



Request for Tenders

To: Agriculture and Agri-Food Canada (AAFC)

Project Title:

Tempered water and cross connection control

At: The Guelph Food Research Centre in Guelph, Ontario

Tenders **must** be received **by: 2:00 PM**, Eastern Standard Time

On: October 8th, 2013 at the following address:

Agriculture and Agri-Food Canada

Corporate Management Branch
Assets Team – Eastern Service Centre

TENDER RECEIVING UNIT

2001 University St., Suite 671-TEN
Montreal, QC
H3A 3N2

**Note: Tenders received at a location other than this one
will be rejected.**



Table of Contents

1. INSTRUCTION TO TENDERERS

Appendix "1"

Appendix "2"

Appendix "3"

Appendix "4"

Appendix "5"

Appendix "6"

2. Appendix "A" / Specifications

3. Appendix "B" / Terms of Payment.

4. Appendix "C" / General Conditions

5. Appendix "D" / Labour Conditions

6. Appendix "E" / Insurance Conditions

7. Appendix "F" / Contract Security Conditions

8. Tender Form

9. Articles of Agreement

PLANS

M-1 OVERALL WATER SUPPLY SYSTEM SCHEMATIC AND FIXTURE CLASSIFICATION

M-2 OVERALL WATER SUPPLY SYSTEM SCHEMATIC

M-3 PENTHOUSE DEMOLITION

M-4 PENTHOUSE PROPOSED LAYOUT

M-5 FLOOR PLAN PLUMBING-DEMOLITION

M-6 FLOOR PLAN PLUMBING-PROPOSED

M-7 SOFT WATER LINE MODIFICATIONS

M-8 WEST WING AND PILOT PLANT PROPOSED

M-9 FLOOR PLAN PLUMBING-PROPOSED

M/E-1 PENTHOUSE PROPOSED NATURAL GAS/ELECTRICAL



INSTRUCTIONS TO TENDERERS

- Invitation** 1. Sealed tenders will be received up to the local time, on the date, and at the location indicated on the Tender Form, for the construction of the described works.
- Information on Site Conditions** 2. Each tenderer must fully inform themselves of the conditions relating to the work to be performed and shall inspect the site and be thoroughly familiar with the Plans Specifications and all terms and covenants of the tender documents. Failure to do so will not relieve the successful tenderer of their obligations to enter into the contract and to carry out the work for the consideration as set forth in their offer.
- Pre-Tender Meeting** 3. A pre-tender information meeting, followed by a site visit is scheduled **for 11:00 AM, October 1st, 2013 at the Guelph Food Research Centre located on 93 Stone Rd. W. Guelph, Ontario, N1G 5C9.** Tenderers are requested to be present at the reception desk at least 10 minutes prior to the meeting. No other pre-tender meeting will be scheduled during the tender process. Attendance by interested tenderers is **not mandatory**.
- Explanations and Modifications** 4. Any explanation desired by tenderers regarding the meaning or interpretation of the tender documents must be requested in writing and with sufficient time allowed for a reply to reach them before the submission of their tenders. Verbal explanations or instructions given before the award of the contract will not be binding. Any request for explanation must be directed **ONLY** to the Contracting Authority named below:

Carol Rahal
Agriculture and Agri-Food Canada
2001 University, 671 -TEN
Montreal, Quebec
Telephone : 514 315-6143
Facsimile : 514 283-3143
carol.rahal@agr.gc.ca

Canada reserves the right to revise or amend the tender documents prior to the date set for opening tenders. Such revisions and amendments, if any, will be announced by an addendum or addenda to the documents.

Tenderers are required to acknowledge receipt of all addenda to the tender documents on the Tender Form in the space provided. Failure to acknowledge all addenda may cause the tender to be rejected.

Tender Security

- 5. Tenders must be accompanied by security having one of the following three forms :
 - (a) A Bid Bond generally in the form prescribed in Appendix "1" of the Instructions annexed hereto, executed by the tenderer and a Surety named in Appendix "4" in the Instructions annexed hereto, in the amount of 10% of the total tender.
 - or alternatively**
 - (b) A Security Deposit in an amount of 10% of the amount of the tender to a value of \$250,000.00, plus 5% of the amount by which the amount of the tender exceeds \$250,000.00. The Security Deposit shall take the form of either
 - (i) a certified cheque payable to the Receiver General for Canada as follows :
 - (A) certified cheques drawn on chartered banks, including Canadian branches of foreign banks, are acceptable as security deposits without confirmation,
 - (B) certified cheques drawn on Province of Alberta Treasury Branches are acceptable as security deposits without confirmation,
 - (C) certified cheques, drawn on trust companies or credit unions, provided as tender and/or contract security must be accompanied by a written statement from the institution on which the cheque is drawn that the institution :



- if a trust company, is a member of the Canadian Payments Association;
- if a credit union, is a member of a central which is a member of the Canadian Payments Association, or is itself a member either individually or through a provincial central;

or

(ii) bonds of the Government of Canada or unconditionally guaranteed as to principal and interest by the Government of Canada, if such bonds are :

- (A) payable to bearer,
- (B) accompanied by a duly executed instrument of transfer to the Receiver General for Canada in the form prescribed by the Domestic Bonds of Canada Regulations, or
- (C) 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.

or alternatively

(c) An irrevocable bid support Letter of Credit in the form prescribed in Appendix "5" of the Instructions annexed hereto, in the amount of not less than 10% of the total tender.

Preparation of Tenders

6. Tenders must be submitted on the printed form provided and must be accompanied by tender security of a form described in the immediately preceding paragraph 4.

The Tender Form provides for quotation of prices only on the scheduled items. Tenderers must quote on each item in the Unit Price Table, and failure to do so may disqualify the tender. Alternative tenders will not be considered unless specifically called for. Any alteration or additions to the pre-printed part of the Tender Form may be cause to reject the tender.

Tenders shall be submitted in sealed envelopes. The following information shall be clearly marked on the outside of the envelope :

- (i) it is a tender,
- (ii) the name of the project,
- (iii) the name and address of the tenderer.

Telegraphic or facsimile tenders will not be considered. Modifications by letter, telegraph or facsimile (514 283-3143) of tenders already submitted will be considered if received prior to the time fixed for receipt of tenders; such modifications **must only state** :

- (i) the item or items to be modified,
- (ii) the amount each item is to be modified,
- (iii) the total amount of the modification.

However, such modifications by letter, telegram or facsimile shall not reveal the amount of the original or the revised total tender.

Signature of Tender Form

- 7. (a) Tenders must be properly completed in full compliance with the requirements indicated herein.
- (b) The signature of persons tendering must be in their respective handwriting.
- (c) The tenderer, or the person or persons duly authorized to sign on their behalf, must



initial and date each and every correction, change, erasure or alteration contained in the completed tender.

- (d) LIMITED COMPANY: If the tender is made by a limited, the tender must be signed in the name of the company by the authorised signing officers should be printed in the spaces provided therefore
- (e) PARTNERSHIP: If the tender is made by a partnership, the tender must be signed in the name of the partnership by the authorised signing officer(s) of the partnership. In addition, the name of the partnership and the name(s) and title(s) of the signing officer(s) should be printed in the spaces provided therefore.
- (f) SOLE PROPRIETORSHIP: If the tender is made by an individual carrying on business as a non-limited company using their own name, a name other than their own or a firm name, the tender must be signed by the individual of the authorized signing officer(s) of the firm. . In addition, the name of the individual or of the firm and the name(s) of the signing officer(s) should be printed in the spaces provided therefore.

Withdrawal Of Tenders 3. Tenders may be withdrawn on written, telegraphic or facsimile **((514) 283-3143)** request received from tenders prior to the time fixed for receipt of tenders. Negligence on the part of the tender in preparing the tender confers no right for the tender after it has been opened.

Rejection of Tenders 9. Canada reserves the right to reject any and all tenders when such rejection is in the interest of Canada.

Award of Contract 10. The contract will be awarded as soon as possible after tenders are received, provided that the lowest or any tender will not necessarily be accepted. All tender security may be held until a contract is awarded, or if no contract is awarded, until so decided by the Minister or his/ her representative.

Contract Security 11. The Contractor whose tender is accepted will be required to furnish to the Minister Contract Security in accordance with the conditions as outlined in Appendix "F", entitled "Contract Security Conditions".

When provided, any Performance Bond and Labour and Material Payment Bond shall be in the form prescribed in Appendices "2" and "3" respectively of the Instructions annexed hereto. These Bonds must be issued by one or more of the Sureties named in Appendix "4" of the Instructions annexed hereto.

When provided, any Irrevocable Contract Support Letter of Credit shall be in the form provided in Appendix "5".

Upon approval of the Minister, a Performance Bond and a Labour and Material Payment bond in the form prescribed above, executed by the successful tenderer and approved Surety, or alternatively, an Irrevocable Contract Support Letter of Credit, may be substituted for the Security Deposit deposited as tender security.

Approved Equals 12. Requests for "Approved Equals" shall be made in writing and shall be received at least seven (7) working days prior to tender closing.

Goods and Services Tax (GST) 13. For the purpose of establishing the amount of taxes that are to be included in the tender price, the Tenderer must take into account all applicable taxes.

The Goods and Services Tax (GST), implemented January 1, 1991, is NOT to be considered an applicable tax for purposes of this tender.

Any amount to be levied in respect of the GST will be billed as a separate item with each request for progress payment submitted by the Contractor. The GST levy will be paid to the Contractor in addition to the amount approved by the Engineer for work performed under the contract and will, therefore, not affect the amount of the contract. The Contractor's GST registration number must be shown on all requests for progress payments. No GST levy will be paid to the Contractor if the Contractor does not have a GST registration number.



The Contractor will be required to make the appropriate remittance to Revenue Canada in accordance with the legislation.

Income Tax Requirement

14. Pursuant to paragraph 221 (1)(d) of the Income Tax Act, payments made by departments and agencies under applicable contracts (including contracts involving a mix of goods and services) must be reported on a T4A supplementary slip. To comply with this requirement, contractors are required to provide certification on the form shown in Appendix "6" in the Instructions annexed hereto within fourteen (14) calendar days of notification of contract award and within fourteen (14) calendar days immediately following any change to the information already provided under the Contract.



APPENDIX "1" OF INSTRUCTIONS TO TENDERERS

BID BOND

Bond No. : _____

Amount: _____ \$

KNOW ALL MEN BY THESE PRESENTS, that

as Principal, hereinafter called the Principal, and

as Surety, hereinafter called the Surety, are, subject to the conditions hereinafter contained, held and firmly bound unto Her Majesty the Queen in Right of Canada, Represented by the Minister of Agriculture and Agri-Food as Oblige, hereinafter called the Crown, in the amount of _____ dollars (\$ _____), lawful money of Canada, for the payment of which sum, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

SIGNED AND SEALED this _____ day of _____, 20_____.

WHEREAS, the Principal has submitted a written tender to the Crown, dated the _____ day of _____, 20_____, for

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION are such that if:

- (a) the Principal, should his tender be accepted within the period be specified by the Crown, or, if no period be specified, within sixty (60) days after closing date of the tender, does execute within a period specified by the Crown, or, if no period be specified therein, within fourteen (14) days after the prescribed forms are presented to him for signature, execute such further contractual documents, if any, as may be required by the terms of the tender as accepted, and does furnish a Performance Bond and a Labour and Material Payment Bond, each in the amount of 50% of the Contract price and satisfactory to the Crown, or other security acceptable to the Crown, or
- (b) the Principal does pay to the Crown the difference between the amount of the Principal's tender and the amount of the Contract entered into by the Crown for the work, supplies and services which were specified in the said tender, if the latter amount be in excess of the former, then this obligation shall be void; otherwise it shall remain in full force and effect.

PROVIDED, HOWEVER, that the Surety and the Principal shall not be liable to the Crown for an amount greater than the amount specified in this bond.

PROVIDED FURTHER that the Surety shall not be subject to any suit or action unless such suit or action is instituted and process therefore served upon the Surety at its Head Office in Canada, within twelve (12) months from the date of this bond.

IN TESTIMONY WHEREOF, the Principal has hereto set its hand and affixed its seal, and the Surety has caused these presents to be sealed with its corporate seal duly attested by the signature of its authorized signing authority, the day and year first above written.

SIGNED, SEALED AND DELIVERED
in the presence of :

Principal

Witness

Surety

Note: Affix Corporate seal, if applicable.



APPENDIX "2" OF INSTRUCTIONS TO TENDERERS

PERFORMANCE BOND

Bond No. : _____

Amount: _____ \$

KNOW ALL MEN BY THESE PRESENTS, that

as Principal, hereinafter called the Principal, and

as Surety, hereinafter called the Surety, are, subject to the conditions hereinafter contained, held and firmly bound unto Her Majesty the Queen in Right of Canada, Represented by the Minister of Agriculture and Agri-Food as Obligee, hereinafter called the Crown, in the amount of : _____ dollars (\$ _____), lawful money of Canada, for the payment of which sum, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

SIGNED AND SEALED this _____ day of _____, 20_____.

WHEREAS, the Principal has submitted a written tender to the Crown, dated the _____ day of _____, 20_____, for which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall well and faithfully observe and perform all the obligations on the part of the Principal to be observed and performed in connection with the Contract, then this obligation shall be void, otherwise it shall remain in full force and effect, subject, however, to the following conditions:

- (1) Whenever the Principal shall be, and declared by the Crown to be, in default under the Contract, the Surety shall
 - (a) if the work is not taken out of the Principal's hands, remedy the default of the Principal,
 - (b) if the work is taken out of the Principal's hands and the Crown directs the Surety to undertake the completion of the work, complete the work in accordance with the Contract provided that if a contract is entered into for the completion of the work
 - (i) it shall be between the Surety and the Completing Contractor, and
 - (ii) the selection of such completing contractor shall be subject to the approval of the Crown,
 - (c) if the work is taken out of the Principal's hands and the Crown, after reasonable notice to the Surety, does not direct the Surety to undertake the completion of the work, assume the financial responsibility for the cost of completion in excess of the moneys available to the Crown under the Contract,
 - (d) be liable for and pay all the excess costs of completion of the Contract, and
 - (e) not be entitled to any Contract moneys earned by the Principal, up to the date of his default on the Contract and any holdbacks relating to such earned Contract moneys held by the Crown, and the liability of the Surety under this Bond shall remain unchanged provided, however, and without restricting the generality of the foregoing, upon the completion of the Contract to the satisfaction of the Crown, any Contract moneys earned by the Principal or holdbacks related thereto held by the Crown may be paid to the Surety by the Crown.
- (2) The Surety shall not be liable for a greater sum than the amount specified in this Bond.
- (3) No suit or action shall be instituted by the Crown herein against the Surety pursuant to these presents after the expiration of two (2) years from the date on which final payment under the Contract is payable.

IN TESTIMONY WHEREOF, the Principal has hereto set its hand and affixed its seal, and the Surety has caused these presents to be sealed with its corporate seal duly attested by the signature of its authorized signing authority, the day and first above written.

SIGNED, SEALED AND DELIVERED
in the presence of :

Principal

Surety

Note: Affix Corporate seal if applicable.



APPENDIX "3" OF INSTRUCTIONS TO TENDERERS

LABOUR AND MATERIAL PAYMENT BOND

Bond No. : _____

Amount: _____ \$

KNOW ALL MEN BY THESE PRESENTS, that

as Principal, hereinafter called the Principal, and

as Surety, hereinafter called the Surety, are, subject to the conditions hereinafter contained, held and firmly bound unto Her Majesty the Queen in Right of Canada, Represented by the Minister of Agriculture and Agri-Food as Obligee, hereinafter called the Crown, in the amount of _____ dollars (\$ _____), lawful money of Canada, for the payment of which sum, well and truly to be made, the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

SIGNED AND SEALED this _____ day of _____, 20_____.

WHEREAS, the Principal has submitted a written tender to the Crown, dated the _____ day of _____, 20_____, for

which Contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION are such that, if payment is promptly made to all Claimants who have performed labour or services or supplied material in connection with the Contract and any and all duly authorized modifications and extensions of the Contract that may hereafter be made, notice of which modifications and extensions to the Surety being hereby waived, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions :

- (1) For the purpose of this bond, a Claimant is defined as one having a direct contract with the Principal or any Sub-Contractor of the Principal for labour, material or both, used or reasonably required for use in the performance of the Contract, labour and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone services or rental of equipment (but excluding rental of equipment where the rent pursuant to an agreement is to be applied towards the purchase price thereof) directly applicable to the Contract.
- (2) For the purpose of this Bond, no payment is required to be made in respect of a claim for payment for labour or services performed or material supplied in connection with the Contract that represents a capital expenditure, overhead or general administration costs incurred by the Principal during the currency or in respect of the Contract.
- (3) The Principal and the Surety hereby jointly and severally agree with the Crown that if any Claimant has not been paid as provided for under the terms of his contract with the Principal or a Sub-Contractor of the Principal before the expiration of a period of ninety (90) days after the date on which the last of such Claimant's labour or service was done or performed or materials were supplied by such Claimant, the Crown may sue on this bond, have the right to prosecute the suit to final judgment for such sum or sums as may be due and have execution thereon; and such right of the Crown is assigned by virtue of Part VIII of the Financial Administration Act to such Claimant.
- (4) For the purpose of this bond the liability of the Surety and the Principal to make payment to any claimant not having a contract directly with the Principal shall be limited to that amount which the Principal would have been obliged to pay to such claimant had the provisions of the applicable provincial or territorial legislation on lien or privileges been applicable to the work. A claimant need not comply with provisions of such legislation setting out steps by way of notice, registration or otherwise as might have been necessary to preserve or perfect any claim for lien or privilege which the claimant might have had. Any such claimant shall be entitled to pursue a claim and to recover judgment hereunder subject to the terms and notification provisions of the Bond.



- (5) Any material change in the Contract between the Principal and the Crown shall not prejudice the rights or interest of any Claimant under this Bond who is not instrumental in bringing about or has not caused such change.
- (6) No suit or action shall be commenced hereunder by any Claimant:
 - (a) Unless such Claimant shall have given written notice within the time limits hereinafter set forth to the Principal and the Surety above named, stating with substantial accuracy the amount claimed. Such notice shall be served by mailing the same by registered mail to the Principal and the Surety at any place where an office is regularly maintained for the transaction of business by such persons or served in any manner in which legal process may be served in the Province or other part of Canada in which the subject matter of the Contract is located. Such notice shall be given
 - (i) in respect of any claim for the amount or any portion thereof required to be held back from the Claimant by the Principal or by the Sub-Contractor of the Principal under either the terms of the Claimant's Contract with the Principal or the Claimant's Contract with the Sub-Contractor of the Principal within one hundred and twenty (120) days after such Claimant should have been paid in full under this Contract,
 - (ii) in respect of any claim other than for the holdback or portion thereof referred to above within one hundred and twenty (120) days after the date upon which such Claimant did or performed the last of the service, work or labour or furnished the last of the materials for which such claim is made under the Claimant's Contract with the Principal or a Sub-Contractor of the Principal,
 - (b) After the expiration of one (1) year following the date on which the Principal ceased work on the said Contract, including work performed under the guarantees provided in the Contract,
 - (c) Other than in a court of competent jurisdiction in the province or district of Canada in which the subject matter of the Contract or any part thereof is situated and not elsewhere, and the parties hereto hereby agree to submit to the jurisdiction of such court.
- (7) The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.
- (8) The Surety shall not be entitled to claim any moneys relating to the Contract and the liability of the Surety under this Bond shall remain unchanged and, without restricting the generality of the foregoing, the Surety shall pay all valid claims of Claimants under this Bond before any moneys relating to the Contract held by the Crown are paid to the Surety by the Crown.
- (9) The Surety shall not be liable for a greater sum than the amount specified in this bond.

IN TESTIMONY WHEREOF, the Principal has hereto set its hand and affixed its seal, and the Surety has caused these presents to be sealed with its corporate seal duly attested by the signature of its authorized signing authority, the day and first above written.

SIGNED, SEALED AND DELIVERED
in the presence of :

Principal

Surety

Witness

Note: Affix Corporate seal, if applicable.



APPENDIX "4" OF INSTRUCTIONS TO TENDERERS

LIST OF COMPANIES WHOSE GUARANTEE BONDS ARE ACCEPTABLE BY GOVERNMENT OF CANADA

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

Revised - September, 2010



APPENDIX "5" OF INSTRUCTIONS TO TENDERERS

Use of Irrevocable Letters of Credit for Tender or Contract Security for Federal Government Contracts.

1. Definitions

For the purpose of these instructions:

- 1.1 a Letter of Credit means any arrangement, however named or described, whereby a financial institution, acting at the request and on the instructions of a Contractor, or on its own behalf, is to make a payment to or to the order of Her Majesty, as the beneficiary, or is to accept and pay bills of exchange drawn by Her Majesty, provided that the terms and conditions of the letter of credit are complied with.
- 1.2 a Bid Support Letter of Credit is a letter of credit pursuant to which demand may be made if the proposed Contractor refuses or fails to enter into a written contract in accordance with the terms and conditions of the bid or fails to provide the required contract security.
- 1.3 a Contract Support Letter of Credit is a letter of credit pursuant to which demand may be made if the Contractor, having entered into a contract with Her Majesty, does not perform the contract in accordance with the terms and conditions of that contract.
- 1.4 the expression "Member of the Canadian Payments Association", is defined in the Canadian Payments Association Act.
- 1.5 the expression "UCP" means the International Chamber of Commerce (ICC) Uniform Customs and Practice for Documentary Credits, 1993 Revision, ICC Publication No. 500.

2. Form of Letter of Credit

2.1 A letter of credit shall:

- (a) clearly specify that it is irrevocable or is deemed to be irrevocable pursuant to article 6 (c) of the UCP;
- (b) be issued by a financial institution which is a member of the Canadian Payments Association or issued by a financial institution confirmed by a financial institution that is a member of the Canadian Payments Association;
- (c) state the face amount which may be drawn against it;
- (d) state its expiry date (date to be 60 days beyond the specified contract completion date);
- (e) provide for sight payment to the Receiver General for Canada by way of the financial institution's draft against presentation of a written demand for payment signed by the authorized departmental representative identified in the letter of credit by his/her officer;
- (f) provide that more than one written demand for payment may be presented subject to the sum of those demands not exceeding the face amount of the Letter of Credit;
- (g) provide that it is subject to the International Chamber of Commerce (ICC) Uniform Customs and Practice for Documentary Credits, 1993 Revision, ICC Publication No. 500.



3. Payment of a Letter of Credit

- 3.1 After an offer is accepted within the specified time after the closing date for bidding, and if the contractor refuses to enter into the contract or refuses or is unable to furnish any required contract security or contract support letter of credit, Her Majesty may demand payment under the bid support letter of credit in accordance with its terms. Proceeds from the letter of credit shall be applied in accordance with the terms and conditions governing the bid solicitation.
- 3.2 During the performance of a contract, if the contractor does not comply with all the terms and conditions of the contract, Her Majesty may demand payment under the contract support letter of credit in accordance with its terms. Proceeds from the letter of credit shall be applied in accordance with the terms and conditions of the contract.



APPENDIX "6" OF INSTRUCTIONS TO TENDERERS

The Contractor shall complete and submit this T4-A Certification within fourteen (14) calendar days of Notification of Contract award and within fourteen (14) calendar days immediately following any change to the information already provided under the Contract. Failure to provide this information or failure to provide the correct information shall result in a fundamental breach of the Contract.

1. The Contractor shall enter a [x] in one of the boxes below opposite the description that best describes its status.

- [] A business incorporated either federally or provincially;
[] An unincorporated business, either as a sole proprietor or a partnership; or
[] An individual.

Note: The information provided in Section 2 must correspond with that provided in Section 1.

Corporate or unincorporated business or individual's name: _____

Street Name or Box #: _____

City, Town or Village: _____

Province: _____

Postal Code: _____

2. Contractor shall complete Section 2(a) or 2(b) or 2(c), whichever is applicable to its situation.

(a) If incorporated:

Business Number (BN): _____, or
GST / HST Number: _____, or
T2 Corporation Tax Number (T2N): _____, whichever is applicable

(b) If unincorporated:

Social Insurance Number (SIN): _____, and
Business Number (BN): _____, or
GST / HST Number: _____, whichever is applicable

Note: The Unincorporated Business Name must be the same as the name associated with the Revenue Canada Business Number or the GST Number.

(c) If individual:

Social Insurance Number (SIN): _____, and
Business Number (BN): _____, or
GST / HST Number: _____, whichever is applicable

Note: The Individual's Name must be the same as the name associated with the Social Insurance Number.

3. WE HEREBY CERTIFY that I/We have examined the information provided above, including the legal name, address and Revenue Canada identifier (SIN, BN, GST / HST No., T2N), as applicable, and that it is correct and complete, and fully discloses my/our identification.

Contractor's signature Title of Signatory Date



APPENDIX "A"
SPECIFICATIONS

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 All other sections forming part of the contract documentation.

1.2 **WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises providing backflow/cross contamination devices to meet City of Guelph backflow bylaw, Canada Labour code, and tempered water upgrade for emergency fixtures and as indicated below:
 - .1 Demolition and removal of piping as shown and as required.
 - .2 Provision of new backflow preventers as shown on drawings and as required.
 - .3 Provision of recirculation pumps c/w starters, power wiring, control wiring and conduits.
 - .4 Provision of tempered water piping and recirculation piping.
 - .5 Provision of water piping c/w fittings, valves, supports and pipe insulation (min. 25mm).
 - .6 Provision of hot water tank c/w gas piping and all associated electrical.
 - .7 Provision of expansion tanks.
 - .8 Piping and equipment identification.
 - .9 Testing, commissioning, adjusting and water balancing. Testing of all newly installed backflow preventers to ensure proper operation and submission of test reports to City of Guelph.
 - .10 Associated electrical and controls work.
 - .11 All associated civil work such as new concrete, ultrasonic scanning, boring, cutting, patching and painting, and restoring all fire separations that are penetrated.
 - .12 Include for relocation of all existing mechanical, plumbing, electrical services, hangers, supports as necessary to allow for installation of proposed work as identified in drawings and specifications.
 - .13 Include for after hours work and security. Work in penthouse areas can be completed during the day. All other work in the buildings shall be after hours from 6:00pm to 6:00am. Equipment and water shutdowns shall only be performed on Saturday after 18:00 to Sunday 06:00.
 - .14 Contractor shall review existing designated substance survey provided by AAFC and shall include in pricing all remedial work and air testing as necessary for the scope of work covered in this project.

1.3 **CONTRACT METHOD**

- .1 Construct Work under single contract.
- .2 Relations and responsibilities between Contractor and Owner are as defined in Conditions of Contract. Assigned Subcontractors must, in addition: Furnish to Contractor bonds covering faithful performance of subcontracted work and payment of obligations there under when Contractor is required to furnish such bonds to Consultant.

- .1 Purchase and maintain liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required to provide to Consultant.

1.4 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Consultant.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Consultant in writing, any defects which may interfere with proper execution of Work.
- .3 Work of this Project must include provisions for co-ordinating additional work, identified in Contract Documents, for following principal items.
 - .1 Abatement of designated substances.

1.5 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction.
- .2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .3 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.
- .4 Maintain fire access/control.

1.6 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for Work, for storage and for access to allow:
 - .1 Owner occupancy.
 - .2 Partial owner occupancy.
 - .3 Work by other contractors.
 - .4 Public usage.
- .2 Co-ordinate use of premises under direction of Owner's representative.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Consultant.
- .6 At completion of operations condition of existing work shall be equal to or better than that which existed before new work started.

1.7 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations. Contractor shall price and schedule all work for after hours from 06:00pm to 06:00am.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.8 PARTIAL OWNER OCCUPANCY

- .1 Schedule and substantially complete designated portions of Work for Owner's occupancy prior to Substantial Performance of entire Work.
- .2 Owner will occupy designated areas for purpose of storage of furnishings and equipment.
- .3 Execute Certificate of Substantial Performance for each designated portion of Work prior to Owner occupancy. Contractor shall allow:
 - .1 Access for Owner personnel.
 - .2 Use of parking facilities.
 - .3 Operation of H & V and electrical systems.
- .4 On occupancy, Owner will provide for occupied areas:
 - .1 Operation of H & V and electrical systems.
 - .2 Maintenance.
 - .3 Security.

1.9 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations, occupants, and normal use of premises. Arrange with Owner's representative to facilitate execution of work.
- .2 Use only elevators existing in building for moving workers and material.
 - .1 Protect walls of passenger elevators, to approval of Owner prior to use.
 - .2 Accept liability for damage, safety of equipment and overloading of existing equipment.

1.10 EXISTING SERVICES

- .1 Notify Consultant and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give the Owner a minimum of 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to building operations.
- .3 Provide alternative routes for personnel, pedestrian and vehicular traffic, as deemed necessary by the Consultant or Owner.

- .4 Establish location and extent of service lines in area of work before starting Work. Notify Consultant of findings.
- .5 Submit schedule to and obtain approval from Consultant for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide temporary services to maintain critical building and tenant systems.
- .7 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .8 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.
- .9 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .10 Record locations of maintained, re-routed and abandoned service lines.
- .11 Construct barriers, in accordance with the applicable standards, as required for execution of this project.

1.11 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other Modifications to Contract.
 - .8 Field Test Reports.
 - .9 Copy of Approved Work Schedule.
 - .10 Health and Safety Plan and Other Safety Related Documents.
 - .11 Other documents as specified.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

93 Stone Road, Guelph, ON

September 2013

Project A317 Cross Connection Control & Potable Tempered Water Distribution

Section 01 11 00

SUMMARY OF WORK

Page 5 of 5

END OF SECTION

PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Administrative
- .2 Shop drawings and product data.
- .3 Operating Manuals

1.2 **ADMINISTRATIVE**

- .1 Submit to Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present shop drawings, product data and samples in both Imperial and SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as a specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work is coordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .10 Keep one (1) reviewed copy of each submission on site.

1.3 **SHOP DRAWING AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work
- .2 Indicated materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of work. Where article or equipment attach or connect to other articles or equipment, indicate that such items will be supplied and installed. Indicate cross reference to design drawings and specifications.

- .3 Allow ten days for Consultant's review of each submission.
- .4 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with work.
- .5 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revision other than those requested.
- .6 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractors name and address.
 - .4 Identification and quantity of each shop drawing and product data.
 - .5 Other pertinent data.
- .7 Submission shall include:
 - .1 Date and revision dates
 - .2 Project title and number.
 - .3 Name and address of :
 - .1 Subcontractor.
 - .2 Supplier and manufacturers
- .8 Contractor's stamp, signed by Contractors authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .9 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout,
 - .3 Setting or erection details
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
- .10 After Consultants review, distribute copies.
 - .1 Submit one electronic copy of shop drawings for each requirement requested in specification Sections and as consultant may reasonably request.
- .11 Submit one electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.

