in the quotation and the difference from the base bid price indicated.

.5 Approved equivalents and/or alternatives to specified products shall be equal in performance and materials to the specified product in every respect, operate as intended, meet the space, capacity, and noise requirements outlined.

.6 Submit clear drawings and design records of all resultant alterations required to accommodate alternate material. Submit drawings with related shop drawings to form complete alternate arrangement.

1.7 PROGRESS CLAIMS AND CHANGE NOTICES

.1 All progress claims and pricing for Contemplated Change Notices to be submitted with a complete detailed equipment, material, and labour breakdown applicable to the project for all systems including plumbing, heating, cooling, ventilation & refrigeration, HVAC controls, insulation, balancing, O & M manuals / as-built drawings.

.2 Progress claim breakdown to include contract amount, completed to date, previous claim, claim this month, % complete, balance to complete.

1.8 HOLDBACK

.1 A deficiency holdback will be retained until the final documentation, as-builts, maintenance manuals and related contract close-out requirements are completed.

1.9 SUBMITTALS

.1 Shop Drawings

1. Provide in accordance with Section 00 10 00 - General Instructions.
2. Provide shop drawings in PDF format for all equipment as specified in the equipment sections of this specification or the equipment schedules. All shop drawings are to be legible and shall not include copies of faxed or poor quality information. Identify materials and equipment by manufacturer, trade name and model number. Include copies of applicable brochure or product material. Do not assume applicable product data is available in the Departmental Representative's office. Maintenance and operating manuals are not suitable submittal material. Do not order equipment or material until the Departmental Representative has reviewed and returned shop drawings. Departmental Representative's review will be for conformity with the design concept and criteria. The contractor remains solely responsible for ensuring that the materials meet or exceed the requirements of any and all related construction documents, and that the materials suit the site conditions and fit in the available space.
3. Prior to submission to Departmental Representative, Contractor shall review all shop drawings and indicate, by stamp, date and signature of a responsible person.

.2 Closeout Submittals

1. In accordance with Section 00 10 00 - General Instructions.
2. Submit operations and maintenance data for incorporation into Mechanical Operation and Maintenance Manual.
3. Record Documentation: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors, etc.
4. Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in NRC’s name and registered with manufacturer.
5. Operation Data - Plumbing Systems:
   .1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Indicate frequency of treatment required for interceptors.

.8 Include operations, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

.9 Maintenance Data: Installation instruction, spare parts lists, exploded assembly view, servicing, maintenance, operation, and trouble-shooting instructions for each item of equipment. Data to include schedules of tasks, frequency, tools required, and task time.

1.10 OPERATING AND MAINTENANCE MANUALS

.1 Provide a fully indexed, user-friendly digital copy (PDF).

.2 Index Mechanical Divisions (20, 21, 22, 23, 25) of maintenance manuals according to the following indexing system.

1. Tab 1.0 - Mechanical Systems:
2. Tab 1.2 - Description of Systems:
   .1 Provide complete description of each system. Include detailed system description and components comprising of that system and location of each thermostat or control device.
3. Tab 1.3 - Operating Division:
   .1 Provide complete and detailed operation of each major component.
   .2 Include starting procedure, exact switch and control location. Include how to energize, exact location of switches and controls, operation of controls, including operational sequence, complete troubleshooting sequence if set points cannot be maintained.
   .3 Describe operation of component controls, changes required for summer or winter operation and method of accomplishment.
4. Tab 1.4 - Maintenance and Lubrication Division:
   .1 Maintenance Tasks and Schedules: Provide detailed preventative maintenance and lubrication schedule for each of the major components including daily, weekly, monthly, semi-annual and yearly checks and tasks.
   .2 Tags and Directories: Provide a copy of tag and other directories.
5. Tab 1.5 - List of Equipment Suppliers and Contractors
   .1 Provide complete list of equipment suppliers and contractors, including address and telephone number. Outline procedures for purchasing parts and equipment. Include steps to take in order to purchase new parts.
6. Tab 2.0 - Contract Documentation
   .1 Include copies of:
      .1 Drawings and drawing list

.2 Certifications

.3 Warranties and Bonds

.4 Maintenance Brochures

.5 Field Testing and Start-up Reports

7. Tab Shop Drawings (3.0, 3.1, etc.):

.1 Include final copy of all approved shop drawings and maintenance and installation brochures for all components.

.3 Submit documents to the Departmental Representative for approval prior to substantial completion site review and being turned over to NRC.

1.11 RECORD DRAWINGS

.1 Provide in accordance with Section 00 10 00 - General Instructions.

.2 All deviations from contract to be approved by NRC.

.3 Maintain a set of record drawings, updated daily, consisting of marked-up prints identifying all deviations from the contract documents, location of smoke and fire dampers, control sensors, access doors, tagged valves on floor plans and schematics and actual room names or numbers.

.4 Deviations that are to be recorded shall include, in general, items that are significant or are hidden from view and items of major importance to future operations and maintenance, and to future alterations and additions including cleanouts and isolation valves.

.5 Record drawings for mark-up to be maintained on site, and made available to the Departmental Representative upon request, during site reviews.

.6 As-built information shall be identified on a clean set of drawings in a red or other contrasting colour with changes crossed off and the as-installed clearly marked. Do not use white out.

.7 Provide NRC with three clean marked-up prints of the Record Drawings

1.12 DELIVERY, STORAGE, HANDLING, AND EQUIPMENT PROTECTION

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

.2 Deliver and store materials in original packaging with manufacturer’s labels.

.3 Store components in a clean, dry space until site construction is ready for installation. Protect from exposure to weather conditions, at a temperature and humidity conditions recommended by the manufacturer, and construction work. Handle with care to protect from damage to components, enclosure and finish.

.4 Store and protect from nicks, scratches, and blemishes.

.5 Be responsible for any damage caused to NRC's or other Contractor's work, property or personnel and protect finished and unfinished work from damage. Cover floors and other work with tarpaulins and other protective coverings to prevent damage from oil and grease spillages. Repair all damage to parts of the building resulting from the carrying out of work without expense to NRC. Be responsible for the condition of all material and equipment supplied under this contract and provide all necessary protection for same, until the building has been completed and accepted. Damaged materials shall be rejected.

.6 Ensure that existing equipment is carefully dismantled and not damaged or lost. Do not reuse existing materials and equipment unless specifically indicated.

1.13 WARRANTY

.1 Comply with requirements defined in Section 00 10 00 - General Instructions.

.2 The system provided by the contractor shall be guaranteed free from defects in workmanship and material. If within 12 months from date of substantial completion acceptance, if any systems or equipment installed by the Contractor is proven defective, it shall be repaired or replaced free of charge. Contractor to visit site at end of warranty period and submit report to Departmental Representative.

.3 The period of guarantee specified shall not, in any way, supplant any other guarantees of a longer period provided by manufacturers or as called for in the project documents.

1.14 CUTTING AND PATCHING

.1 Coordinate with the various trades regarding locations of all holes for pipes, ducts, etc., included in the contract before walls and floors are built. Do all drilling for expansion bolts, hanger rods, brackets, supports, etc.. Obtain approval from NRC before drilling and coring of existing structure. Provide X-ray of all required penetrations of the existing floor for locating in-floor rebar and conduit.

.2 Provide fire stopping in full compliance with manufacturer's installation instructions for all piping and ductwork that passes through fire-rated assemblies. Fire stopping to be provided by a certified contractor. Coordinate with the General Contractor.

.3 Patch and make good building where damaged from equipment installation, improperly located holes etc. Use matching materials as specified in the respective section.

1.15 ACCESS DOORS

.1 Provide doors, where required, to gain access to valves, dampers, vents, cleanouts, etc.

.2 Supply hinged access doors for installation by the General Contractor. Access shall be provided for all concealed valves, cleanouts, traps, air vents, balancing & fire dampers, etc.

.3 Where distance from finished wall or ceiling to device requiring access is less than 300 mm (12"), provide a 250 mm x 250 mm (10" x 10") door. Where access distance exceeds 300 mm (12") provide a 600 mm x 600 mm (24" x 24") door.

.4 Doors shall be steel 1.5 mm (17 gauge) door with 1.2 mm (19 gauge) frame for sizes less than 450 mm x 450 mm (18" x 18"). For larger sizes, construct doors of 1.9 mm (14 gauge) steel and frames of 1.5 mm (17 gauge) steel.

.5 Access doors to be baked enamel white.

.6 Provide insulated fire rated access doors where access is required in rated walls or ceilings.

1.16 SITE COORDINATION, SYSTEM LAYOUT, AND INTERFERENCE DRAWINGS

.1 Layout and schedule all work to preclude interference with other work being carried out in the building. Cooperate with and give every facility to the several trades to expedite the installation to the best advantage. Where equipment is to be built in with work of others, supply the equipment on schedule or give measurements to allow the necessary openings and space to be left. The Contractor shall coordinate with the various trades to ensure pipes and ductwork routing is achievable. A thorough examination of the drawings and on-site conditions shall be completed prior to ordering of material and equipment. This includes all mechanical, architectural, electrical, structural, millwork, kitchen drawings, etc. Changes in duct sizing, as required, rerouting of piping or ducts, or any additional fittings or offsets shall be provided as required.

1.17 NRC'S DEMONSTRATION AND TRAINING

.1 Arrange for presentation and demonstration of mechanical equipment and systems by appropriate specialists and ensure that required manufacturer's representatives are in attendance.

.2 Coordinate demonstration and instruction agenda and schedule with NRC and Departmental Representative.

.3 Provide personnel when necessary to ensure proper detailed training is provided for all mechanical systems.

.4 Demonstrate specific starting and stopping, and general maintenance requirements for each major piece of equipment in the form of instruction seminars and contractor guided tour of the facility. Ensure all labelling and identification is completed.

.5 Answer all questions raised by NRC at demonstrations. If unable to satisfactorily answer questions immediately, provide written response within three days.

.6 Provide sign-off sheets for each session. Sign-off sheets to have attendees, date, subject, presentation by, comments, and sign-off acceptance from NRC. Attach the sign-off sheets to the agenda and submit a copy to the Departmental Representative following training seminars.

1.18 CLEANING

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

.2 Clean and touch-up surfaces of shop painted equipment scratched or marred during shipment or installation to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks, and fastening to prevent rusting.

.4 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

.5 Remove recycling containers and bins from site and dispose of materials at appropriate facilities.

1.19 START-UP AND ACTIVATION

.1 Contractor to ensure all systems and equipment are installed, started, and operating in accordance with the manufacturers' installation and operating instructions and the contract documents to the Departmental Representative and NRC's approval and acceptance.

END OF SECTION

1. General

1.1 INTENT

1. This section specifies the requirements that are common to all mechanical sections that are part of this specification.

1.2 SCOPE

1. Sanitary drainage

.1 Domestic water

.2 Piping

.3 Pipe hangers, duct hangers and brackets.

.4 Turn signal, counter-inflation and sleeving for mechanical equipment.

.5 Fire Arrest Sealants

.6 Expansion Compensation

.7 Identification

1.3 RELATED WORK IN OTHER SECTIONS

.1 Section 20 05 00 - General Mechanical Requirements

.2 Section 20 05 80 - Testing, Adjustment and Balancing

.3 Section 20 07 00 - Duct and Piping Insulation

.4 Section 23 00 02 - Heating, Ventilation and Air Cooling

.5 Section 25 05 05 - General SCMO Requirements

2. Product

2.1 PIPES & FITTINGS

1. The following specification indicates the piping and fittings that can be used for the project. The contractor will confirm the specific manufacturer, application and installation requirements as well as warranty limits before selecting and installing a particular product. The Contractor shall ensure that all materials comply with the requirements of the applicable code with respect to the flame propagation of materials and the development of smoke, the use of combustible materials, and the use of materials in fire-resistant assemblies and penetrating assemblies.

.1 The contractor must submit manufacturer's shop drawings for the piping and fixtures proposed to be used in the project.

2. Schedule:

1. The materials and applications permitted for this project must be in strict compliance with the applicable codes that govern the project's installation permits.

Service	*Material*	*Fittings*	*Connections*
Sanitary	DWV Copper	Cast Bronze	Welded 50-50
	PVC Pipe	PVC Socket Weld, Flame Spread Rating 25	Solvent Weld & Primer
Natural gas piping	Polyethylene Pipe	Socket Weld	Fusion Weld
	Copper tubes, type L	Cast copper alloy made of forged copper and bronze	Brazed or flared
Laboratory gases, compressed air	Stainless steel	Seamless	Swagelok Compression Fittings
	Copper water tube type L	Forged Copper	Solder, 95-5-tin antimony
	Aluminum	Aluminum	Mechanical

2.2 HANGERS & PIPE HOLDERS

1. Hangers for piping should be of the ring type or adjustable clevis. Steel for ferrous piping and copper for copper piping. Trapezoidal type hangers can be used when multiple pipes are operating at the same altitude. Provide insulation between copper pipes and steel hangers. The use of perforated metal, wire or chain as a hanger or bracket is not acceptable.

2. All steel hanger rods, hangers, and brackets must be galvanized or factory primed with an alkyd red oxide primer to CGSB 1-GP-40m.

