Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

INVITATION TO TENDER

RETURN BIDS TO:

Bid Receiving / Agriculture and Agri-Food Canada

Agriculture and Agri-Food Canada
Central Experimental Farm (CEF)
Bid Receiving (Main Entrance)
K.W. Neatby Building (#20)
960 Carling Avenue
Ottawa, Ontario K1A 0C6

TENDER TO:

Agriculture and Agri-Food Canada
We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the construction listed herein and on any attached sheets at the price(s) set out therefor.

Comments

ISSUING OFFICE

Agriculture and Agri-Food Canada
CEF Integrated Services
K.W. Neatby Building (#20)
960 Carling Avenue
Ottawa, Ontario K1A 0C6

Title: Building 20 Chiller Replacement	
Solicitation No.: 15-1478	Date: 2016-05-04
Client Reference No.: MCE15-A645	
File No.: 15-1478	
Solicitation Closes: Wednesday, May 25, 2016, at 02:00 PM, EDT.	
F.O.B ◯ Plant ◉ Destination ◯ Other	
Address Enquiries to: Mike Pignat	
Title: Procurement Officer	
Email: mike.pignat@canada.ca	
Telephone Number Ext.: 613 759-6157	Fax Number
Destination	

Instructions: See Herein

Delivery Required	Delivery Offered
Vendor / Firm Name and Address	
Telephone Number Ext.	Fax Number
Name and title of person authorized to sign on behalf of Vendor / Firm (type or print)	
Signature	Date

Canada

SPECIAL INSTRUCTIONS TO BIDDERS (SI)

SI01 BID DOCUMENTS

1) The following are the bid documents:

(a) INVITATION TO TENDER - Page 1 form AAFC / AAC5323-E;
(b) SPECIAL INSTRUCTIONS TO BIDDERS form AAFC / AAC5301-E;
(c) GENERAL INSTRUCTIONS TO BIDDERS form AAFC / AAC5313-E;
(d) Clauses and Conditions identified in “CONTRACT DOCUMENTS”;
(e) Drawings and Specifications;
(f) BID AND ACCEPTANCE form AAFC / AAC5320-E and any Appendices attached thereto; and,
(g) Any amendment issued prior to solicitation closing.

Submission of a bid constitutes acknowledgement that the Bidder has read and agrees to be bound by these documents.

SI02 ENQUIRIES DURING THE SOLICITATION PERIOD

1) Enquiries regarding this bid must be submitted in writing to the Contracting Officer named on the INVITATION TO TENDER - Page 1 as early as possible within the solicitation period. Except for the approval of alternative materials as described in GI13 of the GENERAL INSTRUCTIONS TO BIDDERS, enquiries should be received no later than five (5) calendar days prior to the date set for solicitation closing to allow sufficient time to provide a response. Enquiries received after that time may not result in an answer being provided.

2) To ensure consistency and quality of the information provided to Bidders, the Contracting Officer shall examine the content of the enquiry and shall decide whether or not to issue an amendment.

3) All enquiries and other communications related to this bid sent throughout the solicitation period are to be directed ONLY to the Contracting Officer named on the INVITATION TO TENDER - Page 1. Non-compliance with this requirement during the solicitation period can, for that reason alone, result in disqualification of a bid.

SI03 MANDATORY SITE VISIT

1) There will be a site visit on Wednesday, May, 11 , 2016 at 10:00 ◉ AM ○ PM EDT.

Interested bidders are to meet at:

CEF Ottawa
K.W. Neatby Building #20 (Main Entrance)
960 Carling Avenue
Ottawa, Ontario
K1A 0C6

The site visit for this project is MANDATORY. The representative of the bidder will be required to sign the Site Visit Attendance Sheet at the site visit. Bids submitted by Bidders who have not signed the attendance sheet will not be accepted.

SI04 REVISION OF BID

1) A bid may be revised by letter or facsimile in accordance with GI09 of the GENERAL INSTRUCTIONS TO BIDDERS. The facsimile number for receipt of revisions is .

SI05 BID RESULTS

1) Following bid closing, bid results may be obtained from the bid receiving office by email at mike.pignat@canada.ca .

SI06 INSUFFICIENT FUNDING

1) In the event that the lowest compliant bid exceeds the amount of funding allocated for the Work, Canada in its sole discretion may:
   (a) cancel the solicitation; or
   (b) obtain additional funding and award the Contract to the Bidder submitting the lowest compliant bid; and/or
   (c) negotiate a reduction in the bid price and/or scope of work of not more than 15% with the Bidder submitting the lowest compliant bid. Should an agreement satisfactory to Canada not be reached, Canada shall exercise option (a) or (b).

SI07 BID VALIDITY PERIOD

1) Canada reserves the right to seek an extension to the bid validity period prescribed in Clause 4 of the BID AND ACCEPTANCE Form. Upon notification in writing from Canada, Bidders shall have the option to either accept or reject the proposed extension.

2) If the extension referred to in paragraph 1) of SI07 is accepted, in writing, by all those who submitted bids, then Canada shall continue immediately with the evaluation of the bids and its approvals processes.

3) If the extension referred to in paragraph 1) of SI07 is not accepted in writing by all those who submitted bids then Canada shall, at its sole discretion, either:
   (a) continue to evaluate the bids of those who have accepted the proposed extension and seek the necessary approvals; or
   (b) cancel the invitation to bid.

4) The provisions expressed herein do not in any manner limit Canada's rights in law or under GI10 of the GENERAL INSTRUCTIONS TO BIDDERS.

SI08 CONSTRUCTION DOCUMENTS

1) The successful contractor will be provided with one paper copy of the sealed and signed plans, the specifications and the amendments upon acceptance of the offer. Additional copies, up to a maximum of one (1), will be provided free of charge upon request by the Contractor. Obtaining more copies shall be the responsibility of the Contractor including costs.

SI09 WEB SITES

The connection to some of the Web sites in the solicitation documents is established by the use of hyperlinks. The following is a list of the addresses of the Web sites:

Treasury Board Appendix L, Acceptable Bonding Companies
http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=14494&section=text#appL

Canadian economic sanctions
http://www.international.gc.ca/sanctions/index.aspx?lang=eng

SI10 PERSONNEL SECURITY REQUIREMENTS

1) The successful Bidder's personnel, as well as any subcontractor and its personnel, who are required to perform any part of the work pursuant to the subsequent contract, must meet the following contract security requirements:

- Personnel who are required to perform any part of the work must EACH hold a valid personnel security screening at the level of RELIABILITY STATUS, granted or approved by Agriculture and Agri-Food Canada. Until the security screening of the personnel has been completed satisfactorily by Agriculture and Agri-Food Canada, the Contractor/Subcontractor personnel MAY NOT perform contract work. Each of the proposed staff must complete "Security Clearance Form" (TBS 330-23E) upon request from Canada.

GENERAL INSTRUCTIONS TO BIDDERS

GI01 COMPLETION OF BID

1) The bid shall be:

   (a) submitted on the BID AND ACCEPTANCE FORM provided by AAFC with the bid package or on a clear and legible reproduced copy of such BID AND ACCEPTANCE FORM that must be identical in content and format to the BID AND ACCEPTANCE FORM provided by AAFC;

   (b) based on the Bid Documents listed in the Special Instructions to Bidders;

   (c) correctly completed in all respects;

   (d) signed, with an original signature, by a duly authorized representative of the Bidder; and

   (e) accompanied by

      (i) bid security as specified in GI07; and
      (ii) any other document or documents specified elsewhere in the solicitation where it is stipulated that said documents are to accompany the bid.

2) Subject to paragraph 6) of GI10, any alteration to the pre-printed or pre-typed sections of the Bid and Acceptance Form, or any condition or qualification placed upon the bid shall be cause for disqualification. Alterations, corrections, changes or erasures made to statements or figures entered on the Bid and Acceptance Form by the Bidder shall be initialed by the person or persons signing the bid. Alterations, corrections, changes or erasures that are not initialed shall be deemed void and without effect.

3) Unless otherwise noted elsewhere in the Bid Documents, facsimile copies of bids are not acceptable.

GI02 IDENTITY OR LEGAL CAPACITY OF THE BIDDER

1) In order to confirm the authority of the person or persons signing the bid or to establish the legal capacity under which the Bidder proposes to enter into Contract, any Bidder who carries on business in other than its own personal name shall, if requested by Canada, provide satisfactory proof of

   (a) such signing authority; and

   (b) the legal capacity under which it carries on business;

   prior to contract award. Proof of signing authority may be in the form of a certified copy of a resolution naming the signatory(ies) that is (are) authorized to sign this bid on behalf of the corporation or partnership. Proof of legal capacity may be in the form of a copy of the articles of incorporation or the registration of the business name of a sole proprietor or partnership.

GI03 APPLICABLE TAXES

1) "Applicable Taxes" means the Goods and Services Tax (GST), the Harmonized Sales Tax (HST), and any provincial tax, by law, payable by Canada such as, the Quebec Sales Tax (QST) as of April 1, 2013.

GI04 CAPITAL DEVELOPMENT AND REDEVELOPMENT CHARGES

1) For the purposes of GC1.8 LAWS, PERMITS AND TAXES in the General Conditions of the Contract, only fees or charges directly related to the processing and issuing of building permits shall be included. The Bidder shall not include any monies in the bid amount for special municipal development, redevelopment or other fees or charges which a municipal authority may seek as a prerequisite to the issuance of building permits.

GI05 REGISTRY AND PRE-QUALIFICATION OF FLOATING PLANT

1) Dredges or other floating plant to be used in the performance of the Work must be of Canadian registry. For dredges or other floating plant that are not of Canadian make or manufacture, the Bidder must obtain a certificate of qualification from Industry Canada and this certificate must accompany the bid. Plant so qualified by Industry Canada may be accepted on this project.

GI06 LISTING OF SUBCONTRACTORS AND SUPPLIERS

1) Notwithstanding any list of Subcontractors that the Bidder may be required to submit as part of the bid, the Bidder shall, within 48 hours of receipt of a notice to do so, submit all information requested in the said notice including the names of Subcontractors and Suppliers for the part or parts of the Work listed. Failure to do so shall result in the disqualification of its bid.

GI07 BID SECURITY REQUIREMENTS

1) The Bidder shall submit bid security with the bid in the form of a bid bond or a security deposit in an amount that is equal to not less than 10 percent of the bid amount. Applicable Taxes shall not be included when calculating the amount of any bid security that may be required. The maximum amount of bid security required with any bid is $2,000,000.00.

2) A bid bond shall be in an approved form http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=14494&section=text#appS, properly completed, with original signature(s) and issued by an approved company whose bonds are acceptable to Canada either at the time of solicitation closing or as identified in Treasury Board Appendix L: Acceptable Bonding Companies.

3) A security deposit shall be an original, properly completed, signed where required and be either:

   (a) a bill of exchange, bank draft or money order 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

   (b) bonds of, or unconditionally guaranteed as to principal and interest by, the Government of Canada;

4) For the purposes of subparagraph 3) (a) of GI07

   (a) a bill of exchange is an unconditional order in writing signed by the Bidder and addressed to an approved financial institution, requiring the said institution to pay, on demand, at a fixed or determinable future time a sum certain of money to, or to the order of, the Receiver General for Canada;

   (b) if a bill of exchange, bank draft or money order is certified by or drawn on an institution or corporation other than a chartered bank, it must be accompanied by proof that the said institution or corporation meets at least one of the criteria described in subparagraph 4.c. of GI07, either by letter or by a stamped certification on the bill of exchange, bank draft or money; and

   (c) An approved financial institution is:
      (i) a corporation or institution that is a member of the Canadian Payments Association as defined in the Canadian Payments Act;
      (ii) a corporation that accepts deposits that are insured, to the maximum permitted by law, by the Canada Deposit Insurance Corporation or the "Autorité des marchés financiers";
      (iii) a corporation that accepts deposits from the public if repayment of the deposit is guaranteed by Her Majesty the Queen in right of a province;
      (iv) a corporation, association or federation incorporated or organized as a credit union or co-operative credit society that conforms to the requirements of a credit union which are more particularly described in paragraph 137(6) of the Income Tax Act; or
      (v) Canada Post Corporation.

5) Bonds referred to in subparagraph 3)(b) of GI07 shall be provided on the basis of their market value current at the date of solicitation closing, and shall be:

   (a) payable to bearer;

   (b) 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

   (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.

6) As an alternative to a security deposit an irrevocable standby letter of credit is acceptable to Canada and the amount shall be determined in the same manner as a security deposit referred to above.

7) An irrevocable standby letter of credit referred to in paragraph 6) of GI07 shall

(a) be an arrangement, however named or described, whereby a financial institution (the "Issuer") acting at the request and on the instructions of a customer (the "Applicant) or on its own behalf,

(i) is to make a payment to, or to the order of, the Receiver General for Canada as the beneficiary;

(ii) is to accept and pay bills of exchange drawn by the Receiver General for Canada;

(iii) authorizes another financial institution to effect such payment or accept and pay such bills of exchange; or

(iv) authorizes another financial institution to negotiate against written demand(s) for payment provided that the terms and conditions of the letter of credit are complied with;

(b) state the face amount which may be drawn against it;

(c) state its expiry date;

(d) 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 Departmental Representative identified in the letter of credit by his/her office;

(e) provide that more than one written demand for payment may be presented subject to the sum of those demands not exceeding the face value of the letter of credit;

(f) provide that it is subject to the International Chamber of Commerce (ICC) Uniform Customs and Practice (UCP) for Documentary Credits, 2007 Revision, ICC Publication No. 600; pursuant to the ICC UCP; a credit is irrevocable even if there is no indication to that effect; and

(g) be issued or confirmed, in either official language, by a financial institution which is a member of the Canadian Payments Association and is on the letterhead of the Issuer or Confirmer. The format is left to the discretion of the Issuer or Confirmer.

8) Bid security shall lapse or be returned as soon as practical following:

(a) the solicitation closing date, for those Bidders submitting non-compliant bids; and

(b) the administrative bid review, for those Bidders submitting compliant bids ranked fourth to last on the schedule of bids; and

(c) the award of contract, for those Bidders submitting the second and third ranked bids; and

(d) the receipt of contract security, for the successful Bidder; or

(e) the cancellation of the solicitation, for all Bidders.

9) Notwithstanding the provisions of paragraph 8) of GI07 and provided more than three compliant bids have been received, if one or more of the bids ranked third to first is withdrawn or rejected

for whatever reason then Canada reserves the right to hold the security of the next highest ranked compliant bid in order to retain the bid security of at least three valid and compliant bids.

GI08 SUBMISSION OF BID

1) The Bid and Acceptance Form, duly completed, and the bid security shall be enclosed and sealed in an envelope provided by the Bidder, and shall be addressed and submitted to the office designated on the INVITATION TO TENDER Form for the receipt of bids. The bid must be received on or before the date and time set for solicitation closing.

2) Unless otherwise specified in the Special Instructions to Bidders

   (a) the bid shall be in Canadian currency;

   (b) exchange rate fluctuation protection is not offered; and

   (c) any request for exchange rate fluctuation protection shall not be considered.

3) Prior to submitting the bid, the Bidder shall ensure that the following information is clearly printed or typed on the face of the bid envelope:

   (a) Solicitation Number;

   (b) Name of Bidder;

   (c) Return address; and

   (d) Closing Date and Time.

4) Timely and correct delivery of bids is the sole responsibility of the Bidder.

GI09 REVISION OF BID

1) A bid submitted in accordance with these instructions may be revised by letter or facsimile provided the revision is received at the office designated for the receipt of bids, on or before the date and time set for the closing of the solicitation. The letter or facsimile shall be on the Bidder's letterhead or bear a signature that identifies the Bidder;

2) A revision to a bid that includes unit prices must clearly identify the changes(s) in the unit price(s) and the specific item(s) to which each change applies.

3) A letter or facsimile submitted to confirm an earlier revision shall be clearly identified as a confirmation.

4) Failure to comply with any of the above provisions shall result in the rejection of the non-compliant revision(s) only. The bid shall be evaluated based on the original bid submitted and all other compliant revision(s).

GI10 REJECTION OF BID

1) Canada may accept any bid, whether it is the lowest or not, or may reject any or all bids.

2) Without limiting the generality of paragraph 1) of GI10, Canada may reject a bid if any of the following circumstances is present:

(a) the Bidder, or any employee or subcontractor included as part of the bid, has been convicted under Section 121 ("Frauds on the government" & "Contractor subscribing to election fund"), 124 "Selling or purchasing office"), 380 ("Fraud committed against Her Majesty") or 418 ("Selling defective stores to Her Majesty") of the Criminal Code of Canada, or under paragraph 80(1)(d) ("False entry, certificate or return"), subsection 80(2) ("Fraud against Her Majesty") or Section 154.01 ("Fraud against Her Majesty") of the *Financial Administration Act*;

(b) the Bidder's bidding privileges are suspended or are in the process of being suspended;

(c) the bidding privileges of any employee or subcontractor included as part of the bid are suspended or are in the process of being suspended, which suspension or pending suspension would render that employee or subcontractor ineligible to bid on the Work, or the portion of the Work the employee or subcontractor is to perform;

(d) the Bidder is bankrupt, or where for whatever reason, its activities are rendered inoperable for an extended period;

(e) evidence, satisfactory to Canada, of fraud, bribery, fraudulent misrepresentation or failure to comply with any law protecting individuals against any manner of discrimination, has been received with respect to the Bidder, any of its employees or any subcontractor included as part of its bid;

(f) evidence satisfactory to Canada that based on past conduct or behavior, the Bidder, a sub-contractor or a person who is to perform the Work is unsuitable or has conducted himself/herself improperly;

(g) with respect to current or prior transactions with Canada
  (i) Canada has exercised, or intends to exercise, the contractual remedy of taking the work out of the contractor's hands with respect to a contract with the Bidder, any of its employees or any subcontractor included as part of its bid; or
  (ii) Canada determines that the Bidder's performance on other contracts is sufficiently poor to jeopardize the successful completion of the requirement being bid on.

3) In assessing the Bidder's performance on other contracts pursuant to subparagraph 2)(g)(ii)of GI10, Canada may consider, but not be limited to, such matters as:

(a) the quality of workmanship in performing the Work;

(b) the timeliness of completion of the Work;

(c) the overall management of the Work and its effect on the level of effort demanded of the department and its representative; and

(d) the completeness and effectiveness of the Contractor's safety program during the performance of the Work.

4) Without limiting the generality of paragraphs 1), 2) and 3) of GI10, Canada may reject any bid based on an unfavourable assessment of the:

(a) adequacy of the bid price to permit the work to be carried out and, in the case of a bid

providing prices per unit or a combination of lump sum and prices per unit, whether each such price reasonably reflects the cost of performing the part of the work to which that price applies;

(b) Bidder's ability to provide the necessary management structure, skilled personnel, experience and equipment to perform competently the work under the Contract; and

(c) Bidder's performance on other contracts.

5) Where Canada intends to reject a bid pursuant to a provision of paragraphs 1), 2), 3) or 4) of GI10, other than subparagraph 2)(g)of IT10, the contracting authority will inform the Bidder and provide the Bidder ten (10) days within which to make representations, before making a final decision on the bid rejection.

6) Canada may waive informalities and minor irregularities in bids received if Canada determines that the variation of the bid from the exact requirements set out in the Bid Documents can be corrected or waived without being prejudicial to other Bidders.

GI11 BID COSTS

1) No payment will be made for costs incurred in the preparation and submission of a bid in response to the bid solicitation. Costs associated with preparing and submitting a bid, as well as any costs incurred by the Bidder associated with the evaluation of the bid, are the sole responsibility of the Bidder.

GI12 COMPLIANCE WITH APPLICABLE LAWS

1) By submission of a bid, the Bidder certifies that the Bidder has the legal capacity to enter into a contract and is in possession of all valid licences, permits, registrations, certificates, declarations, filings, or other authorizations necessary to comply with all federal, provincial and municipal laws and regulations applicable to the submission of the bid and entry into any ensuing contract for the performance of the work.

2) For the purpose of validating the certification in paragraph 1) of GI12, a Bidder shall, if requested, provide a copy of every valid licence, permit, registration, certificate, declaration, filing or other authorization listed in the request, and shall provide such documentation within the time limit(s) set out in the said request.

3) Failure to comply with the requirements of paragraph 2) of GI12 shall result in disqualification of the bid.

GI13 APPROVAL OF ALTERNATIVE MATERIALS

1) When materials are specified by trade names or trademarks, or by manufacturers' or suppliers' names, the bid shall be based on use of the named materials. During the solicitation period, alternative materials may be considered provided full technical data is received in writing by the Contracting Officer at least 10 calendar days prior to the solicitation closing date.

GI14 CONFLICT OF INTEREST - UNFAIR ADVANTAGE

1) In order to protect the integrity of the procurement process, bidders are advised that Canada may reject a bid in the following circumstances:

(a) if the Bidder, any of its subcontractors, any of their respective employees or former employees was involved in any manner in the preparation of the bid solicitation or in any situation of conflict of interest or appearance of conflict of interest;

(b) if the Bidder, any of its subcontractors, any of their respective employees or former employees had access to information related to the bid solicitation that was not available to other bidders and that would, in Canada's opinion, give or appear to give the Bidder an unfair advantage.

2) The experience acquired by a bidder who is providing or has provided the goods and services described in the bid solicitation (or similar goods or services) will not, in itself, be considered by Canada as conferring an unfair advantage or creating a conflict of interest. This bidder remains however subject to the criteria established above.

3) Where Canada intends to reject a bid under this section, the Contracting Authority will inform the Bidder and provide the Bidder an opportunity to make representations before making a final decision. Bidders who are in doubt about a particular situation should contact the Contracting Authority before bid closing. By submitting a bid, the Bidder represents that it does not consider itself to be in conflict of interest nor to have an unfair advantage. The Bidder acknowledges that it is within Canada's sole discretion to determine whether a conflict of interest, unfair advantage or an appearance of conflict of interest or unfair advantage exists.

MAJOR WORKS - CONTRACT DOCUMENTS

SC01 CONTRACT DOCUMENTS

1) The following are the contract documents:

(a) Contract page when signed by Canada;

(b) Duly completed Bid and Acceptance Form and any Appendices attached thereto;

(c) Drawings and Specifications;

(d) AAFC General Conditions form AAFC / AAC5321-E:

(i)	GC1	General Provisions
(ii)	GC2	Administration of the Contract
(iii)	GC3	Execution and Control of the Work
(iv)	GC4	Protective Measures
(v)	GC5	Terms of Payment
(vi)	GC6	Delays and Changes in the Work
(vii)	GC7	Default, Suspension or Termination of Contract
(viii)	GC8	Dispute Resolution
(ix)	GC9	Contract Security
(x)	GC10	Insurance

(e) Supplementary Conditions, if any;

(f) Insurance Terms form AAFC / AAC5315-E;

(g) Any amendment issued or any allowable bid revision received before the date and time set for solicitation closing;

(h) Any amendment incorporated by mutual agreement between Canada and the Contractor before acceptance of the bid; and

(i) Any amendment or variation of the contract documents that is made in accordance with the General Conditions.

2) The language of the contract documents shall be the language of the Bid and Acceptance Form submitted.

SC02 ACCEPTANCE AND CONTRACT

1) Upon acceptance of the Contractor's offer by Canada, a binding Contract shall be formed between Canada and the Contractor. The documents forming the Contract shall be the contract documents referred to in SC01 CONTRACT DOCUMENTS.

MAJOR WORKS – GENERAL CONDITIONS

MAJOR WORKS GENERAL CONDITIONS FORM AAFC 5321: Revision Date

GC1 GENERAL PROVISIONS

GC1.1 INTERPRETATION

GC1.1.1 Headings and References

1) The headings in the contract documents, other than those in the drawings and specifications, form no part of the Contract but are inserted for convenience of reference only.

2) A reference made to a part of the Contract by means of numbers preceded by letters is 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.

3) A reference to a paragraph or subparagraph followed by an identifying number, letter or combination thereof is, unless specifically stated otherwise, a reference to the paragraph or subparagraph that forms part of the clause within which the reference is made.

GC1.1.2 Terminology

1) In the Contract

"Applicable Taxes" means the Goods and Services Tax (GST), the Harmonized Sales Tax (HST), and any provincial tax, by law, payable by Canada such as, the Quebec Sales Tax (QST) as of April 1, 2013;

"Canada", “Crown”, “Her Majesty” means Her Majesty the Queen in right of Canada;

"Contract" means the contract documents referred to as such therein and every other document specified or referred to in any of them as forming part of the Contract, all as amended by agreement of the parties;

"Contract Amount" means the amount set out in the Contract to be payable to the Contractor for the Work, subject to the terms and conditions of the Contract, exclusive of Applicable Taxes;

"Contract Security" means any security given by the Contractor to Canada in accordance with the Contract;

"Contractor" means the person contracting with Canada to provide or furnish all labour, Material and Plant for the execution of the Work under the Contract, and includes the Contractor's superintendent as designated in writing to Canada.