- .14 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.4 OPERATING MAINTENANCE MANUALS

- .1 Refer to section 019151.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Consultant (3) three copies of operating and maintenance manuals.
- .3 Manuals to contain operational information on equipment, cleaning and lubrication schedules, filters, overhaul and adjustment schedules and similar maintenance information.
- .4 Bind contents in a three-ring, D ring style hard covered, plastic jacketed binder. Organize contents into applicable categories of work, parallel to specifications Sections.

END OF SECTION

PART 1 **GENERAL****1.1** **SECTION INCLUDES**

- .1 Health and safety considerations required to ensure that the contractor shows due diligence towards health and safety on construction sites, and meets the requirements laid out in Occupational Health and Safety standards.

1.2 **RELATED SECTIONS**

- .1 All other sections forming part of the contract documentation.

1.3 **REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Ontario
 - .1 Occupational Health and Safety Act, R.S.O. [1990 Updated 2005].

1.4 **SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction, daily.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .7 Owner's representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Owner's representative within 5 days after receipt of comments from Owner's representative.
- .8 Owner's representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Owner's representative.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.5 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

1.6 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

1.7 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Owner's representative prior to commencement of Work.

1.8 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with federal and provincial regulations. Where federal regulations are more stringent, the more stringent regulations shall be followed.

1.9 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Owner's representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.10 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 AAFC will provide a list of chemicals contained in the AAFC facility. Any work done by the contractor shall maintain the safety of all persons on site and safety of property on site. If the contractor deems that some products are dangerous, the chemical will be moved by AAFC in order for AAFC employees and contractor employees to remain safe during the course of construction for this project.
- .4 If contractor deems that some research laboratory equipment may be at risk of damage during construction, the contractor shall notify AFCC and AFCC shall relocate the equipment or protect the equipment.

1.11 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Health and Safety Act, R.S.O.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.12 UNFORESEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Ontario having jurisdiction and advise Owner's representative verbally and in writing.

1.13 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with construction.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work.

1.14 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Ontario having jurisdiction, and in consultation with Owner's representative.

1.15 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Owner's representative.
- .2 Provide Owner's representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Owner's representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.16 BLASTING

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Owner's representative.

1.17 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after receipt of written permission from Owner's representative.

1.18 **WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

PART 2 **PRODUCTS**

2.1 **NOT USED**

- .1 Not used.

PART 3 **EXECUTION**

3.1 **NOT USED**

- .1 Not used.

END OF SECTION

PART 1 **GENERAL**

1.1 **REFERENCE STANDARD**

- .1 Comply with provisions of OAA, OGCA Document No. 100, "Take-Over Procedures" except as modified in these Specifications.

1.2 **OPERATING AND MAINTENANCE MANUALS**

- .1 Refer to Sections 011100 and 019151
- .2 Provide operation and maintenance manuals.
- .3 Provide operating and maintenance data, prepared on 8 1/2" X 11" sheets in printed or typewritten form.
- .4 Provide the following materials as applicable to work of this Contract:
 - .1 Complete list of products used in the work showing product name, part number or code and manufacturer for each listing; follow specification format.
 - .2 Brochures, cuts of all equipment and fixtures.
 - .3 Operating and maintenance instructions for all equipment.
 - .4 Valve manual.
 - .5 Controls schematics.
 - .6 Extended warranties.
 - .7 Other data required elsewhere in Contract Documents or deemed necessary by Consultant.

1.3 **WARRANTIES**

- .1 Definition: Warranty = guarantee.
- .2 Submission Requirements:
 - .1 Submit extended warranties as part of "Operating and Maintenance Manuals".
 - .2 Each warranty must show:
 - .1 Name and address of Project
 - .2 Name of the Owner
 - .3 Section Number and Title
 - .3 All warranties must be presented under Contractor's letterhead, seal and signature and must bear similar wording to that specified in Contract Documents.
 - .4 Submit manufacturers' Product warranties.

1.4 RECORD DRAWINGS

- .1 Prior to Substantial Performance obtain a CAD file of all Contract Drawings from Consultant and transfer changes, revisions, deletions and additions made throughout the execution of the Work, from the set of prints kept on site to the CAD file.
- .2 Clearly and prominently mark each drawing "RECORD DRAWING prepared by
- .3 (name of Contractor).

1.5 CERTIFICATES OF COMPLIANCE

- .1 Submit Certificates of Compliance, prior to the application for Substantial Performance, for each of the following items:
 - .2 An affidavit relative to the use of lead-free solder for all domestic water lines, regardless of location.
 - .3 Products for which Material Safety Data Sheets have been submitted and accepted.
 - .4 Other Work / Products identified in the Contract Documents as requiring a Certificate of Compliance.
 - .5 Each Certificate of Compliance shall indicate names and addresses of the project, the Owner, the date of issue, product description including name, number, manufacturer, with a statement verifying that the Work / Product installed meets specified requirements and, if applicable, complies with the submitted and accepted Material Safety Data Sheets.
 - .6 Each Certificate of Compliance shall be issued on the subcontractor's letterhead, properly executed, under whose work the respective Work / Product has been provided.
 - .7 Each Certificate of Compliance shall be endorsed by the Contractor with his authorized stamp / signature.
 - .8 Ensure that submissions are made to allow sufficient time for review without delaying progress of scheduled completion.
 - .9 The Completion Security Account will not be paid to the Contractor without submission of all required affidavits and requested material and safety data sheets.
 - .10 Potable water network shall meet all regulations and Canada Labour code specific to domestic water quality.

1.6 OPERATING AND MAINTENANCE INSTRUCTIONS

- .1 Prior to requesting Substantial Performance, at a time acceptable to the Owner and Consultant, but not before operating and maintenance data has been reviewed and accepted by Consultant, instruct designated Owner's representatives in the operation and maintenance of all systems and equipment.
- .2 Arrange training sessions for each type of operating system and equipment. Sessions shall be conducted by qualified instructors and shall be of sufficient duration and depth to adequately instruct participants.

- .3 Throughout the training sessions make reference to reviewed operation and maintenance manuals to familiarize participants with the data provided.
- .4 Prepare an attendance record for each training session, to be signed by each participant upon conclusion of session. Show date and time of session, subject of session and name, title and organization of each participant. Submit a copy of each record to Consultant.
- .5 Subcontractor whose work is subject of training session and Contractor shall be represented during training session by qualified personnel.

1.7 SYSTEMS DEMONSTRATION

- .1 Prior to final inspection, demonstrate operation of each system to Owner and Consultant.
- .2 Instruct personnel in operation, adjustment, and maintenance of equipment and systems, using provided operation and maintenance data as the basis for instruction.
- .3 Include specific system demonstration instructions in all sections of the specifications.

1.8 INSPECTION AND ACCEPTANCE OF WORK

- .1 Prior to application for certificate of Substantial Performance, carefully inspect the Work and ensure it is complete, that major and minor construction deficiencies are complete, defects are corrected and the building is clean and in condition for occupancy. Notify the Consultant in writing, of satisfactory completion of the Work. If Consultant agrees that this stage has been reached, prepare a complete list of deficiencies and submit this list to Consultant.
- .2 On receipt of the above deficiency list in a satisfactory form, the Consultant, accompanied by Sub-consultants, the Contractor and the Owner, if deemed necessary, will carry out an inspection of the Project.
- .3 Add to the deficiency list, in accordance with Consultant's directions, any additional deficiencies which are identified during inspection and reissue updated deficiency list.
- .4 When the Consultant considers deficiencies and defects have been corrected and it appears requirements of the Contract have been performed, and all required documents requested have been submitted and accepted, such as maintenance manuals, inspection certificates, acceptance certificates, etc., make application for certificate of Substantial Performance.

1.9 FINAL SUBMISSION

- .1 Prior to claiming Final Payment do the following:
 - .1 Submit record drawings.
 - .1 Submit one complete set of reviewed shop drawings, folded to 8-1/2" x 11" size, contained in heavy duty manila envelopes, numbered and labelled.
 - .2 Submit one CD of record drawings and maintenance manuals and all instructions suitably labelled with project name and locations.
 - .3 Submit a final accounting of all approved changes to the Contract Price, including adjustments to cash allowances.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED REQUIREMENTS**

- .1 01 77 00 Project Closeout.

1.2 **REFERENCES**

- .1 NA.

1.3 **ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with contractor's representative and Owner's representative to:
 - .1 Verify Project requirements.
 - .2 Review manufacturer's installation instructions and warranty requirements.
 - .2 Consultant to establish communication procedures to:
 - .1 Notify construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.4 **ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Owner's Representative 3 final copies of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.5 **FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
 - .1 Identify contents of each binder on spine.

- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by [systems,] [process flow,] under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide scaled CAD files in dwg format on CD.

1.6 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor and suppliers with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

1.7 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for the Owner's Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.

- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Consultant.

1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of blue line opaque drawings, and in copy of Project Manual.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.9 FINAL SURVEY

- .1 Submit final site survey certificate, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.10 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.

- .1 Give function, normal operation characteristics and limiting conditions.
- .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 91 13 - General Commissioning (Cx) Requirements.
- .15 Additional requirements: as specified in individual specification sections.

1.11 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - .1 Provide information for re-ordering custom manufactured products
 - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .2 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

- .3 Additional requirements: as specified in individual specifications sections.

1.12 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Owner's representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Owner's representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to [site] [location as directed]; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Owner's representative.
 - .2 Include approved listings in Maintenance Manual.

1.13 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Owner's representative.

1.14 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.

- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Owner's representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Owner's representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Owner's representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Owner's representative.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include HVAC systems.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.

- .8 Starting point and duration of warranty period.
- .9 Summary of maintenance procedures required to continue warranty in force.
- .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
- .11 Organization, names and phone numbers of persons to call for warranty service.
- .12 Typical response time and repair time expected for various warranted equipment.
- .4 Contractor's plans for attendance at 9 and 9 month post-construction warranty inspections.
- .5 Procedure and status of tagging of equipment covered by extended warranties.
- .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Owner's representative to proceed with action against Contractor.

1.15 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Owner's representative.
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3

EXECUTION

3.1

NOT USED

.1

Not Used.

END OF SECTION

Part 1 General**1.1 ADMINISTRATIVE REQUIREMENTS**

- .1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of substantial performance.
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation.
 - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the designated location.
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system as follows:
 - .1 Plumbing System: 4 hours of instruction.
 - .2 Electrical System: 4 hours of instruction.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.

- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.3 QUALITY ASSURANCE

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
 - .1 Instruct Owner's personnel.
 - .2 Provide written report that demonstration and instructions have been completed.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

PART 1 **GENERAL****1.1** **SUMMARY**

.1 Section Includes:

- .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.

.2 Related Sections:

- .1 All divisions

.3 Acronyms:

- .1 Cx - Commissioning.
- .2 EMCS - Energy Monitoring and Control Systems.
- .3 O&M - Operation and Maintenance manual
- .4 PI - Product Information.
- .5 PV - Performance Verification.
- .6 TAB - Testing, Adjusting and Balancing.

1.2 **GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved.

.2 Objectives:

- .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
- .2 Ensure appropriate documentation is compiled into the O&M manual.
- .3 Effectively train O&M staff.

- .3 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.

- .1 Systems are to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems are to be interactively with each other as intended in accordance with Contract Documents and design criteria.
- .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

- .4 Design Criteria: as per client's requirements or determined by designer to meet Project functional and operational requirements.

1.3 COMMISSIONING OVERVIEW

- .1 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .2 Cx responsibilities is to ensure the built system is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .3 Consultant will issue Interim Acceptance Certificate when:
 - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Commissioning manager.
 - .2 Equipment, components and systems have been commissioned.
 - .3 O&M Manual received, reviewed and approved.
 - .4 O&M training has been completed.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

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

1.5 PRE-CX REVIEW

- .1 Before Construction:
 - .1 Review contract documents, confirm by writing to consultant.
 - .1 Adequacy of provisions for Cx.
 - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
 - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
 - .1 Ensure installation of related components, equipment, sub-systems, and systems are complete.
 - .2 Fully understand Cx requirements and procedures.
 - .3 Have Cx documentation shelf-ready.
 - .4 Understand completely design criteria and intent and special features.
 - .5 Submit complete start-up documentation to Commissioning manager and Consultant
 - .6 Have Cx schedules up-to-date.
 - .7 Ensure systems have been cleaned thoroughly.

- .8 Complete TAB procedures on systems; submit TAB reports to consultant for review and approval.
- .9 Ensure "As-Built" system schematics are available.
- .4 Inform consultant in writing of discrepancies and deficiencies on finished works.

1.6 CONFLICTS

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

1.7 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures
 - .1 Submit no later than 4 weeks after award of Contract:
 - .1 Name of Contractor's Cx agent.
 - .2 Draft Cx documentation.
 - .3 Preliminary Cx schedule.
 - .2 Request in writing to consultant for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
 - .3 Submit proposed Cx procedures to consultant where not specified and obtain written approval at least
 - .4 8 weeks prior to start of Cx.
 - .5 Provide additional documentation relating to Cx process required by Commissioning manager.

1.8 COMMISSIONING DOCUMENTATION

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

1.9 COMMISSIONING SCHEDULE

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16.07
- .2 Construction Progress Schedules - Bar (GANNT) Chart.

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

1.10 COMMISSIONING MEETINGS

- .1 Convene Cx meetings following project meetings: Section 01 32 16.07 - Construction Progress
- .2 Schedules - Bar (GANTT) Chart and as specified herein.
- .3 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .4 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .5 At 60% construction completion stage. Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart. Consultant to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
 - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
 - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .6 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .7 Meeting will be chaired by consultant, who will record and distribute minutes.
- .8 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent
- .9 Cx meetings and as required.

1.11 STARTING AND TESTING

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

1.12 WITNESSING OF STARTING AND TESTING

- .1 Provide 14 days notice prior to commencement.
- .2 Commissioning manager to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

- .1 Factory testing: manufacturer to:
 - .1 Coordinate time and location of testing.
 - .2 Provide testing documentation for approval by consultant.
 - .3 Arrange for Commissioning manager to witness tests.
 - .4 Obtain written approval of test results and documentation from consultant before delivery to site.
- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with consultant
 - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
 - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
 - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
 - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
 - .1 Experienced in design, installation and operation of equipment and systems.
 - .2 Ability to interpret test results accurately.
 - .3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
 - .1 Included in delivery and installation:
 - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
 - .2 Visual inspection of quality of installation.
 - .2 Start-up: follow accepted start-up procedures.
 - .3 Operational testing: document equipment performance.
 - .4 System PV: include repetition of tests after correcting deficiencies.
 - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Document require tests on approved PV forms
- .4 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by consultant. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:

- .1 Minor equipment/systems: implement corrective measures approved by consultant.
- .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by consultant.
- .3 If evaluation report concludes that major damage has occurred, consultant shall reject equipment.
 - .1 Rejected equipment to be remove from site and replace with new.
 - .2 Subject new equipment/systems to specified start-up procedures.

1.15 START-UP DOCUMENTATION

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

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

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

1.17 TEST RESULTS

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

1.18 START OF COMMISSIONING

- .1 Notify consultant and commissioning manager at least 14 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.19 INSTRUMENTS / EQUIPMENT

- .1 Submit to consultant for review and approval:
 - .1 Complete list of instruments proposed to be used.
 - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:
 - .1 2-way radios.
 - .2 Ladders.
 - .3 Equipment as required to complete work.

1.20 COMMISSIONING PERFORMANCE VERIFICATION

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

1.21 WITNESSING COMMISSIONING

- .1 Commissioning manager to witness activities and verify results.
- .2 Engineer to certify all PV results.
- .3 Contractors to be present at all tests.

1.22 AUTHORITIES HAVING JURISDICTION

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

1.23 EXTENT OF VERIFICATION

- .1 Elsewhere:

-
- .1 Provide manpower and instrumentation to verify all reported results, unless specified otherwise in other sections.
 - .2 Number and location to be at discretion of consultant.
 - .3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
 - .4 Perform additional commissioning until results are acceptable to consultant.

1.24 REPEAT VERIFICATIONS

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

1.25 SUNDRY CHECKS AND ADJUSTMENTS

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

1.26 DEFICIENCIES, FAULTS, DEFECTS

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

1.27 COMPLETION OF COMMISSIONING

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

1.28 ACTIVITIES UPON COMPLETION OF COMMISSIONING

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

1.29 TRAINING

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

1.30 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.31 OCCUPANCY

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

1.32 INSTALLED INSTRUMENTATION

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

1.33 PERFORMANCE VERIFICATION TOLERANCES

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

1.34 OWNER'S PERFORMANCE TESTING

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

1.35 PRODUCTS

- .1 Not Used.

1.36 EXECUTION

- .1 Not Used.

END OF SECTION

PART 1 **GENERAL**

1.1 **SUMMARY**

- .1 Section Includes:
 - .1 Commissioning forms to be completed for equipment, system and integrated system.
- .2 Related Sections:
 - .1 All divisions

1.2 **INSTALLATION/START-UP CHECK LISTS**

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

1.3 **PRODUCT INFORMATION (PI) REPORT FORMS**

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

1.4 **PERFORMANCE VERIFICATION (PV) FORMS**

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

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

1.5 SAMPLES OF COMMISSIONING FORMS

- .1 Contractor shall fill up the commissioning forms for plumbing systems.
- .2 Submit completed forms to the Cx Manager and Consultant for review.
- .3 Revise items on PV forms to suit project requirements.
- .4 Samples of PV forms are included in this section.

1.6 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS

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

1.7 COMMISSIONING FORMS

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

PART 2 **LANGUAGE**

.3 To suit the language profile of the awarded contract.

PART 3 **PRODUCTS**

.4 Not Used.

PART 4 **EXECUTION**

.5 Not Used.

END OF SECTION

PART 1 **GENERAL**

1.1 **REFERENCES**

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

1.2 **DEFINITIONS**

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

1.3 **SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets for all proposed products.
- .3 Shop Drawings:
 - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.
- .4 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.

- .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
- .4 Manufacturer's Field Reports: submit to manufacturer's written reports within 5 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: A company specializing in fire stopping installations with 5 years documented experience and approved by manufacturer.
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section with contractor's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 Once during progress of Work at 50% completion.
 - .3 Upon completion of Work, after cleaning is carried out.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, & ULC markings.
- .2 Storage and Protection:
 - .1 Store materials indoors in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

PART 2 **PRODUCTS**

2.1 **MATERIALS**

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended [and conforming to specified special requirements described in PART 3.
 - .2 Fire stop system rating: 2 Hours.
- .2 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .10 Sealants for vertical joints: non-sagging.

PART 3 **EXECUTION**

3.1 **MANUFACTURER'S INSTRUCTIONS**

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

3.2 **PREPARATION**

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
 - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.3 INSTALLATION

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

3.4 SEQUENCES OF OPERATION

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

3.5 FIELD QUALITY CONTROL

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

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

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

END OF SECTION

Part 1 General**1.1 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .3 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
- .4 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
- .5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative & Consultant before final inspection.
 - .3 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.
 - .5 Description of actions to be taken in event of equipment failure.
 - .6 Valves schedule and flow diagram.
 - .7 Colour coding chart.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
 - .5 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

- .2 Equipment performance verification test results.
- .3 Special performance data as specified.
- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing.
- .6 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative & Consultant for approval. Submission of individual data will not be accepted unless directed by Departmental Representative & Consultant.
 - .2 Make changes as required and re-submit as directed by Departmental Representative & Consultant.
- .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
 - .1 Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur.
 - .2 Transfer information to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative & Consultant for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

1.2 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.3 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
 - .1 One set of packing for each pump.

- .2 One casing joint gasket for each size pump.
- .3 One glass for each gauge glass.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .2 Do verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification.

Part 3 Execution

3.1 PAINTING REPAIRS AND RESTORATION

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

3.2 CLEANING

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

3.3 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Departmental Representative will record these demonstrations on video tape for future reference.

3.5 PROTECTION

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

END OF SECTION

1.0 GENERAL

1.1 WORK INCLUDED

1.1.1 Provide work of this Section in accordance with the Contract Documents.

1.2 SUBMITTALS

1.2.1 Samples

.1 Submit samples of piping, valve identification markers.

2.0 PRODUCTS

2.1 MATERIALS

2.1.1 Equipment Nameplates

.1 Laminated phenolic plastic with white finish and minimum 10 mm high black letters.

.2 Three rows of text, based as shown in equipment Schedules.

.1 Line 1: Equipment ID (e.g. P-1)

.2 Line 2: Equipment Name (e.g. Northwest Zone Heating Pump)

.3 Line 3: Optional, up to 15 characters (e.g. Standby Pump)

.3 This identification is in addition to manufacturers nameplate data.

2.1.2 Pipe Identification – Type 1 : Adhesive Labels

.1 Pre-printed 6 mil thick vinyl cloth, plastic coated with pressure sensitive self-adhesive backing surface. On insulated pipe, use adhesive suitable for this application.

.1 Pipe diameter (including insulation) 75 mm or less: 29 mm width, 25 mm high lettering. Length of labels as dictated by legend.

.2 Pipe diameter (including insulation) greater than 75 mm: minimum width of 64 mm and with 50 mm high letters.

.3 Primary label colour: to CAN/CGSB-24.3.

.4 Pipe label to include service pressure for steam, compressed air, natural gas (if more than one gas service pressure inside of building), and vacuum.

.5 Legend: black with the legend printed in full wherever feasible.

.2 Direction arrow banding tape: colour coded vinyl tape with pressure sensitive adhesive backing, 50 mm wide, with directional arrows.

.3 Acceptable Manufacturers:

.1 Brady

.2 Safety Supply Co.

.3 S.M.S

.4 Revere-Seton

2.1.3 Pipe Identification – Type 2 : Coil Wrap Labels

.1 Reversible direction, semi-rigid plastic vinyl, with subsurface printing, and integral direction arrows.

.1 Up to 6" diameter: coil wrap six rows of printing

- .2 Over 6" diameter: saddle type with two rows of printing, fastened with stainless steel springs
- .3 Lettering Size:

Outside Dia.	Letter Height
Less than 5/8"	1/4"
3/4" – 1 1/4"	1/2"
1 1/8" – 2 3/8"	3/4"
2 1/2" – 4 1/2"	1 1/4"

- .4 Primary label colour: to CAN/CGSB-24.3.
 - .5 Pipe label to include service pressure for steam, compressed air, natural gas (if more than one gas service pressure inside of building), and vacuum.
 - .6 Legend: black with the legend printed in full wherever feasible.
- .2 Acceptable Manufacturers:
 - .1 Brady
 - .2 Safety Supply Co.
 - .3 S.M.S
 - .4 Revere-Seton

2.1.4 Valve Identification

- .1 Laminated phenolic plastic with minimum 10 mm high lettering, with brass keychain.
- .2 Minimum two lines of text:
 - .1 Line 1: valve designation
 - .2 Line 2: valve position instruction

2.1.5 Manufacturers

- .1 Acceptable manufacturers
 - .1 S.M.S.
 - .2 Brady
 - .3 Safety Supply Co.
 - .4 Revere-Seton

3.0 EXECUTION

3.1 INSTALLATION

3.1.1 Equipment Nameplates

- .1 Identify mechanical and electrical equipment installed under this Division with nameplates describing the function or use of the particular equipment involved.
- .2 Do not commence fabrication of nameplates until after receipt of Consultant's review.
- .3 Equipment includes, but not limited to:

- .1 Equipment as shown on schedules and specified
 - .2 Motor starters
 - .3 Motor Control Centres
 - .4 Pushbutton stations
 - .5 Control panels
 - .6 Time switches
 - .7 Disconnect switches
 - .8 Contactors or relays in separate enclosures
- .4 Equipment nameplates for Building Automation System components are specified under Section 15905.
- .5 Securely fasten nameplates to the equipment with round-head cadmium plated steel self-tapping screws.

3.1.2 Piping Identification

- .1 Label all piping installed under this Division to indicate the content and direction of flow with Type 1 or Type 2 labelling system.
- .2 For piping carrying steam, compressed air and vacuum, show on label the pressure or vacuum, and working units as applicable.
- .3 Locate labels as follows:
 - .1 At every end of pipe run, adjacent to the valve or item of equipment serviced.
 - .2 At valves, tees and changes of direction.
 - .3 On each exposed pipe passing through a wall, partition or floor (one on each side of such wall, partition or floor).
 - .4 At intervals not to exceed 15 m along every exposed pipe run exceeding 15 m in length.
 - .5 At every access point on concealed piping.
- .4 Labels to be visible from 1.5 m above the adjacent floor or platform.
- .5 Type 1 Labels;
 - .1 Clean surfaces before application of labels.
 - .2 Secure label with direction arrow banding tape for full circumference of pipe, at each end of label.
- .6 Natural gas piping: in addition to pipe labels specified above, paint all piping and tubing with one coat oil alkyd primer and one top coat of alkyd enamel, bright yellow.
- .7 Natural gas piping: as specified above except provide labels every 6 m.

3.1.3 Valve Tags

- .1 Provide valve tags on all valves, except as follows:
 - .1 At plumbing fixtures.
 - .2 On steam, condensate, chilled water and heating water shut-off and balancing valves at equipment being served.
 - .3 On isolation valves around control valves
- .2 Provide a valve identification directory for each system.
 - .1 Quantity: two (2) copies of valve identification directories for each system
 - .2 Documented as follows (example given):

Valve No.	Service	Valve Location	Nearest Column
V-1	West Heating Zone	Basement Mech Room	C-8

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials and installation for plumbing pumps.
 - .2 Sustainable requirements for construction and verification.
- .2 Related Sections:
 - .1 Section 01 33 00 - Submittal Procedures.
 - .2 Section 01 35 29.06 - Health and Safety Requirements.
 - .3 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .4 Section 01 78 00 - Closeout Submittals.
 - .5 Section 01 91 13 - General Commissioning (Cx) Requirements.

1.2 REFERENCES

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

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.
 - .2 Submit WHMIS MSDS. Indicate VOC's for adhesive and solvents during application and curing.
- .3 Shop Drawings.
 - .1 Submit shop drawings to indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
 - .2 Wiring and schematic diagrams.
 - .3 Dimensions and recommended installation.
 - .4 Pump performance and efficiency curves.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: manufacturers' field reports specified.
- .7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, include:

- .1 Manufacturers name, type, model year, capacity and serial number.
- .2 Details of operation, servicing and maintenance.
- .3 Recommended spare parts list with names and addresses.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 47 19 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
 - .4 Divert unused materials from landfill to recycling facility as approved.
 - .5 Unused materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
 - .6 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 DOMESTIC HOT WATER CIRCULATING PUMPS

- .1 Construction: closed-coupled, in-line centrifugal, all bronze construction, stainless steel shaft, stainless steel or bronze shaft sleeve, two oil lubricated bronze sleeves or ball bearings. Design for continuous service.
- .2 Motor: Drip-proof, with thermal overload protection.
- .3 Supports: provide as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 INSTALLATION

- .1 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .2 Ensure pump and motor assembly do not support piping.
- .3 Align vertical pit mounted pump assembly after mounting and securing cover plate.
- .4 Place [150] mm sand under sump pit tank.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Check power supply.
 - .2 Check starter protective devices.
- .2 Start-up, check for proper and safe operation.
- .3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.
- .4 Adjust flow from water-cooled bearings.
- .5 Adjust impeller shaft stuffing boxes, packing glands.

3.4 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified herein.
 - .2 Procedures:
 - .1 Check power supply.
 - .2 Check starter O/L heater sizes.
 - .3 Start pumps, check impeller rotation.
 - .4 Check for safe and proper operation.
 - .5 Check settings, operation of operating, limit, safety controls, over-temperature, audible/visual alarms, other protective devices.
 - .6 Test operation of hands-on-auto switch.
 - .7 Test operation of alternator.
 - .8 Adjust leakage through water-cooled bearings.

- .9 Adjust shaft stuffing boxes.
- .10 Adjust leakage flow rate from pump shaft stuffing boxes to manufacturer's recommendations.
- .11 Check base for free-floating, no obstructions under base.
- .12 Run-in pumps for 12 continuous hours.
- .13 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
- .14 Adjust alignment of piping and conduit to ensure full flexibility.
- .15 Eliminate causes of cavitation, flashing, air entrainment.
- .16 Measure pressure drop across strainer when clean and with flow rates as finally set.
- .17 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .18 Verify lubricating oil levels.

3.5 REPORTS

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: reports, supplemented as specified.
- .2 Include:
 - .1 PV results on approved PV Report Forms.
 - .2 Product Information report forms.
 - .3 Pump performance curves (family of curves) with final point of actual performance.

3.6 TRAINING

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O&M Personnel, supplemented as specified.

END OF SECTION

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15-[06], Cast Bronze Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-[01], Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-[01], Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-[01], Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.
- .2 ASTM International Inc.
 - .1 ASTM A307-[07b], Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM A536-[84(2004)e1], Standard Specification for Ductile Iron Castings.
 - .3 ASTM B88M-[05], Standard Specification for Seamless Copper Water Tube (Metric).
- .3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
 - .1 ANSI/AWWA C111/A21.11-[07], Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .4 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.
 - .2 Rating System Addenda for New Construction and Major Renovations LEED Canada-NC Version 1.0-[Addendum 2007].
 - .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA B242-[05], Groove and Shoulder Type Mechanical Pipe Couplings.
- .6 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67-[02a], Butterfly Valves.
 - .2 MSS-SP-70-[06], Gray Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-[05], Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80-[03], Bronze Gate, Globe, Angle and Check Valves.

- .9 National Research Council (NRC)/Institute for Research in Construction
 - .1 NRCC 38728, National Plumbing Code of Canada (NPC) - [1995].
- .10 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse and return in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with Regional and Municipal regulations.

Part 2 Products

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
 - .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class [125] [and] [250]: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 NPS 2 and larger: ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.

- .6 NPS 1 1/2 and smaller: wrought copper to ANSI/ASME B16.22, cast copper to ANSI/ASME B16.18; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

2.3 JOINTS

- .1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: [95/5] [tin copper alloy].
- .4 Teflon tape: for threaded joints.
- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.4 GATE VALVES

- .1 NPS 2 and under, soldered:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section [23 05 23.01 - Valves - Bronze].
- .2 NPS 2 and under, screwed:
 - .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section [23 05 23.01 - Valves - Bronze].
- .3 NPS 2 1/2 and over, in mechanical rooms, flanged:
 - .1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified Section [23 05 23.02 - Valves - Cast Iron].
 - .2 .
- .4 NPS 2 1/2 and over, other than mechanical rooms, flanged:
 - .1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet specified Section [23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check].