2.3 HANGERS & DUCT BRACKETS

1. Hangers: Galvanized steel iron or laminated angle and 9.5 mm (3/8 in.) rods.

.1 Wall Brackets: Galvanized steel hand iron or fabricated corner bracket.

.2 Vertical Ground Support: Rolling Angle.

2.4 HANGER RODS

.1 Above grade: Provide steel hanger rods, threaded at both ends, threaded at one end, or threaded continuously. All steel hanger rods, hangers, and brackets must be galvanized or factory primed with an alkyd red oxide primer to CGSB 1-GP-40m.

.2 Below grade: Provide stainless steel hanger rods, brackets, nuts and washers.

2.5 SLEEVES

.1 Sleeves must be supplied by the mechanical trade for all pipes passing through fire-resistant walls and floors, and potentially damp floors. Sleeves should be standard weight steel pipe or 1.2mm galvanized steel (18 gauge).

.2 Sleeves for pipes through fire-resistant and fire-resistant floors and walls, and pedopne: Prefabricated fire-resistant sleeves, including joints, UL listed.

.3 Large enough size to allow expansion with continuous insulation.

2.6 FIRESTOP SEALANTS

.1 Coordinate fire shutdown requirements with NRC.

.2 General Purpose Fire Stopping Sealant: Water-based, non-clumping sealant, premixed with intumescent properties, rated for three hours by ASTM E814 and UL 1479.

.3 General Purpose Vibration Resistant Fire Arrest Sealant: Silicone-based, non-clumping, premixed sealant with intumescent properties, resistant to vibration and moisture, rated for three hours by ASTM E814 and UL 1479.

.4 DWV Plastic Pipe Systems Fire Stopping Sealant: Silicone-based premixed sealant with intumescent properties, vibration, and moisture resistant, rated for three hours by ASTM E814 and UL 1479 with metal clamps.

3. Execution

3.1 PIPING PREPARATION

.1 Pipes and tube trains. Clean sway and dirt, inside and out, before assembly. Remove welding slag or other foreign material from the piping. Prepare pipe fittings for equipment with flanges or unions.

.2 Protect all steel pipes when stored on-site from external conditions. Make sure the protective coating remains intact. If, in the opinion of the Departmental Representative, the deterioration of the protective coating has caused corrosion, all rust should be removed down to the bare metal and covered with red oxide paint.

.3 Laboratory piping must follow the installation instructions provided by the piping manufacturer.

3.2 PIPING CONNECTIONS

.1 Provide non-conductive dielectric connections wherever dissimilar metals are joined. Brass adapters and valves are acceptable.

.2 Fabricate screw joints with standard full-cut tapered pipe threads with an approved non-toxic gasket compound or Teflon tape applied only to the male threads.

.3 Make connections to the equipment and branch area with syndicates or flanges.

.4 Manufacture Plain End Pipe Gaskets with Stainless Steel Clamp Type Mechanical Gasket and Fastener.

3.3 PIPE ROUTES AND SLOPES

1. Route piping in an orderly manner and maintain proper slopes. Install to maintain headroom and interfere with space usage as little as possible. Run exposed piping parallel to the walls. Group piping at common elevations whenever possible. Install concealed pipes near the building structure to minimize furring.

3.4 PIPING INSTALLATION

.1 Install piping to allow expansion and contraction without stressing the pipe, joints, or connected equipment. Provide flexible pipe connections, expansion joints and compensators, pipe loops, oscillating joints, and offsets.

.2 Provide clearance in hangers and structure and other equipment for proper installation of insulation and for access to valves, fittings, air vents, drains and unions.

.3 Prepare exposed, unfinished pipes, fittings, brackets, and fixtures ready for topcoat.

.4 Test all piping systems in accordance with industry standards. Hydro-test all liquid systems; air or nitrogen test gas systems. Test at least 1-1/2 times the operating pressure for at least 2 hours, or as required by code.

3.5 HANGERS & PIPE HOLDERS

.1 Brackets & Hangers

1. Hangers and brackets should secure the pipe in place, maintain slope by adjustment, allow for expansion, and look neat. Install strength and rigidity brackets to accommodate the load without unduly stressing the structure.
2. Provide hangers and brackets to secure equipment in place, prevent vibration, maintain grade. Anticipate expansion and contraction and accommodate insulation; Provide insulating protective saddles.
3. Install strength and rigidity brackets to accommodate the load without unduly stressing the building. Place next to equipment to avoid undue stress in piping and equipment.
4. Select hangers and brackets for service and in accordance with the manufacturer's recommended maximum load. Hangers should have a safety factor of 5:1.
5. Attach the hangers and brackets to the building structure or inserts in the concrete construction.
6. Install hangers to provide at least 15 mm (1/2 in.) of clear space between the finished siding and adjacent work.
7. Place a hanger within 300 mm (12 in) of each horizontal elbow.
8. Use hangers that are vertically adjustable to a minimum of 40 mm (1-1/2 in.) after the piping has been erected. Design hangers for pipe movement without disengagement from the supported pipe.
9. When several pipes can be installed in parallel and at the same altitude, provide multiple or trapezoidal hangers.

3.6 LOW-VELOCITY HANGERS AND DUCT BRACKETS

.1 Provide duct hangers and brackets with galvanized material in accordance with the SMACNA manual, latest edition.

3.7 IDENTIFICATION

.1 Coordinate color coding of piping and equipment

.2 Label the automatic controls, instruments and relays, and the key to control the pattern on which the instruments are numbered in order.

1. Ducts

Service	Background color	Lettering color	Label Legend
Supply air	Blue	White	SUPPLY AIR
Exhaust air	Blue	White	EXHAUST AIR

END OF SECTION

1. General

1.1 SCOPE

.1 Balance, adjust, and test air systems and equipment and submit reports using identical units to those shown on contract documents.

.2 Pay costs associated with starting, testing, adjusting, balancing, and cleaning, including supply of instruments, equipment, supplies, and consumable materials.

.3 Inspect, start and test each piece of mechanical equipment and system. Verify that equipment has been properly installed and is operating at a level which meets specified requirements.

.4 Test all piping and duct systems.

1.2 RELATED WORK IN OTHER SECTIONS

.1 Section 20 05 00 - General Mechanical Requirements

.2 Section 20 05 20 - Basic Materials and Methods

.3 Section 23 00 02 - Air Heating, Ventilation, and Cooling

1.3 QUALITY ASSURANCE

.1 Testing and balancing shall be performed by an agency that specializes in this type of work. Air balancing company shall be NEBB certified.

.2 Venturi Airflow Control Valves shall be balanced by Aircuity Inc.

.3 Use personnel for starting, testing, adjusting and balancing procedures who have experience in mechanical equipment and systems commissioning, and are able to interpret results of readings and tests and report state of systems in a clear and concise manner.

.4 Balancing of both air and liquid systems and sound level readings shall be performed by the same agency.

.5 Balancing procedures shall be in accordance with SMACNA and ASHRAE Standards.

.6 Test procedures in accordance with applicable portions of ASME, ASHRAE, and other recognized test codes as far as field conditions permit.

.7 Test equipment and material where required by specification or authority having jurisdiction to demonstrate its proper and safe operation.

.8 Begin testing and balancing after systems has been completed and are in full working order. Place systems and equipment into full operation and continue operation during each working day of testing and balancing.

.9 During one year warranty period NRC may request recheck, or resetting of outlets or fans as listed in test report. Provide technicians and instruments required.

.10 Procedures, in general, shall be in accordance with Associated Air Balance Council National Standards for Field Measurement and Instrumentation - Total System Balance.

1.4 SUBMITTALS

.1 Obtain certificates of approval, acceptance, and comply with rules and regulations from authorities having jurisdiction and include in Operating and Maintenance Manuals.

.2 Perform tests as specified and upon completion of mechanical installation. Provide certification of tests with detailed data as required. Itemize each test as to time performed and personnel responsible. Include in Operating and Maintenance Manuals.

.3 Include types, serial number and dates of calibration of instruments.

1.5 MANUFACTURER'S RECOMMENDATIONS

.1 Prior to starting equipment or systems, obtain and review manufacturer's installation, starting and operating instructions. Read in conjunction with procedures specified herein.

.2 Use manufacturer's and supplier's trained personnel where specified and as required to maintain validity of manufacturer's warranty.

.3 Compare actual installation with manufacturer's recommended installation. Record discrepancies. Correct deviations detrimental to equipment performance prior to starting equipment.

1.6 BALANCE REPORT

.1 The report is to include all information available (i.e., fan curves and pump curves with design data plotted, distribution drawings, technical data, descriptive data, etc.).

.2 Provide digital copies of final reports to contractor to include in NRC's Operating and Maintenance Manuals.

.3 Include types, serial number, and dates of calibration of instruments in the reports.

1.7 SYSTEM DATA

.1 Reports shall include balance and equipment installation, design, and recorded data listed.

.2 Include the following:

1. Air Handling Equipment
   - .1 Manufacturer and model
   - .2 Size
   - .3 Motor type, kW (HP), r/min, voltage, phase, cycle and running full load amperage
   - .4 Location and local identification data
   - .5 Static pressure
   - .6 Inlet and outlet, dry and wet bulb temperatures
2. Duct Air Quantities - All mains supplying more than 10% of volume, outside air and exhaust (maximum and minimum) major return air openings back to duct shafts
   - .1 Duct design air flow rate

3. Air Inlets and Outlets
   - .1 Outlet identification location and designation
   - .2 Design and recorded velocities
   - .3 Design and recorded air flow rates

2. Products

2.1 INSTRUMENTS

.1 Provide testing instruments and equipment and ancillary equipment such as two-way radios and ladders required to perform starting, testing, adjusting, and balancing of mechanical equipment and systems. Use accurate instruments for measurement.

.2 Recalibrate instruments at frequency recommended by instrument manufacturer or, in absence of manufacturer's recommendations, as required by Associated Air Balance Council (AABC). Provide calibration histories for each instrument. Recalibration or use of other instruments may be requested when accuracy of reading is questionable.

3. Execution

3.1 GENERAL PROCEDURE

.1 Do not conceal or cover equipment or systems until inspected, tested and approved.

.2 Permanently mark, by stick-on labels and/or fluorescent paint, settings on valves, splitters, dampers, and other adjustment devices.

.3 Balancing shall be performed to the following accuracies:

1. Air - terminal outlets ±10% (outlets less than 200 L/s (425 cfm))
2. Air - terminal outlets ±5% (outlets greater than 200 L/s (425 cfm))

.4 Balancing contractor shall advise mechanical contractor of required revised pulleys, sheaves, belts, and impeller shavings and coordinate replacements, as required, to allow proper balancing of systems.

.5 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.

3.2 COORDINATION

.1 Prior to commencement of each particular testing procedure, coordinate all sub-trades, manufacturers, suppliers and other specialties to ensure all phases of work are properly completed. Establish necessary manpower requirements.

3.3 AIR SYSTEM PROCEDURES

.1 Perform balancing, adjusting, and testing with building doors and windows in their normal operation position.

.2 When balancing air outlets:

1. Rough balance furthest outlets and then balance sequentially back to source.

2. Fine balance furthest outlet back to source.

.3 Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control only by duct internal devices such as dampers and splitters.

.4 Vary total system air quantities by adjustment of fan speeds. Vary branch air quantities by damper regulation.

.5 Verify all terminal unit factory settings for maximum air flow (and minimum if applicable). Adjust terminal unit controller if required. Record adjusted units.

.6 The final balanced condition of each area shall include testing and adjusting of pressure conditions. Test and record building pressurization levels in variable volume systems throughout full range of fan delivery rates, under both heating and cooling conditions. For multi-storey building test pressure conditions at ground, intermediate and upper levels. Front doors, exits, elevator shafts, should be checked for air flow so that exterior conditions do not cause excessive or abnormal pressure conditions. Document abnormal building leakage conditions noted.

.7 Measure air quantities at each air inlet and outlet.

3.4 PRESSURE TESTING OF PIPES AND DUCT SYSTEMS

.1 Provide equipment, materials and labour for tests and pay expenses. Use test instruments by approved laboratory or manufacturer and furnish certificates showing degree of accuracy. Install permanent gauges and thermometers used for tests just prior to tests to avoid possible changes in calibration.

.2 Verify that:

1. All valves are accessible.
2. Instrument tappings are accessible, and adequate clearance has been provided to attach instruments.
3. Major pieces of equipment are serviceable and connected to system with flanges or unions, etc.
4. All pipe expansion has been allowed for.

.3 Carry out pipe and system pressure tests for 8 hour period and maintain pressure with no appreciable pressure drop. Where leakage occurs, repair and retest.

.4 Drainage systems: Test by filling with water to produce water pressure of 35 kPa (5 psi) minimum and 69 kPa (10 psi) maximum. Check for proper grade and obstruction by ball test.

.5 Laboratory and Compressed air: Test piping to 1.1 times operating pressure with air or nitrogen. Maintain pressure for 24 hours with maximum 10 kPa (1.5 psi) pressure drop.

.6 Ductwork: Test for tightness in accordance with SMACNA manuals for the particular duct construction classification and prove airtight before being covered or concealed.

.7 Low velocity ducts: Test for tightness such that leakage is inaudible and not detectable by feel.