"Certificate of Completion" means a certificate issued by Canada when the Work reaches Completion;

"Certificate of Measurement" means a certificate issued by Canada certifying the correctness of the final quantities, prices per unit and values of labour, Plant and Material performed, used and supplied by the Contractor for the construction of the part of the Work to which a Unit Price Arrangement applies;

"Certificate of Substantial Performance" means a certificate issued by Canada when the Work reaches Substantial Performance;

"Departmental Representative" means the person designated in the Contract, or by written notice to the Contractor, to act as the Departmental Representative for the purposes of the Contract, and includes a person, designated and authorized in writing by the Departmental Representative to the Contractor;

"herein", "hereby", "hereof", "hereunder" and similar expressions refer to the Contract as a whole and not to any particular section or part thereof;

"Lump Sum Arrangement" means that part of the Contract that prescribes a lump sum as payment for performance of the Work to which it relates;

"Material" includes all commodities, articles, machinery, equipment, fixtures and things required to be furnished in accordance with the Contract for incorporation into the Work;

"person" also includes, unless there is an express stipulation in the Contract to the contrary, any partnership, proprietorship, firm, joint venture, consortium or corporation;

"Plant" includes all tools, implements, machinery, vehicles, structures, equipment, articles and things that are necessary for the performance of the Contract, other than Material and those tools customarily provided by a tradesperson in practicing a trade;

"Subcontractor" means a person having a direct contract with the Contractor, subject to GC3.6 SUBCONTRACTING, to perform a part or parts of the Work, or to supply Material customized for the Work;

"Superintendent" means the employee or representative of the Contractor designated by the Contractor to act pursuant to GC2.6 SUPERINTENDENT;

"Supplementary Conditions" means the part of the Contract that amends or supplements the General Conditions;

"Supplier" means a person having a direct contract with the Contractor to supply Plant or Material not customized for the Work;

“Total Estimated Cost”, “Revised Estimated Cost”, “Increase (Decrease)” on Page 1 of the Contract or Contract Amendment means an amount used for internal administrative purposes only that comprises the Contract Amount, or the revised Contract Amount, or the amount that would increase or decrease the Contract Amount and the Applicable Taxes as evaluated by the Contracting Authority, and does not constitute tax advice on the part of Canada;

"Unit Price Arrangement" means that part of the Contract that prescribes the product of a price per unit of measurement multiplied by a number of units of measurement for performance of the Work to which it relates;

"Unit Price Table" means the table of prices per unit set out in the Contract;

"Work" means, 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 in accordance with the contract documents; and

“Working Day” means a day other than a Saturday, Sunday, or a statutory holiday that is observed by the construction industry in the area of the place of the Work.

GC1.1.3 Application of Certain Provisions

1) Any 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 Lump Sum Arrangement applies.

2) Any provisions of the Contract that are expressly stipulated to be applicable only to a Lump Sum Arrangement are not applicable to any part of the Work to which a Unit Price Arrangement applies.

GC1.1.4 Substantial Performance

1) The Work shall be considered to have reached Substantial Performance when

   (a) the Work or a substantial part thereof has passed inspection and testing and is, in the opinion of Canada, ready for use by Canada or is being used for the intended purposes; and

   (b) the Work is, in the opinion of Canada, capable of completion or correction at a cost of not more than

      (i) 3 percent of the first $500,000;

      (ii) 2 percent of the next $500,000; and

      (iii) 1 percent of the balance

      of the Contract Amount at the time this cost is calculated.

2) Where the Work or a substantial part thereof is ready for use or is being used for the purposes intended and

(a) the remainder of the Work or a part thereof cannot be completed by the time specified in the Contract, or as amended in accordance with GC6.5 DELAYS AND EXTENSION OF TIME, for reasons beyond the control of the Contractor; or

(b) Canada and the Contractor agree not to complete a part of the Work within the specified time;

the cost of that part of the Work that was either beyond the control of the Contractor to complete or Canada and the Contractor have agreed not to complete by the time specified, shall be deducted from the value of the Contract referred to in subparagraph 1)(b) of GC1.1.4 and the said cost shall not form part of the cost of the Work remaining to be done in determining Substantial Performance.

GC1.1.5 Completion

1) The Work shall be deemed to have reached Completion when all labour, Plant and Material required have been performed, used or supplied, and the Contractor has complied with the Contract and all orders and directions made pursuant thereto, all to the satisfaction of Canada.

GC1.2 CONTRACT DOCUMENTS

GC1.2.1 General

1) The contract documents are complementary, and what is required by any one shall be as binding as if required by all.

2) References in the contract documents to the singular shall be considered to include the plural as the context requires.

3) Nothing contained in the contract documents shall create a contractual relationship between Canada and any Subcontractor or Supplier, their subcontractors or suppliers, or their agents or employees.

GC1.2.2 Order of Precedence

1) In the event of any discrepancy or conflict in the contents of the following documents, such documents shall take precedence and govern in the following order:

(a) any amendment or variation of the contract documents that is made in accordance with the General Conditions;

(b) any amendment issued prior to tender closing;

(c) Supplementary Conditions;

(d) General Conditions;

(e) the duly completed Bid and Acceptance Form when accepted;
(f) drawings and specifications.

later dates shall govern within each of the above categories of documents.

2) In the event of any discrepancy or conflict in the information contained in the drawings and specifications, the following rules shall apply:

   (a) specifications shall govern over drawings;

   (b) dimensions shown in figures on a drawings shall govern where they differ from dimensions scaled from the same drawings; and

   (c) drawings of larger scale govern over those of smaller scale.

GC1.2.3 Security and Protection of Documents and Work

1) The Contractor shall guard and protect contract documents, drawings, information, models and copies thereof, whether supplied by Canada or the Contractor, against loss or damage from any cause.

2) The Contractor shall keep confidential all information provided to the Contractor by or on behalf of Canada in connection with the Work, and all information developed by the Contractor as part of the Work, and shall not disclose any such information to any person without the written permission of Canada, except that the Contractor may disclose to a subcontractor, authorized in accordance with the Contract, information necessary to the performance of a subcontract. This section does not apply to any information that

   (a) is publicly available from a source other than the Contractor; or

   (b) is or becomes known to the Contractor from a source other than Canada, except any source that is known to the Contractor to be under an obligation to Canada not to disclose the information.

3) When the Contract, the Work, or any information referred to in paragraph 2) is identified as top secret, secret, confidential, or protected by Canada, the Contractor shall, at all times, take all measures reasonably necessary for the safeguarding of the material so identified, including such measures as may be further specified elsewhere in the Contract or provided, in writing, from time to time by Canada.

4) Without limiting the generality of paragraphs 2) and 3) of GC1.2.3, when the Contract, the Work, or any information referred to in paragraph 2) is identified as top secret, secret, confidential or protected by Canada, Canada shall be entitled to inspect the Contractor's premises and the premises of its subcontractors or suppliers and any other person at any tier, for security purposes at any time during the term of the Contract, and the Contractor shall comply with, and ensure that any such subcontractors or suppliers comply with all written instructions issued by Canada dealing with the material so identified, including any requirement that employees of the Contractor and its subcontractors and suppliers and any other person at any tier execute and deliver declarations relating to reliability screenings, security clearances and other procedures.

5) The Contractor shall safeguard the Work and the Contract, the specifications, drawings and any other information provided by Canada to the Contractor, and shall be liable to Canada for any loss or damage from any causes.

GC1.3 STATUS OF THE CONTRACTOR

1) The Contractor is engaged under the Contract as an independent contractor.

2) The Contractor, its subcontractors and suppliers and any other person at any tier and their employees are not engaged by the Contract as employees, servants or agents of Canada.

3) For the purposes of the contract 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, Employment Insurance, Worker's Compensation, provincial health or insurance plans, and Income Tax.

GC1.4 RIGHTS AND REMEDIES

1) Except as expressly provided in the Contract, the duties and obligations imposed by the Contract and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights, and remedies otherwise imposed or available by law.

GC1.5 TIME OF THE ESSENCE

1) Time is of the essence of the Contract.

GC1.6 INDEMNIFICATION BY THE CONTRACTOR

1) The Contractor shall pay all royalties and patent fees required for the performance of the Contract and, at the Contractor's expense, shall defend all claims, actions or proceedings against Canada charging or claiming that the Work or any part thereof provided or furnished by the Contractor to Canada infringes any patent, industrial design, copyright trademark, trade secret or other proprietary right enforceable in Canada.

2) The Contractor shall indemnify and save Canada harmless from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings by any third party, brought or prosecuted and in any manner based upon, arising out of, related to, occasioned by, or attributable to the activities of the Contractor, its subcontractors and suppliers and any other person at any tier, in performing the Work.

3) For the purposes of paragraph 2) of GC1.6, "activities" means any act improperly carried out, any omission to carry out an act and any delay in carrying out an act.

GC1.7 INDEMNIFICATION BY CANADA

1) Subject to the *Crown Liability and Proceedings Act*, the *Patent Act*, and any other law that affects Canada's rights, powers, privileges or obligations, Canada shall indemnify and save the Contractor harmless from and against all claims, demands, losses, costs, damage, actions, suits or proceedings arising out of the Contractor's activities under the Contract that are directly attributable to

   (a) a lack of or a defect in Canada's title to the Work site if owned by Canada, whether real or alleged; or

   (b) an infringement or an alleged infringement by the Contractor of any patent of invention or any other kind of intellectual property occurring while the Contractor was performing any act for the purposes of the Contract employing a model, plan or design or any other thing related to the Work that was supplied by Canada to the Contractor.

GC1.8 LAWS, PERMITS AND TAXES

1) The Contractor shall comply with all federal, provincial and municipal laws and regulations applicable to the performance of the Work or any part thereof including, without limitation, all laws concerning health and labour conditions and the protection of the environment, and shall require compliance therewith by all of its subcontractors and suppliers at any tier as if the Work were being performed for an owner other than Canada. The Contractor shall furnish evidence of compliance with such laws and regulations to Canada at such times as Canada may reasonably request.

2) Unless stipulated otherwise in the Contract, the Contractor shall obtain and maintain all permits, certificates, licences, registrations and authorizations required for the lawful performance of the Work.

3) Prior to the commencement of the Work at the site, the Contractor shall 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 an owner other than Canada.

4) Within 10 days of making a tender pursuant to paragraph 3) of GC1.8, the Contractor shall notify Canada of the amount properly tendered and whether or not the municipal authority has accepted that amount.

5) If the municipal authority has not accepted the amount tendered, the Contractor shall pay that amount to Canada within 6 days after the time stipulated in paragraph 4) of GC1.8.

6) For the purposes of this clause, "municipal authority" means any authority that would have jurisdiction respecting permission to perform the Work if the owner were not Canada.

7) Notwithstanding the residency of the Contractor, the Contractor shall pay any applicable tax arising from or related to the performance of the Work under the Contract.

8) In accordance with the Statutory Declaration referred to in paragraph 4) of GC5.5 SUBSTANTIAL PERFORMANCE OF THE WORK, a Contractor who has neither residence nor place of business in the province or territory in which work under the Contract is being performed shall provide Canada with proof of registration with the provincial sales tax authorities in the said province.

9) For the purpose of the payment of any Applicable Taxes or the furnishing of security for the payment of any Applicable Taxes arising from or related to the performance of the Work, and notwithstanding the provision that all Material, Plant and interest of the Contractor in all real property, licences, powers and privileges, become the property of Canada after the time of purchase in accordance with GC3.10 MATERIAL PLANT AND REAL PROPERTY BECOME PROPERTY OF CANADA, the Contractor shall be liable, as a user or consumer, for the payment or for the furnishing of security for the payment of any Applicable Taxes payable, at the time of the use or consumption of that Material, Plant or interest of the Contractor in accordance with the relevant legislation.

10) Federal government departments and agencies are required to pay Applicable Taxes.

11) Applicable Taxes will be paid by Canada as provided in the request for payment. It is the sole responsibility of the Contractor to charge Applicable Taxes at the correct rate in accordance with applicable legislation. The Contractor agrees to remit to appropriate tax authorities any amounts of Applicable Taxes paid or due.

12) The Contractor is not entitled to use Canada's exemptions from any tax, such as provincial sales taxes, unless otherwise specified by law. The Contractor must pay applicable provincial sales tax, ancillary taxes, and any commodity tax, on taxable goods or services used or consumed in the performance of the Contract (in accordance with applicable legislation), including for material incorporated into real property.

13) In those cases where Applicable Taxes, customs duties, and excise taxes are included in the Contract Amount, the Contract Amount will be adjusted to reflect any increase, or decrease, of Applicable Taxes, customs duties, and excise taxes that will have occurred between bid submission and contract award. However, there will be no adjustment for any change to increase the Contract Amount if public notice of the change was given before bid submission date in sufficient detail to have permitted the Contractor to calculate the effect of the change.

14) Tax Withholding of 15 Percent – Canada Revenue Agency

Pursuant to the *Income Tax Act*, 1985, c. 1 (5th Supp.) and the *Income Tax Regulations*, Canada must withhold 15 percent of the amount to be paid to the Contractor in respect of services provided in Canada if the Contractor is not a resident of Canada, unless the Contractor obtains a valid waiver from the Canada Revenue Agency. The amount withheld will be held on account for the Contractor in respect to any tax liability which may be owed to Canada.

GC1.9 WORKERS' COMPENSATION

1) Prior to commencement of Work, at the time of Substantial Performance of the Work, and prior to issuance of the Certificate of Completion, the Contractor shall provide evidence of compliance with workers' compensation legislation applicable to the place of the Work, including payments due thereunder.

2) At any time during the term of the Contract, when requested by Canada, the Contractor shall provide such evidence of compliance by the Contractor, its subcontractors and any other person at any tier and any other person performing part of the Work who is required to comply with such legislation.

GC1.10 NATIONAL SECURITY

1) If Canada determines that the Work is of a class or kind that involves national security, Canada may order the Contractor to

(a) provide Canada with any information concerning persons employed or to be employed by the Contractor for purposes of the Contract; and

(b) remove any person from the site of the Work if, in the opinion of Canada, that person may be a risk to the national security;

and the Contractor shall comply with the order.

2) In all contracts with persons who are to be employed in the performance of the Contract, the Contractor shall make provision for the performance of any obligation that may be imposed upon the Contractor under paragraph 1) of GC1.10.

GC1.11 UNSUITABLE WORKERS

1) Canada shall instruct the Contractor to remove from the site of the Work any person employed by the Contractor for purposes of the Contract who, in the opinion of Canada, is incompetent or is guilty of improper conduct, and the Contractor shall not permit a person who has been removed to return to the site of the Work.

GC1.12 PUBLIC CEREMONIES AND SIGNS

1) The Contractor shall not permit any public ceremony in connection with the Work without the prior consent of Canada.

2) The Contractor shall not erect nor permit the erection of any sign or advertising on the Work or its site without the prior consent of Canada.

GC1.13 CONFLICT OF INTEREST

1) It is a term of the Contract that no individual, for whom the post-employment provisions of the Conflict of Interest and Post-Employment Code for Public Office Holders or the Values and Ethics Code for the Public Service apply, shall derive a direct benefit from the Contract unless that individual is in compliance with the applicable post-employment provisions.

GC1.14 AGREEMENTS AND AMENDMENTS

1) The Contract constitutes the entire and sole agreement between the parties with respect to the subject matter of the Contract and supersedes all previous negotiations, communications and other agreements, whether written or oral, relating to it, unless they are incorporated by reference in the Contract. There are no terms, covenants, representations, statements or conditions binding on the parties other than those contained in the Contract.

2) The failure of either party at any time to require performance by the other party of any provision hereof shall not affect the right thereafter to enforce such provision. Nor shall the waiver by either party of any breach of any covenant, term or condition hereof be taken to be held to be a waiver of any further breach of the same covenant, term or condition.

3) The Contract may be amended only as provided for in the Contract.

GC1.15 SUCCESSION

1) The Contract shall inure to the benefit of and be binding upon the parties hereto and their lawful heirs, executors, administrators, successors and, subject to GC1.16 ASSIGNMENT, permitted assigns.

GC1.16 ASSIGNMENT

1) The Contractor shall not make any assignment of the Contract, either in whole or in part, without the written consent of Canada.

GC1.17 NO BRIBE

1) The Contractor represents and covenants that no bribe, gift, benefit, nor other inducement has been nor shall be paid, given, promised or offered directly or indirectly to any official or employee of Canada or to a member of the family of such a person, with a view to influencing the entry into the Contract or the administration of the Contract.

GC1.18 CERTIFICATION - CONTINGENCY FEES

1) In this clause

   (a) "contingency fee" means any payment or other compensation that is contingent upon or is calculated upon the basis of a degree of success in soliciting or obtaining a Government contract or negotiating the whole or any part of its terms;

   (b) "employee" means a person with whom the Contractor has an employer/employee relationship; and

   (c) "person" includes an individual or a group of individuals, a corporation, a partnership, an organization and an association and, without restricting the generality of the foregoing, includes any individual who is required to file a return with the registrar pursuant to section 5 of the *Lobbying Act* R.S.C. 1985 c.44 (4th Supplement) as the same may be amended from time to time.

2) The Contractor certifies that it has not directly or indirectly paid nor agreed to pay and covenants that it shall not directly or indirectly pay nor agree to pay a contingency fee for the solicitation, negotiation or obtaining of the Contract to any person other than an employee acting in the normal course of the employee's duties.

3) All accounts and records pertaining to payments of fees or other compensation for the solicitation, obtaining or negotiation of the Contract shall be subject to the accounts and audit provisions of the Contract.

4) If the Contractor certifies falsely under this section or is in default of the obligations contained therein, Canada may either take the Work out of the Contractor's hands in accordance with the provisions of the Contract or recover from the Contractor by way of reduction to the Contract Amount or otherwise, the full amount of the contingency fee.

GC1.19 INTERNATIONAL SANCTIONS

1) Persons and companies in Canada, and Canadians outside of Canada are bound by economic sanctions imposed by Canada. As a result, the Government of Canada cannot accept delivery of goods or services that originate, either directly or indirectly, from the countries or persons subject to economic sanctions

2) It is a condition of the Contract that the Contractor not supply to the Government of Canada any goods or services which are subject to economic sanctions.
3) By law, the Contractor must comply with changes to the regulations imposed during the life of the Contract. During the performance of the Contract should the imposition of sanctions against a country or person or the addition of a good or service to the list of sanctioned goods or services cause an impossibility of performance for the Contractor, the Contractor may request that the Contract be terminated in accordance with GC7.3 TERMINATION OF CONTRACT.

GC2 ADMINISTRATION OF THE CONTRACT

GC2.1 DEPARTMENTAL REPRESENTATIVE'S AUTHORITY

1) Canada shall designate a Departmental Representative and shall notify the Contractor of the name, address and telephone number of the Departmental Representative.

2) The Departmental Representative shall perform Canada's duties and functions under the contract.

3) The Departmental Representative shall be authorized to issue notices, instructions and directions to the Contractor and to accept on behalf of Canada any notice, order or other communication from the contractor relating to the Work.

4) The Departmental Representative shall, within a reasonable time, review and respond to submissions made by the Contractor in accordance with the requirements of the Contract.

GC2.2 INTERPRETATION OF CONTRACT

1) If, at any time before Canada has issued a Certificate of Completion, 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

   (a) the meaning of anything in the drawings and specifications;

   (b) the meaning to be given to the drawings and specifications in case of any error therein, omission therefrom, or obscurity or discrepancy in their wording or intention;

   (c) 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;

   (d) whether or not the labour, Plant or Material performed, used and supplied by the Contractor for performing the Work and carrying out the Contract are adequate to ensure that the Work shall be performed in accordance with the Contract and that the Contract shall be carried out in accordance with its terms;

   (e) what quantity of any of the Work has been completed by the Contractor; or

   (f) the timing and scheduling of the various phases of the performance of the Work as specified in the Contract;

   the question shall be decided, subject to the provisions of GC8 DISPUTE RESOLUTION, by Canada.

2) The Contractor shall perform the Work in accordance with any decisions of Canada that are made under paragraph 1) of GC2.2 and in accordance with any consequential directions given by Canada.

3) If the Contractor fails to comply with any instruction or direction issued by Canada pursuant to the Contract, Canada may employ such methods as Canada deems advisable to do what the Contractor failed to do, and the Contractor shall, on demand, pay Canada an amount that is equal to the aggregate of all costs, expenses and damages incurred or sustained by Canada by reason of the Contractor's failure to comply with such instruction or direction, including the cost of any methods employed by Canada in doing what the Contractor failed to do.

GC2.3 NOTICES

1) Subject to paragraph 3) of GC2.3, any notice, order or other communication may be given in any manner, and if required to be in writing, shall be addressed to the party to whom it is intended at the address in the Contract or at the last address of which the sender has received written notice in accordance with this section.

2) Any notice, order or other communication given in writing in accordance with paragraph 1) of GC2.3 shall be deemed to have been received by either party

   (a) if delivered personally, on the day that it was delivered;

   (b) if forwarded by mail, on the earlier of the day it was received or the sixth day after it was mailed; and

   (c) if forwarded by facsimile or electronic mail, 24 hours after it was transmitted.

3) A notice given under GC7.1 TAKING THE WORK OUT OF THE CONTRACTOR'S HANDS, GC7.2 SUSPENSION OF WORK, and GC7.3 TERMINATION OF CONTRACT shall be given in writing and, if delivered personally, shall be delivered, if the Contractor is a sole proprietor, to the Contractor or, if the Contractor is a partnership or corporation, to an officer thereof.

GC2.4 SITE MEETINGS

1) In consultation with Canada, the Contractor shall arrange site meetings at regular intervals, with all involved parties who are to attend, in order to ensure, among other things, the proper co-ordination of the Work.

GC2.5 REVIEW AND INSPECTION OF WORK

1) Canada shall review the Work to determine if it is proceeding in conformity with the Contract and to record the necessary data to make an assessment of the value of Work completed. Canada shall measure and record the quantities of labour, Plant and Material performed, used or supplied by the Contractor in performing the Work or any part thereof that is subject to a Unit Price Arrangement and, on request, shall inform the Contractor of those measurements, and permit the Contractor to inspect any records pertaining thereto.

2) Canada shall reject Work or Material which in Canada's opinion does not conform to the requirements of the Contract, and shall require inspection or testing of Work, whether or not such Work is fabricated, installed, or completed. If such Work is not in accordance with the

requirements of the Contract, the Contractor shall correct the Work and shall pay Canada, on demand, all reasonable costs and expenses that were incurred by Canada in having the examination performed.

3) The Contractor shall provide Canada with access to the Work and its site at all times, and at all times shall provide sufficient, safe, and proper facilities for the review and inspection of the Work by persons authorized by Canada and any representatives of those authorities having jurisdiction. If parts of the Work are in preparation at locations other than the site of the Work, Canada shall be given access to such Work whenever it is in progress.

4) The Contractor shall furnish Canada with such information respecting the performance of the Contract as Canada may require, and render every possible assistance to enable Canada to verify that the Work is performed in accordance with the Contract, carry out any other duties and exercise any powers in accordance with the Contract.

5) If Work is designated for tests, inspections, or approvals in the Contract or by Canada's instructions, or by laws or ordinances of the place of the Work, the Contractor shall give Canada reasonable notice of when such Work shall be ready for review and inspection. The Contractor shall arrange for and shall give Canada reasonable notice of the date and time of inspections, tests or approvals.

6) If the Contractor covers, or permits to be covered, Work that has been designated for tests, inspections or approvals before such tests, inspections or approvals are made, completed or given, the Contractor shall, if so directed by Canada, uncover such Work, have the inspections, tests or approvals satisfactorily made, completed or given and make good the covering of the Work at the Contractor's expense.

GC2.6 SUPERINTENDENT

1) Prior to commencing the Work, the Contractor shall designate a Superintendent and shall notify Canada of the name, address and telephone number of the Superintendent. The Contractor shall keep the Superintendent at the Work site during working hours until the Work has reached completion.

2) The Superintendent shall be in full charge of the operations of the Contractor during the performance of the Work and shall be authorized to accept on behalf of the Contractor any notice, order or other communication given to the Superintendent or the Contractor relating to the Work.