2.5 GLOBE VALVES

- .1 NPS2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified Section [23 05 23.01 - Valves - Bronze].
 - .2 Lockshield handles: as indicated.
- .2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified Section [23 05 23.01 - Valves - Bronze].

- .2 Lockshield handles: as indicated.

2.6 SWING CHECK VALVES

- .1 NPS 2 and under, soldered:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section [23 05 23.01 - Valves - Bronze].
- .2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section [23 05 23.01 - Valves - Bronze].
- .3 NPS 2 1/2 and over, flanged:
 - .1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, [regrind] [renewable] seat, bronze disc, bolted cap specified Section [23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check].

2.7 BALL VALVES

- .1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 [Bronze] [Forged Brass] body, [chrome plated brass] [stainless steel] ball, PTFE adjustable packing, brass gland and [PTFE] [Bunan] [TFE] seat, steel lever handle as specified Section [23 05 23.01 - Valves - Bronze]
- .2 NPS 2 and under, soldered:
 - .1 To ANSI/ASME B16.18, Class 150.
 - .2 Bronze body, [chrome plated brass] [stainless steel] ball, PTFE adjustable packing, brass gland and [PTFE] [Bunan] seat, steel lever handle, with NPT to copper adaptors as specified Section [23 05 23.01 - Valves - Bronze]

2.8 BUTTERFLY VALVES

- .1 NPS 2-1/2 and over,,:
 - .1 To MSS-SP-67, Class 200.
 - .2 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.
 - .3 [Lever operated], [NPS8 and over, gear operated]
- .2 NPS 2-1/2 and over, grooved ends:
 - .1 Class 300 psig CWP, bubble tight shut-off, bronze body EPDM coated ductile iron disc with integrally cast stem.
 - .2 Operator:
 - .1 NPS [4] and under: lever handle.
 - .2 NPS [6] and over: gear operated.

Part 3 Execution**3.1 APPLICATION**

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

3.2 INSTALLATION

- .1 Install in accordance with Ontario Plumbing Code and local authority having jurisdiction.
- .2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .6 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
 - .2 Bend tubing without crimping or constriction. Minimize use of fittings.

3.3 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves.
- .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 PRESSURE TESTS

- .1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.
- .2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.5 PRE-START FLUSHING AND CLEANING

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean copper Federal] potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

3.6 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.

- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

3.7 DISINFECTION

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.
- .2 Upon completion, provide laboratory test reports on water quality for potable water lines for Departmental Representative and Consultant approval. Provide laboratory test reports for initial water quality on all non-potable lines for Departmental Representative and Consultant approval.

3.8 START-UP

- .1 Timing: start up after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
 - .1 Establish circulation and ensure that air is eliminated.
 - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
 - .3 Bring HWS storage tank up to design temperature slowly.
 - .4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
 - .5 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

3.9 PERFORMANCE VERIFICATION

- .1 Scheduling:
 - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
 - .1 Verify that flow rate and pressure meet Design Criteria.
 - .2 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
 - .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
 - .4 Sterilize and take appropriate measures on HWS and HWC systems for Legionella control and other bacteria affecting drinking water systems.

- .5 Verify performance of temperature controls.
 - .6 Verify compliance with safety and health requirements.
 - .7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
 - .8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
- .3 Reports:
- .1 In accordance with Section 01 91 13 - General Commissioning (Cx)
Requirements: Reports, using report forms as specified in Section 01 91 13 - General Commissioning (Cx) Requirements: Report Forms and Schematics.
 - .2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.10 OPERATION REQUIREMENTS

- .1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 05 - Installation of Pipework.

3.11 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section [01 74 21 - Construction/Demolition Waste Management.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM B32-[08], Standard Specification for Solder Metal.
 - .2 ASTM B306-[02], Standard Specification for Copper Drainage Tube (DWV).
 - .3 ASTM C564-[03a], Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
 - .2 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .3 Canadian Standards Association (CSA International).
 - .1 CSA B67-[1972(R1996)], Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories. CAN/CSA-B70-[06], Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .2 CAN/CSA-B125.3-[05], Plumbing Fittings.
- .4 Green Seal Environmental Standards (GSES).
 - .1 Standard GS-36-[00], Commercial Adhesives.
- .5 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-[A2005], Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Packaging Waste Management: remove for reuse and return by manufacturer in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 SUSTAINABLE MATERIAL

- .1 Adhesives and Sealants: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Maximum VOC limit 30 g/L to SCAQMD Rule 1168 and in accordance with LEED Requirements.

2.2 COPPER TUBE AND FITTINGS

- .1 Above ground [sanitary] [storm] and [vent] Type [DWV] to: ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: to CAN/CSA-B125.3.
 - .2 Wrought copper: to CAN/CSA-B125.3.
 - .2 Solder: [tin-lead, 50:50, type 50A] [lead free, tin-95:5, type TA, to ASTM B32.

2.3 CAST IRON PIPING AND FITTINGS

- .1 Buried [sanitary] [storm] and [vent] minimum NPS [3], to: CAN/CSA-B70, with one layer of protective coating.
 - .1 Joints:
 - .1 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets: to CAN/CSA-B70.ASTM C564 or
 - .2 Stainless steel clamps.
 - .2 Hub and spigot:
 - .1 Caulking lead: to CSA B67.
 - .2 Cold caulking compounds.
 - .2 Above ground [sanitary] [storm] and [vent]: to CAN/CSA-B70.
 - .1 Joints:
 - .1 Hub and spigot:
 - .1 Caulking lead: to CSA B67.
 - .2 Mechanical joints:
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

Part 3 Execution

3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.INSTALLATION
- .2 In accordance with Section 23 05 01 - Use of HVAC Systems During Construction.
- .3 Install in accordance with Ontario Plumbing Code and local authority having jurisdiction.

3.2 TESTING

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

3.3 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .1 Ensure accessible and that access doors are correctly located.
 - .2 Open, cover with linseed oil and re-seal.
 - .3 Verify that cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Storm water drainage:
 - .1 Verify domes are secure.
 - .2 Ensure weirs are correctly sized and installed correctly.
 - .3 Verify provisions for movement of roof system.
- .4 Ensure that fixtures are properly anchored, connected to system and effectively vented.
- .5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 American National Standards Institute/Canadian Standards Association (ANSI/CSA)
 - .1 ANSI Z21.10.1-[2004]/CSA 4.1-[2004], Gas Water Heaters - Volume I, Storage Water Heaters With Input Ratings of 75,000 Btu Per Hour or Less.
 - .2 ANSI Z21.10.1A-[2006]/CSA 4.1A-[2006], Addenda 1 to ANSI Z21.10.1-2004/CSA 4.1-2004, Gas Water Heaters Volume I, Storage Water Heaters With Input Ratings of 75,000 Btu Per Hour or Less.
 - .3 ANSI Z21.10.1b-[2006]/CSA 4.1b-[2006], Addenda 2 to ANSI Z21.10.1-2004/CSA 4.1-2004, Gas Water Heaters - Volume I, Storage Water Heaters With Input Ratings of 75,000 Btu Per Hour or Less.
 - .4 ANSI Z21.10.3A-[2007]/CSA 4.3-[2007], Gas Water Heaters - Volume III - Storage Water Heaters, with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous.
- .2 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.
 - .2 Rating System Addenda for New Construction and Major Renovations LEED Canada-NC Version 1.0-[Addendum 2007].
 - .3 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B51-[03(R2007)], Boiler, Pressure Vessel, and Pressure Piping Code.
 - .2 CAN/CSA-B139-[04], Installation Code for Oil Burning Equipment.
 - .3 CAN/CSA-B140.0-[03], Oil Burning Equipment: General Requirements.
 - .4 CAN/CSA-B149.1-[05], Natural Gas and Propane Installation Code.
 - .5 CAN/CSA-B149.2-[05], Propane Storage and Handling Code.
 - .6 CSA B140.12-[03], Oil-Burning Equipment: Service Water Heaters for Domestic Hot Water, Space Heating, and Swimming Pools.
 - .7 CAN/CSA C22.2 No.110-[94(R2004)], Construction and Test of Electric Storage Tank Water Heaters.
 - .8 CAN/CSA-C191-[04], Performance of Electric Storage Tank Water Heaters for Household Service.
 - .9 CAN/CSA-C309-[M90(R2003)], Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Provide manufacturer's printed product literature and datasheets for domestic water heater, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.5 WARRANTY

- .1 For the Work of this Section 22 30 05 - Domestic Water Heaters, 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to number of years specified for each product.
- .2 Contractor hereby warrants domestic water heaters in accordance with CCDC2, but for number of years specified for each product.

Part 2 Products

2.1 COMPONENTS

2.2 ELECTRIC WATER HEATER

- .1 To CAN/CSA C22.2 No.110, CAN/CSA-C191 [and CAN/CSA-C309 for glass-lined storage tanks, with immersion type elements, and surface mounted or immersion type adjustable thermostats.
- .2 Tank: [glass] [nickel] [polymerized fluorocarbon] [or] [combination] lined steel, mineral wool or fiberglass insulation, enamelled steel jacket, 3 year warranty certificate.

2.3 GAS (ATMOSPHERIC) WATER HEATER

- .1 To [ANSI Z21.10.1/CSA 4.1] [ANSI Z21.10.3/CSA 4.3].

- .2 Tank: [glass] [nickel] [polymerized fluorocarbon] [or] [combination] lined steel, mineral wool or fibreglass insulation, enamelled steel jacket.
- .3 Gas burner: complete with high limit control, gas valve, gas pressure regulator, 100% safety shut-off, stainless steel burners.
- .4 3 year warranty certificate.

2.4 GAS (POWER BURNER) WATER HEATER

- .1 To [ANSI Z21.10.1/CSA 1-4.1] [ANSI Z21.10.3/CSA 1-4.3]. Thermal efficiency of 83%.
- .2 Tank: [glass] [nickel] [polymerized fluorocarbon] [or] [combination] lined steel, fibreglass insulation, enamelled steel jacket.
- .3 Gas burner: complete with high limit control, gas valve, gas pressure regulator, 100% safety shut-off, firepower gas burner with air distribution ring.
- .4 3 year warranty certificate.

2.5 DHW HEATER AND STORAGE TANK

- .1 DHW heater:
 - .1 General: packaged unit to ASME standards, stamped for 1100 kPa WP. Provide CGA certification.
 - .2 Heat exchanger: multi-tube, 2 pass, copper and bronze, with NPS 1 extruded and finned tubes rolled into heavy tube sheets. Inlet and outlet headers to include drain valves and thermowells.
 - .3 Combustion chamber: line with 50 mm insulating refractory.
 - .4 Burners: high chromium stainless steel, die stamped, raised port, fixed primary air.
 - .5 Cabinet: baked enamel, welded steel, insulated with foil-faced fibreglass.
 - .6 Trim:
 - .1 Self-actuated modulating valves with 2 ply thermostatic bellows, copper capillary tubing, separate built-in well, tight disc shut-off removable composition disc stem with lubricator temperature adjustment setting reference scale, maximum, pressure differential of 28 kPa, temperature range [25-60] [55-90] degrees C.
 - .7 Controls:
 - .1 Main gas shut-off valve.
 - .2 Approved gas train including pressure regulator, motorized electric shut-off valve, downstream block/test valve, test connection, pressure gauge.
 - .3 Thermopilot safety with 100% shut-off, adjustable electric high limit control.
 - .4 Gas modulating valve adjusted for 100% to 20% input.
 - .5 Minimum input valve, on-off.

- .6 Flow switch, interlocked with ignition system to prevent operation in event of low flow.
- .2 Storage tank:
 - .1 Sizes, capacity: as indicated.
 - .2 Shell: [vertical] [horizontal], steel to CSA B51, ANSI/ASME Unfired Pressure Vessel Code and Province of Ontario standards, WWP/WSP [700] kPa. Provide certificates.
 - .3 Lining: [cement, 20 mm thick] [glass].
 - .4 Service Hole: [280 x 380] mm ASME, with gasketed cover.
 - .5 Cathodic protection: magnesium anodes, number and size to provide for [20] years protection of tank material.
 - .6 Cradles: steel, minimum of 2.
 - .7 Thermal insulation: see Section 23 07 14 - Thermal Insulation for Equipment.
 - .8 Extended warranty: 10 years. Provide certificate.

2.6 TRIM AND INSTRUMENTATION

- .1 Drain valve: NPS 1 with hose end.
- .2 Thermometer: 100 mm dial type with red pointer and thermowell filled with conductive paste.
- .3 Pressure gauge: 75 mm dial type with red pointer, and shut-off cock.
- .4 Thermowell filled with conductive paste for control valve temperature sensor.
- .5 ASME rated temperature and pressure relief valve sized for full capacity of [heater] [control valve], having discharge terminating over floor drain and visible to operators.
- .6 Magnesium anodes adequate for 20 years of operation and located for easy replacement.

2.7 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates for installation in [concrete support pad] [structural steel support].
- .2 Size anchor bolts to withstand seismic zone 4 acceleration and velocity forces.

Part 3 Execution

3.1 APPLICATION

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

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.
- .2 Provide structural steel for horizontal mounted tanks and for instantaneous heaters.
- .3 Provide insulation between tank and supports.
- .4 Install oil burning domestic water heaters in accordance with CAN/CSA-B139.
- .5 Install natural gas fired domestic water heaters in accordance with CAN/CSA-B149.1.
- .6 Install propane gas fired domestic water heaters in accordance with CAN/CSA-B149.2.

3.3 FIELD QUALITY CONTROL

- .1 Manufacturer's factory trained, certified Engineer to start up and commission DHW heaters.

3.4 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 Section Includes:
 - .1 Materials and installation for plumbing specialties and accessories.
 - .2 Sustainable requirements for construction and verification.
- .2 Related Sections:
 - .1 Section 01 33 00 - Submittal Procedures.
 - .2 Section 01 35 29.06 - Health and Safety Requirements.
 - .3 Section 01 45 00 - Quality Control.
 - .4 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .5 Section 01 78 00 - Closeout Submittals.
 - .6 Section 01 91 13 - General Commissioning (Cx) Requirements.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM).
 - .1 ASTM A126-[95(2001)], Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B62-[02], Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA).
 - .1 AWWA C700-[02], Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 AWWA C701-[02], Cold Water Meters-Turbine Type for Customer Service.
 - .3 AWWA C702-1-[01], Cold Water Meters-Compound Type.
- .3 Canadian Standards Association (CSA International).
 - .1 CSA-B64 Series-[01], Backflow Preventers and Vacuum Breakers.
 - .2 CSA-B79-[94(R2000)], Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
 - .3 CSA-B356-[00], Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .5 Plumbing and Drainage Institute (PDI).
 - .1 PDI-G101-[96], Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
 - .2 PDI-WH201-[92], Water Hammer Arresters Standard.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Co-ordinate submittal requirements and provide submittals required by Section 01 47 15 - Sustainable Requirements: Construction.
- .3 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
 - .2 Indicate dimensions, construction details and materials for specified items.
 - .3 Submit WHMIS MSDS. Indicate VOC's for adhesive and solvents during application and curing.
- .4 Shop Drawings:
 - .1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Instructions: submit manufacturer's installation instructions.
- .7 Manufacturers' Field Reports: manufacturers' field reports specified.
- .8 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, include:
 - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal [paper] [plastic] [polystyrene] [corrugated cardboard] packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility as approved by Authority Having Jurisdiction.
- .5 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 FLOOR DRAINS

- .1 Floor Drains and Trench Drains: to CSA B79.
- .2 Type 1: general duty; cast iron body [round] [square] [as indicated], adjustable head, [sediment basket] nickel bronze strainer, integral seepage pan, and clamping collar.
- .3 Type 2: heavy duty; cast iron body, heavy duty non-tilting or hinged lacquered cast iron grate, integral seepage pan and clamping collar.
- .4 Type 3: combination funnel floor drain; cast iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer with integral funnel.
- .5 Type 4: planters; cast-iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer, vandal-proof dome and standpipe, stainless steel screen.
- .6 Type 5: waste oil; heavy duty cast iron body with sediment bucket, vent connection, checkered plate and bronze plug.
- .7 Type 6: epoxy coated trench drain with [cast iron] [ductile iron] [galvanized iron] [stainless steel] grate, [inside domed strainer], [anchor flanges], [membrane clamps].

2.2 ROOF DRAINS

- .1 Type 1: controlled flow; [aluminum] [or] [cast iron] body, under deck clamp and sump receiver to suit roof construction, flashing clamp ring with integral gravel stop, bearing pan, flow control weir assembly, [aluminum] [or] [cast iron] [or] [polyethylene] dome.
- .2 Type 2: standard roof drain with cast iron body with [aluminum] [or] [cast iron] dome, under-deck clamp to suit roof construction, flashing clamp ring with integral gravel stop.
- .3 Type 3: cornice, sill or canopy drain; cast iron body with [cast iron] [cast aluminum] [cast bronze] [polyethylene] dome or strainer and flashing clamp.
- .4 Type 4: parapet or scupper drain; cast iron body with [bronze] [aluminum] strainer/grate and flashing clamp.

- .5 Type 5: inverted roofing system; cast iron body with [aluminum] [or] [cast iron] dome, under-deck clamp and sump receiver to suit roof construction, with integral gravel stop and stainless steel drainage grid.

2.3 CLEANOUTS

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:
 - .1 Wall Access: face or wall type, [polished nickel bronze] [or] [stainless steel] [square] [and] [or] [round] cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
 - .2 Floor Access: [rectangular] [round] [cast iron body and frame with adjustable secured nickel bronze top] [cast box with anchor lugs] and:
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for Unfinished Concrete Floors: [cast iron] [nickel bronze] [round] [or] [square], gasket, vandal-proof screws.
 - .3 Cover for Terrazzo Finish: polished [nickel bronze] [brass] with recessed cover for filling with terrazzo, vandal-proof locking screws.
 - .4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
 - .5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

2.4 NON-FREEZE WALL HYDRANTS

- .1 [Surface mount] [Recessed] with integral vacuum breaker, NPS 3/4" hose outlet, removable operating key. [Chrome plated] [Polished bronze] finish.

2.5 NON-FREEZE GROUND HYDRANT

- .1 Deck type with [polished bronze] [lacquered cast iron] [satin nickel] box with hinged cover, removable operating key, [bronze] [galvanized steel] casing for [2150] mm ground cover, all-bronze valve body and working parts, NPS inlet and outlet, [anchor flange], [membrane clamp].

2.6 WATER HAMMER ARRESTORS

- .1 [Stainless steel] [Copper] construction, [bellows] [piston] type: to PDI-WH201.

2.7 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series, application [as indicated], [reduced pressure principle type] [double check valve assembly] [back flow preventer with intermediate [atmospheric vent] [or] [vacuum breaker]].

2.8 VACUUM BREAKERS

- .1 Breakers: to CSA-B64 Series, vacuum breaker [atmospheric] [hose connection] [laboratory faucet intermediate].

2.9 PRESSURE REGULATORS

- .1 Capacity: [as indicated].
 - .1 Inlet pressure: [1034] kPa.
 - .2 Outlet pressure: [413] kPa.
- .2 Up to NPS1-1/2 bronze bodies, screwed: to ASTM B62.
- .3 NPS2 and over, semi-steel bodies, Class 125, flanged: to ASTM A126, Class B.
- .4 Semi-steel spring chambers with bronze trim.

2.10 HOSE BIBBS AND SEDIMENT FAUCETS

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

2.11 WATER MAKE-UP ASSEMBLY

- .1 Complete with backflow preventer, pressure gauge on inlet and outlet, pressure reducing valve to CSA B356, pressure relief valve on low pressure side and gate valves on inlet and outlet.

2.12 WATER METERS

- .1 [Displacement type to AWWA C700] [Turbine type to AWWA C701] [Compound type to AWWA C702]
- .2 Capacity: [as indicated]. Corrections for temperature.
- .3 Accessories: remote readout device

2.13 TRAP SEAL PRIMERS

- .1 Brass, with integral vacuum breaker, NPS1/2 solder ends, NPS1/2 drip line connection.

2.14 STRAINERS

- .1 [860] kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
- .2 NPS2 and under, bronze body, screwed ends, with brass cap.
- .3 NPS2 1/2 and over, cast iron body, flanged ends, with bolted cap.

Part 3 Execution**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

3.2 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada, Ontario Plumbing Code, and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.4 NON-FREEZE WALL HYDRANTS

- .1 Install 600 mm above finished grade unless otherwise indicated.

3.5 NON-FREEZE GROUND HYDRANT

- .1 Install with top of box flush with ground deck and with drainage connection to discharge as indicated.

3.6 WATER HAMMER ARRESTORS

- .1 Install on branch supplies to fixtures or group of fixtures where indicated.

3.7 BACK FLOW PREVENTORS

- .1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.
- .2 RPP pipe discharge shall terminate over nearest drain and/or service sink.

3.8 BACKWATER VALVES

- .1 Install in main sewer lines where indicated and at weeping tile connection in pit provided at building cleanout.
- .2 Install in access pit as indicated.

3.9 HOSE BIBBS AND SEDIMENT FAUCETS

- .1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.10 TRAP SEAL PRIMERS

- .1 Install for floor drains and elsewhere, as indicated.
- .2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval Authority Having Jurisdiction.
- .3 Install [soft copper] [plastic] tubing to floor drain.

3.11 STRAINERS

- .1 Install with sufficient room to remove basket.

3.12 WATER METERS

- .1 Install water meter provided by local water authority.
- .2 Install water meter as indicated.

3.13 WATER MAKE-UP ASSEMBLY

- .1 Install on valved bypass.
- .2 Pipe discharge from relief valve to nearest floor drain.

3.14 START-UP

- .1 General:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx)
Requirements: General Requirements, supplemented as specified herein.
- .2 Timing: start-up only after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
 - .3 Certificate of static completion has been issued.
 - .4 Water treatment systems operational.
- .3 Provide continuous supervision during start-up.

3.15 FIELD QUALITY CONTROL

- .1 Verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification, include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Wood.

.8 Low-emitting materials.

3.16 TESTING AND ADJUSTING

.1 General:

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

.2 Timing:

.1 After start-up deficiencies rectified.

.2 After certificate of completion has been issued by authority having jurisdiction.

.3 Application tolerances:

.1 Pressure at fixtures: +/- 70 kPa.

.2 Flow rate at fixtures: +/- 20%.

.4 Adjustments:

.1 Verify that flow rate and pressure meet design criteria.

.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.5 Floor drains:

.1 Verify operation of trap seal primer.

.2 Prime, using trap primer. Adjust flow rate to suit site conditions.

.3 Check operations of flushing features.

.4 Check security, accessibility, removeability of strainer.

.5 Clean out baskets.

.6 Vacuum breakers, backflow preventers, backwater valves:

.1 Test tightness, accessibility for O&M of cover and of valve.

.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.

.3 Verify visibility of discharge from open ports.

.7 Access doors:

.1 Verify size and location relative to items to be accessed.

.8 Cleanouts:

.1 Verify covers are gas-tight, secure, yet readily removable.

.9 Water hammer arrestors:

.1 Verify proper installation of correct type of water hammer arrester.

.10 Wall, Ground hydrants:

.1 Verify complete drainage, freeze protection.

.2 Verify operation of vacuum breakers.

.11 Pressure regulators, PRV assemblies:

- .1 Adjust settings to suit locations, flow rates, pressure conditions.
- .12 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.
- .13 Grease interceptors:
 - .1 Activate, using manufacturer's recommended procedures and materials.
- .14 Commissioning Reports:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx)
Requirements: Reports, supplemented as specified.
- .15 Training:
 - .1 In accordance with Section 01 91 13 - General Commissioning (Cx)
Requirements: Training of O&M Personnel, supplemented as specified.
 - .2 Demonstrate full compliance with Design Criteria.

END OF SECTION

PART 1 GENERAL**1.1 SECTION INCLUDES**

- .1 Materials and methods for mechanical work.

1.2 RELATED SECTIONS

- .1 Division 01 - General Requirements.

1.3 INTENT

- .1 Provide complete and fully operational mechanical systems with facilities and services to meet requirements described herein and in complete accord with applicable codes and ordinances.
- .2 Drawings are diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material and quality and are not detailed installation instructions.
- .3 The Work is suitably outlined on the Drawings with regard to sizes, locations, general arrangements and installation details, and has been generally coordinated for routing of services. The routing of ductwork, piping and equipment arrangement are shown more or less in diagrammatic form except where in certain cases the Drawings may include details giving the exact locations and arrangements required.
- .4 The location of equipment, and the associated arrangement of piping, ductwork, and other material describes the general requirements of the Work. Final location is dependant on the actual equipment supplied. The Consultant reserves the right to make reasonable adjustment of up to 2 m to the location of equipment, floor drains, routing of major piping and ductwork, at no additional cost to the Owner.
- .5 In order to provide clarity to the arrangement of the Work, not all details including valves, thermometers, pressure gauges, etc. are shown on the plan Drawings. Refer to schematic Drawings, standard details and the specification for these requirements. In the absence of specific details, the Contractor is expected to follow generally accepted good installation practices. Alternatively, Contractor shall submit a written request for information (RFI) to the Consultant and obtain a ruling prior to proceeding with the Work.
- .6 Where Standard Details are provided, these show the general installation requirements, and are applicable to each occurrence in the Work, unless otherwise specified or shown.
- .7 Coordinate Work with all trades to ensure a proper and complete installation. Notify all trades concerned of the requirements for openings, sleeves, inserts and other hardware necessary for the installation and, where Work is to be integrated with the Work of other trades or is to be installed in close proximity with the Work of the trades, carefully coordinate the Work prior to installation.
- .8 Carefully examine Work and Drawings of all related trades and thoroughly plan the Work in advance so as to avoid interferences.

-
- .9 Connect to equipment furnished in other sections and by Owner, including uncrating equipment, installing, starting, and testing.

1.4 CUTTING AND PATCHING - EXECUTION

- .1 Locate holes and provide sleeves, cutting and fitting required for mechanical work. Relocate improperly located holes and sleeves.
- .2 Perform patching in finished construction of building under the sections of specifications covering these materials.

1.5 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit detailed shop drawings and product data complete with performance data, electrical data and physical data of all equipment and accessories.
- .2 Indicate manufacturer, trade name and model number. Include copies of applicable brochure or catalogue material. Indicate sizes, types, model numbers, ratings, capacities and options actually being proposed.
- .3 Include dimensional data for roughing in and installation, and technical data sufficient to confirm that equipment meets requirements of drawings and specifications.
- .4 Include wiring, piping and service connection data, motor sizes complete with voltage ratings and schedules.

1.6 SUBMITTALS FOR INFORMATION

- .1 Manufacturer's Certificate: Certify that specified products meet or exceed specified requirements.

1.7 CLOSEOUT SUBMITTALS

- .1 Accurately record actual locations of equipment, accessories, structural reinforcement repairs, type of repair, and electrical details of all connected equipment.

1.8 OPERATING AND MAINTENANCE MANUALS

- .1 Provide 3 copies of O&M manuals.
- .2 Include in the O&M manuals all documentations as noted in Specifications Section 019151.

1.9 RECORD DRAWINGS

- .1 Keep on site, an extra set of drawings and specifications recording changes and deviations daily.
- .2 Include for the work required to transfer site changes to Consultant's original CAD files and providing the Owner with one set of hard copy and electronic files of all identified 'Record Drawings'.

1.10 ACCEPTABLE MATERIALS AND EQUIPMENT

- .1 Include for products that meet the requirements of the specifications and the design intent and that are manufactured by reputable manufacturers with a proven track record of at least 5 years.

1.11 EQUIPMENT PROTECTION AND CLEAN-UP

- .1 Protect equipment and materials in storage on site, during and after installation until final acceptance. Leave factory covers in place and take special precautions to prevent entry of foreign material into working parts of piping and duct systems.
- .2 Protect equipment with polyethylene covers and crates.
- .3 Operate, drain and flush bearings and refill with change of lubricant before final acceptance.
- .4 Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Provide extended nipples for lubrication.
- .5 Ensure that existing equipment is carefully dismantled and not damaged or lost. Do not re-use existing materials and equipment unless specifically indicated.

1.12 MATERIAL AND EQUIPMENT

- .1 Material and Equipment: New and quality specified. Statically and dynamically balanced rotating equipment for minimum vibration and low operating noise level.
- .2 Include for all concrete work for mechanical installations. Provide engineered structural drawings and dimensional drawings, templates, anchor bolts and accessories required for mounting and anchoring equipment.

1.13 MATERIAL IDENTIFICATION

- .1 Identify piping, and equipment throughout with labels and direction of flow arrows. Apply labels at 1.5 metre intervals, before and after pipes pass through walls, at access door openings or closer.
- .2 Provide 20 mm diameter brass number tags with number stamped in black, secured to valve wheel with key chain for valves not in plain sight of apparatus controlled. Provide neat, typewritten directories giving valve number, valve service and location of valves. Frame one copy under glass for wall mounting.
- .3 Identify electric starting switches and remote push-button stations with 6 mm laminated plastic plates.

1.14 EQUIPMENT BASES AND SUPPORTS

- .1 Where indicated, mount major equipment of reinforced concrete housekeeping bases poured directly on structural floor slab 100 mm thick minimum, extended 100 mm beyond machinery bed-plates. Provide dimensional drawings, templates, anchor bolts and accessories required for mounting and anchoring equipment.

- .2 Construct supports of structural steel members or steel pipe and fittings. Brace and fasten with flanges bolted to structure.

1.15 FLASHING

- .1 Flash and counter flash where mechanical equipment passes through weather or waterproofed walls, floors and roofs.
- .2 Flash vent and soil pipes projecting 80 mm minimum above finished roof surface with lead worked 25 mm minimum into hub, 200 mm minimum clear on sides with minimum 600 mm x 600 mm sheet size. For pipes through outside walls turn flange back into wall and caulk.
- .3 Provide curbs for mechanical roof installations 300 mm minimum high. Flash and counter flash with galvanized steel, soldered and made waterproof.

1.16 SLEEVES

- .1 Set sleeves in position in advance of concrete work. Provide suitable reinforcing around sleeves.
- .2 Extend sleeves through potentially wet floors 25 mm above finished floor level. Caulk sleeves full depth and provide floor plate.
- .3 Where piping or ductwork passes through floor, ceiling or wall, close off space between pipe or duct and construction with non-combustible insulation. Provide tight fitting metal caps on both sides and caulk.
- .4 Install chrome plated escutcheons where piping passes through finished surfaces.
- .5 Size large enough to allow for movement due to expansion and to provide for continuous insulation.