.8 Check systems during application of test pressure including visual check for leakage of water test medium, soap bubble test for air or nitrogen test medium and halide torch for refrigerant medium.

.9 Should tests indicate defective work or variance with specified requirements, make changes immediately to correct the defects. Correct leaks by re-making joints in screwed fittings, cutting out and rewelding welded joints, remaking joints in copper lines. Do not caulk.

3.5 BALANCING REPORT

.1 Submit draft copies of rough balancing reports prior to final acceptance of project.

.2 Include types, serial number, and dates of calibration of instruments.

.3 Record test data on a sepia made from the latest available revised set of mechanical drawings and submit three copies upon completion of the balancing contract for inclusion in equipment and maintenance manuals.

.4 Submit with report with operating conditions plotted.

END OF SECTION

1. General

1.1 SCOPE

.1 Duct thermal insulation and piping insulation.

.2 Adhesive, tie wires, tapes.

.3 Recovery jackets.

1.2 RELATED WORK IN OTHER SECTIONS

.1 Section 20 05 00 - General Mechanical Requirements

.2 Section 20 05 20 - Basic Materials and Methods

.3 Section 22 05 00 - Plumbing Systems

.4 Section 23 00 02 - Air Heating, Ventilation, and Cooling

1.3 QUALITY ASSURANCE

.1 Insulation materials shall be new, undamaged, and of the respective types specified for each specific application.

.2 Insulation shall be installed by skilled workmen regularly engaged in this type of work, and have experience with work of similar complexity and size as required for this project.

.3 Materials shall meet fire & smoke hazard ratings as stated in this section & defined in the National Building Code.

1.4 JOB CONDITIONS

.1 Deliver material to job site in original non-broken factory packaging, labelled with manufacturer's density and thickness.

.2 Perform work at ambient and equipment temperatures as recommended by the adhesive manufacturer. Make good separation of joints or cracking of insulation due to thermal movement or poor workmanship.

1.5 ALTERNATE MATERIALS AND EQUIPMENT

.1 Alternative insulations are subject to approval. Alternatives shall provide the same thermal resistance within 10%, at normal conditions as material specified.

1.6 DEFINITIONS

.1 For the purposes of this Section, the following definitions apply to piping and ductwork:

1. Concealed: systems and equipment in trenches, shafts, furring, suspended ceilings, and attics.
2. Exposed: systems and equipment in mechanical room or otherwise not “concealed”.
3. "k" Value: thermal conductivity of insulating material per unit of thickness (W/m°C) to ASTM C553.

2. Products

2.1 GENERAL

.1 Adhesives, Insulation, Recovery Materials, Tapes, and Vapour Barrier Facings: Composite fire and smoke hazard ratings shall not exceed 25 for Flame Spread and 50 for Smoke Developed. Adhesives shall be waterproof.

.2 Recovery Jackets: to have flame spread rating not exceeding 25 and smoke developed classification of not more than 50, as supplied by S. Fattal Cotton Inc.

.3 Insulating materials and accessories shall withstand service temperatures without smoldering, glowing, smoking or flaming when tested in accordance with ASTM C411.

2.2 MATERIALS

.1 Insulation, Jacketing, and Accessories

1. Flexible, rigid, or semi-rigid mineral fibre insulation and jacket to applicable ASTM and CAN/CGSB standards.
   - .1 Ductwork.
     - .1 Duct (round / oval): flexible mineral fibre blanket
     - .2 Duct (rectangular): rigid mineral fibre
     - .3 Duct (exposed to outdoors): semi-rigid mineral fibre
     - .4 Acoustic: rigid mineral fibre acoustical with 48 kg/m^3 (3.0 lb/ft^3) density and air stream side coated
2. Adhesive tape: vapour barrier or vapour resistant tape consisting of aluminum foil or service jacket material with pressure sensitive self-adhesive.
3. Quick setting adhesive for joints and lap sealing
4. Plain weave fire retardant washable canvas or stucco embossed aluminum recovery material.
5. Factory applied all service jacketing (ASJ) on all piping insulation
6. Service temperature to suit application.

3. Execution

3.1 INSTALLATION

.1 Apply insulation after required system tests have been completed, witnessed, and certified.

.2 Ensure surfaces are clean and dry before insulating.

.3 Install in accordance with TIAC Mechanical Insulation Best Practices Guide.

.4 Install in accordance with manufacturers' recommendations.

.5 Provide ASJ covering on all piping insulation with preformed fitting insulation with PVC covering.

.6 Provide canvas recovering jackets on indoor exposed insulation and waterproof aluminum jacket on piping exposed to outdoors.

.7 Provide white PVC recovery material and pre-molded fitting covers on exposed insulated piping in wet environments.

3.2 INSULATION THICKNESS SCHEDULE

Piping, Duct, and Mechanical Room Equipment	Thickness mm (inch)	Type
Supply and exhaust air ductwork - All sizes	25 (1)	Acoustic (where shown on drawings

END OF SECTION

1. General

1.1 INTENT

.1 Equipment and materials that need to be supplied and installed relating to air systems that provide heating, ventilation, and cooling.

1.2 SCOPE

.1 Provide complete and operable systems including all materials and equipment as required and indicated on the drawing floor plans and equipment schedules.

1.3 RELATED WORK IN OTHER SECTIONS

.1 Section 20 05 00 - General Mechanical Requirements

.2 Section 20 05 20 - Basic Materials and Methods

.3 Section 25 05 05 - EMCS General Requirements

1.4 DEFINITIONS

.1 Air system: includes central equipment; supply, return and exhaust fans, coils, dampers, turning vanes, grilles, diffusers, high, medium and low pressure ductwork (supply, return and exhaust) that is associated with an air handling system.

.2 Low Pressure: Static pressure in duct less than 0.5 kPa (2” wg) and velocities less than 10 m/s (1970 fpm).

.3 Duct Sizes: Inside clear dimensions. For acoustically lined or internally insulated ducts, maintain sizes inside ducts

.4 Plenum: site fabricated acoustic panel wall for built-up air systems.

1.5 QUALITY ASSURANCE

.1 Provide equipment produced by a recognized manufacturer who maintains a local service agency and parts stock.

.2 Equivalent selections must have air flow rates, external static pressures, water flow rates, coil face velocities, filter face velocities, and water and air side pressure drops that equal or exceed specified performance.

.3 Start-up of equipment shall be executed by manufacturer's personnel. Submit a complete manufacturer's check list of field start-up tests.

.4 Certify that the equipment has been field tested and ready for start-up, including sign-off by the manufacturer’s field representative.

.5 Ductwork

1. Ductwork shall meet the requirements of NFPA 90A, Air Conditioning and Ventilating Systems, NFPA No. 90B, Standard for the Installation of Warm Air Heating and Air Conditioning Systems
2. and ASHRAE handbooks.
3. Protect ductwork from dust and internal contamination during fabrication and installation. Cover openings and seal tight. Wipe down all accessible interior duct plenums and unit surfaces prior to start-up.

4. If, in the opinion of the NRC and Departmental Representative, the ductwork has not been properly protected and cleaned prior to start-up it shall be cleaned by firms specializing in this type of work and all costs incurred by the Contractor.

.6 Ductwork Accessories

1. Fire dampers shall be UL listed and constructed in accordance with CAN/ULC-S112, Fire Test of Fire Damper Assemblies.
2. Fusible links on fire dampers shall be constructed to ULC S505.
3. Demonstrate resetting of fire dampers to authorities having jurisdiction and Departmental Representative.
4. Access doors shall be UL labelled.
5. Accessories shall meet the requirements of NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
6. Fabricate in accordance with ASHRAE handbooks and SMACNA duct manuals.

.7 Air Outlets

1. Air flow tests and sound level measurement shall be made in accordance with applicable ADC equipment test codes and ASHRAE standards.
2. Unit ratings shall be approved by ADC.
3. Manufacturer shall certify catalogued performance and ensure correct application of air outlet types.

1.6 ALTERNATE MATERIALS AND EQUIPMENT

.1 In accordance with *Section 20 05 00 - General Mechanical Requirements*

1.7 DELIVERY, STORAGE, HANDLING AND EQUIPMENT PROTECTION

.1 In accordance with *Section 20 05 00 - Mechanical General Requirements*.

.2 Prior to shipment, comply with the following procedures to ensure equipment delivered to site is clean and protected.

1. Thoroughly clean interior and exterior of the equipment.
2. Vacuum interior of equipment to remove all dust, metal shavings and debris.
3. Wipe down all surfaces with isopropyl alcohol, removing excess caulking.
4. Clean and repaint any scratched surfaces, inside and out.
5. Protect equipment and materials from rain and other sources of moisture during shipping and on-site storage.
6. Identify each module with permanent marker to indicate project, work order number and section identification for staging and installation.

.3 As a minimum, ship product in factory fabricated protective containers with factory installed structural base and lifting lugs.

1.8 SUBMITTALS

.1 In accordance with *Section 20 05 00 - General Mechanical Requirements*

2. Products

2.1 DUCTWORK

.1 Materials

1. Ducts: Galvanized steel lock forming quality, having galvanized coating to ASTM A653M, G90 designation for both sides.
2. Fasteners: Use rivets and bolts throughout; sheet metal screws accepted on low pressure ducts.
3. Sealant: Water resistant, fire resistive, compatible with mating materials.
4. Flexible Ducts: Corrugated aluminum or fabric supported by helically wound steel wire or flat steel strips.

.2 Fabrication

1. Complete metal ducts with themselves with no single partition between ducts. Where width of duct exceeds 450 mm (18") cross break for rigidity. Open corners are not acceptable.
2. Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth duct interior.
3. Construct tees, bends, and elbows with radius of not less than 1 1/2 times width of duct on centre line. Where not possible and where rectangular elbows used, provide approved type air foil turning vanes. Where acoustical lining is provided, provide turning vanes of perforated metal type with fibreglass inside.
4. Increase duct sizes gradually, not exceeding 15 degree divergence wherever possible. Maximum divergence upstream of equipment to be 30 degree and 45 degree convergence downstream.
5. Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate or sag. Caulk duct joints and connections with sealant as ducts are being assembled.
6. Provide easements where low pressure ductwork conflicts with piping and structure where easements exceed 10% duct area, split into two ducts maintaining original duct area.
7. Provide necessary baffling in mixed air plenums to ensure good mixed air temperature with variations of not more than ± 15°C (± 8°F) under all operating conditions.
8. Fabricate continuously welded medium and high pressure round and oval duct fittings of one gauge heavier than gauges indicated for duct size. Joints shall be 100 mm (4") cemented slip joint, brazed or electric welded. Prime coat welded joints. Fabricate elbows of five piece construction. Provide standard 45° take-offs unless otherwise indicated where conical 90° tee take-off connections may be used. Adequately brace with truss couplings or comparison angle flanges with asbestos gaskets bolted at 150 mm (6") centers.

2.2 ALTERNATIVE DUCT SIZES

.1 Size round ducts installed in place of rectangular ducts indicated from ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration of sizes permitted except by written permission.

2.3 DUCTWORK ACCESSORIES

.1 Access Doors

1. Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and suitable quick fastening locking devices. Install minimum 25 mm (1") thick insulation with suitable sheet metal cover frame for insulated ductwork.
2. Fabricate with two butt hinges and two sash locks for sizes up to 450 mm (18"), two hinges and two compression latches with outside and inside handles for sizes up to 600 x 1200 mm (24" x 48") and an additional hinge for larger sizes.

.2 Fire Dampers

1. Fabricate of galvanized steel or prime coated black steel weighted to close and lock in closed position when released by fusible link.
2. Fire dampers shall be curtain type.
3. Curtain type fire dampers shall have blades retained in a recess so free area of connecting ductwork is not reduced.
4. Fusible links shall be set for 72°C (162°F).

.3 Balancing and Control Dampers

1. Fabricate of galvanized steel, minimum 1.6 mm (16 gauge), and provide with quadrants or adjustment rod and lock screw.
2. Fabricate splitter dampers of double thickness sheet metal to streamline shape, properly stiffened to avoid vibration. Size on basis of straight air volume proportioning.
3. Fabricate single blade dampers for duct sizes to 250 mm (10").
4. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 300 x 1800 mm (12" x 72"). Assemble center and edge crimped blade in prime coated or galvanized channel frame with approved type hardware.
5. Construct damper blades for medium and high pressure systems to block air passage 70% maximum. Provide complete with locking type handles.
6. Fabricate multi-blade, parallel action gravity balanced backdraft dampers with blades a maximum of 150 mm (6") width having felt or flexible vinyl sealing edges, linked together in rattle-free manner and with adjustment device to permit setting for varying differential static pressure.
7. Damper handle length to allow for thickness of duct insulation.

.4 Flexible Connections

1. Fabricate of approved neoprene coated flameproof fabric approximately 50 mm (2") wide tightly crimped into metal edging strip and attach to ducting and equipment by screws or bolts at 150 mm (6") intervals.

2.4 AIR OUTLETS

.1 General

1. Provide all grilles, diffuser, louvres, and roof hoods as per the equipment schedules and drawings.
2. Provide supply outlets with sponge rubber seal around the edge.