3) Upon request of Canada, the Contractor shall remove any Superintendent who, in the opinion of Canada, is incompetent or has been guilty of improper conduct, and shall forthwith designate another Superintendent who is acceptable to Canada.

4) The Contractor shall not substitute a Superintendent without the written consent of Canada. If a Superintendent is substituted without such consent, Canada shall be entitled to refuse to issue any documentation or certification relating to progress payments, Substantial Performance or Completion of the Work until the Superintendent has returned to the Work site or another Superintendent who is acceptable to Canada has been substituted.

GC2.7 NON-DISCRIMINATION IN HIRING AND EMPLOYMENT OF LABOUR

1) For the purposes of this clause, “persons" include the Contractor, its subcontractors and suppliers at any tier and their respective employees, agents, licensees or invitees and any other individual involved in the performance of the Work or granted access to the Work site.

A “person” includes any partnership, proprietorship, firm, joint venture, consortium and corporation.

2) Without restricting the provisions of paragraph 3) of GC2.6, SUPERINTENDENT, the Contractor shall not refuse to employ and shall not discriminate in any manner against any person because

(a) 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;

(b) 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

(c) 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 (a) or (b).

3) Within two working days immediately following receipt of a written complaint pursuant to paragraph 2) of GC2.7, the Contractor shall

(a) cause to have issued a written direction to the person or persons named by the complainant to cease all actions that form the basis of the complaint;

(b) forward a copy of the complaint to Canada by registered mail or courier service; and

(c) when the Labour Conditions are applicable under the circumstances of the complaint, forward a copy of the complaint to HRSDC - Labour to the attention of the appropriate Director as described in the Labour Conditions (“HRSDC - Labour" means the labour component of the federal Department of Human Resources and Social Development).

4) Within twenty four (24) hours immediately following receipt of a direction from Canada to do so, the Contractor shall cause to have removed from the site of the Work and from the performance of Work under the Contract, any person or persons whom Canada believes to be in breach of the provisions of paragraph 2) of GC2.7.

5) No later than thirty (30) days after receipt of the direction referred to in paragraph 4) of GC2.7, the Contractor shall cause the necessary action to be commenced to remedy the breach described in the direction.

6) If a direction is issued pursuant to paragraph 4) of GC2.7, Canada may withhold from monies that are due and payable to the Contractor or setoff pursuant to GC5.9 RIGHT OF SETOFF, whichever is applicable, an amount representing the sum of the costs and payment referred to in paragraph 8) of GC2.7.

7) If the Contractor fails to proceed in accordance with paragraph 5) of GC2.7, Canada shall take the necessary action to have the breach remedied, and shall determine all supplementary costs incurred by Canada as a result.

8) Canada may make a payment directly to the complainant from monies that are due and payable to the Contractor upon receipt from the complainant of

(a) a written award issued pursuant to the federal *Commercial Arbitration Act*, R.S.C. 1985, c. 17 (2nd Supp.);

(b) a written award issued pursuant to the *Canadian Human Rights Act*, R.S.C. 1985, c. H-6;

(c) a written award issued pursuant to provincial or territorial human rights legislation; or

(d) a judgement issued by a court of competent jurisdiction.

9) If Canada is of the opinion that the Contractor has breached any of the provisions of this clause, Canada may take the Work out of the Contractor's hands pursuant to GC7.1 TAKING THE WORK OUT OF THE CONTRACTOR'S HANDS.

10) Subject to paragraph 7) of GC3.6 SUBCONTRACTING, the Contractor shall ensure that the provisions of this clause are included in all agreements and contracts entered into as a consequence of the Work.

GC2.8 ACCOUNTS AND AUDITS

1) The Contractor shall, in addition to the requirements expressed in paragraph 6) of GC3.4 EXECUTION OF THE WORK, maintain full records of the Contractor's estimated and actual cost of the Work together with all tender calls, quotations, contracts, correspondence, invoices, receipts and vouchers relating thereto, and shall make them available on request to audit and inspection by Canada and the Deputy Receiver General for Canada or by persons designated to act on behalf of either or both of them.

2) The Contractor shall allow any of the persons referred to in paragraph 1) of GC2.8 to make copies of and take extracts from any of the records and material, and shall furnish such persons or entities with any information those persons or entities may require from time to time in connection with such records and material.

3) The Contractor shall maintain and keep the records intact until the expiration of two years after the date that a Certificate of Completion has been issued or until the expiration of such other period of time as Canada may direct.

4) The Contractor shall cause all subcontractors at any tier 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 the requirements of this clause as if they were the Contractor.

GC3 EXECUTION AND CONTROL OF THE WORK

GC3.1 PROGRESS SCHEDULE

1) The Contractor shall

   (a) prepare and submit to Canada, prior to the submission of the Contractor's first progress claim, a progress schedule in accordance with the requirements set out in the Contract;

   (b) monitor the progress of the Work relative to the schedule and update the schedule as stipulated by the contract documents;

   (c) advise Canada of any revisions to the schedule required as the result of any extension of time for completion of the Contract that was approved by Canada; and

   (d) prepare and submit to Canada, at the time of issuance of a Certificate of Substantial Performance, an update of any schedule clearly showing a detailed timetable that is acceptable to Canada for the completion of any unfinished Work and the correction of all listed defects.

GC3.2 ERRORS AND OMISSIONS

1) The Contractor shall report promptly to Canada any errors, discrepancies, or omissions the Contractor may discover when reviewing the contract documents. In making a review, the Contractor does not assume any responsibility to Canada for the accuracy of the review. The Contractor shall not be liable for damage or costs resulting from such errors, discrepancies, or omissions in the contract documents prepared by or on behalf of Canada that the Contractor did not discover.

GC3.3 CONSTRUCTION SAFETY

1) Subject to GC3.7 CONSTRUCTION BY OTHER CONTRACTORS OR WORKERS, the Contractor shall be solely responsible for construction safety at the place of the Work and for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Work. In any emergency, the Contractor shall either stop the Work, make changes or order extra work to ensure the safety of life and the protection of the Work and neighbouring property.

2) Prior to commencing the Work, the Contractor shall notify the authorities having jurisdiction for construction safety at the site of the Work with respect to the intended commencement of the Work, and shall provide such authority with whatever additional information may be required by that authority.

GC3.4 EXECUTION OF THE WORK

1) The Contractor shall perform, use or supply and pay for, all labour, Plant, Material, tools, construction machinery and equipment, water, heat, light, power, transportation and other facilities and services necessary for the performance of the Work in accordance with the Contract.

2) The Contractor shall, at all times, perform the Work in a proper, diligent and expeditious manner as is consistent with construction industry standards and in accordance with the progress schedule prepared pursuant to GC3.1 PROGRESS SCHEDULE and shall provide sufficient personnel to fulfil the Contractor's obligations in accordance with that schedule.

3) Subject to paragraph 4) of GC3.4, the Contractor shall have complete care, custody and control of the Work and shall direct and supervise the Work so as to ensure compliance with the Contract. The Contractor shall be responsible for construction means, methods, techniques, sequences and procedures and for co-ordinating the various parts of the Work.

4) When requested in writing by Canada, the Contractor shall make appropriate alterations in the method, Plant or workforce at any time Canada considers the Contractor's actions to be unsafe or damaging to either the Work, existing facilities, persons at the site of the Work or the environment.

5) The Contractor shall have sole responsibility for the design, erection, operation, maintenance and removal of temporary structures and other temporary facilities and for the construction methods used in their erection, operation, maintenance and removal. The Contractor shall engage and pay for registered professional engineering personnel, skilled in the appropriate discipline to perform these functions if required by law or by the Contract, and in all cases when such temporary facilities and their methods of construction are of such a nature that professional engineering skill is required to produce safe and satisfactory results.

6) The Contractor shall keep at least one copy of current contract documents, submittals, reports, and records of meetings at the site of the Work, in good order and available to Canada.

7) Except for any part of the Work that is necessarily performed away from or off the site of the Work, the Contractor shall confine Plant, storage of Material, and operations of employees to limits indicated by laws, ordinances, permits or the contract documents.

GC3.5 MATERIAL

1) Unless otherwise specified in the Contract, all Material incorporated in the Work shall be new.

2) Subject to paragraph 3) of GC3.5, if a specified reused, refurbished, or recycled item of Material is not available, the Contractor shall apply to Canada to substitute a similar item for the one specified.

3) If Canada agrees that the Contractor's application for substitution of a reused, refurbished or recycled item is warranted, and that the substitute item is of acceptable quality and value to

that specified and is suitable for the intended purpose, Canada may approve the substitution, subject to the following:

(a) the request for substitution shall be made in writing to Canada and shall be substantiated by information in the form of the manufacturer's literature, samples and other data that may be required by Canada;

(b) the Contractor shall make the request for substitution in a manner that shall not negatively affect the progress schedule of the Contract and well in advance of the time the item of Material must be ordered;

(c) substitution of Material shall be permitted only with the prior written approval of Canada, and any substituted items that are supplied or installed without such approval shall be removed from the site of the Work at the expense of the Contractor, and specified items installed at no additional cost to Canada; and

(d) the Contractor shall be responsible for all additional expenses incurred by Canada, the Contractor, its subcontractors and suppliers at any tier due to the Contractor's use of the substitute.

GC3.6 SUBCONTRACTING

1) Subject to the provisions of this clause, the Contractor may subcontract any part of the Work but not the whole of the Work.

2) The Contractor shall notify Canada in writing of the Contractor's intention to subcontract.

3) A notification referred to in paragraph 2) of GC3.6 shall identify the part of the Work and the Subcontractor with whom the Contractor intends to subcontract.

4) Canada may for reasonable cause, object to the intended subcontracting by notifying the Contractor in writing within six (6) days of receipt by Canada of a notification referred to in paragraph 2) of GC3.6.

5) If Canada objects to a subcontracting, the Contractor shall not enter into the intended subcontract.

6) The Contractor shall not change, nor permit to be changed, a Subcontractor engaged by the Contractor, in accordance with this clause, without the written consent of Canada.

7) The Contractor shall ensure that all the terms and conditions of the Contract that are of general application shall be incorporated in every other contract issued as a consequence of the Contract, at whatever tier, except those contracts issued solely to suppliers at any tier for the supply of Plant or Material.

8) Neither a subcontracting nor Canada's consent to a subcontracting shall be construed to relieve the Contractor from any obligation under the Contract or to impose any liability upon Canada.

GC3.7 CONSTRUCTION BY OTHER CONTRACTORS OR WORKERS

1) Canada reserves the right to send other contractors or workers, with or without Plant and Material, onto the site of the Work.

2) When other contractors or workers are sent on to the site of the Work, Canada shall

   (a) enter into separate contracts, to the extent it is possible, with the other contractors under conditions of contract that are compatible with the conditions of the Contract;

   (b) ensure that the insurance coverage provided by the other contractors is co-ordinated with the insurance coverage of the Contractor as it affects the Work; and

   (c) take all reasonable precautions to avoid labour disputes or other disputes arising from the work of the other contractors or workers.

3) When other contractors or workers are sent on to the site of the Work, the Contractor shall

   (a) co-operate with them in the carrying out of their duties and obligations;

   (b) co-ordinate and schedule the Work with the work of the other contractors and workers;

   (c) participate with other contractors and workers in reviewing their construction schedules when directed to do so;

   (d) where part of the Work is affected by or depends upon the work of other contractors or workers for its proper execution, promptly report to Canada in writing and prior to proceeding with that part of the Work, any apparent deficiencies in such work. Failure by the Contractor to so report shall invalidate any claims against Canada by reason of the deficiencies in the work of other contractors or workers except those deficiencies that are not then reasonably discoverable; and

   (e) when designated as being responsible for construction safety at the place of work in accordance with the applicable provincial or territorial laws, carry out its duties in that role and in accordance with those laws.

4) If, when entering into the Contract, the Contractor could not have reasonably foreseen nor anticipated the sending of other contractors or workers on to the site of the Work and provided the Contractor

   (a) incurs extra expense in complying with the requirements of paragraph 3) of GC3.7; and

   (b) gives Canada written notice of a claim for that extra expense within thirty (30) days of the date that the other contractors or workers were sent onto the Work or its site;

   Canada shall pay the Contractor the cost of the extra labour, Plant and Material that was necessarily incurred, calculated in accordance with GC6.4 DETERMINATION OF PRICE.

GC3.8 LABOUR

1) To the extent to which they are available, consistent with proper economy and the expeditious carrying out of the Work, the Contractor shall, in the performance of the Work, employ a reasonable number of persons who have been on active service with the Armed Forces of Canada and have been honourably discharged therefrom.

2) The Contractor shall maintain good order and discipline among the Contractor's employees and workers engaged in the Work and shall not employ on the site of the Work anyone not skilled in the tasks assigned.

GC3.9 TRUCK HAULAGE RATES

CANCELLED

GC3.10 MATERIAL, PLANT AND REAL PROPERTY BECOME PROPERTY OF CANADA

1) Subject to paragraph 9) of GC1.8 LAWS PERMITS AND TAXES, all Material and Plant and the interest of the Contractor in all real property, licences, powers and privileges purchased, used or consumed by the Contractor for the Work shall, immediately after the time of their purchase, use or consumption be the property of Canada for the purposes of the Work and they shall continue to be the property of Canada

   (a) in the case of Material, until Canada indicates that the Materials shall not be required for the Work; and

   (b) in the case of Plant, real property, licences, powers and privileges, until Canada indicates that the interest vested in Canada therein is no longer required for the purposes of the Work.

2) Material or Plant, that is the property of Canada by virtue of paragraph 1) of GC3.10, shall not be taken away from the site of the Work nor used nor disposed of except for the purposes of the Work without the written consent of Canada.

3) Canada is not liable for loss of nor damage from any cause to the Material or Plant referred to in paragraph 1) of GC3.10, and the Contractor is liable for such loss or damage notwithstanding that the Material or Plant is the property of Canada.

GC3.11 DEFECTIVE WORK

1) The Contractor shall promptly remove from the site of the Work and replace or re-execute defective Work whether or not the defective Work has been incorporated in the Work and whether or not the defect is the result of poor workmanship, use of defective Material, or damage through carelessness or other act or omission of the Contractor.

2) The Contractor, at the Contractor's expense, shall promptly make good other work destroyed or damaged by such removals or replacements.

3) If, in the opinion of Canada, it is not expedient to correct defective Work or Work not performed as provided for in the Contract documents, Canada may deduct from the amount otherwise due to the Contractor the difference in value between the Work as performed and that called for by the contract documents.

4) The failure of Canada to reject any defective Work or Material shall not constitute acceptance of the defective Work or Material.

GC3.12 CLEANUP OF SITE

1) The Contractor shall maintain the Work and its site in a tidy condition and free from an accumulation of waste material and debris.

2) Before the issue of a Certificate of Substantial Performance, the Contractor shall remove waste material and debris, and all Plant and Material not required for the performance of the remaining Work and, unless otherwise stipulated in the Contract Documents, shall cause the Work and its site to be clean and suitable for occupancy by Canada.

3) Before the issue of a Certificate of Completion, the Contractor shall remove all surplus Plant and Materials and any waste products and debris from the site of the Work.

4) The Contractor's obligations described in paragraphs 1) to 3) of GC3.12 do not extend to waste products and other debris caused by Canada's servants, or by other contractors and workers referred to in GC3.7 CONSTRUCTION BY OTHER CONTRACTORS OR WORKERS.

GC3.13 WARRANTY AND RECTIFICATION OF DEFECTS IN WORK

1) Without restricting any warranty or guarantee implied or imposed by law or contained in the Contract, the Contractor shall, at the Contractor's expense

   (a) rectify and make good any defect or fault that appears in the Work or comes to the attention of Canada with respect to those parts of the Work accepted in connection with the Certificate of Substantial Performance within 12 months from the date of Substantial Performance; and

   (b) rectify and make good any defect or fault that appears in or comes to the attention of Canada in connection with those parts of the Work described in the Certificate of Substantial Performance within 12 months from the date of the Certificate of Completion.

   (c) transfer and assign, to Canada, any subcontractor, manufacturer or supplier extended warranties or guarantees implied or imposed by law or contained in the Contract covering periods beyond the 12 months stipulated above. Extended warranties or guarantees referred to herein shall not extend the 12-month period whereby the Contractor, except as may be provided elsewhere in the Contract, must rectify and make good any defect or fault that appears in the Work or comes to the attention of Canada.

   (d) provide, to Canada prior to the issuance of the Certificate of Completion, a list of all extended warranties and guarantees referred to in paragraph (c) above.

2) Canada may direct the Contractor to rectify and make good any defect or fault referred to in paragraph 1) of GC3.13 or covered by any other expressed or implied warranty or guarantee and the Contractor shall rectify and make good such defect within the time stipulated in the direction.

3) A direction referred to in paragraph 2) GC3.13 shall be in writing and shall be given to the Contractor in accordance with GC2.3 NOTICES.

GC4 PROTECTIVE MEASURES

GC4.1 PROTECTION OF WORK AND PROPERTY

1) The Contractor shall protect the Work and its site against loss or damage from any cause and shall similarly protect all Material, Plant and real property under the Contractor's care, custody and control whether or not such Material, Plant and real property are supplied by Canada to the Contractor.

2) The Contractor shall provide all facilities necessary for the purpose of maintaining security, and shall assist any person authorized by Canada to inspect or to take security measures in respect of the Work and its site.

3) Canada may direct the Contractor to do such things and to perform such work as Canada considers reasonable and necessary to ensure compliance with or to remedy a breach of paragraphs 1) or 2) of GC4.1, and the Contractor, shall comply with such direction.

GC4.2 PRECAUTIONS AGAINST DAMAGE, INFRINGEMENT OF RIGHTS, FIRE AND OTHER HAZARDS

1) The Contractor shall do whatever is necessary to ensure that

   (a) no person, property, right, easement nor privilege is injured, damaged or infringed upon by reasons of the Contractor's activities in performing the Work;

   (b) pedestrian and other traffic on any public or private road or waterway is not unduly impeded, interrupted nor endangered by the performance or existence of the Work, Material or Plant;

   (c) fire hazards in or about the site of the Work are eliminated and any fire is promptly extinguished;

   (d) the health and safety of all persons employed in the performance of the Work is not endangered by the methods nor means of their performance;

   (e) adequate medical services are available to all persons employed on the Work or its site at all times during the performance of the Work;

   (f) adequate sanitation measures are taken in respect of the Work and its site; and

   (g) all stakes, buoys and marks placed on the Work or its site by Canada are protected and are not removed, defaced, altered nor destroyed.

2) Canada may direct the Contractor to do such things and to perform such work as Canada considers reasonable and necessary to ensure compliance with or to remedy a breach of paragraph 1) of GC4.2, and the Contractor shall comply with the direction of Canada.

GC4.3 MATERIAL, PLANT AND REAL PROPERTY SUPPLIED BY CANADA

1) Subject to paragraph 2) of GC4.3, the Contractor is liable to Canada 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 Canada for use in connection with the Contract, whether or not that loss or damage is attributable to causes beyond the Contractor's control.

2) The Contractor is not liable to Canada for any loss or damage to Material, Plant or real property referred to in paragraph 1) of GC4.3 if that loss or damage results from and is directly attributable to reasonable wear and tear.

3) The Contractor shall not use any Material, Plant or real property supplied by Canada except for the purpose of performing the Contract.

4) When the Contractor fails to make good any loss or damage for which the Contractor is liable under paragraph 1) within a reasonable time, Canada may cause the loss or damage to be made good at the Contractor's expense, and the Contractor shall thereupon be liable to Canada for the cost thereof and shall, on demand, pay to Canada an amount equal to that cost.

5) The Contractor shall keep records of all Material, Plant and real property supplied by Canada as Canada requires and shall satisfy Canada, when requested, that such Material, Plant and real property are at the place and in the condition in which they ought to be.

GC4.4 CONTAMINATED SITE CONDITIONS

1) For the purposes of GC4.4, a contaminated site condition exists when a solid, liquid, gaseous, thermal or radioactive irritant or contaminant, or other hazardous or toxic substance or material, including moulds and other forms of fungi, is present at the site of the Work to an extent that constitutes a hazard, or potential hazard, to the environment, property, or the health or safety of any person.

2) If the Contractor encounters a contaminated site condition of which the Contractor is not aware or about which the Contractor has not been advised, or if the Contractor has reasonable grounds to believe that such a site condition exists at the site of the Work, the Contractor shall

   (a) take all reasonable steps, including stopping the Work, to ensure that no person suffers injury, sickness or death, and that neither property nor the environment is injured or destroyed as a result of the contaminated site condition;

   (b) immediately notify Canada of the circumstances in writing; and

   (c) take all reasonable steps to minimize additional costs that may accrue as a result of any work stoppage.

3) Upon receipt of a notification from the Contractor, Canada shall promptly determine whether a contaminated site condition exists, and shall notify the Contractor in writing of any action to be taken, or work to be performed, by the Contractor as a result of Canada's determination.

4) If the Contractor's services are required by Canada, the Contractor shall follow the direction of Canada with regard to any excavation, treatment, removal and disposal of any polluting substance or material.

5) Canada, at Canada's sole discretion, may enlist the services of experts and specialty contractors to assist in determining the existence of, and the extent and treatment of contaminated site conditions, and the Contractor shall allow them access and co-operate with them in the carrying out of their duties and obligations.

6) Except as may be otherwise provided for in the Contract, the provisions of GC6.4 DETERMINATION OF PRICE shall apply to any additional work made necessary because of a contaminated site condition.

GC5 TERMS OF PAYMENT

GC5.1 INTERPRETATION

In these Terms of Payment

1) The "payment period" means a period of 30 consecutive days or such other longer period as may be agreed between the Contractor and Canada.

2) An amount is "due and payable" when it is due and payable by Canada to the Contractor according to GC5.4 PROGRESS PAYMENT, GC5.5 SUBSTANTIAL PERFORMANCE OF THE WORK or GC5.6 FINAL COMPLETION.

3) An amount is “overdue” when it remains unpaid on the first day following the day upon which it is due and payable.

4) The "date of payment" means the date of the negotiable instrument of an amount due and payable by the Receiver General for Canada.

5) The "Bank Rate" means the rate of interest established by the Bank of Canada as the minimum rate at which it makes short term advances to members of the Canadian Payments Association.

6) The "Average Bank Rate" means the simple arithmetic mean of the Bank Rate in effect at 4:00 p.m. Eastern Time each day during the calendar month which immediately precedes the calendar month in which payment is made.

GC5.2 AMOUNT PAYABLE

1) Subject to any other provisions of the Contract, Canada shall pay the Contractor, at the times and in the manner hereinafter set out, the amount by which the amounts payable by Canada to the Contractor in accordance with the Contract exceed the amounts payable by the Contractor to Canada, and the Contractor shall accept that amount as payment in full satisfaction for everything furnished and done by the Contractor in respect of the Work to which the payment relates.

2) When making any payment to the Contractor, the failure of Canada to deduct an amount payable to Canada by the Contractor 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.

3) Should any payment be made by Canada in excess of what is owed to the Contractor for the actual work performed, the Contractor will reimburse Canada the excess immediately, with or without demand, and any amounts outstanding shall bear simple interest at the Average Bank rate plus 3 percent per annum from the date of overpayment until the day prior to the date of repayment by the Contractor.

4) No payment other than a payment that is expressly stipulated in the Contract shall be made by Canada to the Contractor for any extra expense or any loss or damage incurred or sustained by the Contractor.

GC5.3 INCREASED OR DECREASED COSTS

1) The Contract Amount shall not be increased nor 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, Material or any wage adjustment arising pursuant to the Labour Conditions.

2) Notwithstanding paragraph 1) of GC5.3, if any change, including a new imposition or repeal, of any tax, customs or other duty, charge, or any similar imposition that is imposed under sales, customs or excise tax legislation of the Government of Canada or any Provincial or Territorial legislation, affects the cost of the Work to the Contractor, and occurs

   (a) after the date of submission by the Contractor of its bid; or

   (b) after the date of submission of the last revision, if the Contractor's bid was revised;

   the Contract Amount shall be adjusted in the manner provided in paragraph 3) of GC5.3.

3) If a change referred to in paragraph 2) of GC5.3 occurs, the Contract Amount shall be increased or decreased by an amount established by an examination by Canada of the relevant records of the Contractor referred to in GC2.8 ACCOUNTS AND AUDITS to be the increase or decrease in the cost incurred by the Contractor that is directly attributable to that change.

4) For the purpose of paragraph 2) of GC5.3, if a tax is changed after the solicitation closing, but public notice of the change has been given by the Minister of Finance or the corresponding Provincial or Territorial authority before that closing, the change shall be deemed to have occurred before the solicitation closing.