1.17 INSERTS

- .1 Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms.
- .2 Size inserts to suit threaded hanger rods.

1.18 ACCESS DOORS

- .1 Access doors to match surrounding surface, provided with recess to accept matching finish. Provide ULC rated doors in fire rated construction.
- .2 Provide flush type steel framed panel with concealed hinges, size minimum 300 mm x 300 mm for inspection and hand access, and minimum 600 mm x 600 mm for man access.
- .3 Provide cam type locking device with hand or key lock when located in public corridors and washrooms complete with master keys.

-
- .4 Provide access doors for maintenance or adjustments purposes for all mechanical system components including valves, volume and splitter dampers, fire dampers, clean outs and traps, controls, coils and terminal units, and expansion joints.

1.19 FLEXIBLE PIPE CONNECTIONS

- .1 Steel Piping: Stainless steel inner hose and braided exterior sleeve.
- .2 Copper Piping: Bronze inner hose and braided exterior sleeve.
- .3 Spool Pieces: Construct to exact size for insertion of flexible connection.

1.20 EXPANSION JOINTS

- .1 Piping 50 mm and under: Copper with packed sliding sleeve.
- .2 Piping 50 mm and over: Spool type expansion, flexible compensator with tapped steel flanges, teflon body.

END OF SECTION

PART 1 **GENERAL****1.1** **RELATED WORK**

- .1 Other Divisions
 - .1 Refer to other divisions of the Specifications and to the Drawings for work related to the mechanical work to avoid interferences with work of other trades (and other contractors) and to ensure proper completion of the work as a whole.

1.2 **GENERAL CONSTRUCTION REQUIREMENTS**

- .1 Applicable Codes and Standards
 - .1 National Building Code
 - .2 Occupational Health and Safety Act and Regulations for Construction Projects, Ontario Regulation 691.
 - .3 Owners Health and Safety Requirements
- .2 Measurements and Deviations
 - .1 Where any parts of the mechanical work are specifically located by dimensions on the Drawings, check and verify these dimensions on site prior to installation.
 - .2 Before installing piping, review architectural, structural and electrical Drawings with mechanical Drawings
 - .1 Where interference may occur and departures from arrangements as shown are required, consult with other trades involved, come to agreement as to changed locations or elevations and obtain approval of the Consultant for proposed changes before proceeding with the work.
 - .3 Examine work of other trades or contractors, prior to commencement of mechanical installations.
 - .1 Report in writing, to the Consultant, any discrepancies which will affect mechanical installations.
 - .2 Failure to do so shall be considered acceptance of the conditions.
 - .4 Where site conditions require minor deviations from indicated arrangements or locations, make such changes on approval of the Consultant without additional cost to the Owner.
 - .5 Should any discrepancies occur during installation of mechanical work which will necessitate major revisions to the mechanical trades work or the work of other trades or contractors, notify the Consultant immediately and obtain written authorization before proceeding with the work.
- .3 Building Attachments:
 - .1 Obtain prior written Consultant's approval before drilling, cutting or welding of the building steel or building structure for erection of materials or equipment.
- .4 Overloading
 - .1 During installation of mechanical work, do not load any part of the building structure with a load greater than it is capable of bearing.

- .1 Should any accident occur or damage result through the violation of this requirement, the contractor shall be held solely responsible.
- .2 Design temporary supports used during installation as being equivalent to permanent supports.
- .3 Remove temporary supports at completion of work.
- .5 Cutting and Patching
 - .1 Do not cut, remove or burn structural parts or sections of the building, whether they are steel, concrete or masonry without the written authorization of the Consultant.
 - .2 Should cutting, repairing, and patching of previously finished work of other trades be required to allow installation of mechanical work, pay all costs for the trade concerned to perform the work.

PART 2 **PRODUCTS**

2.1 **BUILDING ATTACHMENTS**

- .1 Welding Studs
 - .1 Maximum size: 10mm (3/8") for attaching miscellaneous materials and equipment to building steel.
 - .2 If the weight of materials or equipment require bolts or studs larger than 10mm (3/8") diameter, use steel clips or brackets, secured to building steel by (welding or) bolting as approved by the Consultant.
 - .3 Acceptable Manufacturers:
 - .1 Graham
 - .2 Omark
 - .3 Nelson
 - .4 Or approved equivalent
- .2 Self drilling expansion type concrete inserts:
 - .1 To secure miscellaneous equipment and materials to masonry or concrete construction already in place.
 - .2 Of sufficient number and size to prevent concrete from breaking away.
 - .3 The use of powder or power actuated fasteners will not be allowed unless prior written approval is obtained from the Consultant.
 - .4 Acceptable Manufacturers:
 - .1 ITW "Redhead"
 - .2 Star "SSS"
 - .3 USM "Parabolt"
 - .4 Or approved equivalent
- .3 Supports for any suspended items:
 - .1 Do not fasten/attach to or extend through steel pan type roofs or through concrete slab roofs.
- .4 Beam clamps:

- .1 2-bolt design and of such type that the rod load is transmitted only concentrically to the beam web centreline.
- .2 The use of "C" and "I" beam side clamps, etc., will not be allowed without written consent of the Consultant.
- .3 Acceptable Manufacturers:
 - .1 Grinnell
 - .2 Myatt
 - .3 Carpenter & Paterson
 - .4 Or approved equivalent
- .5 Truss or steel joist roof or floor framing:
 - .1 Locate hangers at or within 150mm (6") of the joist top or bottom chord panel points
 - .2 Otherwise provide additional structural steel as required where hanger spacing does not coincide with joist spacing.
 - .3 Transmit hanger load only concentrically to the supporting truss or joist.
- .6 Secondary structural steel members between trusses and/or joists:
 - .1 Locate at or within 150mm (6") of top or bottom chord panel points.
 - .2 Where the secondary structural steel member cannot be located at or near a truss or joist panel point, provide additional diagonal structural steel web member/members designed for the applicable load to the nearest panel point in the opposite chord member.
 - .1 The above condition may be waived if the load to be suspended between panel points is not in excess of 45kg (100 LB).
 - .3 Diagonal hangers which will induce lateral stresses in the chord members of the joist will not be permitted.

2.2 DRIVES AND ACCESSORIES

- .1 Drives
 - .1 V-belt drive selection: 150 percent of the motor size rating.
 - .2 Sheaves: cast iron construction with machined grooves.
 - .1 Sheaves 75mm (3") size and larger diameter: taper lock bushings.
 - .2 Multi-belt drives: matched sets.
 - .3 Statically and dynamically balance all sheaves as an operating unit.
- .2 Adjustable sheaves:
 - .1 Motors less than 1.1Kw (1.5 HP) rating: adjustable pitch motor sheave with diameter range selected to obtain specified RPM of the driven equipment at approximately the mid-point setting of the sheave.
- .3 Fixed Sheaves:
 - .1 Motors of 1.1Kw (1.5 HP) and greater: solid type.
 - .2 Should such sheaves not provide design requirements under operating conditions, supply and install a new drive sheave of proper size at no increase in Contract Price.

- .4 Drive Couplings
 - .1 Acceptable Manufacturers:
 - .1 Falk
 - .2 Fast
 - .3 Thomas
 - .4 Or approved equivalent
- .5 Lubricating Devices
 - .1 Equipment to have oil reservoirs with level indicators, or pressure grease fittings.
 - .2 Inaccessible fittings: provide extended tubes to an accessible location.
 - .3 Grease fittings: Zerk or Alemite.
 - .1 All fittings of one type.
- .6 Drive Guards
 - .1 To OSHA requirements.
 - .2 Build guards of all welded construction on exposed rotating parts or elements and on all drives including the following:
 - .1 V-belt drives
 - .2 Flexible couplings
 - .3 Gear drives
 - .3 Construction (except fan drives):
 - .1 Total enclosure type fabricated of minimum 1.3mm (18 ga.) black sheet steel.
 - .2 Hinged side to allow access for lubrication, inspection or removal of the drive parts.
 - .3 Maximum clearance of openings in guards to rotating parts: not to exceed **13mm (1/2")**.
 - .4 Make provision for slide rail adjustment.
 - .4 Construction for fan drives:
 - .1 V-belt drives: total enclosure type as specified above.
 - .2 Enclosure sides: **13mm (1/2")** mesh, **2.7mm (0.105")** wire screening.
 - .3 Tachometer holes at shaft centres, reinforced as required to maintain rigidity of guard.
 - .5 Flexible drive coupling guards:
 - .1 Location: between motor and driven equipment
 - .2 Minimum 1.3mm (18 ga.) black sheet steel, securely fastened to the equipment baseplate and readily removable.
 - .3 Leave a clearance of approx. **13mm to 25mm (1/2" to 1")** between the guard and the coupling.
 - .4 Extend the guard to within **13mm (1/2")** of both motor and driven equipment housing.

- .6 Rework any substandard guards supplied with mechanical equipment to conform to the above requirements.

2.3 SEALANTS, CONCRETE AND GROUTS

.1 Pipe Sleeve Seals

- .1 Acceptable Manufacturers:
 - .1 Thunderline "Link-Seal" Series LS
 - .2 Or approved equivalent

.2 Concrete

- .1 Strength: Unless otherwise noted, 25 MPa concrete: to CSA-A23.1/A23.2

.3 Concrete Grouts

- .1 Acceptable Manufacturers:
 - .1 Sternson "M-Bed Standard"
 - .2 Sika "SikagROUT 212"
 - .3 Master Builders "Construction Grout"
 - .4 Meadows "CG-86"
 - .5 Euclid "Euco NS Grout"
 - .6 CPD "Non-Shrink Grout"
 - .7 Or approved equivalent

.4 Bonding Agents

- .1 Acceptable Manufacturers:
 - .1 Sika "Sikadur 32" Hi-Mod
 - .2 Or approved equivalent

.5 Caulking Compounds

- .1 Acceptable Manufacturers:
 - .1 Denso-Plast
 - .2 Or approved equivalent

.6 Firestopping

- .1 ULC listed firestopping assembly
- .2 Rating to suit wall and floor penetrations
- .3 Acceptable Manufacturers:
 - .1 Hilti
 - .2 Fire Stop Systems
 - .3 Dow Corning
 - .4 3M
 - .5 Tremco
 - .6 A/D Fire Protection System
 - .7 Johns Manville
 - .8 Or approved equivalent

2.4 MISCELLANEOUS**.1 Access Doors****.1 Size:**

- .1 Minimum size: 300mm x 300mm (12" x 12") size, unless otherwise specified on the Drawings or in other divisions of the Specifications, or as required to replace or repair said equipment.
- .2 Provide 600 x 600 size access doors where personnel entry is required.
- .3 Where access doors are required to be located in fire rated walls, floors and ceilings, provide ULC listed and labelled units having a minimum rating in hours per NBC for the structure being penetrated.

.2 Material:

- .1 Fabricated of 2.5mm (12 ga) bonderized steel.
- .2 Fabricated of 2.5mm (12 ga) stainless steel in areas finished with tile or marble surfaces.
- .3 Flush mounted, concealed hinges and screwdriver lock.
- .4 Plast lock and anchor straps.
- .5 Doors to be of a type and fire rating to suit the particular type of wall or ceiling construction in which they are to be installed.

.3 Acceptable Manufacturers:

- .1 E.H. Price
- .2 Titus
- .3 Controlled Air
- .4 Williams (S.M.S.)
- .5 Acudor
- .6 Or approved equivalent

.2 Isolating Unions**.1 Acceptable Manufacturers:**

- .1 Epco
- .2 Marpac "Petro"
- .3 Corrosion Service
- .4 Or approved equivalent

.3 Fabricated Equipment Supports (Floor Stands and Ceiling or Wall Mounted Supports)

- .1 Structural steel members of welded construction or steel pipe and fittings, suitably braced and secured to the floor by mild steel floor pads or pipe flanges with bolts or anchors.

PART 3 EXECUTION**3.1 EQUIPMENT****.1 General**

- .1 Install equipment in a compact, neat and workmanlike manner.
 - .1 Align, level and adjust for satisfactory operation.
 - .2 Install in such a manner that connecting and disconnecting of piping and accessories can be made readily and that all parts are easily accessible for inspection, operation, maintenance and repair.
- .2 Install and start up items of equipment in accordance with the manufacturer's printed installation and operating instructions.
- .2 Noise and Vibration
 - .1 Noise and vibration levels of equipment and systems shall be within design intent.
 - .2 If noise or vibration levels created by any mechanical equipment and systems and transmitted to occupied portions of building or other mechanical work are over the limits, make all necessary changes and additions as approved by the Consultant without additional cost.
- .3 Lubrication
 - .1 Lubricate all equipment prior to start up in accordance with the manufacturer's printed instructions.
 - .2 Supply all lubrication including sufficient quantity for drainage and refilling of oil sumps, etc., when required by manufacturer's instructions.
- .4 Equipment Bases and Pads
 - .1 Construct bases and pads for all mechanical equipment. Pads shall be constructed of concrete c/w reinforcement and dowels.
 - .1 Exception: bases and pads detailed on the structural Drawings.
 - .2 Construction:
 - .1 10 M deformed dowel anchors to concrete slabs (6 per base or pad).
 - .2 Drill slabs and grout dowels in place.
 - .3 Bond pads and bases to floor. Use grout and bonding agent according to manufacturer's printed instructions.
 - .4 Height of bases and pads: minimum of 150mm (6") or as shown.
 - .5 Width and length: sufficient to extend 75mm (3") beyond centreline of anchor bolts, or to extend a minimum of 50mm (2") beyond equipment base.
 - .6 Chamfer all upper perimeter edges of base.
 - .7 On approval of the Consultant, concrete pads of 150mm (6") maximum thickness may be poured under equipment after equipment is set in place, with concrete fully vibrated into place under the equipment base plate.
 - .3 Layout coordination:
 - .1 Verify size of bases shown on structural Drawings with actual requirements and advise the Consultant and the respective trades if change in size or shape of pad is required.
 - .4 Anchor bolts:
 - .1 Supply anchor bolts required for mechanical equipment unless indicated otherwise on the Drawings.

- .2 Sleeve anchor bolts.
- .3 Supply anchor bolts and sleeves to trade constructing bases in sufficient time for setting in formwork prior to placing concrete and provide anchor bolt location drawing or template for locating anchor bolts.
 - .1 Check anchor bolt locations for proper position before concrete is poured.
- .5 Setting and Alignment of Equipment
 - .1 Rotating equipment (fans, pumps, etc):
 - .1 Use millwrights to set and align to lines established with an engineer's level.
 - .2 Shim equipment using standard brass or bronze shim stock of suitable thickness to provide proper level and alignment.
 - .3 Place 25mm (1") minimum thick grout between equipment base and concrete pad or foundation.
 - .4 Have the Consultant approve equipment settings for equipment mounted on concrete pads or foundations prior to grouting.
 - .5 Re-check alignment prior to start-up of equipment.
- .6 Floor Stands
 - .1 Provide stands for floor mounted equipment.
 - .2 Secure to the floor by mild steel floor pads or pipe flanges with bolts or anchors.
- .7 Ceiling or Wall Mounting
 - .1 Where ceiling or wall mounting is indicated or required, provide a suspended platform, bracket or shelf.
 - .2 Materials: standard steel members and steel plates of welded construction throughout.
 - .3 Attach to building steel with rod hangers and beam clamps, or attach to precast structure as the case may be.
 - .4 Place additional structural steel as required between building steel where beam spacing does not meet requirements.
 - .5 Do not use inserts unless specifically shown on the Drawings or approved by the Consultant for any particular item of equipment.
 - .6 Attach brackets or shelves to vertical member or sections of the building structure as hereinbefore specified.
- .8 Suspended Equipment Support: Provide double locknuts on suspended equipment supports as follows:
 - .1 Upper attachment
 - .1 Beam clamp: provide a double nut on end of beam clamp tie rod.
 - .2 Supplemental steel: double nut all mechanical fasteners fixing supplemental steel to building structural steel.
 - .2 Middle attachment
 - .1 Upper load bearing point, to beam clamp: not applicable.
 - .2 Upper load bearing point, to supplemental steel: double nut on top of load bearing point, single locknut on underside of bearing point

- .3 Lower load bearing point, all: double nut on underside of bearing point, single locknut on top of bearing point.
- .3 Lower attachment
 - .1 Trapeze hanger or equipment fastening: refer to middle attachment requirements above.
- .4 Apply Loctite 242 to the second nut (and matchmark both nuts).

3.2 MISCELLANEOUS STEEL

- .1 General
 - .1 Hang or support equipment, piping, ductwork etc., with miscellaneous structural supports, platforms, braces as may be required unless Drawings or other Sections of the Specifications state otherwise.
- .2 Materials and Fabrication
 - .1 Conform to:
 - .1 CAN/CSA-S16.1-M for materials, design of details and execution of the work.
 - .2 CSA-G40.20/G40.21 grade 300W for structural shapes, plates, etc.
 - .3 CSA W47.1 - for qualification of welders.
 - .4 CSA W48.1-M - for electrodes (only coated rods allowed).
 - .5 CSA W59-M - for design of connections and workmanship.
 - .6 CSA W117.2 - for safety.
 - .2 Construction:
 - .1 Welded construction wherever practicable.
 - .2 Chip welds to remove slag, and grind smooth.
 - .3 Bolted joints allowed for field assembly using high strength steel bolts.
- .3 Painting and Cleaning
 - .1 Clean steel to Steel Structures Painting Council SSPC-SP6, Commercial Blast Cleaning.
 - .2 Apply one coat of oil alkyd primer conforming to CISC/CPMA 2.75 to all miscellaneous steel.
 - .3 In the field, touch up all bolt heads and nuts, previously unpainted connections and surfaces damaged during erection with primer as hereinbefore specified.
 - .4 Apply two coats of primer to all surfaces which will be inaccessible after erection.
 - .5 Thoroughly remove all foreign matter from steelwork on completion of installation.

3.3 CONCRETE INSERTS

- .1 General
 - .1 Install inserts required for attachment of hangers, either for suspension of piping or equipment.
 - .2 For masonry or poured concrete construction use expansion type units. Insert into the concrete after concrete has cured. Do not use anchors or inserts installed by explosive means.

3.4 FLASHINGS

- .1 Coordination
 - .1 Coordinate with general trades and roofing supplier.
- .2 Provide flashing and counter-flashing for all mechanical and related electrical penetrations through roof. Costs resulting from failure to comply with this requirement are the sole responsibility of the contractor.
 - .1 Acceptable Manufacturer: Thaler Metal or approved equal.
 - .1 Plumbing Vent: Thaler model MEF-1
 - .2 Flexible steel conduit: Thaler model MEF-2x
 - .3 Hot pipe: MEF-3A with stainless steel collar
 - .4 Type B vents: MEF-4A
 - .5 Rigid conduit: MEF-AE1
 - .6 Gas Piping: MEF-9

3.5 FIRE STOPPING

- .1 Submittals
 - .1 Submit shop Drawings, including the following information:
 - .1 ULC/CUL listing number
 - .2 Installation Drawings for each type of penetration
 - .3 Installation materials
- .2 General
 - .1 Seal piping, ductwork, conduits and miscellaneous support steel penetrating fire separations.
 - .2 Install fire stopping in accordance with manufacturer's instructions and ULC listing requirements.
 - .3 Provide a written report on completion of fire stopping, by area or floor if necessary, indicating the work is completed and ready for inspection. Do not cover over fire stopping, including installation of walls and ceilings, until work is inspected.

3.6 ACCESS DOORS

- .1 General
 - .1 Supply access doors for installation by other trades in walls or ceilings where accessibility is required for the operation and/or maintenance of:
 - .1 Concealed valves
 - .2 Traps
 - .3 Cleanouts
 - .4 Dampers
 - .5 Fan Coil Units
 - .6 Controls equipment

3.7 ADJUSTMENT AND OPERATION OF SYSTEMS

.1 General

- .1 When the work is complete:
 - .1 Adjust equipment items of the various systems for proper operation within the framework of design intent, and the operating characteristics as published by the equipment manufacturer.
 - .2 Complete additional instructions are specified under the respective Sections of Division 15.
- .2 The Consultant reserves the right to require the services of an authorized representative of the manufacturer in the event that any item of equipment is not adjusted properly.
 - .1 Arrange for such services and pay all costs thereof.
 - .2 After completion of adjustments, place systems in full operating condition and advise the Consultant that the work is ready for acceptance.

3.8 ACCEPTANCE

.1 General

- .1 After all equipment has been installed and adjusted and all systems balanced:
 - .1 Conduct performance tests in the presence of the Consultant and the Owner.
 - .2 Arrange the time for these tests at the convenience of the Consultant and the Owner.
 - .3 Conduct tests under climatic circumstances to ensure complete and comprehensive tests and of such a manner and duration as the Consultant may deem necessary.
- .2 During these tests:
 - .1 Demonstrate the correct performance of all equipment items and of the systems they comprise.
 - .2 Should any system or any equipment item fail to function as required, make such changes, adjustments or replacements necessary to meet performance requirements.
 - .3 Repeat tests until requirements have been fully satisfied and all systems accepted by the Consultant.

3.9 COORDINATION WITH SEPARATE TESTING AND BALANCING WORK

.1 General

- .1 Review with the Mechanical Contractor before fabrication:
 - .1 Location of balancing devices
 - .2 Test connections
 - .3 Access openings
- .2 Report conditions which could affect optimum system performance.
- .3 Inspection:
 - .1 Assure that all testing, balancing and metering devices are installed properly and in pre-selected locations.

- .2 Report any errors to the Consultant.
 - .3 The Mechanical Contractor will obtain the approval of the Testing and Balancing Firm before relocating these devices due to field conditions.
- .2 TAB Contractor Coordination
- .1 Cooperate with the Mechanical Contractor giving adequate prior notification of request for services of tradesmen.
 - .2 Coordinate efforts so that items requiring replacement and/or delivery time (sheaves, motors, etc.) are tested as early as possible.
- .3 Mechanical Contractor Coordination
- .1 Cooperate with the Testing and Balancing Firm.
 - .2 Provide the following assistance and/or services:
 - .1 Schedule sufficient time so that the initial testing and balancing can be completed before occupancy begins and coordinate with the trades involved.
 - .2 Keep the Testing and Balancing Company informed of any major changes made during construction and provide same with a set of project Drawings and reviewed Shop Drawings.
 - .3 Provide balancing devices, test connections access openings, balancing probe inlets and plugs.
 - .4 Clean and pre-run all equipment, filters, etc. and place all heating, ventilating and air conditioning systems into full operation and continue same during each working day of testing and balancing.
 - .5 Provide immediate labour from pertinent mechanical trades and tools, equipment and materials to make equipment and system alterations and adjustments, as required including control adjustments.
 - .6 Make available all equipment data (Shop Drawing performance data and operating instructions) to the Testing and Balancing Firm.
 - .3 As part of the coordination effort, the Mechanical Contractor will be fully responsible for systems constructed, installed and adjusted to Provide optimum performance as required by design intent. Any re-adjusting required as the result of spot checks by the Consultant shall be done at no increase in Contract Price.
 - .4 Nothing contained in this Section voids the responsibility of the Mechanical Contractor (Subcontractor) for systems constructed, installed and adjusted to achieve the design intent.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B31.1-[07], Power Piping.
- .2 ASTM International
 - .1 ASTM A125-[1996(2007)], Standard Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A307-[07b], Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A563-[07a], Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).
 - .2 LEED Canada-CI Version 1.0-[2007], LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.
- .4 Factory Mutual (FM)
- .5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP58-[2002], Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP69-[2003], Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP89-[2003], Pipe Hangers and Supports - Fabrication and Installation Practices.
- .6 Underwriter's Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario of Canada.
 - .2 Submit shop drawings for:
 - .1 Bases, hangers and supports.

- .2 Connections to equipment and structure.
- .3 Structural assemblies.
- .4 Certificates:
 - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturers' Instructions:
 - .1 Provide manufacturer's installation instructions.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
 - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
 - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
 - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
 - .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.
- .2 Performance Requirements:
 - .1 Design supports, platforms, catwalks, hangers to withstand seismic events.

2.2 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.

- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: [galvanized] [painted with zinc-rich paint] after manufacture.
 - .2 Use [electro-plating galvanizing process] [hot dipped galvanizing process].
 - .3 Ensure steel hangers in contact with copper piping are [copper plated] [epoxy coated].
- .2 Upper attachment structural: suspension from lower flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut [and] [carbon steel retaining clip].
 - .1 Rod: [9 mm UL listed] [13 mm FM approved].
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, [UL listed [FM approved][to MSS-SP58] [and] [MSS-SP69]].
- .3 Upper attachment structural: suspension from upper flange of I-Beam:
 - .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, [UL listed] [FM approved] [to MSS SP69].
 - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut [UL listed] [FM approved].
- .4 Upper attachment to concrete:
 - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye [6] mm minimum greater than rod diameter.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate[UL listed] [FM approved] to MSS SP69.
- .5 Shop and field-fabricated assemblies:
 - .1 Trapeze hanger assemblies.
 - .2 Steel brackets.
 - .3 Sway braces for seismic restraint systems.
- .6 Hanger rods: threaded rod material to MSS SP58:
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
 - .3 Do not use [22] mm or [28] mm rod.
- .7 Pipe attachments: material to MSS SP58:
 - .1 Attachments for steel piping: carbon steel [black] [galvanized].

- .2 Attachments for copper piping: copper plated black steel.
- .3 Use insulation shields for hot pipework.
- .4 Oversize pipe hangers and supports.
- .8 Adjustable clevis: material to MSS SP69 [UL listed] [FM approved], clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 [Ensure "U" has hole in bottom for rivetting to insulation shields].
- .9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP69.
- .10 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
 - .1 Finishes for steel pipework: [black] [galvanized].
 - .2 Finishes for copper, glass, brass or aluminum pipework: [black] [[galvanized], with formed portion plastic coated] [epoxy coated].
- .11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP69.

2.4 RISER CLAMPS

- .1 Steel or cast iron pipe: [galvanized] [black] carbon steel to MSS SP58, type 42, [UL listed] [FM approved].
- .2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
- .3 Bolts: to ASTM A307.
- .4 Nuts: to ASTM A563.

2.5 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
 - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
- .2 Insulated hot piping:
 - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

2.6 CONSTANT SUPPORT SPRING HANGERS

- .1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
- .2 Load adjustability: [10]% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.

- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.7 VARIABLE SUPPORT SPRING HANGERS

- .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with [2] springs in series in single casing.
- .3 Variable spring hanger complete with factory calibrated travel stops. [Provide certificate of calibration for each hanger].
- .4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/- 5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.8 EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit calculations with shop drawings.

2.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.10 HOUSE-KEEPING PADS

- .1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads [50] mm larger than equipment; chamfer pad edges.
- .2 Concrete: to Section [03 30 00 - Cast-in-Place Concrete].

2.11 OTHER EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports from structural grade steel meeting requirements.
- .2 Submit structural calculations with shop drawings.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 INSTALLATION

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.
- .3 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to industry standards.
 - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: install below joint.
- .4 Clevis plates:
 - .1 Attach to concrete with [4] minimum concrete inserts, [one] at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .6 Use approved constant support type hangers where:
 - .1 Vertical movement of pipework is 13 mm or more,
 - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .7 Use variable support spring hangers where:
 - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
 - .2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

- .1 Plumbing piping: to National Plumbing Code.
- .2 Fire protection: to applicable fire code.
- .3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.
- .4 Copper piping: up to NPS 1/2: every 1.5 m.
- .5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .6 Within [300] mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	
10	4.9 m	
12	4.9 m	

- .7 Pipework greater than NPS 12: to MSS SP69.

3.4 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
- .1 Ensure that rod is vertical under operating conditions.
- .2 Equalize loads.
- .2 Adjustable clevis:
- .1 Tighten hanger load nut securely to ensure proper hanger performance.
- .2 Tighten upper nut after adjustment.
- .3 C-clamps:
- .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
- .1 Hammer jaw firmly against underside of beam.

3.7 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit

Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .2 Verification requirements in accordance with Section [01 47 17 - Sustainable Requirements: Contractor's Verification], include:
- .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.

3.8 CLEANING

- .1 Clean in accordance with Section [01 74 11 - Cleaning].
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 **GENERAL****1.1** **SUMMARY**

- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing.
- .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 **QUALIFICATIONS OF TAB PERSONNEL**

- .1 Provide documentation confirming qualifications, successful experience.
- .2 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
 - .1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.
 - .2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-1998.
- .3 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .4 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .5 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .6 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .7 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
 - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
 - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 **PURPOSE OF TAB**

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

- .2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

- .1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

- .1 Review contract documents before project construction is started and confirm in writing adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report in writing proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

- .1 Operate systems for length of time required for TAB and as required by Consultant for verification of TAB reports.

1.9 START OF TAB

- .1 Notify the owner and the Consultant 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weatherstripping, sealing, and caulking.

- .5 Pressure, leakage, other tests specified elsewhere Division 23.
- .6 Provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.

1.10 ACCURACY TOLERANCES

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

1.11 INSTRUMENTS

- .1 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .2 Calibrate within 3 months of TAB. Provide certificate of calibration to Consultant.

1.12 SUBMITTALS

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.13 PRELIMINARY TAB REPORT

- .1 Submit for checking and approval of Consultant prior to submission of formal TAB report, sample of rough TAB sheets. Include:
 - .1 Details of instruments used.
 - .2 Details of TAB procedures employed.
 - .3 Calculations procedures.
 - .4 Summaries.

1.14 TAB REPORT

- .1 Format in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:

- .1 Project record drawings.
- .2 System schematics.
- .3 Submit TAB Report to Consultant for verification and approval, in English in D-ring binders, complete with index tabs.

1.15 SETTINGS

- .1 After TAB is completed to satisfaction of Consultant, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.16 COMPLETION OF TAB

- .1 TAB considered complete when final TAB Report received and approved by Consultant.

PART 2 PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General**1.1 SUMMARY****.1 Section Includes:**

- .1 Thermal insulation for piping and piping accessories in commercial type applications.

1.2 REFERENCES**.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)**

- .1 ASHRAE Standard 90.1-, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 American Society for Testing and Materials International (ASTM)

- .1 ASTM B209M-04, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.
- .2 ASTM C335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .3 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .4 ASTM C547-2003, Mineral Fiber Pipe Insulation.
- .5 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

- .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Department of Justice Canada (Jus)Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .2 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

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

- .1 Material Safety Data Sheets (MSDS).

.6 Manufacturer's Trade Associations

- .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).

.7 Underwriters' Laboratories of Canada (ULC)

- .1 CAN/ULC-S102-[03], Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S701-[01], Thermal Insulation, Polystyrene, Boards and Pipe Covering.