3. Provide baffles to direct air away from walls, columns or other obstructions within the radius of diffuser operation.
4. Provide plaster frame for diffusers located in plaster surfaces.
5. Provide anti-smudge frames or plaques on diffusers located in rough textured surfaces such as acoustical plaster.

3. Execution

3.1 GENERAL

.1 Refer to *Section 20 05 20 - Basic Materials and Methods* for general execution and product requirements not specifically noted in this section.

3.2 DUCTWORK

.1 Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pivot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

.2 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

.3 Connect terminal units to medium or high pressure ducts with 300 mm (12") maximum length of flexible duct. Do not use flexible duct to change direction.

.4 Connect diffusers or troffer boots to low pressure ducts with a cushion head or a 1.5 metres (5 feet) maximum length of flexible duct. Refer to detail on mechanical drawings. Hold in place with caulking compound and strap or clamp.

.5 Low Pressure Duct Thicknesses (Minimum)

1. Rectangular Ducts

Maximum Width	mm (gauge)
Up to 300 mm (12")	0.6 (24)
330 mm to 760 mm (13" to 30")	0.8 (21)
790 mm to 1370 mm (31" to 55")	0.8 (21)
1400 mm to 2130 mm (56" to 85")	1.0 (19)
2160 mm (86") and Over	1.2 (18)

2. Round Ducts

Duct Diameter	mm (gauge)
Up to 330 mm (13")	0.6 (24)
350 mm to 550 mm (14" to 22")	0.8 (21)
580 mm to 1270 mm (23" to 51")	0.8 (21)
1300 mm to 1520 mm (52" to 60")	1.2 (18)
1550 mm to 2130 mm (62" to 85")	1.6 (16)

3.3 DUCTWORK ACCESSORIES

.1 Provide adequately sized access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Review locations prior to fabrication.

.2 Provide 100 x 100 mm (4” x 4”) quick opening access doors for inspection at balancing dampers.

.3 Provide fire dampers at locations indicated on drawings. Fire dampers shall be complete with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings, and hinges.

.4 At each point where ducts pass through partitions, the joints around the duct shall be sealed with non-combustible material.

.5 Provide balancing dampers at points on low pressure supply, return and exhaust systems where branches are taken from larger duct as required for proper air balancing.

.6 Install balancing dampers in accessible locations or provide access doors.

.7 Ensure damper operator and locking device are not concealed with duct insulation.

.8 Install ducts associated with fans and equipment subject to forced vibration with flexible connections, immediately adjacent to equipment and where indicated on the drawings.

.9 For connections to medium and high pressure fans, install 12 mm (1/2") thick neoprene pad over fabric and hold in place with additional metal straps.

3.4 ACCESS DOORS

.1 Install additional access doors required to complete the duct cleaning operations specified in this section.

.2 Install 30 mm (1-3/16”) (maximum) OD access points with covers in the following ductwork locations:

1. At base of all duct risers
2. On both sides of turning vanes in all ducts
3. At each fire damper location
4. On each side of all heating and cooling coils

.3 At all locations of internally duct mounted equipment or devices including balancing dampers, automatic dampers, damper motors and controls

3.5 AIR OUTLETS

.1 Positions indicated on drawings are approximate only. Check location of outlets and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.

.2 Sizing

1. Size outside air openings as indicated on drawings.
2. Size air outlets as indicated on drawings.

3.6 DUCTWORK TESTING

.1 Refer to *Section 20 05 80 - Testing, Adjusting, Starting, and Balancing*.

3.7 PERFORMANCE

.1 Refer to equipment schedules on the mechanical drawings.

END OF SECTION

1. General

1.1 ACCEPTABLE CONTRACTORS

.1 All Controls work shall be performed by Johnson Controls Inc.

1.2 INTENT

.1 This Section specifies general requirements common to all Energy Management Control System (EMCS) work. Read this Section in conjunction with all Sections that specify EMCS work.

.2 The intent of this contract is to provide a system to provide satisfactory temperature control by manipulation of hydronic system temperatures, air handling unit supply air temperature control, and room temperature zone control to react to varying solar loads and space temperatures and pressures.

.3 All control programming is the responsibility of the contractor. Control sequences and programming shall be in accordance with general industry practice. Control features to include outdoor/indoor scheduling, space temperature feedback, based on weather prediction/historical trends, and include alarming, trending, time delays, and run time totalization.

.4 Ensure the system is fully operational with all safeguards and interlocks to provide a fail safe operation. Provide full service and operation of the facility for one full year concurrent with the warranty.

.5 Control sequences are the responsibility of the Control Contractor, to be developed in consultation with the Engineer during the shop drawing preparation stage and will be reviewed by the Engineer during the shop drawing review.

.6 The contractor shall review these documents and provide all point connections, as required, for a complete and workable system.

.7 Provide all wiring in accordance with industry standard in full accordance with the Canadian Electrical Code. Wiring in Mechanical rooms and in areas subject to physical damage to be in conduit except for final connections to devices, which may be exposed. Wiring in other areas may be exposed and must be securely tied to the building elements. Provide wiring that meets the code required flame spread and smoke development classification.

.8 Identify all equipment panels, controllers, field points, devices, sensors, actuators, and wiring.

.9 Provide modifications to the ECMS graphics to accurately represent the equipment and control zones as per plans.

1.3 REGULATORY REQUIREMENTS

.1 Comply with the local Electrical Protection Act and rules and regulations made pursuant thereto, including the Canadian Electrical Code.

.2 Unless otherwise indicated, all references to "Canadian Electrical Code" or "CEC" shall mean the edition of the Canadian Electrical Code, Part I, CSA C22.1, and the variations made thereto by Alberta regulation, which are in force on the date of bid closing for the Contract.

.3 All electrical products shall be approved by the Canadian Standards Association (CSA) and bear the CSA label. Alternatively, where a product does not bear a CSA label, it shall be approved in writing by the authority having jurisdiction.

1.4 QUALITY ASSURANCE

.1 Quality Management Program

1. Designate a competent and experienced employee to provide EMCS Project Management. The designated Project Manager shall be empowered to make technical, scheduling, and related decisions on behalf of the EMCS Contractor. Project Manager shall:
   - .1 Manage the scheduling of the work to ensure that adequate materials, labour, and other resources are available as needed.
   - .2 Manage the financial aspects of the EMCS contract.
   - .3 Coordinate as necessary with other trades.
   - .4 Be responsible for the work and actions of the EMCS workforce on site.

1.5 RECORD DOCUMENTATION

.1 Operation and Maintenance Manuals

1. Provide digital pdf copies of the Operation and Maintenance data for inclusion in Mechanical Contractors O & M Manuals. Include the following:
   - .1 Table of contents.
   - .2 As-built system record drawings. Computer Aided Drawings (CAD) record drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
   - .3 Manufacturer's product data sheets or catalog pages for all products including software.
   - .4 System Operator's manuals.
   - .5 Archive copy of all site-specific databases and sequences.
   - .6 EMCS network diagrams.

1.6 WARRANTY

.1 Correct all defects in workmanship, material or software during the duration of the warranty period.

.2 Correct all system failures occurring during warranty period. After each occurrence:

1. Reload software lost as a result of system failure.
2. Record changes made to software in site log.
3. Download any changed databases and programs onto the CCS hard disk.
4. Backup RCU and TCU databases onto removable disk.

.3 Proprietary parts/components required for any warranty work (i.e. RCUs, TCUs, expansion/accessory boards), shall be stocked in locally.

2. Products

2.1 GENERAL DESCRIPTION

.1 The EMCS shall consist of the following:

1. DDC Controllers (HVAC etc.)
2. Local Display Devices
3. Distributed User Interfaces

.2 System architectural design shall eliminate dependence upon any single device for alarm generation and control execution. The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

2.2 MATERIALS

.1 Conduit

1. EMT: to CSA C22.2 No. 83-M1985. Provide rain-tight fittings in weatherproof and damp areas.
2. Rigid Metal: to CSA C22.2 No. 45.

.2 Wire

1. Wiring: to CSA C22.2 No. 75, copper conductor, 600 V RW90 X-link insulation. 300 V insulation allowed for conductors not entering enclosures containing line voltage.
2. 120 VAC Control Wiring: minimum #14 AWG.
3. Low Voltage Field Wiring:
   - .1 Minimum #22 AWG.
   - .2 Twisted pairs.
   - .3 Stranded, except #18 AWG and larger may be solid.
   - .4 Shielded with drain wire, except for digital input/output wiring carrying less than 25 mA and not installed in tray.
   - .5 Multi-conductor wiring must have individually twisted and shielded pairs with a drain wire for each pair. Cable must have overall shield. Maximum 6 pairs.
4. Plenum rated cable:
   - .1 FT6 rated.
   - .2 Refer to the CEC for other designations meeting FT6 criteria.

.3 Identification Materials

1. Wiring Identification Materials:
   - .1 Use one of the following:
     - .1 Heat shrink sleeves, with thermally printed identifier. Label material and printing to be resistant to oil, mineral solvent and methyl alcohol.

.2 Snap-on or slide-on sleeves, or crimp-on pins with integral sleeve. Length to suit number of characters required in identification code, 6 (six) characters minimum. Marking elements to be removable yet secure when inserted into sleeve. Standard of quality: Grafoplast Wiremarkers Inc.

.3 Factory coded slip-on identification bead markers or sleeves.

.2 Size of sleeves to be selected so that they do not slip off when wire is removed from termination and shaken.

.3 Wrap-on adhesive strips not allowed. Hand written identifiers not allowed.

2. Point Identification Tags: 0.75 mm thick plastic laminated luggage style tags containing imprinted information label. Printing on surface of plastic not allowed. Printing shall be 14 point font or larger.

3. Engraved Plastic Nameplate: self-adhesive composite laminated plastic nameplates with one smooth white surface and core of black plastic designed to leave black lettering on a white background. Engraved lettering height as follows:

.1 RCU, TCU and Equipment Cabinets: 20 mm (3/4”).

.2 Magnetic contactors for EMCS controlled equipment: 20 mm (3/4”).

.3 All other: 8 mm (5/16”).

4. Wiring Directories: for each RCU and TCU provide a laminated sheet with a cross-reference listing of logical point mnemonic, descriptor, wiring label and hardware address for each wire terminated in cabinet. Order and placing of information shall mimic pattern of wiring terminations.

5. Equipment Cabinet Directories: for each equipment cabinet provide a laminated sheet graphically showing location of each transducer, relay or other device in cabinet. Each device outline to be labeled and function of device indicated. Provide logical point mnemonic, descriptor, wiring label and hardware address for field wiring terminating at transducers and relays within cabinet.

3. Execution

3.1 INSTALLATION

.1 System Graphics

1. Every installed physical point, schedule, setpoint, user adjust point and alarm must appear at least once on an appropriate screen graphic. Locate points as close as possible to their graphical representations. Schedules and system user adjusts shall be located under the respective system title, left justified. Setpoints must be located under the sensed value but displayed in a different, less prominent colour.

2. Selection of data shall be appropriate with regard to the underlying system schematic diagram and allow for complete operation and troubleshooting as determined by the sequence of operation. Virtual point data that is important to determining the proper operation of the system shall be included. These may be schedules, user adjusts, space condition information, control loop output values, etc.

3. Equipment outlines shall be sized to allow sufficient room for all required dynamic display information to be placed on the screen without creating a cluttered appearance. The graphic designer shall strive to create graphics that provide ease of operation, simplicity and a clean appearance. Text must be large enough for easy viewing and colours should be selected to match visual impact with the importance of the information being displayed. However, the use of too much or clashing colours, or colour combinations that cause eye strain because of incompatible perceptual depths, must be avoided.
4. Units of ON/OFF shall be reserved for a device's actual input point operating status. The commanded condition of a device or virtual point flag shall be defined as Start/Stop, Enable/Disable, Yes/No, Go/NoGo, etc.
5. Analogue input or output values with units of "%" shall be shown as % of product. This is to be the case regardless of the safe failed position of the final control element. Example: cooling coil valve at 100% means full flow through coil, heating coil valve at 100% means full flow through coil even though signal to valve may actually be zero.
6. A depicted device, or portion of that device shall show green when the device command state and status are ON, grey if they are both OFF and flashing red when in an alarm condition. An alarm shall not be displayed unless command value and status do not match and then only after the allotted alarm timeout has expired.
7. Every point on every graphic shall indicate, with colour change or appended letter, whether or not it is under manual override control.
8. Floor plans are to be colour coded to the air handling unit serving that portion of the floor. Selecting (left clicking) the area shall bring up the air handler's graphic.

.2 Sensors, Devices, and Actuators

1. All transducers and devices are to be mounted in equipment cabinets with hinged doors. Equipment cabinets shall be installed near RCU cabinets, at eye level, in easily accessible areas, on solid walls or supported away from vibrating equipment. Cabinets not in mechanical rooms shall have lockable doors keyed the same as RCU cabinets.
2. Use thermal conductive compound when installing sensors in piping to ensure proper thermal coupling of sensor to well. No more than 2 meters (6 feet) of flex shall be used between sensor housing and raceway. Flex to be secured within 1 meter of sensor.
3. Install a pressure gauge on the signal line of each electro-pneumatic transducer (EPT) or pneumatic controller, excepting room temperature controllers.
4. Install a brass tee in the high and low side lines of every air flow station and differential pressure transducer, excepting those on room VAV box controls. Cap off open end of tee with 100 mm (4") stub and plug or brass coupling and rubber cap Tees to be located close to device in such a manner as to allow for easy access during commissioning procedures.