5) Notwithstanding paragraphs 2) to 4) of GC5.3, no adjustment to the Contract Amount in respect of the Work or a part thereof shall be made for a change in any imposition referred to in this section that occurs after the date required by the Contract for completion of the Work or that part of the Work.

GC5.4 PROGRESS PAYMENT

1) On the expiration of a payment period, the Contractor shall deliver to Canada

   (a) a written progress claim in a form acceptable to Canada 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, and

   (b) a completed and signed statutory declaration containing a declaration that, up to the date of the progress claim, the Contractor has complied with all lawful obligations with

respect to the Labour Conditions and that, in respect of the Work, all lawful obligations of the Contractor to its Subcontractors and Suppliers, referred to collectively in the declaration as “subcontractors and suppliers”, have been fully discharged.

2) Within 10 days of receipt of a progress claim and statutory declaration from the Contractor, Canada shall inspect, or cause to have inspected, the part of the Work and the Material described in the progress claim, and shall issue a progress report 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 Canada

   (a) is in accordance with the Contract; and

   (b) was not included in any other progress report relating to the Contract.

3) Subject to GC5.2 AMOUNT PAYABLE, and paragraph 5) of GC5.4, Canada shall pay the Contractor an amount that is equal to

   (a) 95 percent of the value that is indicated in Canada's progress report if a labour and material payment bond has been furnished by the Contractor; or

   (b) 90 percent of the value that is indicated in Canada's progress report if a labour and material payment bond has not been furnished by the Contractor.

4) Canada shall pay the amount referred to in paragraph 3) of GC5.4 not later than

   (a) 30 days after receipt by Canada of both a progress claim and a statutory declaration referred to in paragraph 1) of GC5.4; or

   (b) 15 days after receipt by Canada of the Contractor’s progress schedule or updated progress schedule, in accordance with GC3.1 PROGRESS SCHEDULE,

   whichever is later.

5) In the case of the Contractor's first progress claim, it is a condition precedent to Canada's obligation under paragraph 3) of GC5.4 that the Contractor has provided all necessary documentation required by the Contract for the first progress claim.

GC5.5 SUBSTANTIAL PERFORMANCE OF THE WORK

1) If, at any time before the issuance of a Certificate of Completion, Canada determines that the Work has reached Substantial Performance as described in subparagraph 1) (b) of GC1.1.4 SUBSTANTIAL PERFORMANCE, Canada shall issue a Certificate of Substantial Performance to the Contractor. The Certificate of Substantial Performance shall state or describe

   (a) the date of Substantial Performance;

   (b) the parts of the Work not completed to the satisfaction of Canada; and

   (c) all things that must be done by the Contractor before a Certificate of Completion is issued and before the 12-month warranty period referred to in GC3.13 WARRANTY AND RECTIFICATION OF DEFECTS IN WORK commences for the said parts and all the said things.

2) The issuance of a Certificate of Substantial Performance does not relieve the Contractor from the Contractor's obligations under GC3.11 DEFECTIVE WORK.

3) Subject to GC5.2 AMOUNT PAYABLE and paragraph 4) of GC5.5, Canada shall pay the Contractor the amount referred to in paragraph 1) of GC5.2 AMOUNT PAYABLE, less the aggregate of

   (a) the sum of all payments that were made pursuant to GC5.4 PROGRESS PAYMENT;

   (b) an amount that is equal to Canada's estimate of the cost to Canada of rectifying defects described in the Certificate of Substantial Performance; and

   (c) an amount that is equal to Canada's estimate of the cost to Canada of completing the parts of the Work described in the Certificate of Substantial Performance other than defects listed therein.

4) Canada shall pay the amount referred to in paragraph 3) of GC5.5 not later than

   (a) 30 days after the date of issue of a Certificate of Substantial Performance, or

   (b) 15 days after the Contractor has delivered to Canada

      (i) a statutory declaration containing a declaration by the Contractor that up to the date of the Certificate of Substantial Performance, the Contractor has complied with all lawful obligations with respect to the Labour Conditions, discharged all its lawful obligations to its Subcontractors and Suppliers in respect of the work under the Contract, and discharged its lawful obligations referred to in GC1.8 LAWS, PERMITS AND TAXES;

      (ii) evidence of compliance with workers' compensation legislation in accordance with GC1.9 WORKERS' COMPENSATION; and

      (iii) an update of the progress schedule in accordance with the requirements of GC3.1 PROGRESS SCHEDULE;

   whichever is later.

GC5.6 FINAL COMPLETION

1) When Canada is of the opinion that the Contractor has complied with the Contract and all orders and directions made pursuant thereto, and that the Work has been completed as described in GC1.1.5 COMPLETION, Canada shall issue a Certificate of Completion to the Contractor and, if the Work or a portion of the Work is subject to a Unit Price Arrangement, Canada shall issue a Certificate of Measurement that shall, subject to GC8, be binding upon and conclusive between Canada and the Contractor as to the quantities referred to therein.

2) Subject to GC5.2 AMOUNT PAYABLE and paragraph 3) of GC5.6, Canada shall pay the Contractor the amount referred to in GC5.2 AMOUNT PAYABLE, less the aggregate of the sum of all payments that were made pursuant to GC5.4 PROGRESS PAYMENT and GC5.5 SUBSTANTIAL PERFORMANCE OF WORK.

3) Canada shall pay the amount referred to in paragraph 2) of GC5.6 not later than

   (a) 60 days after the date of issue of a Certificate of Completion; or

(b) 15 days after the Contractor has delivered to Canada

(i) a statutory declaration which contains a declaration 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; and

(ii) evidence of compliance with workers' compensation legislation in accordance with GC1.9 WORKERS' COMPENSATION;

whichever is later.

GC5.7 PAYMENT NOT BINDING ON CANADA

1) Neither acceptance of a progress claim or progress report, nor any payment made by Canada under the Contract, nor partial or entire use or occupancy of the Work by Canada shall constitute an acceptance by Canada of any portion of the Work or Material that is not in accordance with the requirements of the Contract.

GC5.8 CLAIMS AND OBLIGATIONS

1) The Contractor shall discharge all the Contractor's lawful obligations and shall satisfy all lawful claims against the Contractor arising out of the performance of the Work at least as often as the Contract requires Canada to pay the Contractor.

2) Whenever requested to do so by Canada, the Contractor shall make a statutory declaration declaring to the existence and condition of any obligations and claims against the Contractor arising out of the performance of the Work.

3) In order to discharge lawful obligations of and satisfy lawful claims against the Contractor or its Subcontractors arising out of the performance of the Contract, Canada may pay an amount that is due and payable to the Contractor directly to the claimant. Such payment is, to the extent of the payment, a discharge of Canada’s liability to the Contractor under the Contract and may be deducted from any amount payable to the Contractor under the Contract.

4) For the purposes of paragraph 3) of GC5.8, and subject to paragraph 6) of GC5.8, a claim or obligation shall be considered lawful when it is so determined by

(a) a court of legal jurisdiction;

(b) an arbitrator duly appointed to arbitrate the claim; or

(c) the written consent of the Contractor authorizing payment of the claim or obligation.

5) If a claim or obligation would have been subject to the provisions of Provincial or Territorial lien legislation or, in the Province of Quebec, the law relating to legal hypothecs had the Contractor been performing the Work for an entity other than Canada

(a) such amount as may be paid by Canada pursuant to paragraphs 3) and 4) of GC5.8 shall not exceed the amount that the Contractor would have been obliged to pay had the provisions of such legislation or law been applicable to the Work;

(b) a 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 the claimant might have had; and

(c) for the purposes of determining the entitlement of a claimant, the notice required by paragraph 8) of GC5.8 shall be deemed to replace the registration or provision of notice after the performance of work as required by any applicable legislation and no claim shall be deemed to have expired, become void or unenforceable by reason of the claimant not commencing any action within the time prescribed by such legislation.

6) The Contractor shall, at the request of any claimant, submit to binding arbitration those questions that need to be answered to establish the entitlement of the claimant to payment. The arbitration shall have as parties to it any Subcontractor or Supplier to whom the claimant supplied Material, performed work or rented equipment should such Subcontractor or Supplier wish to be adjoined, and Canada shall not be a party to such arbitration. Subject to any agreement between the Contractor and the claimant, the arbitration shall be conducted in accordance with the governing Provincial or Territorial legislation applicable to the site of the Work.

7) Paragraph 3) of GC5.8 shall apply only to claims and obligations

(a) the notification of which has set forth the amount claimed to be owing and the person who by contract is primarily liable and has been received by Canada in writing before final payment is made to the Contractor pursuant to GC5.6 FINAL COMPLETION, and within 120 days of the date on which the claimant

(i) should have been paid in full under the claimant's contract with the Contractor, its Subcontractor or Supplier if the claim is for money that was lawfully required to be held back from the claimant; or

(ii) 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 its Subcontractor or Supplier where the claim is for money not lawfully required to be held back from the claimant; and

(b) the proceedings to determine the right to payment of which, pursuant to paragraph 5) of GC5.8, shall have commenced within one year from the date that the notification required by subparagraph 7)(a) of GC5.8 was received by Canada.

8) Upon receipt of a notice of claim, Canada may withhold, from any amount that is due and payable to the Contractor pursuant to the Contract, the full amount of the claim or any portion thereof.

9) Canada shall notify the Contractor in writing in a timely manner of receipt of any claim and of the intention of Canada to withhold funds. At any time thereafter and until payment is made to the claimant, the Contractor may be entitled to post, with Canada, security in a form acceptable to Canada in an amount equal to the value of the claim, and upon receipt of such security Canada shall release to the Contractor any funds that would be otherwise payable to the Contractor, that were withheld pursuant to the provisions of this clause in respect of the claim of any claimant for whom the security stands.

GC5.9 RIGHT OF SETOFF

1) Without limiting any right of setoff or deduction given or implied by law or elsewhere in the Contract, Canada may set off any amount payable to Canada by the Contractor under the

Contract, or under any current contract, against any amount payable to the Contractor under the Contract.

2) For the purposes of paragraph 1) of GC5.9, "current contract" means a contract between Canada and the Contractor

   (a) under which the Contractor has an undischarged obligation to perform or supply work, labour or material; or

   (b) in respect of which Canada has, since the date of the Contract, exercised any right to take the work that is the subject of that contract out of the Contractor's hands.

GC5.10 ASSESSMENTS AND DAMAGES FOR LATE COMPLETION

1) For the purposes of this clause

   (a) the Work shall be deemed to be completed on the date of the Certificate of Completion; and

   (b) the "period of delay" means the number of days commencing on the day fixed 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 GC6.5 DELAYS AND EXTENSION OF TIME and any other day on which, in the opinion of Canada, completion of the Work was delayed for reasons beyond the control of the Contractor.

2) If the Contractor does not complete the Work by the day fixed for its completion but completes it thereafter, the Contractor shall pay Canada an amount equal to the aggregate of

   (a) all salaries, wages and travelling expenses incurred by Canada in respect of persons overseeing the performance of the Work during the period of delay;

   (b) the cost incurred by Canada as a result of the inability to use the completed Work for the period of delay; and

   (c) all other expenses and damages incurred or sustained by Canada during the period of delay as a result of the Work not being completed by the day fixed for its completion.

3) Canada may waive the right of Canada to the whole or any part of the amount payable by the Contractor pursuant to paragraph 2) of GC5.10 if, in the opinion of Canada, it is in the public interest to do so.

GC5.11 DELAY IN MAKING PAYMENT

1) Notwithstanding GC1.5 TIME OF THE ESSENCE, any delay by Canada in making any payment when it is due pursuant to GC5 TERMS OF PAYMENT, shall not be a breach of the Contract by Canada.

2) Subject to paragraph 3) of GC5.11, Canada shall pay to the Contractor simple interest at the Average Bank Rate plus 3 percent per annum on any amount that is overdue pursuant to paragraph 3) of GC5.1 INTERPRETATION, and the interest shall apply from and include the day such amount became overdue until the day prior to the date of payment.

3) Interest shall be paid without demand by the Contractor except that

   (a) in respect of amounts that are less than 15 days overdue, no interest shall be paid in respect of payment made within such 15 days unless the Contractor so demands after such amounts have become due and payable; and

   (b) interest shall not be payable or paid on overdue advance payments, if any.

GC5.12 INTEREST ON SETTLED CLAIMS

1) For the purposes of this clause, a claim means a disputed amount subject to negotiation between Canada and the Contractor under the Contract.

2) A claim is deemed to have been settled when an agreement in writing is signed by Canada and the Contractor setting out the amount of the claim to be paid by Canada and the items of work for which the said amount is to be paid.

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.

4) Canada shall pay to the Contractor simple interest on the amount of a settled claim at the Average Bank Rate plus 3 percent per annum from the date the settled claim was deemed to be outstanding until the day prior to the date of payment.

GC5.13 RETURN OF SECURITY DEPOSIT

1) After a Certificate of Substantial Performance has been issued, and if the Contractor is not in breach of nor in default under the Contract, Canada shall return to the Contractor all or any part of a Security Deposit that, in the opinion of Canada, is not required for the purposes of the Contract.

2) After a Certificate of Completion has been issued, Canada shall return to the Contractor the remainder of any security deposit unless the Contract stipulates otherwise.

3) If the security deposit was paid into the Consolidated Revenue Fund of Canada, Canada shall pay interest thereon to the Contractor at a rate established pursuant to section 21(2) of the *Financial Administration Act (FAA)*.

GC6 DELAYS AND CHANGES IN THE WORK

GC6.1 CHANGES IN THE WORK

1) At any time before issuance of a Certificate of Completion, Canada may issue orders for additions, deletions or other changes to the Work, or changes in the location or position of the whole or any part of the Work, if the addition, deletion, change or other revision is deemed by Canada to be consistent with the general intent of the Contract.

2) An order referred to in paragraph 1) of GC6.1 shall be in writing and given to the Contractor in accordance with GC2.3 NOTICES.

3) Upon receipt of an order, the Contractor shall promptly perform the work in accordance with the order as if the order had appeared in and been part of the original Contract.

4) If anything done or omitted by the Contractor pursuant to an order increases or decreases the cost of the Work to the Contractor, payment for the work shall be made in accordance with GC6.4 DETERMINATION OF PRICE.

GC6.2 CHANGES IN SUBSURFACE CONDITIONS

1) If, during the performance of the Work, the Contractor encounters subsurface conditions that are substantially different from the subsurface conditions described in the tender documents supplied to the Contractor, or a reasonable assumption of fact based thereon, the Contractor shall give notice to Canada immediately upon becoming aware of the situation.

2) If the Contractor is of the opinion that the Contractor may incur or sustain any extra expense or any loss or damage that is directly attributable to the changed subsurface conditions, the Contractor shall within 10 days of the date the changed subsurface conditions were encountered, give Canada written notice of intention to claim for that extra expense, loss or damage.

3) If the Contractor has given a notice referred to in paragraph 2) of GC6.2, the Contractor shall give Canada a written claim for extra expense, loss or damage no later than 30 days after the date that a Certificate of Substantial Performance is issued.

4) A written claim referred to in paragraph 3) of GC6.2 shall contain a sufficient description of the facts and circumstances of the occurrence that is the subject of the claim to enable Canada to determine whether or not the claim is justified, and the Contractor shall supply such further and other information for that purpose as Canada requires.

5) If Canada determines that a claim referred to in paragraph 3) of GC6.2 is justified, Canada shall make an extra payment to the Contractor in an amount that is calculated in accordance with GC6.4 DETERMINATION OF PRICE.

6) If, in the opinion of Canada, the Contractor effects a saving of expenditure that is directly attributable to a substantial difference between the information relating to subsurface conditions at the site of the Work that is contained in the tender documents, or a reasonable assumption of fact based thereon, and the actual subsurface conditions encountered by the Contractor, the Contract Amount shall be reduced by the amount of the saving of expenditure determined in accordance with GC6.4 DETERMINATION OF PRICE.

7) If the Contractor fails to give a notice referred to in paragraph 2) of GC6.2 and a claim referred to in paragraph 3) of GC6.2 within the times stipulated, an extra payment shall not be made to the Contractor in respect of the occurrence.

8) Canada does not warrant the content expressed in any subsurface report available for the perusal of the Contractor that does not form part of the tender and contract documents.

GC6.3 HUMAN REMAINS, ARCHAEOLOGICAL REMAINS AND ITEMS OF HISTORICAL OR SCIENTIFIC INTEREST

1) For the purposes of this clause

   (a) "human remains" means the whole or any part of a deceased human being, irrespective of the time of death;

   (b) "archaeological remains" are items, artefacts or things made, modified or used by human beings in antiquity and may include, but not be limited to, stone, wood or iron structures or monuments, dump deposits, bone artefacts, weapons, tools, coins, and pottery; and

   (c) "items of historical or scientific interest" are naturally occurring or manufactured objects or things of any age that are not archaeological remains but may be of interest to society because of their historical or scientific significance, value, rarity, natural beauty, or other quality.

2) If, during the course of the Work, the Contractor encounters any object, item or thing which is described in paragraph 1) of GC6.3 or which resembles any object, item or thing described in paragraph 1) of GC6.3, the Contractor shall

   (a) take all reasonable steps, including stopping work in the affected area, to protect and preserve the object, item or thing;

   (b) immediately notify Canada of the circumstances in writing; and

   (c) take all reasonable steps to minimize additional costs that may accrue as a result of any work stoppage.

3) Upon receipt of a notification in accordance with subparagraph 2)(b) of GC6.3, Canada shall promptly determine whether the object, item or thing is one described in, or contemplated by paragraph 1) of GC6.3, and shall notify the Contractor in writing of any action to be performed, or work to be carried out, by the Contractor as a result of Canada's determination.

4) Canada may, at any time, enlist the services of experts to assist in the investigation, examination, taking of measurements or other such recordings, placing of permanent protection around or removing of the object, item or thing encountered by the Contractor, and the Contractor shall, to the satisfaction of Canada, allow them access and co-operate with them in the carrying out of their duties and obligations.

5) Human remains, archaeological remains and items of historical or scientific interest encountered at the site of the Work shall be deemed to be the property of Canada.

6) Except as may be otherwise provided for in the Contract, the provisions of GC6.4 DETERMINATION OF PRICE and GC6.5 DELAYS AND EXTENSION OF TIME shall apply.

GC6.4 DETERMINATION OF PRICE

GC6.4.1 Price Determination Prior to Undertaking Changes

1) If a Lump Sum Arrangement applies to the Contract or a part thereof, the price of any change shall be the aggregate estimated cost of labour, Plant and Material that is required for the change as agreed upon in writing by the Contractor and Canada plus a negotiated allowance for supervision, co-ordination, administration, overhead, margin and the risk of undertaking the work within the stipulated amount.

2) If a Unit Price Arrangement applies to the Contract or a part thereof, the Contractor and Canada may, by agreement in writing, add items, units of measurement, estimated quantities and prices per unit to the Unit Price Table.

3) A price per unit referred to in paragraph 2) of GC6.4.1 shall be determined on the basis of the aggregate estimated cost of labour, Plant and Material that is required for the additional item as agreed upon by the Contractor and Canada, plus a negotiated allowance.

4) To facilitate approval of the price of the change or the additional price per unit as applicable, the Contractor shall submit a cost estimate breakdown identifying, as a minimum, the estimated cost of labour, Plant, Material, each subcontract amount, and the amount of the negotiated allowance.

5) If no agreement is reached as contemplated in paragraph 1) of GC6.4.1, the price shall be determined in accordance with GC6.4.2.

6) If no agreement is reached, as contemplated in paragraphs 2) and 3) of GC6.4.1, Canada shall determine the class and the unit of measurement of the item of labour, Plant or Material and the price per unit shall be determined in accordance with GC6.4.2.

GC6.4.2 Price Determination Following Completion of Changes

1) If it is not possible to predetermine, or if there is failure to agree upon the price of a change in the Work, the price of the change shall be equal to the aggregate of

   (a) all reasonable and proper amounts actually expended or legally payable by the Contractor in respect of the labour, Plant and Material that fall within one of the classes of expenditure described in paragraph 2) of GC6.4.2, that are directly attributable to the performance of the Contract;

   (b) an allowance for profit and all other expenditures or costs, including overhead, general administration costs, financing and interest charges, in an amount that is equal to 10 percent of the sum of the expenses referred to in subparagraph 1)(a) of GC6.4.2; and

   (c) interest on the amounts determined under subparagraphs 1)(a) and 1)(b) of GC6.4.2 calculated in accordance with GC5.12 INTEREST ON SETTLED CLAIMS;

2) The cost of labour, Plant and Material referred to in subparagraph 1)(a) of GC6.4.2 shall be limited to the following categories of expenditure:
   (a) payments to Subcontractors and Suppliers;

   (b) wages, salaries, bonuses and, if applicable, travel and lodging expenses of employees of the Contractor located at the site of the Work and that portion of wages, salaries, bonuses and, if applicable, travel and lodging expenses of personnel of the Contractor generally employed at the head office or at a general office of the Contractor provided they are actually and properly engaged on the Work under the Contract;

   (c) assessments payable under any statutory authority relating to workers' compensation, employment insurance, pension plan or holidays with pay, provincial health or insurance plans, environmental reviews, and Applicable Taxes collection costs;

   (d) 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 Canada;

   (e) payments for maintaining and operating Plant necessary for and used in the performance of the Work, and payments for effecting repairs thereto that, in the opinion of Canada, are necessary for the proper performance of the Contract, other than payments for any repairs to the Plant arising out of defects existing before its allocation to the Work;

   (f) 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;

   (g) payments for preparation, delivery, handling, erection, installation, inspection, protection and removal of the Plant and Material necessary for and used in the performance of the Contract; and

   (h) any other payments made by the Contractor with the approval Canada that are necessary for the performance of the Contract in accordance with the Contract Documents.

GC6.4.3 Price Determination - Variations in Tendered Quantities

1) Except as provided in paragraphs 2), 3), 4) and 5) of GC6.4.3, if it appears that the final quantity of labour, Plant and Material under a price per unit item shall exceed or be less than the estimated tendered quantity, the Contractor shall perform the Work or supply the Plant and Material required to complete the item and payment shall be made for the actual Work performed or Plant and Material supplied at the price per unit set out in the Contract.

2) If the final quantity of the price per unit item exceeds the estimated tendered quantity by more than 15 percent, either party to the Contract may make a written request to the other party to negotiate an amended price per unit for that portion of the item which exceeds 115 percent of the estimated tendered quantity, and to facilitate approval of any amended price per unit, the Contractor shall, on request, provide Canada with

   (a) detailed records of the actual cost to the Contractor of performing or supplying the tendered quantity for the price per unit item up to the time the negotiation was requested; and

(b) the estimated unit cost of labour, Plant and Material required for the portion of the item that is in excess of 115 percent of the tendered quantity.

3) If agreement is not reached as contemplated in paragraph 2) of GC6.4.3, the price per unit shall be determined in accordance with GC6.4.2.

4) If it appears that the final quantity of labour, Plant and Material under a price per unit item shall be less than 85 percent of the estimated tendered quantity, either party to the Contract may make a written request to the other party to negotiate a change to the price per unit for the item if

(a) there is a demonstrable difference between the unit cost to the Contractor of performing or supplying the estimated tendered quantity and the unit cost to the Contractor for performing or supplying the final quantity; and

(b) the difference in unit cost is due solely to the decrease in quantity and not to any other cause.

5) For the purposes of the negotiation referred to in paragraph 4) of GC6.4.3

(a) the onus of establishing, justifying and quantifying a proposed change lies with the party making the request for negotiation; and

(b) in no event shall the total price for an item that has been amended as a result of a reduction in quantity pursuant to paragraph 4) of GC6.4.3 exceed the amount that would have been payable to the Contractor had 85 percent of the tendered quantity actually been performed or supplied.

GC6.5 DELAYS AND EXTENSION OF TIME

1) Upon application of the Contractor made before the date first fixed for completion of the Work or before any other date previously fixed under this clause, Canada may extend the time for completion of the Work by fixing a new date if Canada determines that causes beyond the control of the Contractor have delayed its completion.

2) The Contractor's application shall be accompanied by the written consent of the bonding company whose bond forms part of the Contract Security.

3) Subject to paragraph 4) of GC6.5, no payment, other than a payment that is expressly stipulated in the Contract, shall be made by Canada to the Contractor for any extra expense, loss or damage incurred or sustained by the Contractor due to delay, whether or not the delay is caused by circumstances beyond the control of the Contractor.