- .3 CAN/ULC-S702-[1997], Thermal Insulation, Mineral Fibre, for Buildings
- .4 CAN/ULC-S702.2-[03], Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section [01 33 00 - Submittal Procedures].
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section [01 33 00 - Submittal Procedures].
- .4 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures].
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
- .2 Installer: specialist in performing work of this Section, and have at least [3] years successful experience in this size and type of project, [qualified to standards] [member] of TIAC.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section [01 35 29- Health and Safety Requirements].

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions required by manufacturer.

Part 2 Products**2.1 FIRE AND SMOKE RATING**

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity "k" factor not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702, ASTM C547.
 - .2 Maximum "k" factor: to CAN/ULC-S702.
 - .3

2.3 INSULATION SECUREMENT

- .1 Tape: self-adhesive, aluminum, [plain] [reinforced], [50] mm wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.
- .4 Bands: stainless steel, [19]mm wide, [0.5] mm thick.

2.4 CEMENT

- .1 Thermal insulating and finishing cement:
 - .1 Air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

- .1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: fibrous glass, untreated 305 g/m².

2.8 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .2 Colours: to match existing.
 - .3 Minimum service temperatures: -20 degrees C.
 - .4 Maximum service temperature: 65 degrees C.
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.
 - .7 Location: Indoor piping
- .2 Aluminum:
 - .1 To ASTM B209.
 - .2 Thickness: 0.50 mm sheet.
 - .3 Finish: smooth.
 - .4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
 - .5 Fittings: die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5mm thick at 300 mm spacing.
 - .7 Location: Outdoor piping

PART 3 EXECUTION**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers' instructions and this specification. Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .4 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified. TIAC Code: A-1.
 - .1 Securements: SS bands at 300 mm on centre.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.
- .2 Thickness of insulation shall be 38mm.
- .3 Finishes:
 - .1 Exposed indoors: PVC jacket.
 - .2 Outdoors: water-proof aluminum jacket.
 - .3 Finish attachments: SS bands, at 150 mm on centre. Seals: closed.
 - .4 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.6 CLEANING

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

END OF SECTION

PART 1 **GENERAL****1.1** **POTABLE WATER SYSTEMS**

- .1 When cleaning is completed and system filled:
 - .1 Verify performance of equipment and systems as specified elsewhere in Division 23.
 - .2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.
 - .3 Confirm water quality consistent with supply standards, verifying that no residuals remain resulting from flushing and/or cleaning.

1.2 **REPORTS**

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports, supplemented as specified herein.

1.3 **TRAINING**

- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O&M Personnel, supplemented as specified herein.

PART 2 **PRODUCTS****2.1** **NOT USED**

- .1 Not Used.

PART 3 **EXECUTION****3.1** **NOT USED**

- .1 Not Used.

END OF SECTION

Part 1 General**1.1 SUMMARY**

- .1 Section Includes:
 - .1 Materials and installation for piping, valves and fittings for gas fired equipment.
 - .2 Sustainable requirements for construction and verification:
- .2 Related Sections:
 - .1 Section [01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM)].
 - .2 Section [01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart].
 - .3 Section [01 33 00 - Submittal Procedures].
 - .4 Section [01 45 00 - Quality Control].
 - .5 Section [01 47 15 - Sustainable Requirements: Construction].
 - .6 Section 01 47 17 - Sustainable Requirements: Contractor's Verification.
 - .7 Section [01 74 21 - Construction/Demolition Waste Management and Disposal].
 - .8 Section [01 78 00 - Closeout Submittals].
 - .9 Section [02 81 01 - Hazardous Materials].
 - .10 Section [23 05 01 - Installation of Pipework].
 - .11 Section [23 08 01 - Performance Verification of Mechanical Piping Systems].
 - .12 Section [23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems].

1.2 REFERENCES

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.5-[03], Pipe Flanges and Flanged Fittings.
 - .2 ASME B16.18-[01], Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ASME B16.22-[01], Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
 - .4 ASME B18.2.1-[96], Square and Hex Bolts and Screws Inch Series.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A47/A47M-[99(2004)], Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M-[04], Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .3 ASTM B75M-[99], Standard Specification for Seamless Copper Tube [Metric].
 - .4 ASTM B837-[01], Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA W47.1-[03], Certification of Companies for Fusion Welding of Steel.
- .4 Canadian Standards Association (CSA)/Canadian Gas Association (CGA)

- .1 CAN/CSA B149.1HB-[00], Natural Gas and Propane Installation Code Handbook.
- .2 CAN/CSA B149.2-[00], Propane Storage and Handling Code.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.
 - .2 Indicate on manufacturers catalogue literature following: valves.
 - .3 Submit WHMIS. Indicate VOC's for adhesive and solvents during application and curing.
- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Closeout Submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Construction Progress Schedule.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

Part 2 **Products****2.1** **MATERIALS**

- .1 Materials and products in accordance with drawings and specifications.

2.2 **PIPE**

- .1 Steel pipe: to ASTM A53/A53M, Schedule 40, seamless as follows:
 - .1 NPS 1/2 to 2, screwed.
 - .2 NPS 2 1/2 and over, plain end.
- .2 Copper tube: to ASTM B837.

2.3 **JOINTING MATERIAL**

- .1 Screwed fittings: pulverized lead paste.
- .2 Welded fittings: to CSA W47.1.
- .3 Flange gaskets: nonmetallic flat.
- .4 Brazing: to ASTM B837.

2.4 **FITTINGS**

- .1 Steel pipe fittings, screwed, flanged or welded:
 - .1 Malleable iron: screwed, banded, Class 150.
 - .2 Steel pipe flanges and flanged fittings: to ASME B16.5.
 - .3 Welding: butt-welding fittings.
 - .4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M.
 - .5 Bolts and nuts: to ASME B18.2.1.
 - .6 Nipples: schedule 40, to ASTM A53/A53M.
- .2 Copper pipe fittings, screwed, flanged or soldered:
 - .1 Cast copper fittings: to ASME B16.18.
 - .2 Wrought copper fittings: to ASME B16.22.

2.5 **VALVES**

- .1 Provincial Code approved, lubricated plug, ball type.

Part 3 **Execution****3.1** **MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.2 PIPING

- .1 Install in accordance with applicable Provincial/Territorial Codes, CAN/CSA B149.1, CAN/CSA B149.2, supplemented as specified.
- .2 Install drip points:
 - .1 At low points in piping system.
 - .2 At connections to equipment.

3.3 VALVES

- .1 Install valves with stems upright or horizontal unless otherwise approved by Engineer, Consultant.
- .2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

3.4 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
 - .1 Test system in accordance with [CAN/CSA B149.1] [CAN/CSA B149.2] and requirements of authorities having jurisdiction.
- .2 Manufacturer's Field Services:
 - .1 Have manufacturer of products supplied under this Section review work involved in handling, installation/application, protection and cleaning of its product[s], and submit written reports, in acceptable format, to verify compliance of work with Contract.
 - .2 Provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
 - .3 Schedule site visits to review work at stages listed:
 - .1 After delivery and storage of products, and when preparatory work on which work of this Section depends is complete, but before installation begins.
 - .2 Twice during progress of work at 25% and 60% and completion.
 - .3 Upon completion of work, after cleaning is carried out.
- .3 Obtain reports within 3 days of review and submit immediately to Departmental Representative and Consultant.
- .4 Verification requirements include:
 - .1 Materials and resources.
 - .2 Storage and collection of recyclables.
 - .3 Construction waste management.
 - .4 Resource reuse.
 - .5 Recycled content.
 - .6 Local/regional materials.
 - .7 Certified wood.
 - .8 Low-emitting materials.

.5 Performance Verification:

- .1 Refer to Section 23 08 01 - Performance Verification of Mechanical Piping Systems.

3.5 ADJUSTING

- .1 Purging: purge after pressure test in accordance with CAN/CSA B149.1, CAN/CSA B149.2.

- .2 Pre-Start-Up Inspections:

- .1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.
- .2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.6 CLEANING

- .1 Cleaning: in accordance with CAN/CSA B149.1, CAN/CSA B149.2, supplemented as specified.
- .2 Perform cleaning operations as specified and in accordance with manufacturer's recommendations.
- .3 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.1 REQUIREMENTS

- .1 Conform to General Requirements, Division 1 and Instructions to Bidders.

1.2 REFERENCES

- .1 Refer to and be governed by the conditions and requirements of the "GENERAL CONDITIONS OF CONTRACT", Instructions to Bidders and "Division 1 General Requirements" of the specifications.

1.3 APPLICATION

- .1 This Section applies to and is an integral part of all succeeding Sections of this Division of the specification.

1.4 DEFINITIONS

- .1 The following are definitions of words found in Sections of this Specification and on associated drawings:
- .2 "Concealed" - hidden from normal sight in furred spaces, shafts, crawl spaces, ceiling spaces, walls and partitions;
- .3 "Exposed" - all work normally visible to building occupants;
- .4 "Provide" (and tenses of "Provide") - supply, install and connect complete.
- .5 "Install" (and tenses of "install") - install, and connect complete;
- .6 "Supply" - Supply only.
- .7 "Work" - all equipment, permits, materials and labour to provide a complete electrical installation as required and detailed in Drawings and Specification.
- .8 "Authorities" or "Authorities Having Jurisdiction" - any and all current laws and/or by-laws of any federal, provincial or local authorized agencies having jurisdiction over the sum total or parts of the work including, but not restricted to the Municipal Planning and Building Department, Municipal Fire Department, Labour Canada, The Provincial Fire Marshall, The Local Hydro Supply Authority, The Ontario Building Code, The Construction Safety Act, Municipal Public Works Department, the Canadian Electrical Code with Ontario Supplement, hereinafter referred to as the "Code", the Electrical Safety Authority and all Inspection Bulletins.
- .9 "Drawings and Specifications" - "the Contract Drawings and Specifications".
- .10 "Consultant" shall mean the firm of Moon Matz Ltd., or other person authorized to act on their behalf.
- .11 "DCDSB" Durham Catholic District School Board

1.5 SCHEDULING OF PRODUCT DELIVERY

- .1 Every effort must be made to ensure delivery of all materials and products in the Contract Documents on time. At commencement of contract, assist Contractor in preparation of schedule of order dates for items requiring long delivery periods.

1.6 EXAMINATION OF SITE

- .1 Prior to submitting a tender carefully examine conditions at the site, which may or will affect the work. Refer to and examine all contract documents, including room finish schedules to determine finished, partially finished and unfinished areas of the building.
- .2 Ensure that materials and equipment are delivered to the site at the proper time and in such assemblies and sizes so as to enter into the building and to be moved into the spaces where they are to be located without difficulty. Be responsible for any cutting and patching involved in getting assemblies into place.

1.7 QUALITY ASSURANCE:

- .1 General Codes and Standards:
 - .1 Comply with the Ontario Building Code and Canada Labour Code, Part 4.
 - .2 Where provisions of pertinent codes or local by-laws conflict with these Specifications and Drawings or each other, comply with the more stringent provisions.
 - .3 Accessibility for Ontarians with Disability Act. - AODA
 - .4 Operating voltages shall comply with CAN3-C235-83.
 - .5 Ground system shall comply with CSA Standard C22.1.
 - .6 Abbreviations for electrical terms: to CSA Z85-1983
- .2 Provide new materials bearing certification marks or labels acceptable under Ontario Electrical Safety Code.
 - .1 Equipment must bear, on manufacturer=s label, certification mark or label acceptable under Electrical Safety Authority.
- .3 Provide units of same manufacture where two or more units of same class or type of equipment are required.
- .4 Manufacturer's names are stated in this Specification to establish a definite basis for tender submission and to clearly describe the quality of product that is desired for the work.
- .5 Standard Specifications
 - .1 Ensure that the chemical and physical properties, design, performance characteristics and methods of construction of all products provided comply with latest issue of applicable Standard Specifications issued by authorities having jurisdiction, but such Standard Specifications shall not be applied to decrease the quality of workmanship, products and services required by the Contract Documents.
- .6 Electrical Codes and Permits:
 - .1 The work shall be tendered on and shall be carried out in accordance with these Drawings and Specifications and shall comply with the essential requirements of the latest editions of the Canadian Electrical Code C. 22.1 and the Electrical Safety Code (together with applicable bulletins issued by the Inspection Department of Electrical Safety Authority). In no instance, however, shall the standards established by the Drawings and Specifications be reduced by any of the codes referred to above. In the event of conflicting requirements, the codes shall take precedence over these Contract Documents and the Engineer's decision shall be final.
- .7 Arrange for and obtain all necessary permits, inspection and approvals from authorities having jurisdiction, and also pay all applicable fees. The Contractor shall conform with all Municipal Codes and By-laws which affect the work.
- .8 Applicable Codes
 - .1 Ontario Electrical Safety Code
 - .2 Canadian Electrical Code with applicable regional amendments

- .3 Ontario Building Code
- .4 National Building Code
- .5 Ontario Fire Code
- .6 National Fire Code and Fire Commissioner Canada requirements

- .9 Before starting any work, submit the required number of copies of Drawings and Specifications to the Electrical Safety Authority and the local authority for approval and comments. Comply with any changes requested as part of the Contract, but notify the Engineer immediately of such changes for proper processing of these requirements. Prepare and furnish any additional Drawings, details or information as may be required by the Engineer.

- .10 On or before the completion of this Contract, obtain at own expense, the necessary certificate of inspection from the Inspection Branch of the Electrical Safety Authority of Ontario and forward same to the Engineer.

- .11 Equipment and material must be acceptable to Electrical Safety Authority.

- .12 Where materials are specified which require special inspection and approval, obtain such approval for the particular installation with the co-operation of the material supplier.

- .13 Supply and install warning signs, nameplates and glass covered Single Line Diagrams as required by Electrical Safety Authority.

- .14 Submit required Documents and shop drawings to authorities having jurisdiction in order to obtain approval for the Work. Copies of Contract Drawings and Specifications may be used for this purpose.

1.8 REQUIREMENTS OF DRAWINGS:

- .1 Contract:
 - .1 The Drawings for electrical work are essentially performance drawings, partly schematic, intended to convey the scope of work and extent of work. They only indicate general arrangement and approximate location of apparatus, fixtures and general typical sizes and locations of equipment and connections. The Drawings do not intend to show architectural, structural or mechanical details.
 - .2 Do not scale Drawings, but obtain information involving accurate dimensions to structure from those shown on Architectural and Structural Drawings, or by site measurements of existing areas. Follow the Electrical Drawings in laying out the work but consult general Construction Drawings as well as detail Drawings to become familiar with all conditions affecting the work, and verify spaces in which the work will be installed and structures to which it will be attached.
 - .3 Make, at no additional cost, any changes or additions to materials, and/or equipment necessary to accommodate structural conditions (runs around beams, columns, etc.). Alter, at no additional cost, the location of materials and/or equipment up to 3m, or as directed, provided that the changes are made before installation and do not necessitate additional material or labour.
 - .4 Leave space clear and install work to accommodate future materials and/or equipment as indicated and to accommodate equipment and/or material supplied by other trades. Verify all equipment sizes in relation to space allowed and check all clearances.
 - .5 Confirm on the site, the exact location and mounting elevation of equipment and fixtures as related to Architectural or Structural details. Confirm location of outlets and/or connection points for equipment supplied by other trades.

1.9 SHOP DRAWINGS:

- .1 Pay careful attention to all shop drawings and review comments and ensure that all requirements are fully complied with.

- .2 Submit for review, manufacturer's or vendor's drawings for all products being furnished except cable (up to 1000V), wire and conduit. Include rating, performance, specification sheets, descriptive literature, schematic and wiring diagrams, dimensional layouts and weights of components as well as complete assembly.
- .3 Carefully examine Work and Drawings of all related trades and thoroughly plan the Work so as to avoid interferences. Report defects which would adversely affect the Work. Do not commence installation until such defects have been corrected.
- .4 Submit for review, properly identified shop drawings showing in detail the design and construction of all equipment and materials as requested in sections of the specification governed by this Section.
- .5 Identify the equipment by system name and number, e.g. Fire Alarm Control Panel, Emergency Lighting Fixture "type I", etc.
- .6 Obtain and comply with the manufacturer's installation instructions.
- .7 Endorse each shop drawing copy "CERTIFIED TO BE IN ACCORDANCE WITH ALL REQUIREMENTS", stamp each copy with your company name, date each copy with the submittal date, and sign each copy. Shop drawings which are received and are not endorsed, dated and signed will be returned for re-submittal.
- .8 The Consultant will stamp shop drawings as follows:
 - .1 Drawing: Reviewed ()
 - .2 Reviewed as Modified ()
 - .3 Revise and Resubmit ()
 - .4 Not Reviewed ()
- .9 If "REVIEWED" is checked-off, the shop drawing is satisfactory. If "REVIEWED AS MODIFIED" is checked-off, the shop drawing is satisfactory subject to requirements of remarks put on shop drawing copies. If "REVISE AND RE-SUBMIT" is checked-off, the shop drawing is entirely unsatisfactory and must be revised in accordance with comments written on shop drawing copies and resubmitted. If "NOT REVIEWED" is checked-off, the shop drawing is in error of submission, not applicable for this project.
- .10 This review by the Consultant/Engineer is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Consultant/Engineer approved the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the contract documents. Be responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for co-ordination of the work as well as compliance with codes and inspection authorities such as C.S.A., etc.
- .11 Coordinate Work of this Division such that items will properly interface with Work of other Divisions.
- .12 Architectural Drawings, or in the absence of Architectural Drawings, Mechanical Drawings govern all locations.
- .13 Coordinate work of this Division with Division 7 to ensure that damage does not occur to the fireproofing work of Division 7.

1.10 **SUBSTITUTIONS**

- .1 Refer to Division 01.

- .2 When only one manufacturer=s catalogued trade name is specified, provide only that catalogued trade name, material or product.
- .3 When more than one manufacturer=s trade name is specified for a material or product, the choice is the bidders.
- .4 No substitution is allowed upon award of contract.

1.11 DIMENSIONS AND QUANTITIES

- .1 Dimensions shown on Drawings are approximate. Verify dimensions by reference to shop drawings and field measurement.
- .2 Quantities or lengths indicated in Contract Documents are approximate only and shall not be held to gauge or limit the Work.
- .3 Make necessary changes or additions to routing of conduit, cables, cable trays, and the like to accommodate structural, mechanical and architectural conditions. Where raceways are shown diagrammatically run them parallel to building column lines.

1.12 EQUIPMENT LOCATIONS

- .1 Devices, fixtures and outlets may be relocated, prior to installation, from the location shown on the Contract Drawings, to a maximum distance of 3 m without adjustment to Contract price.
- .2 Switch, control device and outlet locations are shown diagrammatically.

1.13 WORKING DRAWINGS AND DOCUMENTS

- .1 Where the word "HOLD" appears on Drawings and other Contract Documents, the Work is included in the Contract. Execute such Work only after verification of dimensions and materials and obtaining Consultant's written permission to proceed.
- .2 Contractor may be required to prepare working detail drawings supplementary to the contract drawings, when deemed necessary by the Consultant, for all areas where a multiplicity of materials and or apparatus occur, or where work due to architectural and structural considerations involves special study and treatment. Such drawings may be prepared jointly by all trades affected, or by the one (1) trade most affected with due regard for and approval of the other trades, all as the Consultant will direct in each instance. Such drawings must be reviewed by the Consultant before the affected work is installed.
- .3 Carry out all alterations in the arrangement of work which has been installed without proper study and approval, even if in accordance with the contract documents, in order to make such work come within the finished lines of walls, floors and ceilings, or to allow the installation of other work, without additional cost. In addition, make any alterations necessary in other work required by such alterations, without additional cost.

1.14 INSTALLATION DRAWINGS

- .1 Prepare installation drawings for equipment, based upon approved Vendor drawings, to check required Code clearances, raceway, busway and cable entries, sizing of housekeeping pads and structure openings. Submit installation drawings to Consultant for review.

1.15 "AS BUILT" RECORD DRAWINGS

- .1 (Refer to and comply with Division 1) Maintain a set of Contract Drawings on site and record all deviations from the Contract Documents. As a mandatory requirement, recording must be done on the same day deviation is made. Be responsible for full compliance with this requirement.

- .2 Mark locations of feeder conduits, junction and terminal boxes and ducts or conduits run underground either below the building or outside the building.
- .3 Where conduit and wiring are underground or underfloor, furnish field dimension with respect to building column lines and inverts with respect to finished floor levels or grades.
- .4 Record deviations from branch circuit numbers shown on Drawings.
- .5 Prepare diagrams of interconnecting wiring between items of equipment including equipment supplied by Owner and under other Specification Sections.

1.16 SINGLE LINE DIAGRAM

- .1 Reproduce this diagram in drawing form under glazed frame and mount in Electrical Room and provide copies of these diagrams to the Consultant and include in the Maintenance Manuals.

1.17 FIRE BARRIERS

- .1 Where electrical material or devices pass through fire rated separations, make penetrations and provide fire barrier seals with a fire resistance rating equivalent to the rating of the separation.
- .2 Prior to installation, submit for review, proposed fire barrier seal materials, method of installation and ULC system number.
- .3 Acceptable Manufacturers:
 - .1 A/D Fire Protection Systems
 - .2 Dow Corning
 - .3 Fire Stop Systems
 - .4 IPC Flamesafe Firestop
 - .5 Nelson Electric
 - .6 3M
 - .7 Tremco

1.18 MISCELLANEOUS METAL FABRICATIONS

- .1 Provide miscellaneous structural supports, platforms, braces, brackets and preformed channel struts necessary for suspension, attachment or support of electrical equipment in accordance with Section 05500. All supports, platforms, brackets and channel struts shall be made of stainless steel material.

1.19 SLEEVE AND FORMED OPENING LOCATION DRAWINGS

- .1 Prepare and submit to the Consultant for review and forwarding to the appropriate Sub-trade, drawings indicating all required sleeves. Such drawings shall be completely and accurately dimensioned and shall relate sleeves, recesses, and formed openings to suitable grid lines and elevation datum. Begin to prepare such drawings immediately upon notification of acceptance of tender and award of contract. Make all modifications to locations as directed by Structural Engineer at no extra cost to contract.

1.20 SUPERINTENDENCE

- .1 Maintain at the job site, at all times, qualified personnel and supporting staff, with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.
- .2 The supervising personnel and their qualifications are subject to the approval of the Consultant.

1.21 PATENTS

- .1 Pay all royalties and licence fees, and defend all suits or claims for infringement of any patent right, and save the Owner and Consultant harmless of loss or annoyance on account of suit, or claims of any kind for violation of infringement of any letters, patent or patent rights, by this Subcontractor or anyone directly or indirectly employed by him or by reason of the use by him or them of any part, machine, manufacture or composition of matter on the work, in violation or infringement or such letters, patent or rights.

1.22 RIGHTS RESERVED

- .1 Rights are reserved to furnish any additional detail drawings, which in the judgment of the Consultant may be necessary to clarify the work and such drawings shall form a part of this contract.

1.23 METALS

- .1 Steel construction required solely for the work of electrical trades and not shown on architectural or structural drawings shall be provided by this trade in accordance with applicable code requirements.

1.24 FLASHING

- .1 Flash electrical parts passing through or built into a roof, an outside wall, or a waterproof floor.
- .2 Provide 8 pound sheet lead flashing for cast iron or wrought iron sleeve passing through roof.
- .3 Flashing shall suit roof angle and shall extend minimum 457mm (18") on all sides; leave flashing as directed by the Contractor for him to build into roofing, rendering a watertight connection.
- .4 Provide counter flashing on ducts and conduits passing through roofs to fit over flashing or curbs.
- .5 Provide sleeves passing through outside walls with lead or copper flashing as directed.

1.25 WORKMANSHIP

- .1 Install equipment, ductwork, conduit and cables in a workmanlike manner to best suit space, to present a neat appearance and to function properly to the satisfaction of the Consultant.
- .2 Install equipment and apparatus requiring maintenance, adjustment or eventual replacement with due allowance therefore.
- .3 Include in the work all requirements of manufacturers shown on the shop drawings or manufacturers installation instruction.
- .4 Replace work unsatisfactory to the Consultant without extra cost.
- .5 Make provision to accommodate future plant and equipment indicated on drawings.
- .6 Protect from damage all equipment delivered to the site and during installation. Any damage or marking of finished surfaces shall be made good to the satisfaction of the Consultant.

1.26 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

- .2 If mounting height of equipment is not indicated verify before proceeding with installation.
- .3 Install electrical equipment at the following heights unless indicated otherwise.
 - .1 Manual Pull Stations: 1050mm AFF
 - .2 Signalling Devices: 2250mm AFF
 - .3 Visual Signal Devices: 2250mm AFF
 - .4 End of Line Devices: 1800mm AFF
 - .5 Fire Alarm Control Panel: as per CSA/ULC-S524-01
 - .6 Annunciator: as per CSA/ULC-S524-01
 - .7 Local switches; 1050mm
 - .8 Wall receptacles/Data/Telephone:
 - .1 General: 350mm
 - .2 Above top of continuous baseboard heater: 200mm
 - .3 Above top of counters, back splash or desks: 100mm
 - .4 In mechanical room: 1200mm
 - .9 PA Speakers: 1800mm AFF (minimum)
 - .10 Clocks: 2100mm AFF (minimum)

1.27 OWNER RIGHT TO RELOCATE ELECTRICAL ITEMS

- .1 The Owner reserves the right to relocate electrical items (light fixtures, battery pack) during construction, but prior to installation, without cost, assuming that the relocation per item does not exceed 3 m (10'-0") from the original location. No credits shall be anticipated where relocation per item of up to and including 3m reduces materials, products and labour.
- .2 Should relocations per item exceed 3m from the original location the contract price will be adjusted accordingly.
- .3 Necessary changes, due to lack of co-ordination, and as required and when approved, shall be made at no additional cost, to accommodate structural and building conditions. The location of pipes and other equipment shall be altered without charge to the Owner, if approved, provided the change is made before installation.

1.28 OPERATING AND MAINTENANCE INSTRUCTION MANUALS

- .1 Each copy of the manual shall include:
 - .1 A set of as-built prints;
 - .2 Letters of Owners Instructions;
 - .3 Final Electrical Safety Authority Certificate of Inspection;
 - .4 Verification Certificates for all systems as specified hereinafter;
 - .5 A copy of "reviewed" shop drawings;
 - .6 Complete explanation of operation principles and sequences;
 - .7 Complete part lists with numbers;
 - .8 Recommended maintenance practices and precautions;
 - .9 Parts manual and repair manuals
 - .10 Complete wiring and connections diagrams;
 - .11 Certificates of guarantee;
 - .12 Single Line Diagram
- .2 Ensure that operating and maintenance instructions are specific and apply to the models and types of equipment provided.

1.29 TRIAL USAGE

- .1 The Consultant/Engineer reserves the right to use any system, piece of equipment, device, or material for such reasonable lengths of time and at such times as may be required to make a complete and thorough test of the same, or for the purpose of learning operational procedures, before the final completion and acceptance of the work. Such tests shall not be construed as evidence of acceptance of the work, and it is agreed

and understood that no claim for damage will be made for injury or breakage to any part or parts of the above due to the aforementioned tests, where such injuries or breakage are caused by a weakness or inaccuracy of parts, or by defective materials or workmanship of any kind. Supply all labour and equipment required for such tests.

- .2 Perform and pay for all costs associated with any testing required on the system components where, in the opinion of the Consultant/ Engineer the equipment manufacturer's ratings or specified performance is not being achieved.

1.30 **INSTRUCTION TO OWNERS**

- .1 Instruct the Owner's designated representatives in all aspects of the operation and maintenance of all systems and equipment.
- .2 Arrange for, and pay for services of service engineers and other manufacturer's representatives required for instruction in the operation of systems and equipment.
- .3 Submit to the Consultant at the time of final inspection a complete list of systems stating for each system:
 - .1 Date instruction were given to the Owner's staff.
 - .2 Duration of instruction.
 - .3 Name of persons instructed.
 - .4 Other parties present (manufacturer's representative, consultants, etc.)
- .4 Obtain the signature of the Owner's staff verifying that they properly understood the system installation, operation and maintenance requirements, and that they have received the specified manuals and "as-built" drawings.

1.31 **SYSTEM ACCEPTANCE**

- .1 Submit original copies of letters from the manufacturers of all systems indicating that their technical representatives have inspected and tested the respective systems and are satisfied with the method of installation, connection and operation.
- .2 These letters shall state the names of persons present at testing, the methods used, and a list of functions performed with location and room numbers where applicable.
- .3 Submit such letters for the following:
- .4 Fire Alarm System Testing

1.32 **CLEANING**

- .1 Before energizing any systems, inspect and clean the inside of panel boards, switchgear, and cabinets to ensure that they are completely free from dust and debris.
- .2 Clean all polished, painted and plated work bright. Clean all lighting fixtures.
- .3 Remove all debris, surplus material and all tools
- .4 Carry out additional cleaning operating of systems as specified in other sections of this Division.

1.33 **PAINTING WORK SUPPLIED UNDER DIVISION 16**

- .1 Touch up minor chips or damage to electrical equipment, installed in this Division, with standard, factory supplied, enamel finish.
- .2 Colour code, as specified herein, outlet boxes, pull boxes, junction boxes by applying a small dab of paint to inside of each item during installation.

- .3 Colour code, as specified herein, all exposed ducts, conduits, outlet boxes, and similar items by applying a 25 mm (1") wide band of paint around ducts and conduits adjacent to boxes described in above paragraph and on both sides of wall penetration.