.3 Space Thermostats / Sensors

1. Use averaging sensors for all mixed air temperature sensing applications.

2. Use averaging temperature sensors for applications where the duct area is greater than 0.5 m^2 (5.4 ft^2) AND the sensor is located downstream of a coil by a distance less than 4 times the diagonal measurement of the coil.
3. For all sensors in piping, use thermal conducting compound to ensure proper thermal coupling of sensor to well body.

.4 Points Schedule

1. All points included under the same group letter must reside within the same panel. Any form of inter-panel communications link to accomplish this is not allowed unless explicitly stated.
2. When two outdoor air temperature sensors are specified, locate the sensors so that the sun cannot shine on both sensors at once, and airborne waste heat cannot simultaneously affect both sensors.
3. Locate duct temperature and humidity sensors a minimum of 3 metres (9 feet) downstream of humidifiers.
4. Use averaging sensors for all mixed air temperature sensing applications.
5. Use averaging temperature sensors for applications where the duct area is greater than 0.5 m^2 (5.4 ft^2) AND the sensor is located downstream of a coil by a distance less than 4 times the diagonal measurement of the coil.
6. For all sensors in piping, use thermal conducting compound to ensure proper thermal coupling of sensor to well body.
7. Configure each panel to accept the points remarked as “Future” under the remarks column in the point schedules. The panel shall include all hardware and firmware required to directly interface to these future points without subsequent additions.

3.2 IDENTIFICATION

.1 Conduit:

1. Apply paint or colour banding tape in fluorescent orange for control wiring conduit in 35 mm (1-3/8”) wide bands all around conduit as follows:
   .1 At least once in each 10 metres (32 feet) of conduit run.
   .2 Where conduit enters inaccessible ceiling, wall, and floor spaces.
   .3 At least once in each room or area through which a conduit passes.
2. Applying fluorescent orange paint to all conduit fittings prior to installation is an acceptable practice. However, additional identification banding shall be added as required to meet all requirements of this article.

.2 Wiring:

1. Wiring more than 1 meter (3 feet) in length must be labeled at both ends.
2. Labels for all system point wiring shall, as a minimum, contain the following information:
   .1 Panel end: panel terminal number or hardware address.
   .2 Device end: panel number as well as panel terminal number or hardware address.
3. Label panel power supply wiring with the panel connector number.
4. Label communications port wiring with panel connector number and device name (e.g. “J1-modem”, “J2-printer”).

5. Label communications trunk wiring with the panel number, router number etc. to which the other end of the cable is connected.
6. Wiring on each side of a terminal block or splice shall be labeled with the information required for the device end of the wire.
7. In retrofit situations the above labeling requirements are in addition to any existing labeling.

.3 Point Tagging:

1. Identify all input sensors and devices as well as all EMCS controlled output actuators, motors and equipment, with Point Identification Tags. Provide multiple tags as necessary. Additional requirements as follows:
   .1 Tag control wiring for major mechanical equipment at equipment terminal strip.
   .2 Tag any input/output transducers not identified on an Equipment Cabinet Directory.
   .3 Tag electric motors on power cable near motor end.
2. Point Identification Tags shall be attached using two nylon cable ties. One tie is to provide a loose loop through the tag while the other tie is to hold this loop to the wire or conduit.
3. All Point Identification Tags shall include the following minimum information:
   .1 Point Description
   .2 Associated System Identification
   .3 Logical Point Mnemonic
   .4 RCU/TCU number
   .5 Point number
   .6 Panel location

.4 Nameplates:

1. Identify the following with engraved plastic nameplates:
   .1 Magnetic contactors and related local disconnect switches.
   .2 Space temperature sensors and intelligent thermostats.
   .3 RCU cabinets, TCU cabinets, associated equipment cabinets.
   .4 Front panel mounted switches, displays and devices; identify function of each item.
2. Nameplates shall include logical point mnemonic as applicable.
3. All nameplates to be easily visible without need to use ladder or extraordinary body position. Affix additional nameplates if necessary.

.5 Directories:

1. Permanently mount laminated Wiring Directories on door inside surface of each RCU and TCU cabinet.
2. Permanently mount laminated Equipment Cabinet Directories on door inside surface of each equipment cabinet.

3.3 START-UP AND TESTING

.1 Hardware

1. Verify that each hardware component has been properly installed as recommended by manufacturer and is functioning correctly.
2. Verify that all circuits are complete and all terminal wiring connections are tight.
3. Electronic hardware:
   - .1 Start-up electronic hardware as recommended by manufacturer.
   - .2 Replace defective components.
   - .3 Prove proper operation, use software diagnostic.
4. Interfaces:
   - .1 Test to ensure interfaces with Division 25 and 26 and other control packages are complete.
   - .2 Verify that interface cabinets comply with applicable codes and specified requirements.
5. Check operation of system under failure modes:
   - .1 Power failure.
   - .2 RCU failure.
   - .3 Network failure.
   - .4 Sensor failure.
6. Trend Logs:
   - .1 Enter trend logs for each physical analogue input and output point in EMCS database.
   - .2 Trend logs shall retain a minimum of four readings per hour for 24 hours.
   - .3 Trend logs shall be continuous and shall overwrite information that is 24 hours old.
   - .4 Provide an additional trend log of 120, ten second interval, readings for each P.I.D. loop controlling and controlled variable.
   - .5 Grouping of trend log points on print outs shall be agreed with NRC.

.2 Review of Deficiencies Before Interim Acceptance

1. Review all deficiencies and agree upon a deficiency list with NRC, before Interim Acceptance of the Work.

3.4 FINAL UPDATES, BACKUPS AND O & M DISKS

.1 Just prior to Total Completion of the Work, provide the latest versions of all software and firmware in all CCSs, PCSs, RCUs, and TCUs.

.2 Just prior to Total Completion of the Work, provide updated O & M Disks. Copy these updates to all CCS and PCS hard drives.

.3 Just prior to Total Completion of the Work, revalidate and test all CCS and PCS recovery disks. Provide updated backup packages.

END OF SECTION

1. General

1.1 ELECTRICAL CONTRACTOR GENERAL REQUIREMENTS

.1 General Requirements, Division 01, shall form part of this Division, and all instructions to bidders, General Conditions, amendments thereto, and General Requirements of that Division apply to and govern the work of this Division.

1. This section contains requirements applicable and supplementary to other Divisions, and are to be read in conjunction with those Divisions.
2. "Utility" shall hereafter mean the electrical power supply company, telephone supply company, fibre network supply company and cable TV supply company.
3. The electrical installation shall adhere to the latest edition of the Canadian Electrical Code (CEC), applicable building code, and all other codes in force by the local Authority Having Jurisdiction (AHJ).
4. Electrical drawings and these specifications are complementary to each other. Treat discrepancies between them as requirement to adhere to the most restrictive conditions. Contact Engineer 5 days prior to tender close if discrepancies or errors/omissions are found.
5. Provide all labour, materials, tools, equipment, and transportation required for the complete installation and testing of all systems described herein.
6. Obtain exact dimensions and coordinate placement of electrical equipment conduit, devices and fittings from architectural and structural drawings. Make any necessary adjustments to accommodate structural and architectural conditions without additional charge. Notify Engineer prior to all significant revisions.
7. Materials are to be new, not inferior to the quality specified, and conform to standards issued by CSA, ULC, or any other Canadian standards agency.
   .1 Where materials are specified by technical description, provide the best commercial qualities available for the purpose.
   .2 Maintain uniformity of manufacture, type, and style within a particular group or class of equipment throughout the work.
   .3 All work and materials covered by these specifications shall be subject to inspection at any and all times by the Engineer or the Departmental Representative. If the inspection finds any material that does not conform to these specifications, Electrical Contractor shall, within three days after being notified by the Engineer or NRC, remove the material from the premises and is not entitled to any additional charge.
8. Inform Engineer of all inspections by AHJ at least 48 hours in advance.
9. Provide all necessary measurements and assistance to Engineer on his visits to the site at any phase of the project, including after completion.
10. No deviations from the drawings shall be permitted without written permission from the Engineer.
11. Workmanship
    .1 All work is to be executed in a neat and orderly manner, with all surface conduit following building lines, and concrete-embedded conduit having minimum 25% of slab thickness. Coordinate with Structural Engineer.

.2 Keep a competent foreman on the project for its duration, unless able to provide satisfactory reasons for changing that person.

.3 Tradesmen under foreman, including specialty Electrical sub-trades, are to be competent in all aspects of work to which they are assigned. Specialty sub-trades include, but may not be limited to, audio/visual systems, voice/data infrastructure (provide copy of workers' certification by equipment manufacturer), public address, intercommunication, security/access control, and lighting control.

.4 Do not position device boxes based on Electrical drawings unless dimensions are shown. Determine placement of device boxes from Architectural drawings. If placement is not shown, consult with Architect or Engineer for clarification.

.1 Place adjacent device boxes horizontally and vertically so their centrelines align. Boxes on opposite sides of a wall are to be separated by at least one stud space, unless directed otherwise, or provide sound-deadening material between them.

.2 Locating devices 3 meters or less from position shown on drawings as directed by Engineer at rough-in shall not entitle contractor to any extra charges.

12. Protect all finished and unfinished work and equipment.

.1 Any damage by this contractor is to be repaired at no expense to NRC.

.2 Receive and protect electrical equipment provided by NRC.

.3 Where panels or other items are scratched, repaint entire affected surface to same finish as other sides or to voltage or system-coded colours.

.4 All newly installed equipment to be left clean and in new condition at the completion of the project.

13. Visit site / premises before tender in order to ascertain working conditions. No extras will be paid based on site or working conditions.

14. Provide sleeves, inserts, etc, as required, to General Contractor for placement in concrete, and supervise their placement. Correct incorrect placement at own expense.

15. Remove daily debris and surplus materials resulting from this trade's work.

16. No consideration will be given to requests for extras or equipment substitution due to late ordering of material, including delays due to rejection of shop drawings.

1.2 REFERENCES

.1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.

.2 Withdrawn or obsolete Standards may still apply unless it has been replaced with a different Standard, in which case the new Standard shall apply. Report any withdrawn Standards to the Departmental Representative for instruction.

1.3 SHOP DRAWINGS SUBMITTALS

.1 All shop drawings shall be manufacturers' data sheets and information. Provide shop drawings in electronic PDF format. No facsimiles, screen captures, blank catalogue pages, or poor quality reproductions will be accepted.

.2 Include only information relative to the equipment for which the shop drawing is submitted. Where equipment choices exist on cut sheets, indicate the proposed equipment with arrows or highlighting. Additionally, provide a list of the submitted equipment. Shop drawings to clearly state equipment tags/designations.

.3 All shop drawings submitted to the Engineer must bear the approvals of the Contractor prior to Engineer review. Work shall not proceed with items until Engineer's reviews are complete and shop drawings are returned.

1. Engineer's review is only for ascertaining conformance with the general design concept. It does not indicate approval of design detail implied by the shop drawings. Responsibility for said design, errors and omissions in the shop drawings shall remain with Electrical contractor and his sub-trades.
2. Electrical contractor is responsible for dimensions and coordination related to fabrication or construction techniques, compliance with the Canadian Electrical Code, and coordination of the work with all sub-trades.

.4 Supply shop drawings for at least the following items or item types:

1. Distribution and sub-distribution panels, panelboards, disconnect switches, transformers, SPDs, circuit breakers, fuses, and their characteristics, instrument transformers, protective relays, etc.
2. Motor control equipment, including starters, contactors, overload heaters, control relays, time-delay relays, motor circuit and control fuses and breakers, pilot lights, control transformers, and selector switches.
3. All light fixtures and controls (line/low voltage controls).
4. All low voltage systems' components including fire alarm, structured cabling, etc.
5. Wiring and cabling devices including receptacles, switches, floor boxes, power poles, cable tray, data racks, UPS systems, and disconnect switches.
6. Firestopping system and details (Refer to fire stopping section below).

1.4 ALTERNATES

.1 No alternates will be allowed without written approval of acceptance through an addendum to the tender.

.2 Approval for use of alternate materials and equipment shall be submitted for review a minimum of 7 working days prior to the tender closing. Approval request shall be in writing.

.3 The contract documents establish the quality standard. Alternate materials and equipment, to gain approval, must meet these standards.

.4 Provide necessary accessories as required to accommodate alternate materials and equipment.

.5 Submit clear drawings and design records of all resultant alterations required to accommodate alternate material. Submit drawings with related shop drawings to form complete alternate arrangement.

1.5 PERMITS, CERTIFICATES, AND FEES

.1 Obtain, pay for, and submit all permits and necessary documents (including drawing approvals by the Electrical Inspection Authority) necessary for the electrical work to commence.

.2 On completion of the work, submit a Certificate of Acceptance from the Inspection Authority to the Engineer.

1.6 INSURANCE

.1 Provide certification of insurance sufficient to fully cover NRC and his sub-contractor against any and all claims under the Workers' Compensation Act, and any insurance noted within the General Conditions.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 In accordance with Division 01 - Common Product Requirements

.2 Deliver and store materials in original packaging with manufacturers' labels.