4) If the Contractor incurs or sustains any extra expense or any loss or damage that is directly attributable to any neglect or delay that occurs after the date of the Contract on the part of Canada in providing any information or in doing any act that the Contract either expressly requires Canada to do or that would ordinarily be done by an owner in accordance with the practice of the trade, the Contractor shall give Canada written notice of intention to claim for that extra expense or loss or damage within ten working days of the date the neglect or delay first occurred.

5) When the Contractor has given a notice referred to in paragraph 4) of GC6.5, the Contractor shall give Canada a written claim for the extra expense, loss or damage no later than 30 days after the date that a Certificate of Completion is issued and not afterwards.

6) A written claim referred to in paragraph 5) of GC6.5 shall contain a sufficient description of the facts and circumstances of the occurrence that is the subject of the claim to enable Canada to determine whether or not the claim is justified and the Contractor shall supply such further and other information for that purpose as Canada may require.

7) If Canada determines that a claim referred to in paragraph 5) of GC6.5 is justified, Canada shall make an extra payment to the Contractor in an amount that is calculated in accordance with GC6.4 DETERMINATION OF PRICE.

8) If the Contractor fails to give a notice referred to in paragraph 4) and a claim referred to in paragraph 5) of GC6.5 within the times stipulated, an extra payment shall not be made to the Contractor in respect of the occurrence.

GC7 DEFAULT, SUSPENSION OR TERMINATION OF CONTRACT

GC7.1 TAKING THE WORK OUT OF THE CONTRACTOR'S HANDS

1) By giving notice in writing to the Contractor in accordance with GC2.3 NOTICES, Canada, without any other authorization, may take all or any part of the Work out of the Contractor's hands, and may employ such means as Canada sees fit to have the Work completed if the Contractor:

   (a) fails to remedy any delay in the commencement or default in the diligent performance of the Work to the satisfaction of Canada within six days of Canada giving notice to the Contractor in writing in accordance with GC2.3 NOTICES;

   (b) defaults in the completion of any part of the Work within the time fixed for its completion by the Contract;

   (c) becomes 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*;

   (d) abandons the work;

   (e) makes an assignment of the Contract without the consent required by GC1.16 ASSIGNMENT; or

   (f) otherwise fails to observe or perform any of the provisions of the Contract.

2) If the whole or any part of the Work is taken out of the Contractor's hands, the Contractor's right to any further payment that is due or accruing due under the Contract is, subject only to paragraph 3) of GC7.1, extinguished, and the Contractor is liable to pay Canada, upon demand, an amount that is equal to the amount of all loss and damage incurred or sustained by Canada in respect of the Contractor's failure to complete the Work.

3) If the whole or any part of the Work that is taken out of the Contractor's hands is completed by Canada, Canada may pay the Contractor the amount, if any, of the holdback or a progress claim as determined by Canada 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 Canada for any other loss or damage incurred or sustained by reason of the Contractor's default.

4) The taking of the Work or any part thereof out of the Contractor's hands does not relieve the Contractor from any obligation under the Contract or imposed by law except the obligation to complete the performance of that part of the Work that was taken out of the Contractor's hands.

5) If the Work or any part thereof is taken out of the Contractor's hands, all Plant and Material and the interest of the Contractor, or its suppliers or subcontractors at any tier, in all real property, licences, powers and privileges acquired, used or provided by the Contractor, or its suppliers or subcontractors at any tier, under the Contract shall continue to be the property of Canada without compensation.

6) When Canada certifies that any Plant, Material, or any interest of the Contractor is no longer required for the purposes of the Work, or that it is not in the interests of Canada to retain that Plant, Material, or interest, it shall revert to the Contractor.

7) 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 Canada.

GC7.2 SUSPENSION OF WORK

1) When, in Canada's opinion, it is in the public interest to do so, Canada may require the Contractor to suspend performance of the Work either for a specified or an unspecified period, by giving a notice of suspension in writing to the Contractor in accordance with GC2.3 NOTICES.

2) When a notice of suspension is received by the Contractor, the Contractor shall suspend all operations in respect of the Work except those that Canada determines are necessary for the care and preservation of the Work, Plant and Material.

3) During a period of suspension, the Contractor shall not remove any part of the Work, Plant or Material from its site without the consent of Canada.

4) If a period of suspension is 60 days or less, the Contractor shall resume the performance of the Work on the expiration of that period, and the Contractor is entitled to be paid the extra costs necessarily incurred by the Contractor as a result of the suspension, determined in accordance with GC6.4 DETERMINATION OF PRICE.

5) If a period of suspension is more than 60 days, Canada and the Contractor may agree that the performance of the Work shall be continued by the Contractor, and the Contractor shall resume performance of the Work subject to any terms and conditions agreed upon by Canada and the Contractor. If Canada and the Contractor do not agree that performance of the Work shall be continued by the Contractor, or upon the terms and conditions under which the Contractor shall continue the Work, the notice of suspension shall be deemed to be a notice of termination pursuant to GC7.3 TERMINATION OF CONTRACT.

GC7.3 TERMINATION OF CONTRACT

1) Canada may terminate the Contract at any time by giving a notice of termination in writing to the Contractor in accordance with GC2.3 NOTICES.

2) If the Contractor receives a notice of termination, the Contractor shall forthwith cease all operations in performance of the Contract, subject to any conditions stipulated in the notice.

3) Subject to paragraph 4) of GC7.3, if the Contract is terminated, Canada shall pay the Contractor an amount determined to be due to the Contractor pursuant to GC6.4 DETERMINATION OF PRICE less the aggregate of all amounts that were paid to the Contractor by Canada and all amounts that are due to Canada from the Contractor pursuant to the Contract.

4) In no event shall the total amount payable by Canada to the Contractor exceed the amount, calculated in accordance with GC5 TERMS OF PAYMENT, that would have been payable to the Contractor had the Contractor completed the Work.

5) Payment to the Contractor, if any, shall be made as soon as practicable under the circumstances.

GC7.4 SECURITY DEPOSIT - FORFEITURE OR RETURN

1) If the Work is taken out of the Contractor's hands, or the Contractor is in breach of, or in default under, the Contract, Canada may convert a security deposit to Canada's own use.

2) If Canada converts a security deposit, the amount realized shall be deemed to be an amount due from Canada to the Contractor under the Contract.

3) Any balance of the amount realized that remains after payment of all losses, damage and claims of Canada and others shall be paid by Canada to the Contractor if, in the opinion of Canada, it is not required for the purposes of the Contract.

GC8 DISPUTE RESOLUTION

GC8.1 INTERPRETATION

1) "dispute" means any disagreement regarding any issue identified by the Contractor in the notice submitted to Canada in accordance with paragraph 2 of GC8.3 NOTICE OF DISPUTE, and includes any claim by the Contractor arising from such disagreement and any counterclaim by Canada, but does not include any claim by either party for punitive or exemplary damages, injury to persons, death, or any claim based on an allegation of libel or slander.

2) The alternative dispute resolution procedures set out in GC8, do not apply to any claim by Canada against the Contractor except any counterclaim in a dispute as defined in paragraph 1 of GC8.1, including, but not limited to, any claim of setoff regarding any amount due to Canada under GC5.10 ASSESSMENT AND DAMAGES FOR LATE COMPLETION.

GC8.2 CONSULTATION AND CO-OPERATION

1) The parties agree to maintain open and honest communication throughout the performance of the Contract.

2) The parties agree to consult and co-operate with each other in the furtherance of the Work and the resolution of problems or differences that may arise.

GC8.3 NOTICE OF DISPUTE

1) Any difference between the parties to the Contract of any nature arising out of or in connection with the Contract which could result in a claim by the Contractor against Canada, and which is not settled by consultation and co-operation as envisaged in GC8.2 CONSULTATION AND CO-OPERATION, shall be resolved in the first instance by Canada, whose written decision or direction shall be final and binding subject only to the provisions of

GC8. Such written decision or direction includes, but is not limited to, any written decision or direction by Canada under any provision of the General Conditions.

2) The Contractor shall be deemed to have accepted the decision or direction of Canada referred to in paragraph 1) of GC8.3 and to have expressly waived and released Canada from any claim in respect of the particular matter dealt with in that decision or direction unless, within 15 working days after receipt of the decision or direction, the Contractor submits to Canada a written notice of dispute requesting formal negotiation under GC8.4 NEGOTIATION. Such notice shall refer specifically to GC8.4 NEGOTIATION, and shall specify the issues in contention and the relevant provisions of the Contract.

3) The giving of a written notice in accordance with paragraph 2) of GC8.3 shall not relieve the Contractor from complying with the decision or direction that is the subject of the dispute. Such compliance, however, shall not be construed as an admission by the Contractor of the correctness of such decision or direction.

4) If a dispute is not resolved promptly, Canada shall give such instructions as, in Canada's opinion, are necessary for the proper performance of the Work and to prevent delays pending a resolution of the matter. Unless Canada terminates the Contract, orders the Contractor to suspend the Work, or takes the Work out of the hands of the Contractor, the Contractor shall continue to perform the Work in accordance with the provisions and requirements of the Contract and the instructions of Canada. Such performance shall not prejudice any claim that the Contractor may have.

5) Nothing in GC8 relieves the Contractor from its obligation to provide any other notice required by the Contract within the time specified in the Contract, including but not limited to, any notice required under GC6.2 CHANGES IN SUBSURFACE CONDITIONS.

GC8.4 NEGOTIATION

1) Within 10 working days after receipt by Canada of a notice referred to in paragraph 2) of GC8.3 NOTICE OF DISPUTE, or within such other period of time as may be mutually agreed to, the parties shall commence formal negotiations in order to resolve the dispute. Negotiations shall occur initially between representatives of the Contractor and Canada who play a direct supervisory role in the performance, administration or management of the Contract.

2) If the representatives referred to in paragraph 1) of GC8.4 are unable to resolve some or all of the issues which are the subject of the negotiations within 10 working days, the parties shall refer the remaining issues which are in dispute to a second level of negotiation between a principal or principals of the Contractor and a senior level manager or senior level managers representing Canada.

3) If negotiations fail to resolve the dispute within 30 working days from the date of delivery of the notice referred to in paragraph 2) of GC8.3 NOTICE OF DISPUTE, or within such longer period as may have been agreed to by the parties, the Contractor may, by giving written notice to Canada, in accordance with GC2.3 NOTICES, within 10 working days from the end of such period, request that mediation be undertaken to assist the parties to reach agreement on the outstanding issues.

4) If the Contractor does not request mediation within the period permitted by paragraph 3) of GC8.4, the Contractor shall be deemed to have accepted the decision or direction of Canada under paragraph 1) of GC8.3 NOTICE OF DIPUTE and to have expressly waived and released Canada from any claim in respect of the particular matter dealt with in that decision or direction.

GC8.5 MEDIATION

1) If the Contractor has requested mediation in accordance with paragraph 3) of GC8.4 NEGOTIATION, mediation shall be conducted in accordance with GC8.8 RULES FOR MEDIATION OF DISPUTES.

2) If a Project Mediator has not previously been appointed for the purposes of the Contract, a Project Mediator shall be appointed in accordance with GC8.8 RULES FOR MEDIATION OF DISPUTES forthwith after delivery of a notice in accordance with paragraph 3) of GC8.4 NEGOTIATION, requesting mediation.

3) If the dispute has not been resolved within

   (a) Ten (10) working days following the appointment of a Project Mediator in accordance with paragraph 2) of GC8.5, if a Project Mediator was not previously appointed;

   (b) Ten (10) working days following receipt by Canada of a written notice in accordance with paragraph 3) of GC8.4 NEGOTIATION, if a Project Mediator was previously appointed; or

   (c) such other longer period as may have been agreed to by the parties;

   the Project Mediator shall terminate the mediation by giving written notice to the parties stating the effective date of termination.

GC8.6 CONFIDENTIALITY

1) All information exchanged during alternative dispute resolution procedures, by whatever means, shall be without prejudice and shall be treated as confidential by the parties and their representatives, unless otherwise required by law. However, evidence that is independently admissible or discoverable shall not be rendered inadmissible or non-discoverable by virtue of its use during an alternative dispute resolution process.

GC8.7 SETTLEMENT

1) Any agreement to settle all or any part of a dispute, by whatever means, shall be in writing and be signed by the parties or their authorized representatives.

GC8.8 RULES FOR MEDIATION OF DISPUTES

GC8.8.1 Interpretation

In these Rules

1) “Coordinator” means the person designated by Canada to act as the Dispute Resolution Coordinator.

GC8.8.2 Application

1) By mutual agreement, the parties may change or make additions to the Rules.

GC8.8.3 Communication

1) Written communications pursuant to these Rules shall be given in accordance with GC2.3 NOTICES.

GC8.8.4 Appointment of Project Mediator

1) The parties to the Contract may, by mutual consent, at any time after entry into the Contract, appoint a mediator (the "Project Mediator") to conduct mediation proceedings in accordance with these Rules for Mediation of Disputes, in regard to any dispute that may arise with regard to the interpretation, application or administration of the Contract. In this case, they shall jointly enter into a contract with the appointed Project Mediator, which contract shall be in a form drafted by the Coordinator and agreed to by the parties.

2) If the parties do not appoint a Project Mediator pursuant to paragraph 1) of GC8.8.4, the parties shall appoint a Project Mediator within 17 working days following receipt of a written notice from the Contractor, in accordance with GC2.3 NOTICES, requesting that mediated negotiations be undertaken in accordance with these Rules to assist the parties to reach agreement on any outstanding issues that may be in dispute. Any contract entered into with the appointed Project Mediator shall meet the requirements as set out for the contract described in paragraph 1) of GC8.8.4.

3) When mediation is requested by the Contractor pursuant to paragraph 3) of GC8.4 NEGOTIATION, if the parties have previously entered into a contract with a Project Mediator, the parties shall within 2 days send to both the Project Mediator and the Coordinator

   (a) a copy of the notice requesting negotiation under paragraph 2) of GC8.3 NOTICE OF DISPUTE;

   (b) a copy of Canada's written position in relation to the notice, the issues in contention and the relevant provisions of the contract; and

   (c) a copy of the Contractor's written request for mediation required under paragraph 3) of GC8.4 NEGOTIATION.

4) If the parties have not agreed on a Project Mediator, the parties shall forthwith provide the Coordinator with the written materials referred to in subparagraphs 3)(a), 3)(b) and 3)(c) of GC8.8.4 together with a request that the Coordinator assist in the appointment of a mutually acceptable Project Mediator in accordance with these Rules.

5) Within 5 working days following receipt of the request and materials referred to in paragraph 4) of GC8.8.4, the Coordinator shall provide the parties with a list of qualified private sector mediators obtained from an independent and impartial entity, together with instructions to each party to individually and confidentially select and rank their preferred and fully acceptable choices of mediator in descending order. Each mediator listed shall be impartial and independent of the parties, and shall be an experienced and skilled commercial mediator, preferably with knowledge of the subject matter of the dispute.

6) Within 10 working days of receipt of the list referred to in paragraph 5) of GC8.8.4 each party shall comply with the instructions accompanying the list(s) and shall deliver the completed listing to the Coordinator.

7) Within 2 working days following receipt of the completed listings, the Coordinator shall select the highest common ranked mediator to act as Project Mediator for the purposes of the contract.

8) In the event of a tie, the Coordinator shall consult both parties to re-evaluate their rankings in order to assist the Coordinator in selecting a Project Mediator acceptable to both parties. If the parties cannot agree upon a Project Mediator, the Coordinator shall forthwith provide the parties with a second list of mediators and the procedure shall be repeated.

9) If the parties have not previously entered into a contract with a mutually acceptable Project Mediator, the Coordinator shall use reasonable efforts to negotiate a contract with a mutually acceptable Project Mediator on behalf of the parties, which contract shall incorporate or otherwise comply with the provisions of these Rules. If negotiations are unsuccessful, or if for other reason the individual is unwilling or unable to enter into a contract to act as Project Mediator, the Coordinator shall repeat the process with the second-highest common ranked mediator.

10) The parties agree that, upon successful completion of the negotiations referred to in paragraph 9) of GC8.8.4, they shall jointly enter into a contract with the selected Project Mediator, which contract shall be in a form drafted by the Coordinator and agreed to by the parties.

11) Upon execution of the contract with the Project Mediator referred to in paragraph 10) of GC8.8.4 the Coordinator shall provide the Project Mediator with copies of the documents referred to in paragraph 3) of GC8.8.4.

GC8.8.5 Confidentiality

1) Subject to paragraph 2) of GC8.8.5, and unless otherwise agreed in writing by the parties, the Project Mediator, the parties and their counsel or representatives shall keep confidential all matters and documents disclosed during mediation proceedings except where the disclosure is necessary for any implementation of any agreement reached or is required by law.

2) Evidence that is independently admissible or discoverable in any arbitral or judicial proceeding shall not be rendered inadmissible or non-discoverable by virtue of its use in mediation proceedings.

3) Neither party shall make transcripts, minutes or other records of a mediation conference.

4) The personal notes and written opinions of the Project Mediator made in relation to mediation are in the Project Mediator's sole possession and control, are confidential, and may not be used in any subsequent proceeding between the parties or where they are opposed in interest without the express written permission of the parties.

5) All information exchanged during mediation procedures, by whatever means, shall be without prejudice and shall be treated as confidential by the parties and their representatives, unless otherwise required by law.

GC8.8.6 Time and Place of Mediation

1) The Project Mediator, in consultation with the parties shall set the date, time and place of any mediation conference as soon as possible, bearing in mind that, subject to agreement to

the contrary between the parties, only 10 working days are available within which to attempt to settle the dispute.

GC8.8.7 Representation

1) Representatives of the parties may be accompanied at the mediation conference by legal counsel or any other person.

2) If the Project Mediator is a lawyer, the Project Mediator shall not provide legal advice to a party during the course of the mediation conference, but may recommend that a party obtain independent legal advice before finalizing a settlement agreement.

GC8.8.8 Procedure

1) The parties agree to an exchange of all facts, information and documents upon which they intend to rely in any oral or written presentation during the mediation. This exchange shall be completed no later than 2 working days prior to the date set for a mediation conference.

2) The Project Mediator shall be free to meet with the parties individually during a mediation conference if the Project Mediator is of the opinion that this may improve the chances of a mediated settlement, and either party may request such an individual meeting at any time.

3) The parties may agree to extend the 10 working days available for settlement of the dispute through mediation, and the Project Mediator shall record that agreement in writing.

GC8.8.9 Settlement Agreement

1) The parties shall record in writing any settlement agreement reached, with sufficient detail to ensure a clear understanding of

   (a) the issues resolved;

   (b) any obligations assumed by each party including criteria to determine if and when these obligations have been met; and

   (c) the consequences of failure to comply with the agreement reached.

2) The parties agree to carry out the terms of a settlement agreement as soon as possible and, in any event, within any time periods specified in the agreement.

GC8.8.10 Termination of Mediation

1) Either party may withdraw from mediation at any time without reason and, in that event, the Project Mediator shall give each party a written notice terminating the mediation and establishing the effective date of termination.

2) If, in the opinion of the Project Mediator, either party fails to mediate in good faith or fails to comply with the terms of these Rules, or if the Project Mediator, at any time during mediation, is of the opinion that further negotiations will fail to resolve the issues outstanding, the Project Mediator may terminate the negotiations by providing the parties with a written notice of termination, stating therein the Project Mediator's reasons for the termination, and the effective date of termination.

3) If a dispute has not been resolved within 10 working days or such other longer period as may have been agreed to by the parties, the Project Mediator shall terminate the mediation by giving written notice to the parties stating the effective date of termination.

GC8.8.11 Costs

1) The parties agree that they will each be responsible for the costs of their own representatives and advisors and associated travel and living expenses. Fees and expenses of the Project Mediator and all administrative costs of mediation, such as the cost of the meeting room(s), if any, shall be borne equally by the parties.

GC8.8.12 Subsequent Proceedings

1) The parties shall not rely on or introduce as evidence in any arbitral or judicial proceeding, whether or not such proceeding relates to the subject matter of mediation,

   (a) any documents of other parties that are not otherwise producible in those proceedings;

   (b) any views expressed or suggestions made by any party in respect of a possible settlement of issues;

   (c) any admission made by any party in the course of mediation unless otherwise stipulated by the admitting party; and

   (d) the fact that any party has indicated a willingness to make or accept a proposal or recommendation for settlement.

2) The Project Mediator shall neither represent nor testify on behalf of either of the parties in any subsequent investigation, action or proceeding relating to the issues in mediation proceedings.

3) The Project Mediator shall not be subpoenaed to give evidence relating to

   (a) the Project Mediator's role in mediation; or

   (b) the matters or issues in mediation;

   in any subsequent investigation, action or proceeding and the parties agree to vigorously oppose any effort to have the Mediator so subpoenaed.

GC9 CONTRACT SECURITY

GC9.1 OBLIGATION TO PROVIDE CONTRACT SECURITY

1) The Contractor shall, at the Contractor's expense and within 14 days after the date that the Contractor receives notice that the Contractor's bid was accepted by Canada, obtain and deliver Contract Security to Canada in one of the forms prescribed in GC9.2 TYPES AND AMOUNTS OF CONTRACT SECURITY.

2) If the whole or a part of the Contract Security provided is in the form of a security deposit, it shall be held and disposed of in accordance with GC5.13 RETURN OF SECURITY DEPOSIT and GC7.4 SECURITY DEPOSIT - FORFEITURE OR RETURN.

3) If a part of the Contract Security provided is in the form of a labour and material payment bond, the Contractor shall post a copy of that bond at the site of the Work.

4) It is a condition precedent to the release of the first progress payment that the Contractor has provided the Contract Security as specified herein.

GC9.2 TYPES AND AMOUNTS OF CONTRACT SECURITY

1) The Contractor shall deliver to Canada either (a) or (b).

   (a) A performance bond and a labour and material payment bond each in an amount that is equal to not less than 50 percent of the Contract Amount.

   (b) A security deposit or an irrevocable standby letter of credit in an amount that is equal to not less than 20 percent of the Contract Amount.

2) A performance bond and a labour and material payment bond referred to in paragraph 1) of GC9.2 shall be in a form and be issued by a bonding or surety company that is approved by Canada.

   (a) The approved form for the performance bond is displayed at the following Website: http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=14494&section=text#appS

   (b) The approved form for the labour and material payment bond is displayed at the following website: http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=14494&section=text#appS ; and

   (c) The list of approved bonding or surety companies is displayed at the following Website: http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=14494&section=text#appL

3) A security deposit referred to in subparagraph 1)(b) of GC9.2 shall be in the form of

   (a) a bill of exchange, bank draft or money order 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

(b) bonds of, or unconditionally guaranteed as to principal and interest by, the Government of Canada.

4) For the purposes of subparagraph 3)(a) of GC9.2

(a) a bill of exchange is an unconditional order in writing signed by the Contractor and addressed to an approved financial institution, requiring the said institution to pay, on demand, at a fixed or determinable future time a sum certain of money to, or to the order of, the Receiver General for Canada;

(b) if a bill of exchange, bank draft or money order is certified by or drawn on an institution or corporation other than a chartered bank, it must be accompanied by proof that the said institution or corporation meets at least one of the criteria described in subparagraph 4)(c) of GC9.2, either by letter or by a stamped certification on the bill of exchange, bank draft or money; and

(c) An approved financial institution is

(i) a corporation or institution that is a member of the Canadian Payments Association as defined in the *Canadian Payments Act*;

(ii) a corporation that accepts deposits that are insured, to the maximum permitted by law, by the Canada Deposit Insurance Corporation or the "Autorité des marchés financiers";

(iii) a corporation that accepts deposits from the public if repayment of the deposit is guaranteed by Her Majesty the Queen in right of a province;

(iv) a corporation, association or federation incorporated or organized as a credit union or co-operative credit society that conforms to the requirements of a credit union which are more particularly described in paragraph 137(6) of the *Income Tax Act*; or

(v) Canada Post Corporation.

5) Bonds referred to in subparagraph 3)(b) of GC9.2 shall be provided on the basis of their market value current at the date of the Contract, and shall be

(a) made payable to bearer; or

(b) 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

(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.