1.34 REMOVALS

- .1 Co-ordination Between New and Existing Installations
 - .1 Provide interfacing components between new and existing systems as necessary for proper performance and operation.
- .2 Existing Services
 - .1 Ensure existing services remain undisturbed and energized except where indicated.
 - .2 Disconnect and remove abandoned wiring materials and devices.
 - .3 Cut raceways flush where embedded in structure.
 - .4 Retain abandoned embedded outlet boxes and close with pressed steel cover plates.
 - .5 Make safe all circuit wiring left for future use.
- .3 Modifications to Existing Structures
 - .1 Provide new electrical equipment to existing structures as detailed on drawings. Remove existing devices as shown and as required. Salvage existing circuits for reuse as noted.
- .4 Interruption of Services
 - .1 Maintain existing systems in existing school at all times during construction.
 - .2 Obtain Consultant's written approval before interrupting any service. Long outages are not acceptable.
 - .3 Provide temporary services to maintain continuity in the event that services must be interrupted.
- .5 Premium Time
 - .1 Power shutdowns to the site will only be allowed on weekends between the hours of Friday 12.00 midnight to Sunday 12.00 midnight. Include all costs for this overtime work in the contractor's tender bid.
 - .2 Include cost of premium time in tender price for work during nights, weekends or other time outside normal working hours necessary to do the work and maintain electrical services in operation.
 - .3 Premium time is to include work by local hydro authority, ESA and any other authorities having jurisdiction as required.
- .6 Use of Existing Material And Equipment
 - .1 Unless noted otherwise, do not use any existing panels, boxes and wiring materials unless shown on drawings.
- .7 Existing Material And Equipment
 - .1 Equipment to be reused or relocated: test for proper operation and repair as necessary.
 - .2 Repair or replace existing equipment which is damaged in process of relocation.
 - .3 Relocate existing junction, pull or terminal boxes which become inaccessible due to new mechanical ductwork or equipment.
- .8 Demolition
 - .1 Demolish existing work, where indicated, and remove from site.
 - .2 Execute all demolition work so as to create minimum vibration or dust within and outside the building. Obtain Consultant's approval of methods before proceeding.
- .9 Penetrations in Existing Structure
 - .1 Perform cutting, patching and repairing. Before proceeding obtain Consultant's approval.

- .2 Where necessary to penetrate existing floors, walls, ceiling, roof or structural members provide sleeve and follow Consultant's instructions.
- .3 Restore surfaces to same finish and condition as existing prior to penetration.
- .10 Salvage Materials
 - .1 Remove from site, materials in renovated areas that are not to remain or be reused, unless noted as remaining property of Owner.

2 **PRODUCTS**

Nil

3 **EXECUTION**

Nil

END OF SECTION

1 GENERAL**1.1 GENERAL REQUIREMENTS**

- .1 Conform to General Requirements, Division 1 and Instructions to Bidders.

1.2 REFERENCES

- .1 Comply with Division 1, General Requirements, Instructions to Bidders and all documents referred to therein, also Section 16010, Electrical General Provisions.

1.3 SCOPE OF WORK

- .1 Supply all labour, tools, service and equipment and provide all the materials required to complete the electrical work specified in Division 16.

1.4 SHOP DRAWINGS

- .1 Shop drawings need not be submitted for standard manufactured items and materials provided they are as specified.

1.5 SUBMITTALS

- .1 Submit the items to the Consultant for review:
 - .1 As detailed on Section 16700

1.6 QUALITY ASSURANCE

- .1 All components shall be C.S.A. and/or U.L.C approved listed and labelled.

2 PRODUCTS**2.1 CONDUIT AND RACEWAYS**

- .1 Conduits and Fittings
 - .1 Rigid Galvanized Steel Conduit:
 - .1 To CAN/CSA C22.2 No. 45-M.
 - .2 Rigid thickwall galvanized steel threaded conduit
 - .2 EMT
 - .1 To CSA C22.2 No. 83-M
 - .2 EMT galvanized cold rolled steel tubing
 - .3 Liquid Tight Flexible Steel Conduit Fittings.
 - .1 To CSA 22.2 No. 56.
 - .2 Liquid-tight flexible steel conduit with PVC cover.
 - .3 Watertight connectors with nylon insulated throat.
 - .4 Rigid PVC Conduit
 - .1 To CSA C22.2 No. 211.2-M
 - .2 Rigid PVC conduit
 - .5 Non-Metallic Flexible Conduit
 - .1 Non-metallic extra flexible PVC conduit
- .2 Liquid Tight Flexible Steel Conduit Fittings
 - .1 Watertight connectors with nylon insulated throat
- .3 EMT Fittings
 - .1 Compression type, steel
 - .1 Gland compression connectors with insulated throats
 - .2 Compression couplings
- .4 Set screw type, steel, concrete-tight
 - .1 Connectors with insulated throats
 - .2 Couplings

- .5 Minimum size conduit will be 21mm diameter.
- .6 All conduit shall contain a ground conductor.
- .7 All conduit must have adequate support systems complete with approved fittings, outlet boxes, junction boxes, sealing fittings and drains as indicated or as required. Provide hot dipped galvanized steel beam clamps, hot dipped galvanized steel channel type supports where required. Provide six (6)mm threaded galvanized steel rods to support suspended channels and provide all necessary galvanized steel spring loaded bolts, nuts, washers and lock washers. Support systems shall be Thomas & Betts Superstrut or equal.
- .8 Provide all conduit, fittings and ducts necessary to complete the distribution of all power, lighting and control conductors to electrical equipment specified under the corresponding Section. Include that necessary for connecting to mechanical heating and ventilating equipment, also equipment specified under other Divisions.
- .9 Fasten conduit with malleable PVC coated galvanized steel two-hole straps at intervals to suit code requirements and job conditions.

2.2 DISCONNECT SWITCHES

- .1 Fusible and non-fusible disconnect switch in CSA enclosure as indicated.
- .2 Provision for padlocking in on-off off switch position by three locks.
- .3 Mechanical interlocked door to prevent opening when handle on ON position.
- .4 Fuses: size as indicated.
- .5 Fuseholders: suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.

2.3 FASTENINGS, SUPPORTS AND SLEEVES

- .1 Galvanized steel, size and load rating to suit application.
- .2 One hole steel straps to secure surface mounted conduits or surface mounted cables 50 mm dia. and smaller. Two hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduits to exposed steel work.
- .4 Channel type supports for two or more conduits.
- .5 6 mm minimum dia. threaded rods to support suspended channels.
- .6 6 mm minimum dia. U-bolts.
- .7 Sleeves - schedule 40 steel pipe minimum I.D. 13 mm larger than O.D. of conduit or cable passing through.
- .8 Acceptable Manufacturers: Burndy, Electrovert, Unistrut.

2.4 JUNCTION BOXES

- .1 Code gauge (galvanized) sheet steel EEMAC Type 1 size as required by code for number and size of conduits, conductors and devices, complete with covers, corrosion resistant screws, terminals and mounting channels.

- .2 Screw-on sheet steel covers to match enclosure for surface mounting boxes.
- .3 Covers with 25 mm minimum extension around for flush-mounted junction boxes.

2.5 CONDUIT BOXES - GENERAL

- .1 Size boxes in accordance with latest edition of Electrical Safety Authority (ESA) Electrical Safety Code.
- .2 Code gauge, galvanized pressed steel for EMT.
- .3 Galvanized cast or pressed steel, for rigid thickwall threaded conduit.
- .4 Corrosive resistant coated: cast boxes for corrosive resistant coated rigid steel conduit with same finish as conduit.
- .5 200 mm square or larger outlet boxes as required for special devices.
- .6 Gang boxes where wiring devices are grouped except in classified hazardous areas.
- .7 Blank cover plates for boxes without wiring devices.
- .8 50 mm x 100 mm outlet boxes for devices, ganged for grouped devices, barriers where required by code.
- .9 Rigid PVC boxes for rigid PVC conduit.

2.6 PULL BOXES

- .1 Code gauge galvanized sheet steel welded construction, EEMAC Type 1.
- .2 Screw-on galvanized sheet steel covers for surface mounting boxes.
- .3 Covers with 25 mm minimum extension around, for flush mounted pull boxes.

2.7 OUTLET BOXES - SHEET STEEL

- .1 Pressed steel single and multi-gang flush device boxes for flush installation, minimum size 100 mm x 50 mm x 38 mm. 100 mm square outlet boxes where more than 1 conduit enters 1 side, with extension rings as required.
- .2 100 mm square or octagonal outlet boxes for lighting fixture outlets.
- .3 119 mm square outlet boxes with extension and plaster rings as necessary for flush mounting devices in gypsum board, plaster or panelled walls.

2.8 MASONRY BOXES

- .1 Pressed steel masonry single and multi-gang boxes for devices flush mounted in exposed masonry walls.

2.9 WIREMOLD FIRE ALARM SURFACE MOUNT BACK BOX

- .1 Two-Gang Alarm Device Box –For surface mounting alarm devices and safety signals designed to fit 4" [102mm] square back boxes. Cover has three raceway twistouts on each side. Base has 1/2" and 1" trade size concentric and single-gang box KOs. Cat#: R5752 (Red)-

2.10 CONCRETE BOXES

- .1 Pressed steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.11 RIGID CONDUIT BOXES

- .1 Zinc electroplate and polymer enamelled cast FS boxes with factory-threaded hubs and mounting feet for surface mounted switches and receptacles, with gasketed coverplate for exterior work and wet areas.

2.12 OUTLET BOXES - FITTINGS

- .1 Bushings and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of foreign materials.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings for sheet steel metal boxes.

2.13 SURFACE RACEWAY

- .1 Surface metal raceway, snap-in divider to form 2 compartments for power and voice/data, with removable cover.
- .2 Elbows, couplings, end caps, device brackets and faceplates for power, data and voice, and fittings manufactured as accessories for wireway supplied. 120V power receptacles and mounting only for voice/data.
- .3 Acceptable Material:
 - .1 Wiremold 5400 series: components to meet requirements.
- .4 Acceptable alternate manufactures include:
 - .1 Hubbell: Base Trak
 - .2 Panduit: Pan-Way

2.14 BRANCH CIRCUIT CONDUCTORS

- .1 Conductors
 - .1 ASTM Class B, soft drawn, electrolytic copper
 - .2 Stranded
- .2 Insulation
- .3 CSA type RW90 XLPE (-40°C)
 - .1 Heat and moisture resistant
 - .2 Low temperature, chemically cross-linked thermosetting polyethylene material
 - .3 600V rated
 - .4 For maximum 90°C conductor temperature
 - .5 For installation at minimum -40°C temperature
 - .6 To CSA C22.2 No. 38
- .4 CSA type RWU90 XLPE (-40°C):
 - .1 Heat and moisture resistant
 - .2 Low temperature, chemically cross-linked thermosetting polyethylene material
 - .3 1000V rated
 - .4 For maximum 90°C conductor temperature
 - .5 For installation at minimum -40°C
 - .6 To CSA C22.2 No. 38
- .5 CSA type T90 NYLON (-10°C):
 - .1 Heat resistant
 - .2 Flame retardant
 - .3 Thermoplastic PVC material with extruded nylon cover
 - .4 600V rated
 - .5 For maximum 90°C conductor temperature dry and 75°C in wet locations

- .6 For installation at minimum -10°C
 - .7 To CSA C22.2 No. 75-M
- .6 CSA Type AC90 XLPE (-40°C)
 - .1 Conductors
 - .2 ASTM Class B, soft drawn, electrolytic copper
 - .3 Solid for sizes #10 AWG and smaller
 - .4 Stranded for sizes #8 AWG and larger
 - .7 Insulation
 - .1 Heat and moisture resistant
 - .2 Low temperature, chemically cross-linked thermosetting polyethylene material
 - .3 600V rated for sizes #10 AWG and smaller
 - .4 1000V rated for sizes #8 AWG and larger
 - .5 For maximum 90°C conductor temperature
 - .6 For installation at minimum -40°C temperature
 - .7 To CSA C22.2 No. 38
 - .8 Construction
 - .1 2, 3 or 4 insulated conductors
 - .2 Bare ground conductor
 - .3 Overall interlocking aluminum armour
 - .4 To CSA C22.2 No. 51
 - .9 Branch circuit conductors up to and including #12 AWG shall be solid. Branch circuit conductors in sizes larger than #12 AWG shall be stranded. All branch circuit conductors shall be constructed of 90% conductive copper, unless otherwise noted, and shall be approved for 600 volts.
 - .10 Electric service, distribution and special conductors are specified in this Section and/or on the drawings.
- 2.15 FIRE ALARM CONDUCTORS**
- .1 Colour coded No., 18 AWG twisted pairs, shielded FAS105, FT4, ULC listed meeting specification C22.2 #208.
- 2.16 WIRE AND CABLE CONNECTORS**
- .1 Copper compression type wire and cable terminations for #8 AWG and larger conductors, colour keyed, sized to suit. Long barrel NEMA 2 hole lugs for sizes #1/0 AWG and larger.
 - .1 Acceptable Manufacturers: Thomas & Betts series 54000, Ideal Powr-Connect, Burndy Hylug.
 - .2 Twist type splicing connectors, copper, sized to suit, with nylon or plastic shroud for tee connections in #10 AWG and smaller conductors.
 - .1 Acceptable Manufacturers: Thomas & Betts spring type, Ideal Twister, Marr Marrette.
 - .3 Conductor compression splice for #10 AWG or smaller.
 - .1 Acceptable Manufacturers: Thomas & Betts STA-Kon series, Ideal Splices, Burndy
- 2.17 HEAT SHRINKABLE TUBING INSULATION, HEAVY WALL**
- .1 Acceptable Manufacturers: Thomas & Betts, Shrink-Kon series, Ideal Thermo-Shrink, TS-46, Raychem tubing WCSM, 3M cable sleeve ITCSN.
- 2.18 WIRING DEVICES - SWITCHES**

- .1 Specification grade, general purpose AC switches, manual toggle operated, ivory colour, 15A or 20A, 120V, single pole, double pole, three-way, four-way switches as required.
- .2 Acceptable materials:
 - .1 Single pole: Hubbell - HBL1201 Series
 - .2 Three way: Hubbell - HBL1203 Series
 - .3 Four way: Hubbell - HBL1204 Series
 - .4 Keyed: Hubbell - HBL1221 Series complete with 2 keys per switch
 - .5 (Keys): Hubbell - HBL1209
 - .6 Motor rated: Hubbell - HBL1221PL c/w pilot light (20A)
- .3 Acceptable alternate manufactures include:
 - .1 Pass & Seymour
 - .2 Leviton
 - .3 Arrow Hart

2.19 WIRING DEVICES - RECEPTACLES FOR GENERAL SERVICE

- .1 Receptacles: specification grade suitable for back and side wiring, complete with grounding terminal, colour as required for type of area for straight blade devices and black colour for twistlock devices.
- .2 Receptacles of one manufacturer.
- .3 Acceptable Materials:

15A, 125V, (5-15R) Duplex	-	Hubbell HBL5252CN
20A, 125V, (5-20R) Duplex	-	Hubbell HBL5352
GFCI, Straight Blade	-	Hubbell HBL GFR-5352 A
Range receptacle	-	Hubbell HBL9450A
Kindergarten Areas	-	Hubbell HBL8200SGA
- .4 Acceptable alternate manufactures include:
 - .1 Pass & Seymour
 - .2 Leviton
 - .3 Arrow Hart

2.20 WIRING DEVICES - COVER PLATES

- .1 Stainless steel Type 302 alloy, vertically brushed, 1mm (1/32") thick cover plates.
- .2 Pressed steel, galvanized.
- .3 Cast covers for cast boxes with gaskets.
- .4 Cover plates of same manufacture as devices.
- .5 Submit samples of each device and cover plate to Consultant for approval. All devices must be approved prior to installation.

2.21 SLEEVES

- .1 In concrete slabs, except as noted below, sleeves shall be #24 gauge galvanized steel or factory fabricated plastic sleeves, each with an integral flange to secure the sleeve to form work construction.
- .2 In waterproof concrete slabs and in other slabs where waterproof sleeves are required sleeves shall be Schedule 40 mild steel galvanized.

2.22 ESCUTCHEON PLATES

- .1 One-piece chrome plated steel sized to completely cover sleeves and complete with set screws to secure the plates to the conduit. Split plates will not be acceptable.

2.23 INSERTS, BEAM CLAMPS FASTENERS, EQUIPMENT HANGERS AND SUPPORTS

- .1 Inserts for concrete formwork shall be Crane Canada type, #4-M Unistrut, or approved equal cast iron inserts, multiple type where required.
- .2 Inserts for precast concrete and existing concrete shall be lead cinch anchors of "WEJ-IT" or self-drilling "STARR" or "PHILLIPS" anchors.
- .3 Beam clamps for hanging and support to structural steel shall be Crane Canada Ltd., or equal.

2.24 WATER RESISTANT PROTECTION

- .1 Where the area is sprinklered and electrical distribution equipment is located in sprinklered areas, enclosures shall be louvred and gasketed and provided with water-tight roof assemblies with overhanging drip shields. The equipment shall be fabricated by the manufacturer in such a way as to prevent sprinkler fluid from entering the equipment and/or interfering with its operation as per the requirements of C.S.A. C22.1 Rule 26-006.
- .2 Weatherproof equipment where noted in the specifications and or drawings shall have EEMAC 4X enclosures in accordance with the requirements of C.S.A. C22.2 No. 94 Standard.

2.25 FINISH

- .1 Equipment enclosure finish: baked grey enamel, ANSI 49 or ANSI 61.

3 EXECUTION

3.1 GENERAL CONDUIT AND CONDUCTOR INSTALLATION REQUIREMENTS

- .1 Install conduit and conductors concealed in all finished areas, and concealed to the degree made possible by finishes in partially finished and unfinished areas. Conduit may be exposed in unfinished area such as Electrical Rooms and Mechanical Rooms, unless otherwise noted on the drawings or specified herein. Refer to and examine the architectural drawings and room finish schedules to determine finished, partially finished and unfinished areas of the building.
- .2 Where conduit and/or conductors are exposed, arrange same to avoid interference with other work and parallel to the building lines, where horizontal conduits and/or conductors are exposed, install as high as possible. Do not install conduit and/or conductors within 150mm of flue or heating pipes or equipment.

3.2 CONDUIT AND EMT - GENERAL

- .1 Run parallel or perpendicular to building lines.
- .2 Group raceways wherever possible. Support on channels.
- .3 Install expansion joints as required.
- .4 Run raceways in web portion of structural steel columns and beams.
- .5 Do not drill structural members to pass through.
- .6 Locate raceways not less than 125 mm clear where parallel to steam or hot water lines with a minimum of 75 mm at crossovers.

- .7 Use metallic raceway where temperatures exceed 75°C or where enclosed in thermal insulation.
- .8 All conduits to contain insulated green ground wire.
- .9 Install 6 mm diameter nylon pull cord in empty raceways.
- .10 EMT and non-metallic conduits to contain insulated green ground wire.
- .11 Install 6 mm¹/₄" diameter nylon pull cord in empty raceways.

3.3 CONDUIT AND FITTINGS

- .1 Minimum conduit sizes:
 - .1 Surface installation 21mm trade size conduit
 - .2 Embedded in concrete 27mm trade size conduit
 - .3 Directly buried 53mm trade size conduit
- .2 Conduit application and type:

	Application	Type
.1	Corrosive areas	rigid steel
.2	Hazardous areas	rigid steel
.3	Outdoor areas	rigid steel
.4	Embedded in concrete, other than grade slab	rigid PVC
.5	In or below grade slab	rigid PVC
- .3 Exposed in unfinished areas up to 3m above finished floor, use rigid galvanized steel, above 3m use EMT.
- .4 Connection to motors and equipment subject to vibration use liquid tight flexible steel conduit.
- .5 Use field threads on rigid conduit of sufficient length to draw conduits up tight.
- .6 Do not bend coated steel conduit. Use elbows for deflections.
- .7 Do not install conduit in or under slab.
- .8 Use factory "ells" where 90° bends are required for 27mm trade size and larger conduits.
- .9 Bend conduit offsets cold. Do not install crushed or deformed conduits and avoid trapped runs in damp or wet locations. Prevent the entrance of water and lodging of concrete, plaster, dirt, or trash in conduit, boxes, fittings, and equipment during course of construction.
- .10 Where conduit joints occur in damp or wet locations, make joints watertight by applying an approved compound on the entire thread area before assembling. Draw up all conduit joints as tightly as possible.
- .11 Cap exposed empty conduits which do not terminate in outlets, panels, cabinets, etc., with standard galvanized plumber's pipe caps.
- .12 Plug empty conduits which terminate flush with floors or walls with flush coupling and brass plug.
- .13 Install conduit sleeves for all exposed conduits and cables passing through walls, ceilings, or floors, and fill void between sleeve and conduit with caulking. If fire-rated caulking is required by code, use same class as walls, ceilings or floors.

- .14 Terminate conduit stubbed up through concrete floor for connection to free standing equipment with a coupling flush with finish floor, and extend rigid conduit to equipment, except where required, use flexible conduit from a point 150 mm above floor.
- .15 Install double locknuts and bushings on all rigid conduit terminations into threadless openings. Increase length of conduit threads at terminations sufficiently to permit bushing to be fully seated against end of conduit.
- .16 Mechanically bend steel conduit.
- .17 Install sealing condulets in conduits at hazardous area boundaries.

3.4 CONDUITS IN POURED CONCRETE

- .1 Locate to suit reinforcing steel. Secure firmly to prevent movement during pour.
- .2 Clear each conduit with mandrel and brush before concrete sets.
- .3 Protect conduits from damage where they stub out of concrete.
- .4 Install sleeves where conduits pass through slab or wall.
- .5 Provide oversized sleeve before membrane is installed where conduits pass through waterproof membrane. Use cold mastic between sleeve and conduit.
- .6 Encase conduits completely in concrete; provide 50 mm (2") minimum concrete cover.
- .7 Replace with exposed conduit, any conduit run found to be obstructed after concrete sets.
- .8 Core-line conduit is not allowed and shall not be used.

3.5 EMT AND FITTINGS

- .1 Minimum EMT size: $\frac{3}{4}$ (21) trade size conduit.
- .2 EMT Application
 - .1 Exposed in unfinished areas, above truss level and for drops in column web to 3m above finished floor. Use rigid steel conduit below 3m.
 - .2 In block walls and stud partitions.

3.6 JUNCTION BOXES

- .1 Install junction boxes in inconspicuous but accessible locations. Secure to structure.
- .2 Install terminal blocks on mounting rails, for termination of each wire and cable regardless of size.
- .3 Only one voltage source is permitted in a junction box.
- .4 Install barriers to separate different auxiliary systems

3.7 PULL BOXES

- .1 Install pull boxes in inconspicuous but accessible locations. Secure to structure.
- .2 Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.
- .3 Only one voltage source is permitted in a pull box.
- .4 Install barriers to separate different auxiliary systems.

3.8 OUTLET AND CONDUIT BOXES

- .1 Install conduit outlet boxes for conduit up to 32 mm and pull boxes for larger conduits.
- .2 Support boxes independently of connecting conduits.
- .3 Seal boxes during construction to prevent entry of debris, dust and dirt.
- .4 For flush installations mount plaster rings to box, flush with wall surface to permit wall finish to come within 6 mm of opening.
- .5 Provide correct size of openings in boxes for conduit, armoured cable connections. Reducing washers will not be acceptable.
- .6 Install switches and other controls close to door lock or latch jambs and other openings, maintaining a minimum of 100 mm from trims of doors (except where installed in door frames of metal partitions) check door swings.
- .7 Install 100 mm square or octagonal outlet boxes for lighting fixture outlets.

3.9 MASONRY BOXES

- .1 In block walls use deep boxes to provide clear space around knockout for AC90 cable entry.

3.10 SURFACE MOUNTED RACEWAY

- .1 Raceway is to be supplied and installed c/w all necessary fittings, hardware and device brackets for configuration as noted on the drawings for a complete functional system.
- .2 Install conduit system, wiring and devices as indicated.
- .3 Ensure raceway is installed as per manufactures recommendations.
- .4 Where the raceway ends at a wall install end cap.

3.11 INSTALLATION OF BRANCH CIRCUIT CONDUCTORS

- .1 Install wiring in raceways unless noted otherwise.
- .2 Minimum wire sizes:
 - .1 Power and lighting -No. 12 AWG
 - .2 Control -No. 14 AWG
 - .3 Fire alarm -No. 18 AWG
- .3 Wire and cable application and type:
 - .1 Lighting branch circuit where connection to luminaire is AC90 cable use T90 nylon
 - .2 Receptacle branch circuits use T90 nylon
 - .3 Ceiling boxes to luminaires in suspended ceiling use T90 nylon or AC90 cable
 - .4 Branch circuits other than those covered above use RW90
 - .5 Equipment feeders and circuits use RW90
 - .6 Underground and under slab raceways, duct banks, direct burial use RWU90.
 - .7 Type AC90 cable length limitations:
 - .1 Ceiling box to luminaire: 1.2m maximum in non-accessible ceilings; 1.8m in accessible ceilings
 - .2 Junction box to outlet: 3m maximum.
- .4 Use lubricant when pulling wires into conduit. Ensure that wires are kept straight and are not twisted or abraded.
- .5 Neatly secure exposed wire in apparatus enclosures with approved supports or ties.

- .6 Junctions of all conductors shall be done with Ideal Wing nut #450 Series for conductors from #14 AWG to #8 AWG.
- .7 For all conductors larger than #8 AWG junctions shall be done with Burndy Servit connectors wrapped with 3 M #33 Scotch tape.
- .8 Maximum voltage drop for 12V DC wiring to remote lighting heads shall be 5% max at the farthest remote head. Size conductors accordingly.

3.12 CONNECTORS

- .1 Install compression terminations and splices in accordance with manufacturer's written instructions.
- .2 Make splices in junction boxes.
- .3 Make connections in lighting circuits with twist type splicing connectors.
- .4 Terminate and splice conductors No. 8 and larger at terminal blocks in junction boxes.
- .5 Seal terminations and splices exposed to moisture, corrosive conditions or mechanical abrasions with heavy wall heat shrinkable insulation.
- .6 Install fixture type connectors and tighten. Replace insulating cap.

3.13 INSTALLATION OF FIRE ALARM CONDUCTORS

- .1 Provide all required Fire Alarm conductors, generally as specified unless otherwise noted.
- .2 Install all Fire Alarm wiring in conduit, unless specifically noted.
- .3 Any special requirements pertaining to Fire Alarm wiring will be specified hereinafter in this Division or on the Drawings.

3.14 WIRING DEVICES - RECEPTACLES

- .1 Install receptacles vertically, use gang type outlet box where more than one receptacle is required in a location.
- .2 Where split receptacle has a portion switched, mount vertically and switch upper portion.
- .3 Coordinate with architectural and interior design drawings for final positioning and mounting heights of power and voice/data receptacles. Where there is disagreement between electrical and architectural drawings, take the architectural drawings as correct.
- .4 Maintain clearances between receptacle outlet boxes and millwork as stipulated on the drawings.
- .5 Align and evenly space outlet boxes that are mounted as a group.
- .6 Install receptacle colours as follows:

	Area	Colour
.1	Gypsum board, plaster or panelled	ivory
.2	Office	ivory
.3	Factory, service, exterior	brown

3.15 WIRING DEVICES - SWITCHES

- .1 Install single throw switches with handle in UP position when switch is closed.

- .2 Install switches in gang type outlet box when more than one switch is required in a location.
- .3 Mount toggle switches at height indicated.
- .4 Install switch colours as follows:

	Area	Colour
.1	Gypsum board, plaster or panelled	ivory
.2	Office	ivory
.3	Factory, service	brown

3.16 WIRING DEVICES - COVER PLATES

- .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .2 Install suitable common cover plates where wiring devices are grouped.
- .3 Do not use cover plates designed for flush outlet boxes on surface-mounted boxes.
- .4 Provide plaster ring where necessary.

3.17 INSTALLATION OF SLEEVES

- .1 Where conduits, raceways and conductors pass through structural poured concrete, install sleeves, to suit structural details.
- .2 Size sleeves, unless otherwise noted, to leave 12mm clearance around the conduit, raceway, etc. Pack and seal the void between the sleeves and the conduit, raceway, conductor etc. for the length of the sleeves as follows:
 - .1 Pack sleeves set in interior concrete slabs, masonry walls, fire rated partitions, etc., with a U.L.C. and C.S.A. approved fire barrier caulk equal to 3M #CP25.
 - .2 Pack sleeves set in exterior walls with lead wool or oakum and seal the ends of the sleeves water-tight with an approved non-hardening sealant compound. Co-ordinate with the waterproofing trade.
 - .3 Submit to the concrete reinforcement detailed at the proper times, drawings, indicating all required sleeves, recesses and formed openings in poured concrete work. Such drawings shall be completely and accurately dimensioned and shall relate sleeves, recesses and formed openings to suitable grid lines and elevation datum.
 - .4 Install sleeves of a water protecting type in the following locations:
 - .1 In Mechanical Room floor slabs except where on grades.
 - .2 In slabs over Mechanical, Fan, Electrical and Telephone equipment rooms or closets.
 - .3 In all floors equipped with waterproof membranes.
 - .4 In the roof.
 - .5 "Gang" type sleeving will be permitted only with the Consultant's approval. All sleeves locations in precast slabs shall be approved by structural Engineer.
 - .6 Terminate sleeves for work which will be exposed so that the sleeve is flush at both ends with the wall, partition or slab surface so that the sleeves may be completely covered by escutcheon plates.
 - .7 Openings for multiple conduit or conductor runs, etc., will be provided by the Division responsible for the particular construction in which the opening is required. Carefully co-ordinate the opening locations with the particular Division and ensure that openings are suitably sized and located. Seal the space between the opening and the conduit, conductors, etc., for the length of the opening as for sleeves above.
 - .8 Where a round or formed opening is required, where placement of a sleeve has been missed, or where provision of an opening has not been properly,

coordinated with the Concrete Division, neatly cut a suitably sized hole or opening using proper tools to the approval of the Consultant. Prior to cutting any such hole or openings, determine whether or not any reinforcing steel or services, are concealed behind the surface where the holes or opening is to be cut and be responsible for all costs incurred for correcting any damage caused to the structure or services due to cutting holes or openings without prior study and approval.

3.18 **INSTALLATION OF ESCUTCHEON PLATES**

- .1 Provide escutcheon plates over all exposed conduit passing through walls, floors, ceilings, partitions, furrings etc., in finished areas.

3.19 **INSTALLATION OF INSERTS, BEAM CLAMPS, FASTENERS, HANGERS AND SUPPORTS**

- .1 Install all inserts, beam clamps, fasteners, and similar hardware required for conduit, duct, raceway, conductor, etc., and equipment hanger and/or support materials to best suit structural details.
- .2 Accurately and properly set concrete inserts in the concrete framework.
- .3 For runs of three (3) or more conduits, raceways, or conductors in concrete formwork, use multiple type inserts used for the smallest conduit in the group.
- .4 Where inserts are required in precast concrete and in concrete work where concrete inserts have not been installed, drill a neat hole of the proper diameter and depth in the concrete and insert an anchor to accept the hanger rod, bolt, etc., or where concrete mass permits, use self-drilling concrete anchors.
- .5 Fasten hangers and support provisions to brick or masonry with expansion shields and machine bolts, or for light loads, use plugs, and screws.
- .6 In cavity walls and/or ceilings use two (2) wing toggles and for heavy loads, provide steel anchor plates with two (2) or more toggles to spread the load.
- .7 Provide beam clamps for attaching, hanging and/or support provisions to the Consultant, weld the hanging and support provisions to the structural steel.
- .8 Explosive power actuated fasteners will not be permitted unless specific approval for their use has been obtained from the Consultant.
- .9 Securely mount plywood backboards to structure or use independent mounting channels, secured to floor.