.3 Store materials indoors, in dry location, and in accordance with manufacturers' recommendations. Protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

.4 Store and protect from nicks, scratches, and blemishes.

.5 Replace defective or damaged materials with new.

1.8 FIRE STOPPING

.1 The electrical contractor, in coordination with the general contractor, is responsible for the installation of all fire stopping systems relating to electrical penetrations through fire rated ceilings, wall or assemblies. The fire stopping systems utilized, shall maintain an effective barrier against the spread of flames, smoke and hot gases and shall have passed the CAN4-S115M approved testing procedure.

.2 The electrical contractor must provide adequate notification to the Electrical Engineer that firestopping has been completed to allow for field observations and reporting prior to concealment.

.3 Submit shop drawings for approval, of all fire stopping system details, including but not limited to, product manufacturer's specifications, technical data for each material and cUL approved documentation.

1.9 PROGRESS CLAIMS, EXTRAS, AND CREDITS

.1 Immediately after award of contract, provide Engineer with an itemized schedule of the tender price, with major items, milestones, etc. as line items (examples: Mobilization, Conduit, Service Equipment, Luminaires, Wiring, Voice/Data system) shown, totaling to the quoted price. Thereafter, when submitting progress claims, this schedule shall be used, and claims shall be made based upon percentage completion of each line item. Extras or credits shall be shown added or deleted to main contract.

.2 Any claim for progress or extras or offer of credit with respect to proposed electrical changes must be accompanied by a complete breakdown of labour and materials, together with explanation of any condition warranting additional consideration. Failure to supply such information will result in immediate rejection of the claim or offer.

1. Such claim must show quantities, unit prices, labour rates and hours, suppliers' invoices, and any other substantiating documentation.
2. Where agreement cannot be arrived at, claims are to be dealt with under General Conditions, and proposed changes are to be enacted as directed in writing.

1.10 INSPECTIONS AND TESTS

.1 Before energizing any portion of the electrical system, provide and pay for testing equipment as part of this contract to perform 1000 volt megger tests (L-L, L-N, L-G) on all feeders and branch circuits, and verify that results conform to the Canadian Electrical Code, and to the satisfaction of the Inspection Authority and to the Engineer.

1.11 ENGINEER SITE OBSERVATIONS

.1 Contact the Engineer for field reviews at the following stages of construction (provide five working days notice):

1. Rough-in
2. Substantial Completions
3. Completion of Deficiencies (if required)

.2 The following items are to be completed prior to substantial inspection:

1. All devices not installed must have wiring terminated inside a junction box c/w cover (no exposed wiring).
2. All electrical equipment to have covers and doors installed.

.3 Failure to inform the Engineer of construction progress as described above may result in the Engineer being unable to issue an "Assurance of Professional Review and Compliance" to the local building authority which is required for occupancy.

.4 Cost for additional site reviews being required due to failure to comply with these requirements will be charged to the contractor.

1.12 AS-BUILT DRAWINGS

.1 Maintain at the job site, one set of prints on which is recorded, day-by-day, all outlets, conduit, fixtures, and equipment as installed; together with any changes made to the work. Checking of progress on the preparation of the as built drawings will be carried out by the supervising Engineer regularly.

.2 Dimension underground services installed relative to the structure, clearly dimension and mark, to ensure ease of locating at future date, all concealed conduits and/or other equipment.

.3 Create digital PDF mark-up of as-built drawing set. Obtain final electrical PDF from engineer prior to creation to use as a background. Provide physical and digital copies as per the Operation and Maintenance Manual section.

1.13 OPERATION AND MAINTENANCE MANUALS

.1 Provide four hardcopy sets and one electronic copy (PDF format) of O & M Manuals for the electrical equipment covered under these specifications. Electronic set to be submitted on CD-R, USB flashdrive, or portable hard drive; as specified by NRC.

.2 Manuals shall consist of manufacturers' and general maintenance schedules, on typed or printed sheets, and mounted in a hard cover three-post binder. One copy of these manuals shall be submitted to the Engineer for approval prior to the final issue.

.3 Manuals shall cover a minimum of the following major electrical systems; distribution and panels, lighting, voice/data, fire alarm, power, emergency lighting and controls. Provide the following headings for each:

1. Name of system
2. Operating instruction
3. Maintenance instruction
4. Trouble shooting guide
5. Light fixture type designations including:
   - .1 Name of manufacturer
   - .2 Catalogue # of fixture
   - .3 Catalogue # of lamps for replacements
   - .4 Catalogue # of ballasts for replacements

.4 The O & M Manual shall also include all specified warranties, the name, address, and telephone number of the company providing the warranty, operation procedures, and the manufacturers' recommended maintenance procedures.

1.14 GUARANTEE/WARRANTY

.1 All electrical equipment and systems installed and connected shall be guaranteed free of defective material and workmanship for a period of the greater of one year or any manufacturer offered extended warranty on specific items or systems, with time started from date of substantial completion (or system start-up, if later than substantial completion). Any defects shall be remedied without cost to NRC during this period.

.2 Provide documents of guarantee/warranty in the O & M Manuals, stating commencement of warranty period. Any manufacturer's extended warranty/warranties shall be provided as part of these documents, and drawn to NRC's notice on turnover of manuals.

1.15 EXISTING BUILDING

.1 The electrical contractor is required to visit the existing site to review conditions relating to their work and inform the Engineer of any questions he requires clarification on 5 days prior to close of tender.

.2 The electrical contractor is to repair any damage to the existing building, service lines, electrical systems or adjoining property incurred by his workmen.

.3 The electrical contractor shall take into consideration, the occupants of the existing building in terms of noise, safety, and access during construction. He shall allow for in his pricing, the requirements to meet the following:

1. After hours work for construction intrusive to tenants, ie: X-Raying, jack hammering/drilling, coring, systems shutdowns.
2. All life safety systems to be maintained, ie: fire alarm, emergency lighting, generators/transfer switches, egress lighting.
3. Coordinate all necessary electrical system shutdowns, relocates and tie-ins, ie: telephone/data, panel power, lighting, elevators.
4. All live equipment shall be either in a locked room/closet, or permanent covers replaced when not been worked on.
5. All electrical material or debris shall be maintained daily. In occupied areas, paths of egress shall be maintained, kept clean and sufficiently illuminated.

1.16 WASTE MANAGEMENT AND DISPOSAL

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

.2 Construction / Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

.3 Packaging Waste Management: remove from site and dispose of pallets, crates, padding, packaging materials, plastic, corrugated cardboard, and metal materials at appropriate recycling facilities.

.4 Place materials defined as hazardous or toxic in designated containers. Handle and dispose of hazardous materials in accordance with Regional and Municipal Regulations.

.5 Ensure emptied containers are sealed and stored safely for disposal away from children.

1.17 CLEANING

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

.2 Leave work area clean at end of each day.

.3 Clean and touch-up surfaces of shop painted equipment scratched or marred during shipment or installation to match original paint.

.4 Clean and prime exposed non-galvanized hangers, racks, and fastening to prevent rusting.

.5 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

.6 Remove recycling containers and bins from site and dispose of materials at appropriate facilities.

END OF SECTION

1. General

1.1 RELATED REQUIREMENTS

.1 Section 00 10 00 - General Instructions

.2 Section 26 00 10 - General Electrical Requirements

.3 Section 26 05 53 - Identification for Electrical Systems

1.2 REFERENCE DOCUMENTS

.1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.

.2 Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard, in which case the new Standard shall apply. Report any withdrawn Standards to the Departmental Representative for instruction.

.3 Perform work in accordance with the following standards, except where specified otherwise.

1. Canadian Standards Association (CSA)
   - .1 CSA C22.2 No. 51 - Armoured Cables
   - .2 CSA C22.2 No. 52 - Underground Service-Entrance Cables
   - .3 CSA C22.2 No. 75 - Thermoplastic-Insulated Wire and Cables
   - .4 CAN/CSA-C22.2 No 131 - Type TECK 90 Cable
   - .5 CSA C22.2 No. 0.3 - Test Methods for Electrical Wires and Cables
   - .6 CSA C22.2 No. 38 - Thermoset-Insulated Wires and Cables
   - .7 CSA C22.2 No. 188 - Splicing Wire Connectors
   - .8 CSA C22.2 No. 198.2 - Sealed Wire Connector Systems

1.3 SUBMITTALS

.1 Provide required information in accordance with Section 00 10 00 - General Instructions.

.2 Action Submittals: Provide the following submittals before starting work of this Section:

1. Product Data: Submit manufacturer’s product data for accessories proposed for use on the project before ordering materials for Departmental Representative’s review and acceptance.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: Install materials in accordance with governing standards, requirements of electric utility and Authority Having Jurisdiction.

.2 Certifications; Provide the following during the course of the Work:

1. Compliance Certification: Provide certificates from manufacturer indicating tested performance requirements required by Authorities Having Jurisdiction and as specified in this Section.

1.5 DELIVERY, STORAGE AND HANDLING

.1 In accordance with *Section 26 00 10 - General Electrical Requirements*.

2. Products

2.1 GENERAL

.1 All wiring within a plenum space must be rated FT6. All raceways installed in a plenum space must meet the same rating.

2.2 BUILDING WIRING

.1 Building Wiring: to CSA C22.2 No. 75 and as follows:

1. Conductors: solid copper for No. 10 AWG and smaller, stranded copper for No. 8 AWG and larger.
2. Aluminum feeders shall be acceptable for sizes of 100A and larger.
3. Insulation: RW90 X-link.
4. Insulation Rating: 600 V.
5. Sizes: minimum #12AWG, as indicated on drawings.

2.3 CABLES

.1 Armoured Cable: to CSA C22.2 No. 51, and as follows:

1. Conductor: copper.
2. Insulation: RW90 X-link.
3. Rating: 600 V.
4. Minimum Size: 12 AWG.
5. Configuration: as indicated on drawings.
6. Armour: aluminum interlocking.

.2 Type TECK 90 Cable: to CSA C22.2 No. 131 and as follows:

1. Conductor: copper.
2. Insulation: cross linked polyethylene (XLP).
3. Rating: 1000 V.
4. Configuration: as indicated in schedules.
5. Inner Jacket: PVC -40°C.
6. Armour: aluminum.
7. Outer Jacket: PVC -40°C.

.3 VFD Cable:

1. Conductor: copper
2. Insulation: Industrial Grade XLPE
3. Rating: 1000 V
4. Inner Jacket: copper tape shield
5. Outer Jacket: sunlight/oil resistant PVC 90°C Wet/Dry

.4 Control Cable for Class 2 Remote Control and Signal Circuits:

1. Conductor: copper.
2. Insulation: 300 V insulation, rated 60°C.
3. Configuration: individual conductors twisted together, shielded, and covered with a PVC jacket.

2.4 CONNECTORS

.1 Provide factory fabricated, metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated.

3. Execution

3.1 WIRING, GENERAL

.1 Splice only in junction or outlet boxes.

.2 Conductor length for parallel circuits shall be identical.

.3 Neatly train and lace conductors inside cabinets, equipment, and panelboards.

.4 Contractor to follow conductor colour coding as indicated in *Section 26 05 53 - Identification for Electrical Systems*.

.5 Armoured cabling (AC90) permitted for lighting drops from junction boxes mounted above fixture. AC90 not permitted for horizontal installations within walls.

3.2 WIRING INSTALLATION IN RACEWAYS

.1 Swab raceway system before installing wiring.

.2 Use pulling lubricant for conductors No. 4 AWG and larger.

.3 All empty raceways to include pull strings.

3.3 WIRE CONNECTIONS AND TERMINATIONS

.1 Use solderless pressure connectors with insulated covers for copper wire splices and taps, No. 8 AWG and smaller.

.2 Use insulated spring wire connectors with plastic caps for conductors No. 10 AWG and smaller.

.3 Use split bolt connectors for copper wire splices and taps, No. 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150% of insulation value of conductor.

.4 Terminations to be copper and/or aluminum, as per wire type.

3.4 TECK 90 / VFD CABLE INSTALLATION

.1 Provide protection for exposed cables where subject to damage.

.2 Support horizontal runs on channels complete with spacers and clamps.

.3 Support vertical runs on channels complete with spacers and clamps.

.4 Space cables minimum one diameter apart. Maintain equal spacing across supports.

3.5 WIRE SIZE SCHEDULE

.1 Lighting Circuits: No. 12 AWG minimum.

.2 Power Circuits: No. 12 AWG minimum, except as follows:

1. No. 10 AWG for 15 A, 120 V circuits longer than 23 metres.
2. No. 8 AWG for 15 A, 120 V circuits longer than 35 metres.

.3 Motor Circuits: No. 12 AWG minimum, except as otherwise indicated on drawings or in schedules.

.4 Feeder Circuits: as indicated on drawings or in schedules.

.5 Neutral conductors to be fully rated. De-rating of any neutral conductors is not acceptable.

END OF SECTION

1. General

1.1 RELATED REQUIREMENTS

.1 Section 00 10 00 - General Instructions

.2 Section 26 00 10 - General Electrical Requirements

.3 Section 26 05 13 - Building Wire and Cable

1.2 REFERENCE DOCUMENTS

.1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.