6) An irrevocable standby letter of credit referred to in subparagraph 1)(b) of GC9.2 shall:

(a) be an arrangement, however named or described, whereby a financial institution (the “Issuer”) acting at the request and on the instructions of a customer (the “Applicant”) or on its own behalf,

(i) is to make a payment to, or to the order of, Canada as the beneficiary;

(ii) is to accept and pay bills of exchange drawn by Canada;

(iii) authorizes another financial institution to effect such payment or accept and pay such bills of exchange; or

(iv) authorizes another financial institution to negotiate against written demand(s) for payment provided that the terms and conditions of the letter of credit are complied with;

(b) state the face amount that may be drawn against it;

(c) state its expiry date;

(d) 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 Canada;

(e) provide that more than one written demand for payment may be presented subject to the sum of those demands not exceeding the face value of the letter of credit;

(f) provide that it is subject to the International Chamber of Commerce (ICC) Uniform Customs and Practice (UCP) for Documentary Credits, 2007 Revision, ICC Publication No. 600. Pursuant to the ICC UCP, a credit is irrevocable even if there is no indication to that effect; and

(g) be issued or confirmed, in either official language in a format left to the discretion of the issuer or confirmer, by an approved financial institution on its letterhead.

GC10 INSURANCE

GC10.1 INSURANCE CONTRACTS

1) The contractor shall, at the contractor's expense, obtain and maintain insurance contracts in respect of the work and shall provide evidence thereof to Canada in accordance with the requirements of the INSURANCE TERMS.

2) The insurance contracts referred to in paragraph 1) of GC10.1 shall

   (a) be in a form, of the nature, in the amounts, for the periods and containing the terms and conditions specified in INSURANCE TERMS; and

   (b) provide for the payment of claims under such insurance contracts in accordance with GC10.2 INSURANCE PROCEEDS.

GC10.2 INSURANCE PROCEEDS

1) In the case of a claim payable under a Builders Risk/Installation (All Risks) insurance contract maintained by the contractor pursuant to GC10.1 INSURANCE CONTRACTS, the proceeds of the claim shall be paid directly to Canada, and

   (a) the monies so paid shall be held by Canada for the purposes of the contract, or

   (b) if Canada elects, shall be retained by Canada, in which event they vest in Canada absolutely.

2) In the case of a claim payable under a General Liability insurance contract maintained by the contractor pursuant to GC10.1 INSURANCE CONTRACTS, the proceeds of the claim shall be paid by the insurer directly to the claimant.

3) If an election is made pursuant to paragraph 1) of GC10.2, Canada may cause an audit to be made of the accounts of the contractor and of Canada in respect of the part of the work that was lost, damaged or destroyed for the purpose of establishing the difference, if any, between

   (a) the aggregate of the amount of the loss or damage suffered or sustained by Canada, 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 Canada under the contract, minus any monies retained pursuant to subparagraph 1)(b) of GC10.2; and

   (b) the aggregate of the amounts payable by Canada to the contractor pursuant to the contract up to the date of the loss or damage.

4) A difference that is established pursuant to paragraph 3) of GC10.2 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.

5) When payment of a deficiency has been made pursuant to paragraph 4) of GC10.2, all rights and obligations of Canada 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 paragraph 3) of GC10.2, be deemed to have been expended and discharged.

6) If an election is not made pursuant to subparagraph 1)(b) of GC10.2, the contractor shall, subject to paragraph 7) of GC10.2, clear and clean the work and its site and restore and replace the part of the work that was lost, damaged or destroyed at the contractor's expense as if that part of the work had not yet been performed.

7) When the contractor clears and cleans the work and its site and restores and replaces the work referred to in paragraph 6) of GC10.2, Canada shall pay the contractor out of the monies referred to in paragraph 1) of GC10.2 so far as they will thereunto extend.

8) Subject to paragraph 7) of GC10.2, payment by Canada pursuant to paragraph 7) of GC10.2 shall be made in accordance with the contract but the amount of each payment shall be 100 percent of the amount claimed notwithstanding subparagraphs 3)(a) and 3)(b) of GC5.4 PROGRESS PAYMENT.

INSURANCE TERMS

IN1 GENERAL

IN1.1 Worker's Compensation

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

IN1.2 Indemnification

1) The insurance required by the provisions of these Insurance Terms shall in no way limit the Contractor's responsibility under the Indemnification clause of the General Conditions of the contract. Any additional coverage the Contractor may deem necessary to fulfill his obligations under the aforesaid clause shall be at his own discretion and expense.

IN1.3 Proof of Insurance

1) Before commencement of the Work, and within thirty (30) days after acceptance of its bid, the Contactor shall deposit with Canada a CERTIFICATE OF INSURANCE (form AAFC / AAC5314) available upon request.

2) Upon request by Canada, the Contractor shall provide originals or certified true copies of all contracts of insurance maintained by the Contractor pursuant to the provisions contained herein.

IN1.4 Insured

1) Each policy shall insure the Contractor and shall include Her Majesty the Queen in right of Canada, represented by the Minister of Agriculture & Agri-Food Canada as an additional Insured, with respect to liability arising out of the operations of the contractor with regard to the work.

IN1.5 Payment of Deductible

1) The payment of monies up to the deductible amount made in satisfaction of a claim shall be borne by the Contractor.

IN2 COMMERCIAL GENERAL LIABILITY

IN2.1 Scope of Policy

1) The insurance coverage provided shall not be less than that provided by IBC Form 2100, as amended from time to time, and shall have:

   (a) an Each Occurrence Limit of not less than $5,000,000.00 ;

   (b) a Products/Completed Operations Aggregate Limit of not less than $5,000,000.00 ; and

   (c) a General Aggregate Limit of not less than $10,000,000.00 per policy year, if the policy is subject to such a limit.

2) The policy shall either include or be endorsed to include coverage for the following exposures or hazards if the Work is subject thereto:

   (a) Blasting.

   (b) Pile driving and caisson work.

   (c) Underpinning.

   (d) Removal or weakening of support of any building or land whether such support be natural or otherwise if the work is performed by the insured contractor.

   (e) Asbestos.

   (f) Non-owed Automobile Policy.

IN2.2 Period of Insurance

1) Unless otherwise directed in writing by Canada, or, otherwise stipulated elsewhere herein, the policy required herein shall be in force and be maintained from the date of contract award until the day of issue of the Certificate of Completion except that the coverage for Completed Operations Liability shall, in any event, be maintained for a period of at least six (6) years beyond the date of the CERTIFICATE OF SUBSTANTIAL PERFORMANCE.

IN3 AUTOMOBILE INSURANCE

IN3.1 Scope of Policy

1) 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.

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

BID AND ACCEPTANCE FORM

CONSTRUCTION CONTRACT - MAJOR WORKS

BA01 IDENTIFICATION

Description of the Work

Building 20 Chiller Replacement

Solicitation Number	File / Project Number
15-1478	MCE15-A645

BA02 BUSINESS NAME AND ADDRESS OF BIDDER

Name

Address

Unit/Suite/Apt.	Street number	Number suffix	Street name	Street type	Street direction

PO Box or Route Number	Municipality (City, Town, etc.)	Province	Postal Code

Phone Number	Fax Number	Email Address

BA03 THE OFFER

1) The Bidder offers to Canada as represented by the Minister of Agriculture and Agri-food Canada to perform and complete the Work for the above named project in accordance with the Bid Documents for the Total Bid Amount of:

$ _____ excluding Applicable Taxes (GST/HST/QST).

(to be expressed in numbers only)

BA04 BID VALIDITY PERIOD

1) The bid shall not be withdrawn for a period of 30 days following the date of solicitation closing

BA05 APPENDICES

1) The following appendices are included in this Bid and Acceptance Form:

☒ No appendices

BA06 ACCEPTANCE AND CONTRACT

1) Upon acceptance of the Bidder's offer by Canada, a binding Contract shall be formed between Canada and the resulting Contractor. The documents forming the Contract shall be the contract documents referred to in SC01 CONTRACT DOCUMENTS.

BA07 CONSTRUCTION TIME

1) The Contractor shall perform and complete the Work within 23 weeks from the date of notification of acceptance of the offer.

BA08 BID SECURITY

1) The Bidder shall enclose bid security with its bid in accordance with GI07 BID SECURITY REQUIREMENTS.

2) If a security deposit is furnished as bid security, it shall be forfeited in the event that the bid is accepted by Canada and the Contractor fails to provide Contract Security in accordance with GC9 CONTRACT SECURITY, provided that Canada may, if it is in the public interest, waive the right of Canada to forfeiture any or all of the security deposit.

BA09 SIGNATURE	
Name and title of person authorized to sign on behalf of Bidder (type or print)	Name
	Title
	Signature Date
	Name
	Title
	Signature Date

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
15-1478
Security Classification / Classification de sécurité

SECURITY REQUIREMENTS CHECK LIST (SRCL)
LISTE DE VÉRIFICATION DES EXIGENCES RELATIVES À LA SÉCURITÉ (LVERS)

PART A - CONTRACT INFORMATION / PARTIE A - INFORMATION CONTRACTUELLE

1. Originating Government Department or Organization / Ministère ou organisme gouvernemental d'origine	2. Branch or Directorate / Direction générale ou Direction
AAFC	Corporate Management Branch

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

4. Brief Description of Work / Brève description du travail

5. a) Will the supplier require access to Controlled Goods? Le fournisseur aura-t-il accès à des marchandises contrôlées?	☒ No Non	☐ Yes Oui
5. b) Will the supplier require access to unclassified military technical data subject to the provisions of the Technical Data Control Regulations? Le fournisseur aura-t-il accès à des données techniques militaires non classifiées qui sont assujetties aux dispositions du Règlement sur le contrôle des données techniques?	☒ No Non	☐ Yes Oui
6. Indicate the type of access required / Indiquer le type d'accès requis		
6. a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets? Le fournisseur ainsi que les employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS? (Specify the level of access using the chart in Question 7. c) (Préciser le niveau d'accès en utilisant le tableau qui se trouve à la question 7. c)	☒ No Non	☐ Yes Oui
6. b) Will the supplier and its employees (e.g. cleaners, maintenance personnel) require access to restricted access areas? No access to PROTECTED and/or CLASSIFIED information or assets is permitted. Le fournisseur et ses employés (p. ex. nettoyeurs, personnel d'entretien) auront-ils accès à des zones d'accès restreintes? L'accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS n'est pas autorisé.	☐ No Non	☒ Yes Oui
6. c) Is this a commercial courier or delivery requirement with **no** overnight storage? S'agit-il d'un contrat de messagerie ou de livraison commerciale **sans** entreposage de nuit?	☒ No Non	☐ Yes Oui

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

Canada ☐	**NATO / OTAN** ☐	**Foreign / Étranger** ☐
7. b) Release restrictions / Restrictions relatives à la diffusion		
No release restrictions Aucune restriction relative à la diffusion ☐	All NATO countries Tous les pays de l'OTAN ☐	No release restrictions Aucune restriction relative à la diffusion ☐
Not releasable À ne pas diffuser ☐		
Restricted to: / Limité à : Specify country(ies): / Préciser le(s) pays : ☐	Restricted to: / Limité à : Specify country(ies): / Préciser le(s) pays : ☐	Restricted to: / Limité à : Specify country(ies): / Préciser le(s) pays : ☐

7. c) Level of information / Niveau d'information

PROTECTED A / PROTÉGÉ A ☐	NATO UNCLASSIFIED / NATO NON CLASSIFIÉ ☐	PROTECTED A / PROTÉGÉ A ☐
PROTECTED B / PROTÉGÉ B ☐	NATO RESTRICTED / NATO DIFFUSION RESTREINTE ☐	PROTECTED B / PROTÉGÉ B ☐
PROTECTED C / PROTÉGÉ C ☐	NATO CONFIDENTIAL / NATO CONFIDENTIEL ☐	PROTECTED C / PROTÉGÉ C ☐
CONFIDENTIAL / CONFIDENTIEL ☐	NATO SECRET / NATO SECRET ☐	CONFIDENTIAL / CONFIDENTIEL ☐
SECRET / SECRET ☐	COSMIC TOP SECRET / COSMIC TRÈS SECRET ☐	SECRET / SECRET ☐
TOP SECRET / TRÈS SECRET ☐		TOP SECRET / TRÈS SECRET ☐
TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) ☐		TOP SECRET (SIGINT) / TRÈS SECRET (SIGINT) ☐

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
15-1478
Security Classification / Classification de sécurité

PART A *(continued)* / PARTIE A *(suite)*

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets? ☒ No / Non ☐ Yes / Oui
Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS?
If Yes, indicate the level of sensitivity:
Dans l'affirmative, indiquer le niveau de sensibilité :

9. Will the supplier require access to extremely sensitive INFOSEC information or assets? ☒ No / Non ☐ Yes / Oui
Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate?

Short Title(s) of material / Titre(s) abrégé(s) du matériel :
Document Number / Numéro du document :

PART B - PERSONNEL (SUPPLIER) / PARTIE B - PERSONNEL (FOURNISSEUR)

10. a) Personnel security screening level required / Niveau de contrôle de la sécurité du personnel requis

☒ RELIABILITY STATUS / COTE DE FIABILITÉ	☐ CONFIDENTIAL / CONFIDENTIEL	☐ SECRET / SECRET	☐ TOP SECRET / TRÈS SECRET
☐ TOP SECRET– SIGINT / TRÈS SECRET – SIGINT	☐ NATO CONFIDENTIAL / NATO CONFIDENTIEL	☐ NATO SECRET / NATO SECRET	☐ COSMIC TOP SECRET / COSMIC TRÈS SECRET
☐ SITE ACCESS / ACCÈS AUX EMPLACEMENTS			

Special comments:
Commentaires spéciaux : _____

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

10. b) May unscreened personnel be used for portions of the work? ☒ No / Non ☐ Yes / Oui
Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail?
If Yes, will unscreened personnel be escorted? ☐ No / Non ☐ Yes / Oui
Dans l'affirmative, le personnel en question sera-t-il escorté?

PART C - SAFEGUARDS (SUPPLIER) / PARTIE C - MESURES DE PROTECTION (FOURNISSEUR)

INFORMATION / ASSETS / RENSEIGNEMENTS / BIENS

11. a) Will the supplier be required to receive and store PROTECTED and/or CLASSIFIED information or assets on its site or premises? ☒ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS?

11. b) Will the supplier be required to safeguard COMSEC information or assets? ☒ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC?

PRODUCTION

11. c) Will the production (manufacture, and/or repair and/or modification) of PROTECTED and/or CLASSIFIED material or equipment occur at the supplier's site or premises? ☒ No / Non ☐ Yes / Oui
Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ?

INFORMATION TECHNOLOGY (IT) MEDIA / SUPPORT RELATIF À LA TECHNOLOGIE DE L'INFORMATION (TI)

11. d) Will the supplier be required to use its IT systems to electronically process, produce or store PROTECTED and/or CLASSIFIED information or data? ☒ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu d'utiliser ses propres systèmes informatiques pour traiter, produire ou stocker électroniquement des renseignements ou des données PROTÉGÉS et/ou CLASSIFIÉS?

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

PART C - *(continued)* / PARTIE C - *(suite)*

For users completing the form **manually** use the summary chart below to indicate the category(ies) and level(s) of safeguarding required at the supplier's site(s) or premises.
Les utilisateurs qui remplissent le formulaire **manuellement** doivent utiliser le tableau récapitulatif ci-dessous pour indiquer, pour chaque catégorie, les niveaux de sauvegarde requis aux installations du fournisseur.

For users completing the form **online** (via the Internet), the summary chart is automatically populated by your responses to previous questions.
Dans le cas des utilisateurs qui remplissent le formulaire **en ligne** (par Internet), les réponses aux questions précédentes sont automatiquement saisies dans le tableau récapitulatif.

SUMMARY CHART / TABLEAU RÉCAPITULATIF

Category Catégorie	PROTECTED PROTÉGÉ			CLASSIFIED CLASSIFIÉ			NATO				COMSEC					
	A	B	C	CONFIDENTIAL CONFIDENTIEL	SECRET	TOP SECRET TRÈS SECRET	NATO RESTRICTED NATO DIFFUSION RESTREINTE	NATO CONFIDENTIAL NATO CONFIDENTIEL	NATO SECRET	COSMIC TOP SECRET COSMIC TRÈS SECRET	PROTECTED PROTÉGÉ A	 B	 C	CONFIDENTIAL CONFIDENTIEL	SECRET	TOP SECRET TRES SECRET
Information / Assets Renseignements / Biens	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Production	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
IT Media / Support TI	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
IT Link / Lien électronique	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

12. a) Is the description of the work contained within this SRCL PROTECTED and/or CLASSIFIED?
La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE?

☒ No / Non ☐ Yes / Oui

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

12. b) Will the documentation attached to this SRCL be PROTECTED and/or CLASSIFIED?
La documentation associée à la présente LVERS sera-t-elle PROTÉGÉE et/ou CLASSIFIÉE?

☒ No / Non ☐ Yes / Oui

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

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
15-1478
Security Classification / Classification de sécurité

PART D - AUTHORIZATION / PARTIE D - AUTORISATION

13. Organization Project Authority / Chargé de projet de l'organisme

Name (print) - Nom (en lettres moulées)	Title – Titre	Signature	
Telephone No. - N° de téléphone	**Facsimile No. - N° de télécopieur**	**E-mail address - Adresse courriel**	**Date**

14. Organization Security Authority / Responsable de la sécurité de l'organisme

Name (print) - Nom (en lettres moulées)	Title – Titre	Signature	
Telephone No. - N° de téléphone	**Facsimile No. - N° de télécopieur**	**E-mail address - Adresse courriel**	**Date**

15. Are there additional instructions (e.g. Security Guide, Security Classification Guide) attached?
Des instructions supplémentaires (p. ex. Guide de sécurité, Guide de classification de la sécurité) sont-elles jointes?

☐ No / Non ☐ Yes / Oui

16. Procurement Officer / Agent d'approvisionnement

Name (print) - Nom (en lettres moulées)	Title – Titre	Signature	
Mike Pignat	Procurement/Contracts Officer		
Telephone No. - N° de téléphone	**Facsimile No. - N° de télécopieur**	**E-mail address - Adresse courriel**	**Date**
613 759-6157	N/A	mike.pignat@canada.ca	

17. Contracting Security Authority / Autorité contractante en matière de sécurité

Name (print) - Nom (en lettres moulées)	Title – Titre	Signature	
Telephone No. - N° de téléphone	**Facsimile No. - N° de télécopieur**	**E-mail address - Adresse courriel**	**Date**

Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada

DRAWINGS AND SPECIFICATIONS

#15-1478

FOR

REPLACEMENT OF CHILLER
BUILDING 20
PROJECT: MCE15-A645

CENTRAL EXPERIMENTAL FARM (CEF)
Agriculture and Agri-Food Canada (AAFC)
K.W. Neatby building
960 Carling Avenue
Ottawa, Ontario K1A 0C6

List of Drawings

1 General

1.1 WORK COVERED BY PROJECT DOCUMENTS

.1 The work covered by this project includes, replacement of equipment on the cooling system as well as all associated works for the K.W. Neatby Buidling 20 for Agriculture Canada (Ottawa)

.2 More specifically, Work in this Contract consists of without being limited to (see plans):

- .1 Removal of equipment from the cooling system (chiller, pumps, insulation, electrical supply, control, etc);
- .2 Supply and installation of new equipment (chillers, VFD pumps, piping, piping specialties, electrical, control, etc).

.3 The present list of works is not necessarily complete and does not release the responsibility for the contractor to carry out any other work, change or modification necessary, with satisfaction to supplement the work envisaged with the present project.

.4 The work included in this project includes the supply of all materials, labour, tools, equipment, protection and transport necessary to carry out, at the request of the government, required work, accordance with the requirements specified on the plans and in the various sections of the specification, so as to produce an effect of standardization on the project. All works must be done in accordance with codes and standards in force.

1.2 INTERPRETATION

.1 Any discrepancies between the Specifications and Drawings must be submitted in writing to the Departmental Representative, so the latter can render a final decision, also in writing, in this regard.

.2 The Specifications and Drawings are complementary, such that what is required by the one is also required by the other. The structure which is to be built, in accordance with the Specifications and Drawings, must constitute a complete work in its essential parts, i.e. it must notably include all articles normally arising from the instructions in the Specifications and Drawings, even if each of these articles is not specifically mentioned.
The Departmental Representative may not take advantage of any apparently involuntary error or any omission it might become aware of to the detriment of Canada. Where the quality of the work or materials is not clearly indicated, the construction trade concerned must provide that which is of the best quality available.

.3 The Departmental Representative may, for clarification purposes only, provide the Contractor with additional drawings to ensure proper execution of the Work. These drawings shall carry the same meaning and scope as if they were contained with the plans mentioned in the Contract documents.

1.3 SITE INSPECTION

.1 In order to get familiar with specific project conditions and to gather all the information required to successfully execute the contract, carefully inspect the premises. Ignorance of site conditions will, in no case, be a valid reason to claim a payment.

1.4 WORK SEQUENCE

.1 Construct Work in "phases" as indicated in drawing package to accommodate Representative's use of premises during construction project.

.2 Co-ordinate Progress Schedule and co-ordinate shut-downs and temporary cooling and ventilation requirements with the Departmental Representative Occupancy during construction.

.3 Construct Work in stages to provide for continuous operation as instructed on drawings. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

1.5 CONTRACTOR USE OF PREMISES

.1 Limit use of premises for Work, for storage, and for access, to allow:

.1 The Departmental Representative occupancy.

.2 Co-ordinate use of premises under direction of Departmental 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 Departmental Representative.

.6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.6 OCCUPANCY BY THE DEPARTMENTAL REPRESENTATIVE

.1 The Departmental Representative will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with the Departmental Representative in scheduling operations to minimize conflict and to facilitate the Departmental Representative usage.

1.7 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations, occupants and public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.8 EXISTING UTILITY SERVICES

.1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.

.2 Submit schedule to and obtain approval from Departmental Representative 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.

.3 Provide temporary services when directed by Departmental Representative to maintain critical building and tenant systems.

1.9 REQUIRED DOCUMENTS

.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.

2 Products

2.1 NOT USED

.1 Not used.

3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

1 GENERAL

1.01 ADMINISTRATIVE

.1 Submit to Consultant submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify 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 are co-ordinated.

.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 reviewed copy of each submission on site.

1.02 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Allow 5 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 the Consultant in writing of revisions other than those requested.

.6 Accompany submissions with transmittal letter containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.7 Submissions include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.8 After Consultant's review, distribute copies.

.9 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

.10 Submit electronic copies 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.

.11 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant.
- .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
- .2 Testing must have been within 3 years of date of contract award for project.

.12 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Consultant.
- .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
- .2 Certificates must be dated after award of project contract complete with project name.

.13 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Consultant.
.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.14 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.

.15 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.16 Submit 6 electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant.

.17 Delete information not applicable to project.

.18 Supplement standard information to provide details applicable to project.

.19 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, reviewed shop drawings 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.

1.03 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic and hard copy of grey tone colour digital photography in jpg, bin, tif format, fine standard resolution monthly with progress statement and as directed by Consultant.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: 2 to 4 locations.
.1 Viewpoints and their location as determined by Consultant.

.4 Frequency of photographic documentation: monthly as directed by Consultant.
.1 Upon completion of: demolition, new construction of Work, and as directed by Consultant.

1.04 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Province of Ontario
  .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, c.0.1, as amended and O. Reg. 213/91 as amended - Updated 2005.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit 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 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Consultant and or authority having jurisdiction, weekly.

.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 and Section 02 81 01 - Hazardous Materials.

.7 Consultant will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Consultant within 7 days after receipt of comments from Consultant.

.8 Consultant'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 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.03 FILING OF NOTICE

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

1.04 SAFETY ASSESSMENT

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

1.05 MEETINGS

.1 Schedule and administer Health and Safety meeting with Consultant prior to commencement of Work.

1.06 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:
- .1 Vehicular traffic
- .2 Rotating objects
- .3 Dangerous materials handling
- .4 Overhead hoisting

1.07 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 Consultant may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns. Relief from or substitution for any portion or provision of minimum health and safety guidelines specified herein or reviewed site-specific health and safety plan must be submitted to Departmental representative in writing. Departmental representative will respond in writing, either accepting or requesting improvements.

1.08 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.

1.09 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.

1.10 UNFORSEEN 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 Province having jurisdiction and advise Consultant verbally and in writing.

1.11 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 working knowledge of occupational safety and health regulations.
- .2 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.
- .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
- .4 Be on site during execution of Work and report directly to and be under direction of Registered Occupational Hygienist Certified Industrial Hygienist and or site supervisor.

1.12 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 Province Territory having jurisdiction, and in consultation with Consultant.

1.13 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Consultant.

.2 Provide Consultant with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Consultant may stop Work if non-compliance of health and safety regulations is not corrected.

1.14 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.

2 PRODUCTS

2.01 NOT USED

.1 Not used.

3 EXECUTION

3.01 NOT USED

.1 Not used.