3.20 **PAINTING AND FINISHES**

- .1 Provide all painting and patching to match existing services as required.
- .2 All exposed electrical fittings, supports, hangers, frames conduit, racks, boxes, raceways and similar material and apparatus shall be galvanized or finished with corrosion resistant primer ready to accept paint. Take special care when priming work exposed to the elements or in wet areas to prevent rust or corrosion from damaging adjacent surfaces.
- .3 Touch up and/or repaint any factory finished equipment that has been scratched or otherwise damaged during installations.
- .4 Provide for all patching and painting for all removals and as required. Painting shall be completed to the approval of the Consultant and Owner. Paint shall match adjacent surfaces. Include all costs.
- .5 Where cutting, patching, fire stopping and construction involves painted surfaces these must be painted to match the surrounding surfaces or as directed by Consultant.

3.21 **STANDARD IDENTIFICATION**

- .1 Identify electrical work as specified below.
- .2 For each piece of electrical equipment from the existing panelboard up to and including battery packs and for any other piece of equipment where specified in this Section, provide engraved lamacoid identification nameplates. Nameplates shall generally be lamacoid black with white letters and with bevelled edges, secured to apparatus with stainless steel screws. Warning signs, if and when required, shall be red with white lettering.

- .3 Exact nameplate wording and sizes must be approved by and confirmed by the Consultant prior to manufacture.
- .4 Clearly identify main pull or junction boxes (excluding obvious outlet boxes) by painting the outside of the covers. Paint colours shall be in accordance with the following schedule:
- .5 Fire Alarm – Red
- .6 Colour code conductors, throughout to identify phases, neutrals and grounds by means of self-laminating coloured tape, coloured conductor insulation, or properly secured coloured plastic discs. Colours shall be as follows:
 - .1 Phase A - Red
 - .2 Phase B - Black
 - .3 Phase C - Blue
 - .4 Ground - Green
 - .5 Neutral - White

3.22 CUTTING AND PATCHING

- .1 Inform other trades in time concerning required openings. In work already finished, cutting and patching shall be done by the trades installing the affected work at the expense of Division 16. Obtain the approval of the Consultant, before doing any cutting.

3.23 PROVISIONS FOR SERVICES CROSSING BUILDING EXPANSION JOINT

- .1 Wherever services (conduit, cables, etc.) cross building expansion joints, install the services in such a manner to permit free movement without imposing additional stress or loading upon the support system, and to prevent excessive movement at joints and connections.

3.24 FIELD FABRICATED METAL WORK

- .1 Clean and prime paint field fabricated metal work.
- .2 After fabrication deburr, scrape, grind smooth, wire brush with power brush and degrease metal work.
- .3 Prime paint steel with 1 coat of CISC/CPMA 2.75 oil alkyd primer.
- .4 Prime paint aluminum as follows: wash with detergent solution and wipe down with SSPC-SP1 solvent. Apply Glidden #Y-5229 primer to 1.5 mils DFT.
- .5 For brass and bronze alloy materials, prepare as for aluminum but apply 1 coat of CAN/CGSB-1.40-M zinc chromate primer.

3.25 TESTS

- .1 Branch circuit balancing.
- .2 Connect all new branch power circuits to existing panelboards so as to balance the actual loads (wattage) within 5%.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Conform to General Requirements, Division 1.
- .2 This Section of the Contract Specifications shall be read in conjunction with, and shall govern the work of the following Standard Sections:
 - .1 Section 26 00 00 - General Electrical Provisions
 - .2 Section 26 05 00 - Electrical Basic Materials and Methods
 - .3 Section 26 28 16 02 – Molded Case Circuit Breakers

1.2 REFERENCES

- .1 Comply with requirements of Division 1, and all documents to therein.
- .2 Section 26 00 00 Electrical General Provisions also applies to and is a part of this Section of the Specification.
- .3 Conform to latest issues, amendments and supplements of following standards:
 - .1 CSA C22.2 No. 5.1M Moulded Case Circuit Breakers
 - .2 ANSI/ASTM:
 - .1 A-666-84 Austinitic Stainless Steel, 304 - 2B Sheet, Strip, Plate and Flat Bar for Structural Applications
 - .2 A-480-1984a General Requirements for Flat Rolled Stainless Steel and Heat Resisting Steel Plate, Sheet and Strip
- .4 Canadian Standards Association:
 - .1 C22.2 No. 0.4-M1982 Bonding and Grounding of Electrical Equipment (Protective Grounding)
 - .2 C22.2 No. 5-M1986 Service Entrance and Branch Circuit Breakers
 - .3 C22.2 No. 0.12-M1985 Wiring Space and Wire Bending Space in Enclosures for Equipment Rated 750 V or Less
 - .4 C22.2 No. 14-M91 Industrial Control Equipment
 - .5 C22.2 No. 29-1989 Panelboards and Enclosed Panelboards
 - .6 C22.2 No. 38-1986 Thermoset Insulated Wires and Cables

1.3 SCOPE OF WORK

- .1 Supply all labour, tools, services and equipment and provide all materials and equipment required to complete service and distribution work in accordance with this section of the specification and the drawings.

1.4 QUALITY ASSURANCE

- .1 All low voltage distribution work shall be executed by skilled tradesmen fully experienced in the installation of electrical power systems.
- .2 All equipment shall be constructed to EEMAC standard and shall carry the CSA label or the contractor shall obtain Electrical Safety Authority approval.

- .3 All equipment shall be suitably noted for the system available fault and HRC fuses shall comply with CSA C22.2 No. 106.
- .4 Standards:
 - .1 Panelboards shall comply with C22.2 No. 29.
 - .2 Wiring devices shall comply with C.S.A. Specification C22.2 No. 42.
- .5 Provide all products and services in accordance with the following codes and standards:
 - .1 OHESC - Ontario Hydro Electrical Safety Code
 - .2 CSA - Canadian Standard Association
 - .3 EEMAC - Electrical and Electronics Manufacturers Association of Canada

1.5 SUBMITTALS

- .1 Refer to Division 1 General Requirements and submit shop drawings for the following:
 - .1 Fusible disconnect switch
 - .2 Weather Proof disconnect switch
 - .3 Breakers
 - .4 System Controls

2 PRODUCTS

2.1 REFERENCES

- .1 Refer to Section 26 00 00 Electrical General Provisions. This Section also applies to and is part of this section of the specifications.
- .2 Refer to Section 26 05 00 Basic Materials and Methods. This Section also applies to and is part of this section of the specifications.

2.2 BREAKERS

- .1 All breakers shall conform to CSA C22.2 No. 5.

2.3 CONTACTORS

- .1 All contactors shall conform to CSA C22.2 No. 14.
- .2 EEMAC type, electrically held, heavy duty, designed for the application, e.g. lighting contactors for lighting circuits.
- .3 Auxiliary contacts, minimum 2N.O. and 2N.C.
- .4 Control transformer, fused primary and secondary, 120 volt output.

2.4 WIRE CONNECTORS

- .1 All wire connectors shall conform to CSA C22.2 No.65.

2.5 GROUNDING AND BONDING EQUIPMENT

- .1 All equipment used for grounding and bonding shall conform to CSA C22.2 No.0.4 and C22.2 No. 41.

2.6 THERMOSET INSULATED WIRES CABLES

- .1 All interconnecting wires and cables shall be copper of Type RWU90. Interconnecting wire and cables shall conform to CSA C22.2 No. 38.

2.7 PANELBOARD

- .1 The panelboard layout and manufacture shall conform to CSA C22.2 No. 29. The panelboard shall accept bus bar bolt-on breakers, and all bus work shall be of copper construction. All interconnecting wire and cables shall be of copper construction and conform to CSA C22.2 No. 12 for bending radius. The panelboard shall meet service entrance requirements of subsection "Combination Service/Entrance Panelboards" of CSA C22.2 No. 29.
- .2 The panelboard cover shall be manufactured to accept up to 10 standard-sized single-pole branch circuit breakers without drilling. Unused openings shall be covered with removable blank covers or inserts.
- .3 Panelboard bussing shall be copper flat bars.
- .4 Acceptable manufacture shall be Siemens Canada, Schneider Canada or approved equivalent.

2.8 LOW VOLTAGE SERVICES

- .1 Provide all low voltage service feeders and branch circuits and connect all equipment indicated on the drawings.
- .2 All wiring shall be rated 600 volt unless otherwise noted, and shall comply with the general requirements specified in Section 26 00 00 and 26 05 00.

2.9 RECEPTACLES

- .1 General Use Receptacles, Covers, and Similar Wiring Devices: CSA C22.2 No. 42.
- .2 General Use Receptacles: Rated 15A, 125V, 3 wire, 'U-ground' type, GFI type with screw terminals, side and back wiring, specification grade.
- .3 Acceptable Products
 - .1 Pass & Seymour 5262 (Duplex)
 - .2 Hubbell 5262 (Duplex)
 - .3 Leviton 262-B(Duplex)
- .4 Wall Plates and Covers: stainless steel deluxe type 302 with matching screws, to suit wiring devices and boxes, finished wall, flush mounting.
- .5 Self-Closing Cover Plates, gasketed, built-in spring mechanism, locking tabs, twin-hole for duplex or rectangular for GFCI receptacles.
- .6 Acceptable Product: Molvan Enterprises, Inc "Safe-Let" series.
- .7 Conduit Box Covers: Galvanized pressed steel covers, to match type "FS" or "FD" conduit boxes.
- .8 Utility Box Cover: Sheet steel to match wiring device and surface mounted utility boxes.

- .9 Weatherproof Cover Plates: Spring-loaded, cast aluminum, complete with gaskets, to match single or duplex receptacle and outlet box.

3 EXECUTION

3.1 GENERAL

- .1 Protect equipment from dust, debris, moisture, and physical damage, with sealed envelope of plastic or other impervious material until building is enclosed and cleaned and equipment is energized.
- .2 Protect from condensation by maintaining at suitable temperature above 0°C.
- .3 Finish equipment enclosures to ANSI 49 or ANSI 61, baked grey enamel.

3.2 RECEPTACLES

- .1 Install receptacles in outlet box.
- .2 Mount receptacles as shown on drawings.

3.3 TESTING AND INSPECTION OF POWER DISTRIBUTION SYSTEM

- .1 Include in the tender price the cost of on-site inspection and testing of the following main distribution equipment.
 - .1 Distribution Equipment
 - .2 Grounding System
- .2 This engineering inspection and testing shall be done prior to the system being energized and shall include the following items where applicable:
 - .1 Testing, cleaning and where necessary, calibrating all relays and circuit breaker trip devices.
 - .2 Function test of protection and control devices.
 - .3 Megger test interconnecting cables.
 - .4 Replacement of fuses destroyed or damaged during the start- up or testing;
- .3 Acceptance tests shall be conducted in the presence of and to the satisfaction of the Consultant.
- .4 Make good any defects indicated in the equipment and in the installation by the tests.

3.4 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list: Service equipment, duct systems, cable tray, frames of motors, starters, control panels, building steel work, distribution panels, outdoor lighting.

END OF SECTION

1 GENERAL

1.1 General Requirements

- .1 Conform to the requirements stated in General Conditions and Supplementary General Conditions and General Requirements of this Specification and all addenda.

1.2 Shop Drawings And Product Data

- .1 Submit shop drawings and product data in accordance with Section 01300.
- .2 Include time-current characteristic curves for breakers with ampacity of 400A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at systems voltage.

1.3 SUBMITTALS

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

2 PRODUCTS

2.1 Breakers General

- .1 Bolt-on moulded case circuit breaker, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg. C ambient.
- .2 Common trip breakers with single handle for multipole applications.

- .3 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3 -10 times current rating.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 Short circuit rating of 240V breakers to be 100kA rms sym.
- .6 Short circuit rating of 120V breakers to be 10kA rms sym.

2.2 Thermal Magnetic Breakers Design A

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping.

2.3 Solid State Trip Beakers Design D

- .1 Moulded case circuit breaker to operate by means of a solid-state trip unit with associated current monitors and self-powered externally powered shunt trip to provide inverse time current trip under overload condition, and long time short time instantaneous tripping for phase ground fault short circuit protection.

2.4 Optional Features (If So Noted)

- .1 Include:
 - .1 shunt trip
 - .2 auxiliary switch
 - .3 motor-operated mechanism
 - .4 under-voltage release
 - .5 on-off locking device

2.5 Manufacturers

- .1 Acceptable manufactures are Eaton, Siemens, Schneider Group or approved equal.

3 EXECUTION

3.1 Installation General

- .1 Install circuit breakers as indicated.

END OF SECTION



APPENDIX "B"

TERMS OF PAYMENT

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 amount described in TP2 exceeds

1.1.2. the aggregate of the amount 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, if any, that the Contractor is liable to pay Her Majesty pursuant to the contract.

3.2 When making any payment to the Contractor, the failure of Her Majesty to deduct an amount referred to in TP3.1 from an amount referred to in TP2 shall not constitute a waiver of the right to do so, or an admission of lack of entitlement to do so in any subsequent payment to the Contractor.

TP4 Time of Payment

4.1 In these Terms of Payment :

4.1.1 The "payment period" means a period of 30 consecutive days or such other longer period as is agreed between the Contractor and the Engineer.

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 1st 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 Engineer 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 Engineer shall, not later than 10 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 Engineer 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 Engineer;
 - 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 the receipt by the Engineer of a progress report 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 Engineer:
- 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, up to the date of the Contractor's progress claim, the Contractor has complied with all its lawful obligations with respect to the Labour Conditions, and that 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 Engineer's estimate of the cost to Her Majesty of rectifying defects described in the Interim Certificate of Completion; and
 - 4.7.3 an amount that is equal to the Engineer'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.



- 4.8 It is a condition precedent to Her Majesty's obligation under TP4.7 that the Contractor has made and delivered to the Engineer :
- 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, an 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 Engineer for the completion of any unfinished work and the correction of all listed 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 TP4.6.
- 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 GC 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 Engineer.
- 4.12 A statutory declaration referred to in TP4.11 shall, in addition to the depositions described in TP4.9, contain a disposition by the Contractor that all of the Contractor's lawful obligations and any lawful claims against the Contractor that arose out of the performance of the contract have been discharged and satisfied.

TP5 Progress Report and Payment Thereunder Not Binding on Her Majesty

- 5.1 Neither a progress report referred to in TP4.3 nor any payment made by Her Majesty pursuant to these Terms of Payment shall be construed as an admission by Her Majesty that the work material or any part thereof is complete, is satisfactory or is in accordance with the contract.

TP6 Delay in Making Payment

- 6.1 Notwithstanding TP5 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 % centum on any amount which is overdue pursuant to TP4.1.3, and the interest shall apply from and include the day such amount became overdue until the day prior to the date of payment except that :



- 6.2.1 interest shall not be payable or paid unless the amount referred to in TP6.2 has been overdue for more than 15 days following
 - 6.2.1.1 the date the said amount became due and payable; or
 - 6.2.1.2 the receipt by the Engineer of the Statutory Declaration referred to in TP4.5, TP4.8 or TP4.11;whichever is the later; and
- 6.2.2 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 on 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 in 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 Engineer and the Contractor setting out the amount of the claim to be paid by Her Majesty and the items of 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.



APPENDIX "C"

GENERAL CONDITIONS

Section	Page	Heading
GC1	1	Interpretation
GC2	1	Successors and Assigns
GC3	2	Assignment of Contract
GC4	2	Subcontracting by Contractor
GC5	2	Amendments
GC6	2	No Implied Obligations
GC7	2	Time of Essence
GC8	2	Indemnification by Contractor
GC9	3	Indemnification by Her Majesty
GC10	3	Members of House of Commons Not to Benefit
GC11	3	Notices
GC12	3	Material, Plant and Real Property Supplied by Her Majesty
GC13	4	Material, Plant and Real Property Become Property of Her Majesty
GC14	4	Permits and Taxes Payable
GC15	5	Performance of Work under Direction of Engineer
GC16	5	Cooperation with other Contractors
GC17	5	Examination of Work
GC18	5	Clearing of Site
GC19	6	Contractor's Superintendent
GC20	6	National Security
GC21	6	Unsuitable Workers
GC22	7	Increased or Decreased Costs
GC23	7	Canadian Labour and Material
GC24	7	Protection of Work and Documents
GC25	8	Public Ceremonies and Signs
GC26	8	Precautions Against Damage, Infringement of Rights, Fire and Other Hazards
GC27	8	Insurance
GC28	9	Insurance Proceeds
GC29	9	Contract Security
GC30	10	Changes in the Works
GC31	10	Interpretation of Contract of Engineer
GC32	11	Warranty and Rectification of Defects in Work
GC33	11	Non-Compliance by Contractor
GC34	11	Protesting Engineer's Decision
GC35	12	Changes in Soil Conditions and Neglect or Delay by Her Majesty
GC36	12	Extension of Time
GC37	13	Assessments and Damages for Late Completion
GC38	13	Taking the Work Out of the Contractor's Hands
GC39	14	Effect of Taking the Work Out of the Contractor's Hands
GC40	14	Suspension of Work by Minister
GC41	15	Termination of Contract
GC42	16	Claims Against and Obligations of the Contractor or Subcontractor
GC43	17	Security Deposit- Forfeiture or Return
GC44	17	Engineer's Certificate
GC45	18	Return of Security Deposit
GC46	18	Clarification of Terms in GC47 and GC50
GC47	18	Additions or Amendments to Unit Price Table
GC48	19	Determination of Cost- Unit Price Table
GC49	19	Determination of Cost- Negotiation
GC50	19	Determination of Cost- Failing Negotiation
GC51	20	Records to be Kept by Contractor
GC52	20	Conflict of Interest
GC53	21	Contractor's Status
GC54	21	Determination of Cost- Clarification of Terms



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 documents 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 “Engineer” means the officer or employee of Her Majesty who is designated pursuant to the Articles of Agreement and includes a person specially authorized by him to perform, on his behalf, any of his functions under the contract and is so designated in writing to the Contractor.
- 1.1.5 “material” includes all commodities, articles and things required to be furnished by or for the Contractor under the contract for incorporation into the work;
- 1.1.6 “Minister” includes a person acting for, or if the office is vacant, in place of the Minister and his successors in the Office, and his or their lawful deputy and any of his or their representatives appointed for the purposes of the contract;
- 1.1.7 “person” includes, unless the context otherwise requires, a partnership, proprietorship, firm, joint venture, consortium and a corporation;
- 1.1.8 “plant” includes all animals, tools, implements, machinery, vehicles, buildings, structures, equipment and commodities, articles and things other than material, that are necessary for the due performance of the contract;
- 1.1.9 “subcontractor” means a person to whom the Contractor has, subject to GC4, subcontracted the whole or any part of the work;
- 1.1.10 “superintendent” means the employee of the Contractor who is designated by the Contractor to act pursuant to GC19;
- 1.1.11 “work” includes, subject only to any express stipulation in the contract to the contrary, everything that is necessary to be done, furnished or delivered by the Contractor to perform the contract.

1.2 The headings in the contract documents, other than in the Plans and Specifications, form no part of the contract but are inserted for convenience of reference only.

1.3 In interpreting the contract, in the event of discrepancies or conflicts between anything in the Plans and Specifications and the General Conditions, the General Conditions govern.

1.4 In interpreting the Plans and Specifications, in the event of discrepancies or conflicts between :

- 1.4.1 the Plans and Specifications, the Specifications govern;
- 1.4.2 the Plans, the Plans drawn with the largest scale govern; and
- 1.4.3 figured dimensions and scaled dimensions, the figured dimensions govern.

GC2 Successors and Assigns

2.1 The contract shall inure to the benefit of and be binding upon the parties hereto and their lawful heirs, executors, administrators, successors and assigns.



GC3 Assignment of Contract

- 3.1 The contract may not be assigned by the Contractor, either in whole or 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 Engineer in writing of this 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 Engineer may object to the intended subcontracting by notifying the Contractor in writing within 6 days of receipt by the Engineer of a notification referred to in GC4.2.
- 4.5 If the Engineer objects to a subcontracting pursuant to GC4.2 the Contractor shall not enter into the intended subcontract.
- 4.6 The Contractor shall not, without the written consent of the Engineer, change a subcontractor who has been engaged by him in accordance with this General Conditions.
- 4.7 Every subcontract entered into by the Contractor shall adopt all of the terms and conditions of the contract that are of general application.
- 4.8 Neither a subcontracting nor the Engineer'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 in 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 was 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 identify and save Her Majesty harmless from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings by whomever made, brought or prosecuted and in any
- 8.2 manner bases 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 and infringement or an alleged infringement of a patent of invention or any other kind of intellectual property.
- 8.3 For the purposes 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 of 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 or 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 Engineer, or forwarded by mail, telex or facsimile to the Engineer 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, GC40 and GC41, if delivered personally, shall be delivered to the Contractor if the Contractor is doing business as a 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 Engineer, the Engineer 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 Engineer from time to time requires and shall satisfy the Engineer, when requested, that such material, plant and real property are at the place and in the condition in 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 Engineer 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 Engineer 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 V 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 Engineer.
- 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 and 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 Engineer 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 Contractor.
- 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, the liable, as a user of 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 Engineer

15.1 The Contractor shall:

- 15.1.1 permit the Engineer to have access to the work and its site of all times during the performance of the contract;
- 15.1.2 furnish the Engineer with such information respecting the performance of the contract as he may require; and
- 15.1.3 give the Engineer every possible assistance to enable the Engineer 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 Engineer under the contract.

GC16 Cooperation with Other Contractors

16.1 Where, in the opinion of the Engineer, 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 Engineer, allow them access and cooperate with them in the carrying out of their duties and obligations.

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 Engineer, extra expense in complying with GC16.1, and
- 16.2.3 the Contractor has given the Engineer 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 Engineer has reason to believe that the work or any part thereof has not been performed in accordance with the contract, the Engineer 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 Engineer.

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 Engineer of the name, address and telephone number of a superintendent designated 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 work hours.
- 19.5 The Contractor shall, upon the request of the Engineer, remove any superintendent who, in the opinion of the Engineer, is incompetent or has been conducting himself improperly and shall forthwith designate another superintendent who is acceptable to the Engineer.
- 19.6 Subject to GC19.5, the Contractor shall not substitute a superintendent without the written consent of the Engineer.
- 19.7 A breach by the Contractor of GC19.6 entitles the Engineer 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 Engineer 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 provisions 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 Engineer, remove any person employed by him for purposes of the contract who, in the opinion of the Engineer, 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 GCS1 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 the 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 Centers 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 honorably 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 plants 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 maybe 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 Engineer 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 Engineer may direct the Contractor to do such things and to perform such additional work as the Engineer 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 prior consent of the Engineer.

GC26 Precautions Against Damage, Infringement of Rights, Fire and Other Hazard

- 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, damages 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 hazard in or about the work or its site are eliminated and, subject to any direction that may be given by the Engineer, 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 Engineer are protected and are not removed, defaced, altered or destroyed.
- 26.2 The Engineer may direct the Contractor to do such things and to perform such additional work as the Engineer 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 Engineer 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 Engineer in accordance with the requirements of the Insurance Conditions in Appendix "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 in Appendix "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 costs 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 GC28.1.2, 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 GC28.6, 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 Engineer in accordance with the provisions of the Contract Security Conditions.
- 29.2 If the whole or a part of the contract security referred to in GC29.1 is in the form of a security deposit, it shall be held and disposed of in accordance with GC43 and GC45.
- 29.3 If a part of the contract security referred to in GC29.1 is in the form of a labour and material payment bond, the Contractor shall post a copy of that bond on the work site.

GC30 Changes in the Work

- 30.1 Subject to GC5, the Engineer 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, quality, quality, description, location or position of the whole or any part of the work or material provided for in the Plans and Specifications or in any order made pursuant to GC30.1.1, if that additional work or material, deletion, or change is, in his opinion, consistent with the general intent of the original contract
- 30.2 The Contractor shall perform the work in accordance with such orders, deletions and changes that are made by the Engineer 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 Engineer 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 Engineer 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 Engineer determines pursuant to GC30.3 that the cost of the work to the Contractor has been decreased, Her Majesty shall reduce the amount payable to the Contractor under the contract by an amount equal to the decrease in the cost caused by the deletion or change referred to in GC30.1.2 and calculated in accordance with GC49.
- 30.6 GC30.3 to GC30.5 are applicable only to a contract or a portion of a contract for which a Fixed Price Arrangement is stipulated in the contract.
- 30.7 An order, deletion or change referred to in GC30.1 shall be in writing, signed by the Engineer and given to the Contractor in accordance with GC11.

31 Interpretation of Contract by Engineer

- 31.1 If, at the time before the Engineer 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 Specifications,
 - 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 wording 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 Engineer 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 Engineer that are made under GC31.1 and in accordance with any consequential directions given by the Engineer.

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 in 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 part 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 Engineer 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 Engineer pursuant to GC18, GC24, GC26, GC31 or GC32, the Engineer 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 costs, 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 Engineer pursuant to GC33.1.

GC34 Protesting Engineer's Decisions

- 34.1 The Contractor may, within 10 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 Engineer.
- 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 circumstance.
- 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 required Her Majesty to do or that would ordinarily be done by an owner in accordance with the usage of the trade, he shall, within 10 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 Engineer 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 Engineer 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 Engineer to determine whether or not the claim is justified and the Contractor shall supply such further and other information for that purpose as the Engineer requires from time to time.
- 35.5 If the Engineer 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 Engineer, 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 to Time

- 36.1 Subject to GC36.2, the Engineer 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 Conditions, extend the time for its completion by fixing a new date if, in the opinion of the Engineer, 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 Conditions :
 - 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 Engineer, 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 costs 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 fixes 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 if, 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 6 days of the Minister or the Engineer 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 Engineer;
 - 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 or has committed an act of bankruptcy, and has neither made a proposal to its creditors nor filed a notice of intention to make such a proposal, pursuant to the Bankruptcy and Insolvency Act;
 - 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 Contractor has become insolvent or has committed an act of bankruptcy, and has either made a proposal to its creditors or filed a notice of intention to make such a proposal, pursuant to the *Bankruptcy and Insolvency Act*, the Contractor shall immediately forward a copy of the proposal or the notice of intention to Her Majesty.
- 38.3 If the whole or any part of the work is taken out of the Contractor's hands pursuant to GC38.1,
 - 38.3.1 the Contractor's right to any further payment that is due or accruing due under the contract is, subject only to GC38.5, extinguished, and
 - 38.3.2 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.
- 38.4 If the whole or any part of the work that is taken out of the Contractor's hands pursuant to GC38.1 is complete by Her Majesty, the Engineer 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.
- 38.5 Her Majesty may pay the Contractor the amount determined not to be required pursuant to GC38.4.



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 in 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 Engineer 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 interests of Her Majesty to retain that plant, material, or interest, it shall revert to the Contractor.

GC40 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 notice of suspension in writing to the Contractor in accordance with GC11.
- 40.2 When a notice referred to in GC40.1 is received by the Contractor in accordance with GC11, he shall suspend all operations in respect of the work except those that, in the opinion of the Engineer, 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 Engineer.
- 40.4 If a period of suspension is 30 days or less, the Contractor shall, upon the expiration of the period, resume the performance of the work and has 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 Contractor

- 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 Agreement 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 is 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 obliges 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 amounts 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 provisions 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 this 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 Engineer, 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 Engineer 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 Engineer, 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, without 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 Engineer shall notify the Contractor in writing of receipt of any claim referred to in GC42.8.2 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 Engineer 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 for by Her Majesty to the Contractor if, in the opinion of the Engineer, it is not required for the purposes of the contract.

GC44 Engineer'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 Engineer, the Engineer shall issue a Final Certificate of Completion to the Contractor.
- 44.2 If the Engineer 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 Engineer, ready for use by Her Majesty or is being used for the purposes intended; and
- 44.2.1.2 when the work remaining to be done under the contract is, in the opinion of the Engineer, capable of completion or correction at a cost of not more than :
- 44.2.1.2.1 3% of the first \$500,000, and
- 44.2.1.2.2 2% of the next \$500,000, and
- 44.2.1.2.3 1% of the balance
- of the value of the contract at the time this cost is calculated.
- 44.3 For the sole purpose of GC44.2.1.2, where the work or a substantial part thereof is ready for use or is being used for the purpose 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 Engineer 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 Engineer 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 Engineer and all things that must be done by the Contractor :
- 44.4.1 before a Final Certificate of Completion referred to in GC 44.1 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 Engineer 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 Engineer 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 Engineer in the performance of his duties referred to in GC44.6 and shall be entitled to inspect any record made by the Engineer pursuant to GC44.6.
- 44.8 After the Engineer has issued a Final Certificate of Completion referred to in GC 44.1, 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 GC44.5, and



44.9.2 be binding upon and conclusive between Her Majesty and the Contractor as to the quantities referred to therein.

GC45 Return to 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 Engineer, is not required for the purposes of the contract.

45.2 After a Final Certificate of Completion referred to in GC 4401 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 and 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 supplies to the contract or a part thereof the Engineer and the Contractor may, by an arrangement in writing :

47.1.1 add classes of labour, plant 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 per unit 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 Engineer and the Contractor do not agree as contemplated in GC47.1, the Engineer 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 Determine of Cost Prior to Undertaking Work : Lump Sum

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 Engineer.

49.2 For the purposes of GC49.1, the Contractor shall submit to the Engineer any necessary cost information requested by the Engineer in respect of the labour, plant and material referred to in GC49.1.

GC50 Determine of Cost Following Completion of Work

50.1 Where it is not possible to pre-determine the cost of a change including elements not set out in the Unit Price Table, the actual cost of the change 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 for all other expenditures or costs, included overhead, general administration costs, 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 of 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 for that portion of the work undertaken by the Contractor's own forces, and 10 % for that portion of the work undertaken by subcontractors; plus

50.1.3 interest on the costs determined under GC50.1.1 and GC50.1.2, which interest shall be calculated in accordance with TP9;

provided that the total cost of an item set out in the Unit Price Table that is subject to the provisions of GC47.1.2.1 does not exceed the amount that would have been payable to the Contractor had the estimated total quantity of the said item actually been performed, used or supplied.