.2 Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard, in which case the new Standard shall apply. Report any withdrawn Standards to the Departmental Representative for instruction.

.3 Perform work in accordance with the following standards, except where specified otherwise.

1. Canadian Standards Association (CSA)
   - .1 CSA C22.2 No. 0.4 - Bonding Electrical Equipment (Protective Grounding)
   - .2 CSA C22.2 No. 41 - Grounding and Bonding Equipment
   - .3 CSA T527 - Grounding and Bonding for Telecommunications in Commercial Buildings

1.3 SUBMITTALS

.1 Provide required information in accordance with Division 01 - Submittals.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

1. Product Data: Submit manufacturer's product data for accessories proposed for use on the project before ordering materials for Departmental Representative's review and acceptance.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: Install materials in accordance with governing standards, requirements of electric utility and Authority Having Jurisdiction.

.2 Certifications; Provide the following during the course of the Work:

1. Compliance Certification: Provide certificates from manufacturer indicating tested performance requirements required by Authorities Having Jurisdiction and as specified in this Section.

2. Products

2.1 MATERIALS

.1 Grounding and bonding equipment: to CSA C22.2 No. 41 and as follows:

1. Ground Conductors: as specified in *Section 26 05 13 - Building Wire & Cable*.

3. Execution

3.1 INSTALLATION

.1 Comply with requirements of CSA C22.2 No. 0.4 and Canadian Electrical Code.

.2 Protect exposed ground conductors from mechanical injury.

.3 Use mechanical connectors for ground connection to equipment provided with lugs.

.4 Do not solder joints.

.5 Install bonding wire in all metal conduit connected at both ends to grounding bushing, solderless lug, clamp, cup washer, screw, outlet box or junction box.

3.2 GROUND CONDUCTORS

.1 Use green insulated ground conductors for the following:

1. Distribution Centres
2. Circuit Bond Conductors
3. Bonding Jumpers

END OF SECTION

1. General

1.1 RELATED REQUIREMENTS

.1 Section 00 10 00 - General Instructions

.2 Section 26 00 10 - General Electrical Requirements

.3 Section 26 05 13 - Building Wire and Cable

.4 Section 26 05 33 - Boxes and Fittings for Electrical Systems

.5 Section 26 05 34 - Conduit for Electrical Systems

1.2 COORDINATION

.1 Coordinate installation of inserts with:

1. Mechanical work specified in Divisions 20, 23, and 26 sections.

2. Products

2.1 SUPPORTING DEVICES

.1 Provide metal brackets, frames, hinges, clamps and related types of supporting devices and support systems adequate for weight of equipment and raceways, including wiring which they carry.

.2 Straps: malleable iron or steel.

.3 Channels: 42 x 42 mm galvanized steel.

.4 Rod Hangers: 9.5 mm galvanized steel.

.5 Inserts: preset or afterset.

3. Execution

3.1 INSTALLATION

.1 Install supporting devices to maintain headroom, neat mechanical appearance and to support equipment loads required.

.2 Except where otherwise indicated, support equipment, conduit and cables using clips, spring loaded bolts, or cable clamps designed as accessories to base channel members.

.3 Support exposed conduit and conduit installed in space above suspended ceilings and in crawl spaces using hangers, clamps or clips. Support conduit on each side of bends and on spacing in accordance with Canadian Electrical Code.

.4 Where three or more conduits run parallel, install conduit on conduit racks. Size conduit racks to provide 25% spare capacity.

.5 Support riser conduit at each floor level with clamp hangers.

.6 Do not fasten supports to piping, ductwork, mechanical equipment or conduit.

.7 Do not use shot driven pins.

.8 Install surface mounted cabinets and panelboards with minimum of four anchors.

.9 Bridge studs top and bottom with channels to support flush mounted cabinets and panel boards in stud walls.

END OF SECTION

1. General

1.1 RELATED REQUIREMENTS

.1 Section 00 10 00 - General Instructions

.2 Section 26 00 10 - General Electrical Requirements

.3 Section 26 05 53 - Identification for Electrical Systems

.4 Section 26 27 26 - Wiring Devices

1.2 REFERENCE DOCUMENTS

.1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.

.2 Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard, in which case the new Standard shall apply. Report any withdrawn Standards to the Departmental Representative for instruction.

.3 Perform work in accordance with the following standards, except where specified otherwise.

1. Canadian Standards Association (CSA)
   - .1 CAN/CSA C22.2 No. 18 - Outlet Boxes, Conduit Boxes, and Fittings
   - .2 CSA C22.2 No. 40 - Junction and Pull Boxes
   - .3 CAN/CSA C22.2 No. 85 - Rigid PVC Boxes and Fittings

2. Products

2.1 METAL OUTLET BOXES

.1 Outlet boxes: to CAN/CSA-C22.2 No. 18 and as follows:

1. Sheet Steel Boxes: pressed sheet steel, galvanized, blanked for conduit, integral locating lugs.
2. Cast Boxes: aluminum or corrosion resistant iron, factory threaded hubs, weatherproof.
3. Shallow or deep boxes may be required, as indicated on drawings.
4. 100 mm square with plaster ring for single gang installations.

2.2 NON-METALLIC OUTLET BOXES

.1 Outlet boxes: to CAN/CSA-C22.2 No. 85 and as follows:

1. Same as sheet steel boxes, except of rigid PVC material.

2.3 PULL AND JUNCTION BOXES

.1 Pull and junction boxes: to CSA C22.2 No. 40 and as follows:

1. Material: sheet steel.
2. Covers: screw mounting.
3. Barriers: where indicated.

2.4 BUSHINGS, KNOCKOUT CLOSURES, AND LOCKNUTS

.1 Bushings, Knockout Closures and Locknuts: to CAN/CSA-C22.2 No. 18, corrosion resistant.

2.5 AIR / VAPOUR HATS

.1 Air/vapour Hats: polyethylene, minimum 0.40 mm thick, with minimum 25 mm wide flanges, designed to be installed over electrical boxes and provide an effective air/vapour seal.

3. Execution

3.1 OUTLET BOX INSTALLATION

.1 Provide boxes where indicated and as required for:

1. Splices.
2. Taps.
3. Wire pulling.
4. Equipment.
5. Device location.

.2 Install boxes flush mounted, except in following locations where boxes shall be surface mounted:

1. Electrical rooms.
2. Mechanical rooms.
3. Other locations where surface mounting is indicated on drawings.

.3 Except where otherwise indicated, install boxes for vertical mounting of devices.

.4 Support boxes independent from conduit.

.5 Provide box extenders in areas where required, as indicated on the drawings.

.6 Use metal outlet boxes, except in following locations where non-metallic outlet boxes shall be used:

1. Wet / damp locations.

.7 The use of sectional single gang device boxes are not permitted.

3.2 LOCATION OF WALL OUTLET BOXES

.1 Outlets are indicated on drawings schematically. Consider locations indicated as approximate. Verify locations prior to rough-in.

.2 Confirm size and location of equipment supplied and installed under other Sections, prior to rough-in.

.3 Do not install boxes back-to-back. Allow minimum:

1. One stud space separation in conventional walls.
2. One stud space separation in acoustic rated walls and provide sound proof wrapping / putty around each box.

.4 Position boxes in masonry walls to suit masonry course lines.

.5 Back-to-back boxes are not permitted to share horizontal conduit through wall plenum. Individual vertical conduit runs between rooms are required.

.6 Except where otherwise indicated, mount boxes at following heights:

1.	Local switches:		1200 mm
2.	Receptacles:		
	.1	General:	300 mm
	.2	Above counters:	150 mm
	.3	Above baseboard heaters:	200 mm
	.4	Utility rooms:	1200 mm
3.	Telephone outlets:		
	.1	General:	300 mm
	.2	Wall mounted telephone:	1200 mm

.7 Measure mounting height from finished floor to centre line of device.

.8 NRC reserves the right to change location of outlets prior to installation with no change in Contract Price, provided that distance does not exceed 3 metres from originally indicated location.

.9 Receptacles or other electrical devices protruding 12 mm or more from the wall shall not be installed within 450 mm of a railing.

3.3 PULL AND JUNCTION BOX INSTALLATION

.1 Locate above accessible ceilings and in unfinished areas.

.2 Locate so as to minimize need for access doors.

.3 Support boxes independent from conduit.

3.4 AIR / VAPOUR HAT INSTALLATION

.1 Install air/vapour hats around electrical boxes located in walls and ceilings where polyethylene vapour retarder is indicated on drawings or schedules.

END OF SECTION

1. General

1.1 RELATED REQUIREMENTS

.1 Section 26 00 10 - General Electrical Requirements

.2 Section 26 05 13 - Building Wire & Cable

.3 Section 26 05 29 - Hangers and Supports for Electrical Systems

.4 Section 26 05 33 - Boxes and Fittings for Electrical Systems

.5 Section 26 05 53 - Identification for Electrical Systems

1.2 REFERENCE DOCUMENTS

.1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.

.2 Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard, in which case the new Standard shall apply. Report any withdrawn Standards to the Departmental Representative for instruction.

.3 Perform work in accordance with the following standards, except where specified otherwise.

1. Canadian Standards Association (CSA)
   - .1 CSA C22.2 No.45 - Rigid Metal Conduit
   - .2 CSA C22.2 No. 56 - Flexible Metal Conduit and Liquid and Liquid Tight Flexible Metal Conduit
   - .3 CSA C22.2 No.83 - Electrical Metallic Tubing
   - .4 CSA C22.2 No. 211.1 - Rigid Types EB1 and DB2/ES2 PVC Conduit
   - .5 CSA C22.2 No.211.2 - Rigid PVC (Unplasticized) Conduit

1.3 COORDINATION

.1 Coordinate with other work including wire and cable, boxes and fittings and panel work, as necessary to interface installation of conduit with other work.

2. Products

2.1 CONDUIT, GENERAL

.1 Except where otherwise required by Canadian Electrical Code (CEC), provide conduit of types specified in Conduit Installation Schedule and sizes indicated on drawings or specified.

.2 Where sizes are not indicated, select proper sizes to suit intended use, fulfill wiring requirements, and comply with Canadian Electrical Code (CEC).

.3 Minimum size: 21 mm.

2.2 METAL CONDUIT AND TUBING

.1 Rigid Metal Conduit: to CSA C22.2 No. 45, and as follows:

1. Galvanized Rigid Steel Conduit: zinc coated steel.

2. PVC Externally Coated Rigid Steel Conduit: zinc coated steel with additional external coating of PVC.
3. Fittings: same material as conduit.

.2 Electrical Metallic Tubing (EMT): to CSA C22.2 No. 83, with fittings as follows:

1. Fitting Material for 25 mm size Conduit and Smaller: zinc alloy or zinc coated steel.
2. Fitting Material for Conduit Larger than 25 mm Size: zinc coated steel.
3. Type: compression or set screw.

.3 Flexible Metal Conduit: to CSA C22.2 No. 56, and as follows:

1. Flexible Metal Conduit: spirally wound, interlocked zinc coated strip steel, minimum 10 mm diameter.
2. Flexible Metal Conduit Fittings: threadless hinged clamp type.
3. Liquid-Tight Flexible Metal Conduit: continuous interlocked and double-wrapped steel, zinc coated inside and outside, coated with liquid-tight jacket of flexible PVC, minimum 12 mm diameter.
4. Liquid-Tight Flexible Metal Conduit Fittings: cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings.

.4 Miscellaneous Fittings: locknuts, bushings, reducers, chase nipples, 3 piece unions, split couplings, plugs, and expansion fittings specifically designed for their particular application.

3. Execution

3.1 INSTALLATION OF CONDUIT, GENERAL

.1 Install conduit concealed, in walls, floors, ceilings, above suspended ceilings, and underground, except in following rooms:

1. Mechanical Rooms.
2. Electrical Rooms.
3. Storage Rooms used to house electrical panel boards

.2 Where required to be concealed, install conduit neatly and close to building structure so as to minimize need for furring.

.3 Installed conduit shall be free from dents, bruises and other damage.

.4 Plug conduit ends to prevent entry of dirt and moisture.

.5 Seal conduit with duct seal compound or fibreglass where conduit leaves heated area and enters unheated area.

.6 Provide necessary flashing and pitch-pockets, making watertight joints where conduit passes through roof or waterproofing membranes.

.7 Where conduit crosses building expansion joints, install expansion fitting approved by authority having jurisdiction, complete with grounding jumper. Provide bend or offset in conduit adjacent to building expansion joint where conduit is installed above suspended ceilings.

.8 Where conduit is required for low voltage wiring, provide plastic bushings on all stub-outs.

.9 All empty conduits require pull string, labelled for location on both ends.

.10 Provide 20% spare conductor capacity in home-run conduits

3.2 INSTALLATION OF METAL CONDUIT AND TUBING

.1 Field-bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.

.2 Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.

3.3 INSTALLATION OF RIGID METAL CONDUIT

.1 Cut conduit straight, properly ream, cut threads and brush threads clean.

.2 Fasten conduit terminations in sheet metal enclosures with two locknuts and terminate with bushing. Install locknuts inside and outside enclosure.