END OF SECTION

1 GENERAL

1.01 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including other than that caused by Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.

.3 Clear snow and ice from access to building, remove from site.

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling.

.6 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.

.7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.9 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.02 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris including that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.8 Remove dirt and other disfiguration from exterior surfaces.

.9 Sweep and wash clean paved areas.

.10 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 ACTION AND INFORMATIONAL SUBMITTALS

1. Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
2. Prepare instructions and data using personnel experienced in maintenance and operation of described products.
3. Copy will be returned after final inspection, with comments.
4. Revise content of documents as required prior to final submittal.
5. Two (2) weeks prior to Substantial Performance of the Work, submit to the , four final copies of operating and maintenance manuals in English.
6. Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
7. Furnish evidence, if requested, for type, source and quality of products provided.
8. Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
9. Pay costs of transportation.

1.02 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 using under Section numbers and 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 1:1 scaled CAD files in dxf dwg format on CD.

1.03 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 Design-Builder 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.

1.04 AS -BUILT DOCUMENTS AND SAMPLES

.1 Maintain, in addition to requirements in General Conditions, at site for Consultant Owner 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.

1.05 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of blue line black line opaque drawings, and in copy of Project Manual, provided by Consultant.

.2 Use felt tip marking pens, maintaining separate colors 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 Provide digital photos, if requested, for site records.

1.06 FINAL SURVEY

.1 Submit final site survey certificate stating that completed works are in conformance, and outlining any agreed non-conforming aspects formally accepted in writing .

1.07 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.

1.08 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.

.3 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.

.4 Additional requirements: as specified in individual specifications sections.

1.09 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 Consultant approval.

.3 Warranty management plan to include required actions and documents to assure that Consultant 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 Consultant 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 9 month warranty inspection, measured from time of acceptance, by Consultant.

.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 balancing, pumps, motors,

.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 4 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 Consultant to proceed with action against Contractor.

1.10 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Consultant.

.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.

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 SUMMARY

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

.2 Acronyms:
- .1 AFD - Alternate Forms of Delivery, service provider.
- .2 BMM - Building Management Manual.
- .3 Cx - Commissioning.
- .4 EMCS - Energy Monitoring and Control Systems.
- .5 O&M - Operation and Maintenance.
- .6 PI - Product Information.
- .7 PV - Performance Verification.
- .8 TAB - Testing, Adjusting and Balancing.

1.02 GENERAL

.1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
- .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
- .2 Ensure appropriate documentation is compiled into the BMM.
- .3 Effectively train O&M staff.

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

.3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

.4 AFD managed projects the term Consultant in Cx specifications to be interpreted as AFD Service Provider.

1.03 COMMISSIONING OVERVIEW

.1 Cx to be a line item of Contractor's cost breakdown.

.2 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.3 Cx is conducted in concert with activities performed during stage of project delivery. Cx

identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the 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.

.4 Consultant will issue Interim Acceptance Certificate when:
- .1 Completed Cx documentation has been received, reviewed for suitability and approved by Consultant.
- .2 Equipment, components and systems have been commissioned.
- .3 O&M training has been completed.

1.04 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.

1.05 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 Have completed Cx Plan up-to-date.
- .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
- .3 Fully understand Cx requirements and procedures.
- .4 Have Cx documentation shelf-ready.
- .5 Understand completely design criteria and intent and special features.
- .6 Submit complete start-up documentation to Consultant.
- .7 Have Cx schedules up-to-date.
- .8 Ensure systems have been cleaned thoroughly.
- .9 Complete TAB procedures on systems, submit TAB reports to Consultant for review and approval.
- .10 Ensure "As-Built" system schematics are available.

.4 Inform Consultant in writing of discrepancies and deficiencies on finished works.

1.06 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.

1.07 ACTION AND INFORMATIONAL 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 8 weeks prior to start of Cx.
- .4 Provide additional documentation relating to Cx process required by Consultant.

1.08 COMMISSIONING DOCUMENTATION

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

.2 Consultant to review and approve Cx documentation.

.3 Provide completed and approved Cx documentation to Consultant.

1.09 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction schedule.

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

1.10 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings as required.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage. Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM) 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.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by Cx Agent, who will record and distribute minutes.

.7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

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

1.12 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days notice prior to commencement.

.2 Consultant 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 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.

.2 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.

.3 Qualifications of manufacturer's personnel:
- .1 Experienced in design, installation and operation of equipment and systems.
- .2 Ability to interpret test results accurately.
- .3 To report results in clear, concise, logical manner.

1.14 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and testing in following distinct phases:
- .1 Included in delivery and installation:
  - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
  - .2 Visual inspection of quality of installation.
- .2 Start-up: follow accepted start-up procedures.
- .3 Operational testing: document equipment performance.
- .4 System PV: include repetition of tests after correcting deficiencies.
- .5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Consultant after distinct phases have been

completed and before commencing next phase.

.4 Document require tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by 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 Consultant 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 at least 21 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 Consultant to witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to Consultant within 5 days of test and with Cx report.

1.23 EXTRAPOLATION OF RESULTS

.1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Consultant in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

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 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.30 OCCUPANCY

.1 Cooperate fully with Consultant during stages of acceptance and occupancy of facility.

1.31 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 Consultant.

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

1.32 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:
- .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.

.2 Instrument accuracy tolerances:
- .1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement tolerances during verification:

.1 Unless otherwise specified actual values to be within +/- 2 % of recorded values.

1.33 OWNER'S PERFORMANCE TESTING

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

2 PRODUCTS

2.01 NOT USED

.1 Not Used.

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA S350-M1980(R1998), Code of Practice for Safety in Demolition of Structures.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 00 10 00 – General Instructions.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 PREPARATION

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

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

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

3.2 PROTECTION

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

.2 Protect building systems, services and equipment.

3.3 SITE REMOVALS

.1 Remove items as indicated.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 Canadian General Standards Board (CGSB)
  .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.2 Canadian Standards Association (CSA International)
  .1 CSA B139-04, Installation Code for Oil Burning Equipment.

.3 National Fire Code of Canada (NFCC 2005)

1.02 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, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 QUALITY ASSURANCE

1.04 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.

2 EXECUTION

2.01 APPLICATION

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

2.02 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

2.03 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation,

inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada, CSA B139.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer, CSA B139 without interrupting operation of other system, equipment, components.

2.04 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain.
.1 Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

2.05 AIR VENTS

.1 Install air vents to CSA B139 at high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

2.06 DIELECTRIC COUPLINGS

.1 General: compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

2.07 PIPEWORK INSTALLATION

.1 Install pipework to CSA B139.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards.

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible [and as indicated].

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

.15 Valves:
- .1 Install in accessible locations.
- .2 Remove interior parts before soldering.
- .3 Install with stems above horizontal position unless indicated.
- .4 Valves accessible for maintenance without removing adjacent piping.
- .5 Install globe valves in bypass around control valves.
- .6 Use ball or butterfly valves at branch take-offs for isolating purposes except where specified.
- .7 Install butterfly valves on chilled water and related condenser water systems only.
- .8 Install butterfly valves between weld neck flanges to ensure full compression of liner.
- .9 Use chain operators on valves NPS 2 1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

.16 Check Valves:
- .1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.
- .2 Install swing check valves in horizontal lines on discharge of pumps and as indicated.

2.08 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush system in accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

.2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 - Cleaning supplemented as specified in relevant mechanical sections.

.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

2.09 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Consultant 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Consultant.

.6 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests Consultant.

2.10 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Consultant.

.2 Request written approval by Consultant 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 ASTM International Inc.
- .1 ASTM A 53/A 53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A 105/A 105M-05, Standard Specification for Carbon Steel Forgings, for Piping Applications.

1.02 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 fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.
  - .1 Manufacturer, model number, line contents, pressure and temperature rating.
  - .2 Movement handled, axial, lateral, angular and the amounts of each.
  - .3 Nominal size and dimensions including details of construction and assembly.

1.03 CLOSEOUT SUBMITTALS

.1 Provide maintenance and operation data in accordance with Section 01 78 00 - Closeout Submittals.
- .1 Data to include:
  - .1 Servicing requirements, including special requirements, stuffing box packing, lubrication and recommended procedures.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

2 PRODUCTS

2.01 FLEXIBLE CONNECTION

.1 Application: to suit motion as indicated.

.2 Minimum length in accordance with manufacturer's recommendations to suit offset [as indicated].

.3 Inner hose: stainless steel corrugated.

.4 Braided wire mesh stainless steel outer jacket.

.5 Diameter and type of end connection: as indicated.

.6 Operating conditions:
- .1 Working pressure: 1034 kPa.
- .2 Working temperature: [Range: 0-120° F] degrees C.

.3 To match system requirements.

.7 Three flexible grooved couplings placed in close proximity to vibration source for vibration attenuation and stress relief.

3 EXECUTION

3.01 APPLICATION

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

3.02 INSTALLATION

.1 Install expansion joints with cold setting, as indicated as instructed by Consultant. Make record of cold settings.

.2 Install expansion joints and flexible connections in accordance with manufacturer's instructions.

.3 Install pipe anchors and guides as indicated. Anchors to withstand 150 % of axial thrust.

3.03 PIPE CLEANING AND START-UP

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

3.04 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

1 General

1.1 SECTION INCLUDES

.1 Materials and installation for thermometers and pressure gauges in piping systems.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

- .1 ASME B40.100-2005, Pressure Gauges and Gauge Attachments.
- .2 ASME B40.200-2008, Thermometers, Direct Reading and Remote Reading.

.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 LEED Canada 2009 for Design and Construction-2010, LEED Canada 2009 for Design and Construction Leadership in Energy and Environmental Design Green Building Rating System Reference Guide.
- .4 LEED Canada for Existing Buildings, Operations and Maintenance-2009, LEED Canada 2009 Leadership In Energy and Environmental Design Green Building Rating System Reference Guide.

.3 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-14.4-M88, Thermometers, Liquid-in-Glass, Self Indicating, Commercial/Industrial Type.
- .2 CAN/CGSB-14.5-M88, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

.4 Efficiency Valuation Organization (EVO)

- .1 International Performance Measurement and Verification Protocol (IPMVP)
  - .1 IPMVP 2007 Version.

.5 Green Seal Environmental Standards (GS)

- .1 GS-11-11, Standard for Paints and Coatings.
- .2 GS-36-11, Standard for Commercial Adhesives.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

.3 Certificates:

.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Test and Evaluation Reports:

.1 Submit certified test reports for thermometers and pressure gauges from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store thermometers and pressure gauges off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect thermometers and pressure gauges from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

2 Products

2.1 GENERAL

.1 Select thermometers and manometers according to the temperature and the pressure to be measured, and so that the design point to be at mid-point of scale or range.

2.2 DIRECT READING THERMOMETERS

.1 Industrial Thermometers numeric type, light-emitting diode (LED) 246 mm in height, with an accuracy of 1% with solar cell.

.2 Thermometers rectangular type, rigid with aluminum frame and adjustable angle.

.3 Thermometers combined graduation (º C and º F).

.4 Scale: -40 ° C to 150 ° C (-40 ° F to .302 ° F).

.5 Resistance to shock and vibration.

2.3 THERMOCONDUCTOR MATERIAL

.1 Thermally gel to fill the air space between the walls of the thermowell and the thermometer probe.

2.4 THERMOMETER WELLS

.1 Copper pipe: copper or bronze.

.2 Steel pipe: brass or stainless steel.

.3 Stainless steel pipe: stainless steel.

2.5 PRESSURE GAUGES

.1 Industrial pressure gage, light-emitting diode (LED) 246 mm in height, with an accuracy of 1% with solar cell.

.1 Graduates to operate in the central third of graduation.

.2 Gauges built to withstand a minimum pressure of 5500 kPa (800 lb / in ²).

.3 Screw fitting DN ¼ copper or bronze to copper pipes or plastic and brass or stainless steel for steel pipes.

.2 Provide:

.1 Snubber for pulsating operation.

.2 Gasketted pressure relief back with solid front.

.3 Bronze stop cock.

3 Execution

3.1 EXAMINATION

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

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 GENERAL

.1 Install thermometers and gauges so they can be easily read from floor or platform.

.2 Install between equipment and first fitting or valve.

.3 For a precise reading, be sure to install the well in order to have direct contact with the fluid.

3.3 THERMOMETERS

.1 Install in wells on piping. Include heat conductive material inside well.

.2 Install in locations as indicated and on inlet and outlet of:

.1 Chillers.

.3 Install wells as indicated only for balancing purposes.

.4 Use extensions where thermometers are installed through insulation.

3.4 PRESSURE GAUGES

.1 Install in locations as follows:

.1 In other locations as indicated.

.2 Use extensions where pressure gauges are installed through insulation.

3.5 NAMEPLATES

.1 Install engraved lamicoid nameplates in accordance with Section 23 05 53.01 - Mechanical Identification, identifying medium.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by thermometer and gauge installation.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
- .1 ANSI/ASME B1.20.1-1983(R2006), Pipe Threads, General Purpose (Inch).
- .2 ANSI/ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.

.2 ASTM International
- .1 ASTM A 276-08, Standard Specification for Stainless Steel Bars and Shapes.
- .2 ASTM B 62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 ASTM B 283-08a, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
- .4 ASTM B 505/B 505M-08a, Standard Specification for Copper-Base Alloy Continuous Castings.

1.02 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 equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit data for valves specified in this Section.

1.03 CLOSEOUT SUBMITTALS

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

1.04 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:
- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

2 PRODUCTS

2.01 MATERIALS

.1 Valves:
- .1 Except for specialty valves, to be single manufacturer.
- .2 Products to have CRN registration numbers.

.2 End Connections:
- .1 Connection into adjacent piping/tubing:
  - .1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.
  - .2 Copper tube systems: solder ends to ANSI/ASME B16.18.

.3 Lockshield Keys:
- .1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.

.4 Gate Valves:
- .1 Requirements common to gate valves, unless specified otherwise:
  - .1 Standard specification: MSS SP-80.
  - .2 Bonnet: union with hexagonal shoulders.
  - .3 Connections: screwed with hexagonal shoulders.
  - .4 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.
  - .5 Packing: non-asbestos.
  - .6 Handwheel: non-ferrous.
  - .7 Handwheel Nut: bronze to ASTM B 62.
- .2 NPS 2 and under, non-rising stem, solid wedge disc, Class 125
  - .1 Body: with long disc guides, screwed bonnet with stem retaining nut.
  - .2 Operator: Handwheel.
- .3 NPS 2 and under, non-rising stem, solid wedge disc, Class 150:
  - .1 Body: with long disc guides, screwed bonnet with stem retaining nut.
  - .2 Operator: handwheel.
- .4 NPS 2 and under, rising stem, split wedge disc, Class 125:
  - .1 Body: with long disc guides, screwed bonnet.
  - .2 Disc: split wedge, bronze to ASTM B 283, loosely secured to stem.
  - .3 Operator: handwheel
- .5 NPS 2 and under, rising stem, solid wedge disc, Class 125:
  - .1 Body: with long disc guides, screwed bonnet.
  - .2 Operator: handwheel.
- .6 NPS 2 and under, rising stem, solid wedge disc, Class 150:
  - .1 Body: with long disc guides, screwed, union bonnet.
  - .2 Operator: handwheel.

.5 Globe Valves:
- .1 Requirements common to globe valves, unless specified otherwise:
  - .1 Standard specification: MSS SP-80.
  - .2 Bonnet: union with hexagonal shoulders.
  - .3 Connections: screwed with hexagonal shoulders.
  - .4 Pressure testing: to MSS SP-80. Tests to be hydrostatic.
  - .5 Stuffing box: threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing.
  - .6 Handwheel: non-ferrous.
  - .7 Handwheel Nut: bronze to ASTM B 62.
- .2 NPS 2 and under, composition disc, Class 125:
  - .1 Body and bonnet: screwed bonnet.
  - .2 Disc and seat: renewable rotating PTFE disc composition to suit service conditions, regrindable bronze seat, loosely secured to bronze stem to ASTM B 505.
  - .3 Operator: handwheel or lockshield.

.3 NPS 2 and under, composition disc, Class 150:
.1 Body and bonnet: union bonnet.
.2 Disc and seat: renewable rotating PTFE disc in easily removable disc holder, regrindable bronze seat, loosely secured to bronze stem to ASTM B 505.
.3 Operator: handwheel or lockshield.
.4 NPS 2 and under, plug disc, Class 150, screwed ends:
.1 Body and bonnet: union bonnet.
.2 Disc and seat ring: tapered plug type with disc stem ring of AISI S420 stainless steel to ASTM A 276, loosely secured to stem.
.3 Operator: handwheel.
.5 Angle valve, NPS 2 and under, composition disc, Class 150:
.1 Body and bonnet: union bonnet.
.2 Disc and seat: renewable rotating PTFE disc in slip-on easily removable disc holder having integral guides, regrindable bronze seat, loosely secured to stem.
.3 Operator: handwheel or lockshield.

.6 Check Valves:
.1 Requirements common to check valves, unless specified otherwise:
.1 Standard specification: MSS SP-80.
.2 Connections: screwed with hexagonal shoulders.
.2 NPS 2 and under, swing type, bronze disc, Class 125:
.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
.3 NPS 2 and under, swing type, bronze disc:
.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
.4 NPS 2 and under, swing type, composition disc, Class 200:
.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
.2 Disc: renewable rotating disc of number [6] composition to suit service conditions, bronze two-piece hinge disc construction.
.5 NPS 2 and under, horizontal lift type, composition disc, Class 150:
.1 Body: with integral seat, union bonnet ring with hex shoulders, cap.
.2 Disc: renewable PTFE [no. 6 composition] rotating disc in disc holder having guides top and bottom, of bronze to ASTM B 62.
.6 NPS 2 and under, vertical lift type, bronze disc, Class 125:
.1 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.

.7 Silent Check Valves:
.1 NPS 2 and under:
.1 Body: cast high tensile bronze to ASTM B 62 with integral seat.
.2 Pressure rating: Class 125.
.3 Connections: screwed ends to ANSI B1.20.1 and with hex. shoulders.
.4 Disc and seat: renewable rotating disc.
.5 Stainless steel spring, heavy duty.
.6 Seat: regrindable.

.8 Ball Valves:
.1 NPS 2 and under:
.1 Body and cap: cast high tensile bronze to ASTM B 62.

.2 Pressure rating: 2760-kPa CWP, 860 kPa steam.
.3 Connections: screwed ends to ANSI B1.20.1 and with hexagonal shoulders, solder ends to ANSI.
.4 Stem: tamperproof ball drive.
.5 Stem packing nut: external to body.
.6 Ball and seat: replaceable [stainless steel] [hard chrome] solid ball and Teflon seats.
.7 Stem seal: TFE with external packing nut.
.8 Operator: removable lever handle.

.9 Butterfly Valves:
.1 NPS 2 1/2 through NPS 6, 2068 kPa with grooved ends.
.1 Body: cast bronze, with copper-tube dimensioned grooved ends.
.2 Disc: elastomer coated ductile iron with integrally cast stem.
.3 Operator: lever.

3 EXECUTION

3.01 INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Remove internal parts before soldering.

.3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

3.02 CLEANING

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

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
- .1 ASME B16, Fittings and Valves Package.
- .2 ASME B16.5-2009, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard.
- .3 ANSI/ASME B16.10-2009, Face-to-Face and End-to-End Dimensions Valves.
- .4 ANSI/ASME B16.25-2007, Buttwelding Ends.
- .5 ANSI/ASME B16.34-2009, Valves Flanged, Threaded and Welding End. Includes Supplement (2010).

.2 American Petroleum Institute (API)
- .1 API STD 598-2009, Valve Inspection and Testing.

.3 ASTM International
- .1 ASTM A 49-12, Standard Specification for Heat-Treated Carbon Steel Joint Bars, Micro Alloyed Joint Bars, and Forged Carbon Steel Comprise Joint Bars.
- .2 ASTM A 182/A 182M-11a, Standard Specification for Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valve Parts for High Temperature Service.
- .3 ASTM A 193/A 193M-12, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High Pressure Service and Other Special Purpose Applications.
- .4 ASTM A 194/A 194M-2011, Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure and High-Temperature Service, or Both.
- .5 ASTM A 216/A 216M-08, Standard Specification for Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Service.
- .6 ASTM B 85/B 85M-10, Standard Specification for Aluminum-Alloy Die Castings.

.4 Efficiency Valuation Organization (EVO)
- .1 International Performance Measurement and Verification Protocol (IPMVP)
  - .1 IPMVP 2007 Version.

.5 Manufacturers Standardization Society of the Valve and Fittings Industry (MSS)
- .1 MSS SP-25-2008, Standard Marking System for Valves, Fittings, Flanges and Unions.
- .2 MSS SP-61-2009, Pressure Testing of Valves.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for [each valve] 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, Canada.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified

performance characteristics and physical properties.

1.03 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for valves for incorporation into manual.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:
- .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect valves from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

1.05 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Extra Stock Materials:

.3 Furnish following spare parts:
- .1 Valve seats: one for every 10 valves each size, minimum 1.
- .2 Discs: one for every 10 valves, each size, minimum 1.
- .3 Stem packing: one for every 10 valves, each size. Minimum 1.
- .4 Valve handles: 2 of each size.
- .5 Gaskets for flanges: one for every 10 flanged joints.

2 PRODUCTS

2.01 MATERIAL

.1 Valves:
- .1 To be of single manufacturer.
- .2 Test valves individually.

.2 Requirements common to valves, unless specified otherwise:
- .1 Pressure-temperature ratings: to ANSI B16.34.
- .2 Inspections and tests: to API 598.
- .3 Pressure testing: to MSS SP-61.
- .4 Flanged valves:
  - .1 Face-to-face dimensions: to ANSI B16.10.
  - .2 Flange dimensions: to ANSI B16.5 with 1.6 mm raised face.
- .5 Butt-weld valves:
  - .1 End-to-end dimensions: to ANSI B16.10.
  - .2 End dimensions: to ANSI B16.25 bored for [standard pipe schedule].
- .6 Handwheel: non-heating type with raised rim of die-cast aluminum alloy to ASTM B 85 or

malleable iron to ASTM A 49.

.7 Markings: to MSS SP-25.

.8 Identification:

.1 Plate showing catalogue number, size, material of body disc, stem seat, fluid, pressure-temperature rating.

.2 Body markings: manufacturer, size, primary service rating, material symbol.

.9 CRN registration number required for all products.

2.02 GATE VALVES

.1 NPS 2 1/2 - 12, rising stem, OS&Y, solid flexible wedge disc, flanged butt-weld ends, Class 150:

.1 Body and multiple-bolted integral yoke and bonnet: cast steel to ASTM A 216/A 216M WCB, with full length disc guides designed to ensure correct re-assembly.

.2 Body/bonnet joint: flat face with corrugated metallic gasket.

.3 Bonnet studs: to ASTM A 193/A 193M Type B7.

.4 Bonnet nuts: to ASTM A 194/A 194M Type 2H.

.5 Stuffing box: including non-galling two-piece ball jointed packing gland, with swing-type eye bolts and nuts.

.6 Gland packing: containing corrosion inhibitor to prevent stem pitting.

.7 Yoke sleeve: Ni-Resist, minimum melting point above 954 degrees C.

.8 Hydraulic grease fitting: for lubrication of yoke sleeve bearing surfaces.

.9 Disc: with disc stem ring to connect to stem, guided throughout its travel.

.1 NPS 2 1/2 - 6: solid corrosion and heat resistant 13% chromium steel with minimum hardness of 350 HB.

.2 NPS 8 and larger: carbon steel faced with corrosion and heat resistant 13 chromium steel with minimum hardness of 350 HB.

.10 Seat ring: seamless carbon steel with hard-faced cobalt-chromium-tungsten alloy seating surface, slipped in, seal welded, ground to match disc.

.11 Stem: heat treated corrosion and heat resistant 13% chromium steel with accurately-cut precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut, T-head disc-stem connection.

.12 Operator: see elsewhere in this Section.

2.03 VALVE OPERATORS

.1 Handwheel: on all valves.

.2 Handwheel with chain operators: on valves installed more than 2400 mm above floor in chiller room.

.3 Pumps:

.1 Application: [full open and full close applications].

.2 [Position and precision control].

2.04 BYPASSES FOR GATE AND GLOBE VALVES

.1 Locations: on valves as indicated.

.2 Size of bypass valve:

.1 Main valve up to NPS 8: NPS 3/4.

.2 Main valve NPS 10 and over: NPS 1.

.3 Type of bypass valves:

.1 On gate valve: globe, with composition bronze disc, bronze trim, to Section 23 05 23.01 - Valves

- Bronze.