50.2 For the 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 located at the worksite and that portion of wages, salaries, bonuses, living and travelling expenses of personnel of the Contractor generally employed at the head office or at a general office to the Contractor provided they are actually and properly engaged on the work under the contract;

50.2.3 assessments payable under any statutory authority, which include, but are not exclusive to, workers' compensation, unemployment insurance, pension plan or holidays with pay, and provincial health or insurance plans;

50.2.4 rent that is paid for plant or an amount equivalent to 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 or the equivalent amount is reasonable and use of that plant has been approved by the Engineer;

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 Engineer, are necessary to the proper performance of the contract other than payments for any repairs to the plant arising out of the 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;
- 50.2.8 any other payments made by the Contractor with the approval of the Engineer 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 GC51.1.1 available to audit and Inspection by the Minister and the Deputy Receiver General for Canada or by persons acting on behalf of either or both of them, when requested;
- 51.1.3 allow any of the persons 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 materials.

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 GC 44.1 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 or 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.

GC54 Determination of Cost – Clarification of Terms

54.1 For the purposes of GC50, the rental rates of machinery and equipment owned by the Contractor and by subcontractors retained in accordance with the provisions of GC54 shall be in accordance with the most current Schedule of Equipment Rental Rates as set out by the Provincial Highway's and Transportation Departments in the Province of the work.

54.2 Notwithstanding the provisions of GC50.1.2, the 10 % allowance shall not apply to rental equipment where the Engineer determines it is included in Provincial schedules.



- 54.3 Notwithstanding the provisions of GC50.2.5, the rental rates set out in the "Provincial Scheduling" shall be deemed to include payment for effecting repairs to plant used in the performance of the work.



APPENDIX "C"

LABOUR CONDITIONS / CONDITIONS DE TRAVAIL

Index

- 01 Interpretation
- 02 General Fair Wage Clause
- 03 Hours of Work
- 04 Labour Conditions to be Posted
- 05 The Contractor to Keep Records which are to be kept Open for Inspection
- 06 Departmental Requirements before Payment made to Contractor
- 07 Authority to pay Wages in the Event of Default by the Contractor
- 08 Conditions of Subcontracting
- 09 Non-discrimination in Hiring and Employment of Labour

01 Interpretation

- (a) "Act" means the Fair Wages and Hours of Labour Act;
- (b) "Regulations" means the Fair Wages and Hours of Labour Regulations made pursuant to the Act;
- (c) "Contract" means the contract of which these Labour Conditions are part;
- (d) "Contracting Authority" means the department of Government or a crown corporation with whom the contract is made;
- (e) "Contractor" means the person who has entered into the contract with the contracting authority;
- (f) "regional Director" means the director of a regional office of the Department of Human Resources Development or the director's designated representative;
- (g) "Inspector" has the meaning assigned to the term by Part III of the Canada Labour Code;
- (h) "Minister" means the Minister of Labour of Canada;
- (i) "Persons" means those workers employed by the Contractor, subcontractor or any other person doing or contracting to do the whole or any part of the work contemplated by the contract;

Table des matières

- 01 Interprétation
- 02 Clause générale de justes salaires
- 03 Durée du travail
- 04 Affichage des conditions de travail
- 05 L'entrepreneur s'engage à tenir des dossiers pour fins d'inspection
- 06 Exigences du ministère avant le versement des sommes dues à l'entrepreneur
- 07 Paiement des salaires par l'adjudicateur si l'entrepreneur omet de le faire
- 08 Conditions imposées à un sous-traitant
- 09 Non-discrimination dans l'embauchage et l'emploi de main-d'œuvre

01 Interprétation

- (a) « Loi » désigne la Loi sur les justes salaires et les heures de travail;
- (b) « Règlement » désigne le Règlement sur les justes salaires et les heures de travail établi en application de la Loi;
- (c) « Contrat » désigne le contrat auquel sont annexées les présentes Conditions de travail;
- (d) « Adjudicateur » désigne le ministère du gouvernement ou la société d'État avec lequel le contrat a été passé;
- (e) « Entrepreneur » désigne la personne qui a passé le contrat avec l'adjudicateur;
- (f) « Directeur Régional » le responsable d'un bureau régional du ministère du Développement des ressources humaines ou son représentant désigné;
- (g) « Inspecteur » s'entend au sens de la partie III du Code canadien du travail;
- (h) « Ministre » désigne le ministre du Travail du Canada;
- (i) « Personnes » désigne les travailleurs employés par l'entrepreneur, le sous-traitant ou toute autre personne exécutant ou s'engageant par contrat à exécuter la totalité ou une partie quelconque des travaux prévus dans le contrat.



APPENDIX "C"

LABOUR CONDITIONS / CONDITIONS DE TRAVAIL

02 General Fair Wage Clause

- (a) All persons in the employ of the Contractor, subcontractor, or any other person doing or contracting to do the whole or any part of the work contemplated by the contract, shall during the continuance of the work :
 - (i) be paid fair wages that is, such wages as are generally accepted as current for competent workers in the district in which the work is being performed for the character or class of work in which such workers are respectively engaged; and
 - (ii) in all cases, be paid no less than the minimum hourly rate of pay established by the Labour Program of the Department of Human Resources Development in the Fair Wage Schedules which form a part of this contract as Appendix A to these Labour Conditions; and
 - (iii) for contracts covering work performed in the province of Québec, be paid at least the wage rates established by that province for the purposes of the Quebec « Construction Decree ».
- (b) Where there is no wage rate in the schedules referred to in (a) for a particular character or class of work, the Contractor shall pay wages for that character or class of work at a rate not less than the rate for an equivalent character or class of work.
- (c) Where during the term of the contract, the Contractor receives notice from the contracting authority of any change in wage rates, the Contractor shall pay not less than the Contractor shall pay not less than the changed wage rate beginning on the first day after receipt, by the Contractor, of the notice of the change in wage rates.

03 Hours of Work

- (a) The hours of work in a day and in a week of persons employed in the execution of the contract, including the hours of work in excess of which a person shall be paid overtime at a rate at least equal to one and one half times the fair wage, are the hours of work for the province in which the work is being performed as set out from the time to time in an Act of that province.
- (b) The daily or weekly hours of work referred to in paragraph (a) may be exceeded in accordance with the applicable provincial law.

02 Clause générale de justes salaires

- (a) Toutes les personnes employées par l'entrepreneur, le sous-traitant ou toute autre personne exécutant ou s'engageant par contrat à exécuter la totalité ou une partie quelconque des travaux prévus dans le contrat seront payées :
 - (i) des justes salaires tant que dureront les travaux, c'est-à-dire les salaires généralement reconnus comme salaires courants pour les travailleurs qualifiés dans la région où les travaux sont exécutés, selon la nature ou la catégorie du travail auquel ces travailleurs sont respectivement affectés, et
 - (ii) dans tous les cas, pas moins que les taux horaires minima fixes par le Programme du travail du ministère du Développement des ressources humaines dans les échelles de justes salaires qui deviennent partie de ce contrat en tant qu'Annexe A de ces Conditions de travail; et
 - (iii) pour les contrats concernant les travaux effectués dans la province de Québec, pas moins que les taux de salaires qui sont établis par cette province pour les fins du "Décret de la construction" du Québec.
- (b) Lorsqu'il n'y a aucun taux prévu dans l'échelle des taux de salaires à l'égard d'un travail d'une nature ou d'une catégorie donnée, l'entrepreneur verse à l'employé un taux de salaire qui n'est pas inférieur à celui établi pour un travail de nature ou de catégorie équivalente.
- (c) Lorsque pendant la durée du contrat, l'entrepreneur reçoit de l'adjudicateur un avis de modification à l'échelle de salaires, l'entrepreneur rémunère les employés touchés par cette modification à des taux qui ne sont pas inférieurs aux taux modifiés à compter de la journée qui suit la réception par lui, de l'avis.

03 Durée du travail

- (a) Les heures de travail quotidiennes et hebdomadaires des personnes employées à l'exécution du contrat, notamment les heures au-delà desquelles une personne doit être rétribuée selon le tarif pour heures supplémentaires, soit au moins le juste salaire majoré de 50 pour cent, sont celles fixées et éventuellement modifiées par la législation de la province dans laquelle le travail est effectué.
- (b) Les heures de travail quotidiennes ou hebdomadaires mentionnées à l'alinéa (a) peuvent être dépassées conformément à la législation provinciale applicable.



APPENDIX "C"

LABOUR CONDITIONS / CONDITIONS DE TRAVAIL

04 Labour Conditions to be Posted

- (a) For the information and the protection of all persons, the Contractor agrees to post and keep posted, in a conspicuous place on the premises where work contemplated by the contract is being carried out or on premises occupied or used by persons engaged in carrying out such work, a copy of these Labour Conditions, and a copy of the applicable Fair Wage Schedules along with any subsequent changes.

05 The Contractor to Keep Records which are to be Kept Open for Inspection

- (a) The Contractor agrees to keep books and records showing the names, addresses, classification of employment and work of all workers employed under the contract, the rate of wages to be paid, the wages paid and the daily hours worked by the workers.
- (b) The Contractor also agrees that the Contractor's books, records and premises will be open at all reasonable times for inspection by an inspector.
- (c) The Contractor also agrees to furnish the inspector and the contracting authority, on request, with such further information as is required to ascertain that the requirements of the Act, the Regulations and the contract with respect to wages, hours of work and other labour conditions have been complied with.

06 Department Requirements before Payment made to Contractor

- (a) The Contractor agrees that the Contractor will not be entitled to payment of any money otherwise payable under the contract until the Contractor has filed with the contracting authority in support of a claim for payment a sworn statement :
 - (i) that the Contractor has kept the books and records required by these Regulations;
 - (ii) that there are no wages in arrears in respect of work performed under the contract; and
 - (iii) that to the Contractor's knowledge, all the conditions in the contract required by the Act and the Regulations have been complied with.

04 Affichage des conditions de travail

- (a) Pour l'information et la protection de toutes les personnes, l'entrepreneur convient d'afficher et de tenir affichés, bien à la vue, à l'endroit où les travaux prévus dans le contrat sont exécutés, ou dans les locaux occupés ou fréquentés par les personnes employées à l'exécution desdits travaux, un exemplaire des présentes Conditions de travail, un exemplaire de l'échelle de justes salaires applicable et toutes modifications subséquentes.

05 L'entrepreneur tient des dossiers pour fins d'inspection

- (a) L'entrepreneur convient de tenir les registres et dossiers où sont consignés le nom, l'adresse et la catégorie d'emploi et de travail de tous les travailleurs employés à des travaux exécutés en vertu du contrat, de même que le taux de salaire, le salaire payé et la durée journalière du travail pour chacun de ces travailleurs.
- (b) L'entrepreneur convient également à faire en sorte que ses registres, ses dossiers et ses locaux soient accessibles en tout temps opportun, pour fins d'inspection par un inspecteur.
- (c) L'entrepreneur convient en outre de fournir, sur demande, à l'inspecteur et à l'adjudicateur tous les autres renseignements requis pour permettre de constater qu'on a satisfait aux exigences de la Loi, des règlements et du contrat en ce qui concerne les salaires, la durée du travail et les autres conditions de travail.

06 Exigences du ministère avant le versement des sommes dues à l'entrepreneur

- (a) L'entrepreneur convient qu'il n'aura droit au paiement d'aucune somme qui autrement devrait lui être versée en vertu du contrat tant qu'il n'aura pas déposé auprès de l'adjudicateur, à l'appui de sa réclamation de paiement, une déclaration sous serment indiquant :
 - (i) qu'il a tenu les registres et dossiers requis par les présents règlements;
 - (ii) qu'il n'y a pas d'arriérés de salaires à l'égard des travaux exécutés en vertu du contrat, et
 - (iii) qu'à sa connaissance, toutes les conditions du contrat exigées par la Loi et les règlements ont été observées.



APPENDIX "C"

LABOUR CONDITIONS / CONDITIONS DE TRAVAIL

- | | |
|--|--|
| <p>06 (...) (b) The Contractor also agrees that, where fair wages have not been paid by the Contractor to person employed under the contract, the contracting authority shall withhold from any money otherwise payable under the contract to the Contractor the amount necessary to ensure that fair wages are paid to all employees until fair wages are paid.</p> <p>07 Authority to pay Wages in the Event of Default by the Contractor</p> <p>(a) The Contractor agrees that where the Contractor is in default of payment of fair wages to an employee, the Contractor is in default.</p> <p>(b) The Contractor agrees that where the Contractor fails to comply with paragraph (a), the contracting authority will pay to the Receiver General, out of any money otherwise payable to the contract, the amount for which the Contractor is in default.</p> <p>08 Conditions of Subcontracting</p> <p>(a) The Contractor and the subcontractor agree that in subcontracting any part of the work contemplated by the contract, they will place in the subcontract the conditions respecting fair wages, hours of work and other labour conditions set out in the contract and the requirements set out in Section 4. The Contractor further agrees that the Contractor will be responsible for carrying out these conditions in the event the subcontractor fails to carry them out.</p> <p>09 Non-discrimination in Hiring and Employment of Labour</p> <p>(a) The Contractor agrees that in the hiring and employment of workers to perform any work under the contract, the Contractor will not refuse to employ and will not discriminate in any manner against any person because :</p> <p>(i) of that person's race, national or ethnic origin, colour, religion, age, sex, sexual orientation, marital status, disability, conviction for which a pardon has been granted, or family status;</p> <p>(ii) of the race, national or ethnic origin, colour, religion, age, sex, sexual orientation, marital status, disability, conviction for which a pardon has been granted, or family status of any person having a relationship or association with that person; or</p> | <p>06 (...) (b) L'entrepreneur convient en outre que lorsqu'il n'a pas versé un juste salaire à une personne employée en vertu du contrat, l'adjudicateur sera autorisé à retenir de toute somme autrement payable à l'entrepreneur en vertu du contrat la somme requise pour assurer le paiement de justes salaires à tous les employés, jusqu'à ce qu'ils aient touché leur juste salaire.</p> <p>07 Paiement des salaires par l'adjudicateur si l'entrepreneur omet de le faire(a) L'entrepreneur convient qu'à défaut du paiement par ce dernier d'un juste salaire à un travailleur, l'entrepreneur devra verser au ministre le montant qu'il a omis de payer.</p> <p>(b) L'entrepreneur convient que s'il omet de se conformer au paragraphe (a), l'adjudicateur paiera au Receveur général, à même les sommes autrement payables à l'entrepreneur, le montant qu'il a omis de payer.</p> <p>08 Conditions imposées à un sous-traitant</p> <p>(a) L'entrepreneur et le sous-traitant conviennent dans l'adjudication à un sous-traitant de toute partie des travaux prévus par le contrat, d'insérer dans le sous-contrat les conditions relatives aux justes salaires, à la durée du travail et autres conditions de travail indiquées dans le contrat ainsi que les obligations énoncées à l'article 4. L'entrepreneur convient en outre qu'il sera responsable du respect de ces conditions si elles ne sont pas respectées par le sous-traitant.</p> <p>09 Non-discrimination dans l'embauchage et l'emploi de main-d'œuvre</p> <p>(a) L'entrepreneur convient que dans l'embauchage et l'emploi des travailleurs aux fins de l'exécution de tout travail en vertu du contrat, l'entrepreneur ne refusera pas d'employer une personne ou d'exercer de quelque façon que ce soit des distinctions injustes à l'endroit d'une personne en raison :</p> <p>(i) de la race, de l'origine nationale ou ethnique, de la couleur, de la religion, de l'âge, du sexe, de l'orientation sexuelle, de l'état matrimonial, de la situation de famille, de l'état de personne graciée ou d'une déficience de la personne;</p> <p>(ii) de la race, de l'origine nationale ou ethnique, de la couleur, de la religion, de l'âge, du sexe, de l'orientation sexuelle, de l'état matrimonial, de la situation de famille, de l'état de personne graciée ou d'une déficience de toute personne ayant un lien avec elle;</p> |
|--|--|



APPENDIX "C"

LABOUR CONDITIONS / CONDITIONS DE TRAVAIL

09 (...)

- (a) (iii) a complaint has been made or information has been given in respect of that person relating to an alleged failure by the Contractor to comply with subparagraph (i) or (ii).

09 (...)

- (iii) du fait que cette personne a porté plainte ou a fourni des renseignements ou parce qu'une plainte a été portée ou des renseignements ont été fournis en son nom relativement à toute prétendue omission de la part de l'entrepreneur de se conformer aux sous-alinéas (i) ou (ii).



APPENDIX "E"

INSURANCE CONDITIONS

The Contractor shall provide and maintain Worker's Compensation Insurance in accordance with the legal requirements of the Province where the work is being carried out.

The Contractor shall provide and maintain insurance as provided hereunder with companies approved by the Minister.

IC 1 INDEMNIFICATION

The insurance coverage required by the provisions of these Insurance Conditions shall in no way limit the Contractor's responsibility under GC8 (Indemnification by Contractor) of the General Conditions of the contract. Any additional coverage the Contractor may deem necessary to fulfil their obligations under the aforesaid GC8 shall be at their own discretion and expenses.

IC 2 INSURED

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 Minister of Agriculture and Agri-Food Canada.

IC 3 PERIOD OF INSURANCE

Unless otherwise directed in writing by the Engineer, the policies required hereunder shall attach from the date of contract award and shall be maintained until the day of issue of the Engineer's Final Certificate of Completion.

IC 4 PROOF OF INSURANCE

Immediately following notification of contract award and preceding the start of any on-site work, the Contractor shall have their insurance broker or agency provide written confirmation (letter, telegram or facsimile) to the Engineer that all insurance required hereunder is in force.

Within 30 days after acceptance of the Contractor's tender the Contractor shall, unless otherwise directed by the Engineer, deposit with the Engineer, the originals or certified true copies of all contracts of insurance maintained by the Contractor pursuant to the requirements of these Insurance Conditions.

IC 5 NOTIFICATION

Each insurance policy shall contain a provision that 30 days prior written notice shall be given to Her Majesty in the event of any material change in, cancellation of, or expiration of coverage.

IC 6 PAYMENT OF DEDUCTIBLE

The amount of any claim up to the deductible amount shall be borne by the Contractor.

IC 7 COMPREHENSIVE GENERAL LIABILITY

7.1 The policy shall be written on the Comprehensive General Liability Form.

7.2 This policy shall provide for limits of liability of not less than \$1,000,000 inclusive, for Bodily Injury and Property Damage for any one occurrence or series of occurrences arising out of one cause and not less than \$1,000,000 for personal injury.

7.3 The policy shall include but not necessarily be limited to the following coverages :



- 7.3.1 All premises, property and operations necessary or incidental to the performance of this contract.
- 7.3.2 Personal injury.
- 7.3.3 Bodily Injury and Property Damage on an “occurrence” basis.
- 7.3.4 “Broad Form” Property Damage including the loss of use of property.
- 7.3.5 Removal or weakening of support of any property, building or land whether such support be natural or otherwise.
- 7.3.6 Elevators.
- 7.3.7 Contingent Employer’s Liability.
- 7.3.8 Owner’s and Contractor’s Protective Liability.
- 7.3.9 Contractual and Assumed Liabilities under this contract.
- 7.3.10 Completed Operations and Products Liability.
- 7.3.11 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 operate to increase the limit of the Insurer’s liability.

- 7.4 The policy shall be endorsed to include the following exposures or hazards if the work is subject thereto :
 - 7.4.1 Blasting;
 - 7.4.2 Pile Driving and Caisson Work;
 - 7.4.3 Underpinning;
 - 7.4.4 Demolition.
- 7.5 The insurance shall continue for a period of at least one year beyond the date of the Engineer’s Final Certificate of Completion for the Completed Operations Hazard.
- 7.6 The policy shall be issued with a deductible amount of not more than \$1,000.00 per occurrence applying to Property Damage claims only.

IC 8

AUTOMOBILE LIABILITY INSURANCE

Automobile Liability Insurance in respect of licensed vehicles shall have limits of not less than one million dollars inclusive per occurrence for bodily injury, death, and damage to property, in the following forms endorsed to provide Her Majesty with not less than 30 days written notice in advance of any cancellation or change or amendment restricting coverage :

- 8.1.1 Standard non-Owned Automobile Policy including Standard Contractual Liability Endorsement.



- 8.1.2 Standard Owner's Form Automobile Policy providing Third Party Liability and Accident Benefits Insurance and covering licensed vehicles owned or operated by or on behalf of the Contractor.



APPENDIX "F"

CONTRACT SECURITY CONDITIONS

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 Engineer 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 Engineer 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 bond in the amount that is equal to not less than 50 % of the contract amount referred to in the Articles of Agreement, and a security deposit in an amount that is equal to :
 - 2.1.2.1 not less than 10 % of the contract amount referred to in the Articles of Agreement where that amount does not exceed \$250,000; or
 - 2.1.2.2 \$25,000 plus 5 % of the part of the contract amount referred to in the Articles of Agreement that exceeds \$250,000; or
 - 2.1.3 a security deposit in an amount prescribed by CS2.1.2, plus an additional amount that is equal to 10 % of the contract amount referred to in the Articles of Agreement; or
 - 2.1.4 an irrevocable contract support letter of credit in an amount equal to 20 % 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 An irrevocable contract support letter of credit shall be in a form approved by Her Majesty.
- 2.4 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.
- 2.5 A security deposit referred to in CS2.1.2 and CS2.1.3 shall be in the form of :
 - 2.5.2 a bill of exchange made payable to the Receiver General for Canada and certified by an approved financial institution or drawn by an approved financial institution on itself; or
 - 2.5.3 bonds of unconditionally guaranteed as to principal and interest by the Government of Canada.
- 2.6 For purposes of CS2.5 :
 - 2.6.2 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 determinable future time a sum certain of money to, or to the order of, the Receiver General for Canada; and



- 2.6.3 if a bill of exchange is certified by a financial institution other than a chartered bank then it must be accompanied by a letter or stamped certification confirming that the financial institution is in at least one of the categories referred to in CS2.6.3.
- 2.6.4 an approved financial institution is :
 - 2.6.4.1 any corporation or institution that is a member of the Canadian Payments Association;
 - 2.6.4.2 a corporation that accepts deposits that are insured by the Canadian Deposit Insurance Corporation or the Régie de l'assurance-dépôts du Québec to the maximum permitted by law;
 - 2.6.4.3 a credit union as defined in paragraph 137(6)(b) of the Income Tax Act;
 - 2.6.4.4 a corporation that accepts deposits from the public, if repayment of the deposit is guaranteed by Her Majesty in right of a province; or
 - 2.6.4.5 the Canada Post Corporation;
- 2.6.5 the bonds referred to in CS2.5.2 shall be :
 - 2.6.5.1 made payable to bearer; or
 - 2.6.5.2 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
 - 2.6.5.3 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; or
 - 2.6.5.4 provided on the basis of their market value current at the date of the contract.



TENDER FORM

PROJECT:
Tempered Water and Cross-Connection Control

DATE OF RECEIPT:
Quotations will be received until 2:00 p.m., Eastern Standard Time, Tuesday October 8, 2013

TO:

Carol Rahal
Agriculture and Agri-Food Canada
2001 University, 671 -TEN
Montreal, Quebec
Telephone : 514 315-6143
Facsimile : 514 283-3143
carol.rahall@agr.gc.ca

DATE:

We, the undersigned, hereby offer the Honourable Minister of Agriculture and Agri-Food to furnish, execute and complete in a satisfactory and workmanlike manner, in accordance with the specifications, schedules, drawings and conditions, all the work required for this project for the consideration of the unit or lump sum price or prices set forth in the attached UNIT PRICE TABLE. We hereby agree that we will enter into a contract, of the form exhibited to us, for the execution of the work, if required to do so within 10 calendar days after the opening of bids.

We herewith enclose as Tender Security, either

- (a) a Security deposit in the amount and in the form prescribed in the Instructions to Tenderers, or
- (b) a Bid Bond in the amount and in the form prescribed in the Instructions to Tenderers executed by ourselves and as Surety.

We agree upon execution of the Contract to furnish additional security in one of the three (3) alternate forms prescribed in Appendix "F", "Contract Security Conditions".

We further agree that if awarded the contract, we will commence the work as specified and will complete the work on or before **March 31st, 2014.**

We hereby acknowledge receipt of the following addenda to the tender documents (give number and date of each).

Addenda Numbers: _____ Date: _____



TENDER FORM

UNIT PRICE TABLE

Item	Class of Labour Plant or Material	Unit of Measurement	Estimated Total Quantity	Price per Unit	Estimated Total Price
1.		Lump sum	N/A	N/A	
2.	N/A	Lump sum	N/A	N/A	N/A
3.	N/A	Lump sum	N/A	N/A	N/A
4.	N/A	Lump sum	N/A	N/A	N/A
5.	N/A	Lump sum	N/A	N/A	N/A
6.	N/A	Lump sum	N/A	N/A	N/A
7.	N/A	Dollars	N/A	N/A	\$ N/A
TOTAL TENDER (GST/HST extra)					\$

NOTE : BOTH PRICE PER UNIT AND ESTIMATED TOTAL PRICE MUST BE FILLED IN FOR EACH ITEM IN THE UNIT PRICE TABLE. ALL ESTIMATED TOTAL PRICES WILL BE SUBJECT TO VERIFICATION BY CANADA.

IN CASE OF VARIATION BETWEEN THE PRICE PER UNIT AND THE ESTIMATED TOTAL PRICE, THE PRICE PER UNIT WILL BE CONSIDERED TO BE THE PRICE TENDERED.

IN WITNESS whereof (I/We) have hereunto set (my/our) hand(s)

This _____ day of _____, 2013

FIRM NAME : _____

Signature(s) : _____

Print name(s) of Signatory(ies) : _____

Address : _____

Telephone No. : _____ Facsimile No. : _____

Note: Corporate Firms shall affix their Corporate Seal.

For departmental use only
Tender opened in : _____ on : _____, 2013 @ _____ AM G / PM G



TENDER FORM

LIST OF SUBCONTRACTORS

I/ We will subcontract the following parts of the work to the subcontractors listed for each part. I/We agree not to make changes in the following list without the written consent of the Engineer. In my/our opinion the subcontractors named hereunder are reliable and competent to perform that part of the work for which each is listed. The parts of the work not listed below will be performed with my/our own forces.

Part of Work	Subcontractor	Address



TENDER FORM

STATEMENT OF EQUIPMENT

Listed below is a description of equipment owned by the Contractor and the subcontractors listed on "List of Subcontractors" which I/we intend to make available for the satisfactory prosecution of the work of this contract.

Owned (Contractor or Subcontractor)	Description Of Unit (Make, Model, Year)	Capacity, Size, Horsepower, Rating	Condition	Present Location



ARTICLES OF AGREEMENT

Gender

For the sake of conciseness, wherever the forms “he”, “him” and “his” appear, they are to be understood in the generic sense that includes “she” and its related forms.

These Articles of Agreement made in duplicate this *day of* 2013

Between

Her Majesty the Queen, in right of Canada (referred to in the contract documents as “**Her Majesty**”) represented by the Minister of Agriculture and Agri-Food (referred to in the contract documents as the “Minister”)

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

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

A1 Contract Documents

- 1.1 Subject to A1 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 documents attached hereto, marked “Appendix A” and entitled “Specifications” referred to herein as the Specifications,
 - 1.1.3 the document attached hereto, marked “Appendix B” and entitled “Terms of Payment”, referred to herein as the Terms of Payment,
 - 1.1.4 the document attached hereto marked “Appendix C” and entitled “General Conditions”, referred to herein as the General Conditions,
 - 1.1.5 the document attached hereto, marked “Appendix D” and entitled “Labour Conditions”, referred to herein as the Labour Conditions,
 - 1.1.6 the document attached hereto, marked “Appendix E” and entitled “Insurance Conditions”, referred to herein as the Insurance Conditions,
 - 1.1.7 the document attached hereto, marked “Appendix F” and entitled “Contract Security Conditions”, referred to herein as the Contract Security Conditions,
 - 1.1.8 the documents attached hereto, entitled “Plans”, referred to herein as the Plans, and
 - 1.1.9 any amendment or variation of the contract documents that is made in accordance with the General Conditions.
- 1.2 The Minister hereby designates the Senior Procurement Officer, Agriculture and Agri-Food Canada, of the Government of Canada, as the Contracting Authority for the purposes of the contract, and for all purposes of or incidental to the contract the Contracting Officer address shall be deemed to be :

Agriculture and Agri-Food Canada
201 University Street, Suite 671-TEN
Montreal (Quebec)
H3A 3N2



1.3 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 related.

1.4 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.

1.5 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

2.1 The Contractor shall, between the date of these Articles of Agreement and March 31st, 2014, in a careful and workmanlike manner, diligently perform and complete the following work :

“Tempered Water & Cross Connection Control at the Guelph Food Research Centre in Guelph, Ontario”

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

A3 Contract Amount

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 \$ [REDACTED] in consideration for the performance of the work or the part thereof that is subject to a 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 not exceed \$* (*).

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

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

A4 Contractors Address

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

*



A5 Unit Price Table

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

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>	<i>Column 6</i>
Item	Class of Labour Plant or Material	Unit of Measurement	Estimated Total Quantity	Price Per Unit	Estimated Total Price
1				\$	\$
2				\$	\$
3				\$	\$
4				\$	\$
5				\$	\$
6				\$	\$
7				\$	\$
8				\$	\$

Unit Price Table (Concluded)

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>	<i>Column 4</i>	<i>Column 5</i>	<i>Column 6</i>
Item	Class of Labour Plant or Material	Unit of Measurement	Estimated Total Quantity	Price Per Unit	Estimated Total Price
1				\$	\$
2				\$	\$
3				\$	\$
4				\$	\$
5				\$	\$
6				\$	\$
7				\$	\$
8				\$	\$



- 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.

N.B.:

The attention of the Contractor is drawn to the following statutory provision:

"It is a term of every contract providing for the payment of any money by Her Majesty that payment thereunder is subject to there being an appropriation for the particular service for the fiscal year in which any commitment thereunder would come in course of payment".

Section 40, Financial Administration Act, R.S. 1985, c.F-11

Signed on behalf of **Her Majesty**

by _____
Full Name

as _____
Title

Date: _____

Signature

Signed on behalf of **The Consultant/Contractor**

by _____
Full Name

as _____
Title

Date: _____

Signature



Plans and Drawings

M-1 OVERALL WATER SUPPLY SYSTEM SCHEMATIC AND FIXTURE CLASSIFICATION
M-2 OVERALL WATER SUPPLY SYSTEM SCHEMATIC
M-3 PENTHOUSE DEMOLITION
M-4 PENTHOUSE PROPOSED LAYOUT
M-5 FLOOR PLAN PLUMBING-DEMOLITION
M-6 FLOOR PLAN PLUMBING-PROPOSED
M-7 SOFT WATER LINE MODIFICATIONS
M-8 WEST WING AND PILOT PLANT PROPOSED
M-9 FLOOR PLAN PLUMBING-PROPOSED
M/E-1 PENTHOUSE PROPOSED NATURAL GAS/ELECTRICAL