3.4 INSTALLATION OF EXPOSED AND SEMI-CONCEALED CONDUIT

.1 Comply with the following when installing conduit exposed in service areas, unfinished areas, finished areas, and in accessible spaces behind ceilings, walls and floors:

1. Install conduit to conserve headroom and cause minimum interference in spaces through which conduit passes.
2. Install conduit so as not to interfere with ceiling inserts, luminaires or ventilation ducts or outlets.
3. Alter routing to avoid structural obstructions, keeping crossovers to a minimum.
4. Install exposed conduit and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls and structural members.
5. Run conduit for outlets on waterproof walls exposed. Set anchors for supporting conduit on waterproof wall in waterproof cement.
6. Conduit to be painted to match walls / ceiling in non-service room locations.

END OF SECTION

1. General

1.1 SCOPE

.1 Identification for electrical systems, equipment, conduit and related components.

1.2 RELATED SECTIONS

.1 Section 00 10 00 - General Instructions

1.3 QUALITY CONTROL

.1 Colour code electrical equipment, components, and exposed conduits.

.2 Submit a schedule of conduit and equipment identification methods, materials, and colours to the Departmental Representative for review.

1.4 REFERENCE STANDARDS

.1 Federal Standard 595C Colours.

2. Products

2.1 IDENTIFICATION MATERIALS

.1 Lamicoid Nameplates: 3 mm thick plastic engraving sheet, black face, white core, mechanically attached, sizes as follows:

1. Size 1: 12 mm high with 5 mm high letters.
2. Size 2: 20 mm high with 8 mm high letters.
3. Size 3: 25 mm high with 12 mm high letters.

.2 Wire Identification Materials: Use one of the following:

1. Heat shrink sleeves, blank.
2. Clear plastic tape wrap-on strips with white writing section.
3. Wrap-on strips, pre-numbered.
4. Slip-on identification bead markers or sleeves, blank or pre-numbered.

.3 Colour Banding Tape: 25 mm wide adhesive backed plastic tape, integrally coloured.

3. Execution

3.1 COLOUR IDENTIFICATION OF EQUIPMENT

.1 Electrical equipment shall be prefinished in coded colours designating voltage or system, as indicated.

.2 All switchgear, distribution centre, panel boards, motor starter cabinets, motor control cabinets, disconnect switches, contractor cabinets, relay cabinets, transformers, termination cabinets, splitter boxes, busduct, cable duct, etc., are to be color coded as follows:

	Voltage	**Colour**
1.	120/208 V:	Grey
2.	Security/Intrusion/Surveillance:	Green

3. Low Voltage Switching: Black
4. Data/Telephone Cabinets: Blue

.3 All pull boxes, junction boxes, covers, and conduit banding shall be finished in the following colors:

	System	Colour
1.	120/208 V:	Grey
2.	Security/Intrusion/Surveillance:	Green
3.	Low Voltage Switching:	Black
4.	Data/Telephone (VOIP):	Blue

.4 Where impracticable to obtain equipment prefinished in coded colours, equipment may be site painted in coded colours.

3.2 NAMEPLATE IDENTIFICATION OF EQUIPMENT

.1 Identify equipment with lamicoid nameplates, as indicated in Equipment Identification Schedule.

3.3 PANELBOARD DIRECTORIES

.1 Identify loads controlled by each overcurrent protective device in each panelboard, by means of a typewritten panelboard directory.

3.4 COMMUNICATIONS CABLE AND EQUIPMENT LABELING

.1 Label communication outlets, panels and ports with lamicoid nameplates as specified in Equipment Identification Schedule.

.2 Label each of cables with other ends address using Wire Identification Materials.

.3 Label outlets with labels vertically aligned in each row.

.4 Position panel labels in the same position on each panel.

3.5 IDENTIFICATION OF PULL AND JUNCTION BOXES

.1 Identify pull and junction boxes over 100 mm size as follows:

1. Use boxes which are prefinished in coded colours, or spray paint inside and outside of boxes prior to installation, in coded colours designating voltage or system.
2. Apply size 2 lamicoid nameplate to cover of each box. Identify system name. Where sequence identification is required, identify system name and number.

.2 Identify pull and junction boxes 100 mm or less in size as follows:

1. Spray paint inside of boxes in coded colours designating voltage or system.
2. Apply permanent identifying markings directly to box covers designating voltage or system using indelible black ink.

3.6 COLOUR IDENTIFICATION OF WIRING

.1 Identify No. 4/0 AWG wiring and smaller by continuous insulation colour.

.2 Identify wiring larger than No. 4/0 AWG by continuous insulation colour or by colour banding tape applied at each end and at splices.

.3 Colour coding shall be in accordance with Canadian Electrical Code, and as follows:

	Voltage	Colour
1.	120/208 V, 3 phase:	Red, black, and blue.

.4 Where multi-conductor cables are used, use same colour coding system for identification of wiring throughout each system.

.5 Maintain phase sequence and colour coding throughout each system.

3.7 EQUIPMENT IDENTIFICATION SCHEDULE

Equipment	Colour	Nameplate Identification	Lamicoid Nameplate Size
Panelboards	Voltage Colour	- Panelboard designation	2
Manual Motor Starters	N/A	- Load controlled and mnemonics	1
On/Off Switches	N/A	- Load controlled	1
Disconnect Switches, Magnetic Motor Starters and Contactors:	Voltage Colour	- Voltage and equipment controlled and mnemonics	2
Line Voltage Cabinets and Enclosures	Voltage Colour	- Designation and voltage	2
Low Voltage Cabinets and Enclosures	System Colour	- System name; system name and number if more than one cabinet or enclosure - Major components within cabinets and enclosures	2 1
Communication Outlet and Outlet Assemblies	N/A	- Outlet Designation	1
Communication Panels	N/A	- Panel Designation	1
Communication Ports	N/A	- Port Designation	1

3.8 COLOUR SCHEDULE

Electrical Colours	Federal Standard 595C Colour Numbers
Blue	15052
Green	14449
Brown	10115
Sand	12516
Grey	16307 or ASA61 Grey
Black	17038
Bronze	13275
Purple	17100
Orange	12473
Yellow	13655
Red	11350

END OF SECTION

1. General

1.1 RELATED SECTIONS

.1 Section 26 05 26 - Grounding and Bonding.

1.2 REFERENCES

.1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.

.2 Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard, in which case the new Standard shall apply. Report any withdrawn Standards to the Departmental Representative for instruction.

.3 Perform work in accordance with the following standards, except where specified otherwise.

1. NEMA C12.1 - Code for Electricity Metering.
2. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers.
3. CSA-C22.1 - Canadian Electrical Code, Part I (Latest Edition), Safety Standard for Electrical Installations.
4. CSA-C22.2 No. 5 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures.
5. CSA-C22.2 No. 29 - Panelboards and Enclosed Panelboards.
6. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
7. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
8. NEMA PB 2 - Deadfront Distribution Switchboards.
9. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation and Maintenance of Deadfront Distribution Switchboards Rated 600 V or Less.
10. NEMA 260 - Safety Labels for Pad Mounted Switchgear and Transformers Sited in Public Areas.
11. NETA ATS- Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
12. CSA (Canadian Standards Association).
13. CUL (Canadian Underwriters Laboratories Inc.).

1.3 SUBMITTALS FOR REVIEW

.1 Refer to Section 00 10 00 - General Instructions for submission procedures.

.2 Product Data: Provide electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of all equipment and components.

.3 Shop Drawings: Indicate:

1. Front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral ground; and switchboard instrument details.

2. Outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.4 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.5 REGULATORY REQUIREMENTS

.1 Products: Listed and classified by ULC or CSA as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND PROTECTION

.1 Deliver in 1219 mm maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.

.2 Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

.3 Handle to NEMA PB 2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

2. Products

2.1 MANUFACTURERS

.1 Cutler-Hammer (Eaton)

.2 Schneider Electric

.3 Siemens

2.2 SOURCE QUALITY CONTROL

.1 Shop inspect and test switchboard according to NEMA PB 2.

.2 All distribution equipment throughout facility to be by one manufacturer.

2.3 BRANCH CIRCUIT PANELBOARDS

.1 Description: CSA-C22.2 No.29, circuit breaker type, lighting and appliance branch circuit panelboard.

.2 Panelboard Bus: Copper ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.

.3 Minimum Integrated Short Circuit Rating: 10,000 amperes rms symmetrical for 240 volt panelboards; 10,000 amperes rms symmetrical for 600 volt panelboards or as indicated.

.4 Moulded Case Circuit Breakers: CSA-C22.2 No. 5, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, for lighting circuits, Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.

.5 Enclosure: CSA-C22.2 No. 5, Type 1.

.6 Cabinet Box: 153 mm deep, 508 mm wide.

3. Execution

3.1 EXAMINATION

.1 Verify existing conditions before starting work.

.2 Verify that field measurements are as indicated.

3.2 INSTALLATION

.1 Install switchboard and panelboards in locations shown on Drawings, according to CSA-C22.1.

.2 Tighten accessible bus connections and mechanical fasteners after placing switchboard.

.3 Install panelboards plumb.

.4 Height: 1800 mm to top of panelboard; install panelboards taller than 1800 mm with bottom no more than 100 mm above floor.

.5 Provide filler plates for unused spaces in panelboards.

.6 Provide red colour breakers and lock-on device for all fire alarm system loads.

.7 Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

.8 Provide engraved plastic nameplates under the provisions of *Section 26 05 53 – Identification for Electrical Systems*.

.9 Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Minimum spare conduits: 3 empty, 25 mm. Identify each as SPARE.

.10 Ground and bond panelboard enclosure according to *Section 26 05 26 - Grounding and Bonding for Electrical Systems*.

.11 All conduit entries into panels are as per manufacturers' requirements c/w bushing and bond.

3.3 CLEANING

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

.2 Proceed in accordance with *Section 26 00 10 - General Electrical Requirements*.

.3 Touch up scratched or marred surfaces to match original finish.

END OF SECTION

1. General

1.1 RELATED REQUIREMENTS

.1 Section 00 10 00 - General Instructions

.2 Section 26 00 10 - Electrical General Requirements

.3 Section 26 05 26 - Grounding and Bonding for Electrical Systems

.4 Section 26 05 33 - Boxes and Fittings for Electrical Systems

.5 Section 26 05 53 - Identification for Electrical Systems

1.2 REFERENCE DOCUMENTS

.1 All Code and Standard references refer to current updates, revisions, and adjustments in effect as of date of contract.

.2 Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard, in which case the new Standard shall apply. Report any withdrawn Standards to the Departmental Representative for instruction.

.3 Perform work in accordance with the following standards, except where specified otherwise.

1. Canadian Standards Association (CSA)
   - .1 CSA C22.2 No. 42 - General Use Receptacles, Attachment Plugs and Similar Wiring Devices
   - .2 CSA C22.2 No. 111 - General-Use Snap Switches

1.3 PRODUCT OPTIONS AND SUBSTITUTIONS

.1 Refer to Section 00 10 00 - General Instructions for requirements pertaining to product options and substitutions.

1.4 SOURCE OF SUPPLY

.1 Each of the following shall be by a single manufacturer:

1. All receptacles.
2. All plates.

1.5 PRODUCT DATA

.1 Provide manufacturer's literature including applicable reference standards, performance, and test data for products.

1.6 COORDINATION

.1 Coordinate installation of dimmers with associated area switches.

2. Products

2.1 RECEPTACLES

.1 Receptacles, plugs and similar wiring devices to CSA C22.2 No. 42.

.2 General Purpose Receptacles:

1. Rating: 15 A or 20A, 125 V except where otherwise indicated.

2. Configuration: 5-15R, 5T-20R, 2 pole, 3 wire grounding.
3. Features:
   .1 Ground terminal and poles connected to continuous mounting yoke.
   .2 Wiring terminals: 8 back-wired entrances, 4 side screws.
   .3 Split feed operation.
   .4 Nylon face, refer to drawings for colour.
   .5 Double wipe heavy phosphor bronze contacts.
   .6 Decorator style equivalent to those manufactured by Pass & Seymour 26242.

.3 Ground Fault Circuit Interrupter Receptacles: same as general purpose receptacles, except for following features:

1. Solid state ground fault sensing and signaling.
2. 5 milliamperes ground fault trip level.
3. Feed-through type.

.4 Locking Receptacles: same as general purpose receptacles, except as follows:

1. L5-15R or L5-20R configuration.
2. Side wiring only.

2.2 COVER PLATES

.1 Stainless Steel: 1.0 mm thick, protective release paper, stainless steel screws. Type 302/304, #4 finish.

.2 Weatherproof while in-use coverplates to be equal to Hubbell low profile, extra duty, ML500G.

3. Execution

3.1 INSTALLATION, GENERAL

.1 Install wiring devices as indicated and in accordance with manufacturer's written instructions.

.2 Install wiring devices only in electrical boxes which are clean.

.3 Install devices and cover plates flush and level.

.4 Provide a matching male plug for all receptacles other than 15 A, 5-15R configuration receptacles.

3.2 COLOUR SCHEDULE

.1 Receptacles: white colour, except as otherwise indicated.

3.3 REPLACEMENTS

.1 Replace all wiring devices and cover plates damaged during construction.

END OF SECTION