.2 On globe valve: globe, with composition bronze disc, bronze trim, to Section 23 05 23.01 - Valves - Bronze.

2.05 CHECK VALVES

.1 NPS 2 1/2 and over, flanged or butt-weld ends, Class 150: swing check.
- .1 Body and multiple-bolted cap: cast steel to ASTM A 216/A 216M WCB.
- .2 Cap studs: to ASTM A 193/A 193M Type B7.
- .3 Cap nuts: to ASTM A 194/A 194M Type 2H.
- .4 Body/cap joint: male-female face with corrugated metallic gasket.
- .5 Disc: heat treated corrosion and heat resistant 13% chromium steel.
- .6 Seat rings: heat treated corrosion and heat resistant 13% chromium steel, slipped in, seal welded, ground to match disc.
- .7 Hinge: ASTM A 182/A 182M.
- .8 Hinge pin: ASTM A 182/A 182M.
- .9 Hinge pin plugs: ASTM A 182/A 182M.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform [Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.02 INSTALLATION

.1 Install in accordance with manufacturer's recommendations in upright position with stem above horizontal.

3.03 COMMISSIONING

.1 As part of commissioning activities, develop schedule of valves and record thereon identifier, location, service, purchase order number and date, manufacturer, identification data specified above.

3.04 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.05 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by cast steel valve installation.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
- .1 ASME B1.20.1-1983(R2006), Pipe Threads, General Purpose (Inch).
- .2 ASME B16.1-05, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25,125 and 250.
- .3 ANSI/ASME B16.5-03, Pipe Flanges and Flanged Fittings: NPS ½ through 24.
- .4 ANSI/ASME B16.11-05, Forged Fittings, Socket-Welding and Threaded.
- .5 ANSI/ASME B16.25-07, Buttwelding Ends.
- .6 ANSI/ASME B16.34-04, Valves - Flanged, Threaded and Welding Ends.

.2 American Petroleum Institute (API)
- .1 API Std. 609-04, Butterfly Valves: Double Flanged, Lug- and Wafer-Type.

.3 ASTM International Inc.
- .1 ASTM A 126-04, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- .2 ASTM A 536-84(2004)e1, Standard Specification for Ductile Iron Castings.
- .3 ASTM B 62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .4 ASTM B 209M-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
- .1 MSS SP-67-02a, Butterfly Valves.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheets for valves and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit data for valves specified in this section.

.3 Shop Drawings:
- .1 Provide drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.

1.03 CLOSEOUT SUBMITTALS

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

1.04 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials/Spare Parts:

.2 Furnish following spare parts:
- .1 Valve seats: one for every 10 valves each size, minimum 1.
- .2 Discs: one for every 10valves, each size, minimum 1.
- .3 Stem packing: one for every 10 valves, each size, minimum 1.
- .4 Valve handles: 2 of each size.
- .5 Gaskets for flanges: one for every 10 flanged joints.

2 PRODUCTS

2.01 BUTTERFLY VALVES - RESILIENT SEAT - 200 PSIG

.1 Except to specialty valves, to be of single manufacturer.

.2 To be suitable for dead-end service.

.3 CRN registration number required for products.

.4 Sizes:

.5 Pressure rating for tight shut-off at temperatures up to maximum for seat material.
- .1 NPS 2 - 12: 200 psig.
- .2 NPS 14 - 48: 200 psig.

.6 Minimum seat temperature ratings to 121 - 135 degrees C.

.7 Application: on-off operation.

.8 Full lug body (threaded), Grooved ends.

.9 Operators:
- .1 NPS 2 - 6: handles capable of locking in any of ten (10) positions - 0 degrees to 90 degrees. Handle and release trigger - ductile iron. Return spring and hinge pin: carbon steel. Latch plate and mounting hardware: cadmium plated carbon steel. Standard coating: black laquer.
- .2 NPS 8 - 30: manual enclosed gear operator, electric actuators as specified elsewhere in this section.

.10 Designed to comply with MSS SP-67 and API 609.

.11 Compatible with ANSI Class 125/Class 150 flanges.

.12 Construction:
- .1 Body ss.
- .2 Disc: 316 SS.
- .3 Seat: EPDM, Buna-N, Viton, EPT.
- .4 Shaft: 316 stainless steel.
- .5 Taper pin: 316 SS.
- .6 Key: stainless.
- .7 O-Ring: Buna-N, EPDM, Fluoroelastomer.
- .8 Bushings: luberized bronze, Teflon, fibreglass with Teflon lining.

2.02 MOUNTING FLANGES

.1 Class 125 cast iron to ANSI B16.1 or Class 150 steel to B16.5 pipe flanges.

2.03 ELECTRIC ACTUATORS

.1 Operation: designed to provide precise quarter turn electric operation.
- .1 Torque range: up to 1.130 N-m and speed ranges from 10 seconds to 30 seconds to move from fully open to fully closed.
- .2 Gear train within actuator to provide smooth continuous rotary power stroke for accurate automatic valve positioning. Factory-set, field adjustable cam-actuated travel limit switches to provide precise control of shaft rotation.

.2 Construction:
- .1 Castings: heavy duty industrial grade for rugged use.
- .2 Actuators: continuous duty with high efficiency single phase reversing capacitor motor with thermal overload protection.
- .3 Gears and pinions constructed from hardened steel.
- .4 Gear train to be permanently lubricated.
- .5 Mechanical brake to ensure that gear is locked in precise position.

.3 Electrical:
- .1 Standard voltage: 120 VAC. 60 Hz.
- .2 Control options: 4-20 Ma DC, 0-10 V DC.
- .3 CSA approved.
- .4 Electrical rating: NEMA IV.

3 EXECUTION

3.01 PREPARATION

.1 Valve and mating flange preparation.
- .1 Inspect adjacent pipeline, remove rust, scale, welding slag, other foreign material.
- .2 Ensure that valve seats and pipe flange faces are free of dirt or surface irregularities which may disrupt flange seating and cause external leakage.
- .3 Install butterfly valves with disc in almost closed position.
- .4 Inspect valve disc seating surfaces and waterway and eliminate dirt or foreign material.

3.02 INSTALLATION OF VALVES

.1 Install in accordance with manufacturer's instructions.

.2 Do not use gaskets between pipe flanges and valves unless instructed otherwise by valve manufacturer.

.3 Verify suitability of valve for application by inspection of identification tag.

.4 Mount actuator on to valve prior to installation.

.5 Handle valve with care so as to prevent damage to disc and seat faces.

.6 Valves in horizontal pipe lines should be installed with stem in horizontal position to minimize

liner and seal wear.

.7 Ensure that valves are centered between bolts before bolts are tightened and then opened and closed to ensure unobstructed disc movement. If interference occurs due, for example to pipe wall thickness, taper bore adjacent piping to remove interference.

3.03 ACTUATOR INSTALLATION

.1 Air hoses or electrical connections to be made by actuator manufacturer.

.2 Cycle valve operation from fully closed to fully open then back to fully closed.

.3 At same time, check travel stop settings for proper disc alignment.

3.04 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

.2 Clean installed products in accordance to manufacturer's recommendation.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME B31.1-07, Power Piping.

.2 ASTM International
- .1 ASTM A 125-1996(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A 307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .3 ASTM A 563-07], Standard Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM)

.4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
- .1 MSS SP 58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
- .2 MSS SP 69-2003, Pipe Hangers and Supports - Selection and Application.
- .3 MSS SP 89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

.5 Underwriter's Laboratories of Canada (ULC)

1.02 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, 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 Consultant will make available 1 copy of systems supplier's installation instructions.

1.03 CLOSEOUT SUBMITTALS

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

1.04 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:
- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

2 PRODUCTS

2.01 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 SP 58.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under 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 SP 58.

2.02 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with MSS SP 58. ANSI B31.1 and

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

2.03 PIPE HANGERS

.1 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 SP 69.

.2 Hanger rods: threaded rod material to MSS SP 58:
- .1 Ensure that hanger rods are subject to tensile loading only.
- .2 Provide linkages where lateral or axial movement of pipework is anticipated.
- .3 Do not use 22 mm or 28 mm rod.

.3 Pipe attachments: material to MSS SP 58:
- .1 Attachments for steel piping: carbon steel black.
- .2 Attachments for copper piping: copper plated black steel.
- .3 Use insulation shields for hot pipework.

.4 Oversize pipe hangers and supports.

.4 Adjustable clevis: material to MSS SP 69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.5 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP 69.

.6 U-bolts: carbon steel to MSS SP 69 with 2 nuts at each end to ASTM A 563.
.1 Finishes for steel pipework: galvanized.
.2 Finishes for copper, glass, brass or aluminum pipework: galvanized with formed portion plastic or epoxy coated.

.7 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

2.04 RISER CLAMPS

.1 Steel or cast iron pipe: galvanized steel to MSS SP 58, type 42, [UL listed] [FM approved].

.2 Copper pipe: carbon steel copper plated to MSS SP 58, type 42.

.3 Bolts: to ASTM A 307.

.4 Nuts: to ASTM A 563.

2.05 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:
.1 64 kg/mü density insulation plus insulation protection shield to: MSS SP 69, 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 SP 69.

2.06 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.07 HOUSE-KEEPING PADS

.1 Provide minimum 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment; chamfer pad edges. Extend existing housekeeping pads to accommodate manufacturer clearances of new pumps and chillers.

.2 Submit structural calculations with shop drawings.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written recommendations or specifications, including

product technical bulletins, handling, storage and installation instructions, and datasheet.

3.02 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.

3.03 HANGER SPACING

.1 Fire protection: to applicable fire code.

3.04 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.

3.05 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.

3.06 CLEANING

.1 Clean in accordance with Section 01 74 11 - Cleaning.

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

END OF SECTION

1 GENERAL

1.01 SUMMARY

.1 Section Includes:
- .1 Vibration isolation materials and components, seismic control measures and their installation.

1.02 REFERENCES

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

.2 National Fire Protection Association (NFPA)
- .1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.

.3 National Building Code of Canada (NBC) - 2010

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .2 Provide system shop drawings complete with performance and product data.
- .3 Provide detailed drawings of seismic control measures for equipment and piping.

.3 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 Consultant will make available 1 copy of systems supplier's installation instructions.
- .3 Manufacturer's Field Reports: manufacturer's field reports specified.

1.04 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.05 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

2 PRODUCTS

2.01 GENERAL

.1 Size and shape of bases type and performance of vibration isolation as indicated.

2.02 ELASTOMERIC PADS

.1 Type EP1 - neoprene waffle or ribbed; 9 mm minimum thick; 50 durometer; maximum loading 350 kPa.

.2 Type EP2 - neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.

2.03 SPRINGS

.1 Design stable springs: ratio of lateral to axial stiffness is equal to or greater than 1.2 times ratio of static deflection to working height. Select for 50% travel beyond rated load. Units complete with levelling devices.

.2 Ratio of height when loaded to diameter of spring between 0.8 to 1.0.

.3 Cadmium plate for outdoor and 100% relative humidity installations.

.4 Colour code springs.

2.04 SPRING MOUNT

.1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.

.2 Type M1 - restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.

.3 Performance: Per manufacturer specifications.

2.05 HANGERS

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30 degrees arc without metal to metal contact.

.2 Type H1 - neoprene - in-shear, moulded with rod isolation bushing which passes through hanger box.

.3 Performance: Per manufacturer specifications.

2.06 ACOUSTIC BARRIERS FOR ANCHORS AND GUIDES

.1 Acoustic barriers: between pipe and support, consisting of 25 mm minimum thick heavy duty duck and neoprene isolation material.

2.07 SEISMIC CONTROL MEASURES

.1 General:
- .1 Seismic control systems to work in every direction.
- .2 Fasteners and attachment points to resist same maximum load as seismic restraint.
- .3 Drilled or power driven anchors and fasteners not permitted.
- .4 No equipment, equipment supports or mounts to fail before failure of structure.
- .5 Supports of cast iron or threaded pipe not permitted.
- .6 Seismic control measures not to interfere with integrity of firestopping.

.2 Static equipment:
- .1 Anchor equipment to equipment supports. Anchor equipment supports to structure.
- .2 Suspended equipment:
  - .1 Use one or more of following methods as indicated:
    - .1 Install tight to structure.
    - .2 Cross brace in every direction.
    - .3 Brace back to structure.
    - .4 Cable restraint system.
- .3 Seismic restraints:
  - .1 Cushioning action gentle and steady.
  - .2 Never reach metal-like stiffness.

.3 Vibration isolated equipment:
- .1 Seismic control measures not to jeopardize noise and vibration isolation systems. Provide 6 to 9 mm clearance during normal operation of equipment and systems between seismic restraint and equipment.
- .2 Incorporate seismic restraints into vibration isolation system to resist complete isolator unloading.
- .3 As indicated.

.4 Piping systems:
- .1 Fire protection systems: to NFPA 13.
- .2 Piping systems: hangers longer than 300 mm; brace at each hanger.
- .3 Compatible with requirements for anchoring and guiding of piping systems.

.5 Bracing methods:
- .1 SRS Approved by Consultant.
- .2 Structural angles or channels.
- .3 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

.1 Seismic control measures to meet requirements of NBC.

.2 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.

.3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.4 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:
- .1 Up to NPS4: first 3 points of support. NPS5 to NPS8: first 4 points of support. NPS10 and Over: first 6 points of support.
- .2 First point of support: static deflection of twice deflection of isolated equipment, but not more than 50 mm.

.5 Where isolation is bolted to floor use vibration isolation rubber washers.

.6 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.03 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
- .1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.
- .2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:
  - .1 After delivery and storage of Products.
  - .2 After preparatory work is complete but before installation commences.
  - .3 Twice during the installation, at 25% and 60% completion stages.
  - .4 Upon completion of installation.
- .3 Submit manufacturer's reports to Consultant within 3 days of manufacturer representative's review.
- .4 Make adjustments and corrections in accordance with written report.

.2 Inspection and Certification:
- .1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC system[s] after start up and TAB of systems to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .2 Take vibration measurements for equipment listed below.
  - .1 Pumps.

.3 Provide Consultant with notice 48 h in advance of commencement of tests.

.4 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations (including sound curves).

.5 Submit complete report of test results including sound curves.

3.04 CLEANING

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

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

END OF SECTION

1 GENERAL

1.01 SUMMARY

.1 Section Includes:
- .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.
- .2 Sustainable requirements for construction and verification.

1.02 REFERENCES

.1 Canadian Gas Association (CGA)
- .1 CSA/CGA B149.1-05, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
- .2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)
- .1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.
- .2 NFPA 14-2003, Standard for the Installation of Standpipe and Hose Systems.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:
- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.04 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.2 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

2 PRODUCTS

2.01 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
.1 Equipment: manufacturer's name, model, size, serial number, capacity.
.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.02 SYSTEM NAMEPLATES

.1 Colours:
.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:
.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

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

.4 Locations:
.1 Terminal cabinets, control panels: use size # 5.
.2 Equipment in Mechanical Rooms: use size # 9.

.5 Identification for PWGSC Preventive Maintenance Support System (PMSS):
.1 Use arrangement of Main identifier, Source identifier, Destination identifier.
.2 Equipment in Mechanical Room:
.1 Main identifier: size #9.
.2 Source and Destination identifiers: size #6.
.3 Terminal cabinets, control panels: size #5.
.3 Equipment elsewhere: sizes as appropriate.

2.03 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, obtain written approval of identification system from Departmental Representative and Consultant.

2.04 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:
- .1 Natural gas: to CSA/CGA B149.1 authority having jurisdiction.
- .2 Propane gas: to CSA/CGA B149.1 authority having jurisdiction.
- .3 Sprinklers: to NFPA 13.
- .4 Standpipe and hose systems: to NFPA 14.

2.05 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:
- .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:
- .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:
- .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
- .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
- .3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:
- .1 To full circumference of pipe or insulation.
- .2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:
- .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
- .2 Other pipes: pressure sensitive [plastic-coated cloth] [vinyl] with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:
- .1 Where not listed, obtain direction from Consultant.
- .2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

- .3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
City water	Green	CITY WATER
Condenser water supply	Green	COND. WTR. SUPPLY
Condenser water return	Green	COND. WTR. RETURN
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Make-up water	Yellow	MAKE-UP WTR

Domestic cold water supply	Green	DOM. CWS
Refrigeration liquid	Yellow	REF. LIQUID

2.06 VALVES, CONTROLLERS

.1 Tag new and existing valves in the mechanical room.

.2 Brass tags with 12 mm stamped identification data filled with black paint.

.3 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.07 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.08 LANGUAGE

.1 Identification in English and French.

.2 Use one nameplate and label for both languages.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 TIMING

.1 Provide identification only after painting specified Section [09 91 23 - Interior Painting] has been completed.

3.03 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC or CSA registration plates as required by respective agency.

.3 Identify systems, equipment to conform to PWGSC PMSS.

3.04 NAMEPLATES

.1 Locations:
  .1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:
  .1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:
.1 Do not paint, insulate or cover.

3.05 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.
.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.06 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.07 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

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

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .1 ANSI/ASHRAE 90.1-04-SI Edition, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM International Inc.
- .1 ASTM C 335-05ae1, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .2 ASTM C 449/C 449M-07, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .3 ASTM C 533-07, Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- .4 ASTM C 547-07, Standard Specification for Mineral Fiber Pipe Insulation.
- .5 ASTM C 553-02, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .6 ASTM C 612-04e1, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
- .7 ASTM C 795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- .8 ASTM C 921-03a, 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.
- .2 CAN/CGSB 51.53-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts.

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

.5 Thermal Insulation Association of Canada (TIAC)
- .1 National Insulation Standards 2005.

.6 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-07, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.02 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, include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Provide for review: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
.1 Mount sample on 12 mm plywood board.
.2 Affix typewritten label beneath sample indicating service.

.4 Manufacturer's Instructions:
.1 Include procedures to be used and installation standards to be achieved.

.5 Qualifications:
.1 Installer to be specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, member of TIAC.

1.03 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Store at temperatures and conditions recommended by manufacturer.

2 PRODUCTS

2.01 FIRE AND SMOKE RATING

.1 Fire and smoke ratings to CAN/ULC-S102:
.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

2.02 INSULATION

.1 TIAC Code A.6: flexible unicellular tubular elastomer.
.1 Insulation: [with vapour retarder jacket].
.2 Jacket: to CGSB 51-GP-52MA.
.3 Maximum "k" factor.
.4 Certified by manufacturer free of potential stress corrosion cracking corrodents.

3 EXECUTION

3.01 ITEMS TO INSULATE

.1 Chillers: evaporator heat exchangers

.1 ACIT code A-6

3.02 APPLICATION

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

3.03 PRE- INSTALLATION REQUIREMENTS

.1 Pressure testing of equipment and adjacent piping systems complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.04 INSTALLATION

.1 Install in accordance with TIAC National Standards
- .1 Hot equipment: To TIAC code 1503-H.
- .2 Cold equipment: to TIAC code 1503-C.

.2 Elastomeric Insulation to remain dry. Overlaps to manufacturer's instructions. Joints tight and sealed properly.

.3 Provide vapour retarder as recommended by manufacturer.

.4 Apply materials in accordance with insulation and equipment manufacturer's instructions and this specification.

.5 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.6 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
- .1 Hangers, supports outside vapour retarder jacket.

.7 Supports, Hangers:
- .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.05 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: At expansion joints, valves, primary flow measuring elements, flanges and unions at equipment.

.2 Installation to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

3.06 EQUIPMENT INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 Cold equipment:
- .1 TIAC A-3 or C-4 with mechanical fastenings or wire or bands and 13 mm cement reinforced with one layer of reinforcing mesh.
- .2 TIAC C-2 faced with vapour retardant jacket and with wire or bands and 13 mm cement preceded by one layer of reinforcing mesh.
- .3 TIAC A-6 or C-4 with mechanical fastenings or wire or bands.
- .4 Thicknesses: chillers (except factory insulated) 50 mm.

3.07 CLEANING

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

END OF SECTION

1 GENERAL

1.01 SUMMARY

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

1.02 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 B 209M-04, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
- .2 ASTM C 335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .3 ASTM C 411-04, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .4 ASTM C 449/C 449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .5 ASTM C 533-2004, Calcium Silicate Block and Pipe Thermal Insulation.
- .6 ASTM C 547-2003, Mineral Fiber Pipe Insulation.
- .7 ASTM C 795-03, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- .8 ASTM C 921-03a, 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.
- .2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Department of Justice Canada (Jus)
- .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
- .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .3 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.

1.03 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.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
.1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in the Province of Onatrio, Canada.

1.05 QUALITY ASSURANCE

.1 Qualifications:

.2 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, member of TIAC.

.3 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.06 DELIVERY, STORAGE AND HANDLING
.1 Packing, shipping, handling and unloading:
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:
.1 Protect from weather, construction traffic.
.2 Protect against damage.
.3 Store at temperatures and conditions required by manufacturer.

2 PRODUCTS

2.01 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

2.02 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 C 335.

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
.1 Mineral fibre: to CAN/ULC-S702, ASTM C 547.
.2 Maximum "k" factor: to CAN/ULC-S702.

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
.1 Mineral fibre: to CAN/ULC-S702, ASTM C 547.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to CAN/ULC-S702, ASTM C 547.

.5 TIAC Code C-2: mineral fibre blanket faced without factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
.1 Mineral fibre: to CAN/ULC-S702, ASTM C 547.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to CAN/ULC-S702, ASTM C 547.

.6 TIAC Code A-6: flexible unicellular tubular elastomer.
.1 Insulation: with vapour retarder jacket.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Certified by manufacturer: free of potential stress corrosion cracking corrodants.

.7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
.1 Insulation: to ASTM C 533.
.2 Design to permit periodic removal and re-installation.

2.03 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, plain, reinforced, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.04 CEMENT

.1 Thermal insulating and finishing cement:
.1 Hydraulic setting or Air drying on mineral wool, to ASTM C 449/C 449M.

2.05 VAPOUR RETARDER LAP ADHESIVE

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

2.06 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.07 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: fibrous glass, untreated 305 g/mý.

2.08 JACKETS

.1 Polyvinyl Chloride (PVC):
- .1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
- .2 Colours: white.
- .3 Minimum service temperatures: -20 degrees C.
- .4 Maximum service temperature: 65 degrees C.
- .5 Moisture vapour transmission: 0.02 perm.
- .6 Thickness: 30 mm.
- .7 Fastenings:
  - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
  - .2 Tacks.
  - .3 Pressure sensitive vinyl tape of matching colour.
- .8 Special requirements:

.2 ABS Plastic:
- .1 One-piece moulded type and sheet with pre-formed shapes as required.
- .2 Colours: white
- .3 Minimum service temperatures: -40 degrees C.
- .4 Maximum service temperature: 82 degrees C.
- .5 Moisture vapour transmission: 0.012 perm.
- .6 Thickness: 0.75 mm.
- .7 Fastenings:
  - .1 Solvent weld adhesive compatible with insulation to seal laps and joints.
  - .2 Tacks.
  - .3 Pressure sensitive vinyl tape of matching colour.
- .8 Locations:
  - .1 For outdoor use ONLY.

.3 Canvas:
- .1 220 and 120 gm/mý cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.
- .2 Lagging adhesive: compatible with insulation.

.4 Aluminum:
- .1 To ASTM B 209.
- .2 Thickness: 0.50 mm sheet.
- .3 Finish: smooth, stucco embossed or corrugated.

.4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

.5 Stainless steel:
.1 Type: 304.
.2 Thickness: 0.25 mm.
.3 Finish: smooth, corrugated, or stucco embossed.
.4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 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.

3.03 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:
.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.04 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: at valves, primary flow measuring elements, flanges and unions at equipment.

.2 Design: to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:
.1 Insulation, fastenings and finishes: same as system.
.2 Jacket: aluminum, SS, PVC, high temperature fabric.

3.05 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.06 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-3.
- .1 Securements: SS wire, bands, Tape at 300 mm on centre.
- .2 Seals: VR lap seal adhesive, VR lagging adhesive.
- .3 Installation: TIAC Code: 1501-C.

.3 Thickness of insulation as listed in following table.
- .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
- .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp degrees C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			Run out	to 1	1 ¼ to 2	2 ½ to 4	5 to 6	8 & over
Chilled Water	4-13	A-3	25	25	25	25	25	25
Chilled Water	below 4	A-3	25	25	38	38	38	38

.4 Finishes:
- .1 Exposed indoors: [canvas] [[aluminum] [SS] [PVC] jacket].
- .2 Exposed in mechanical rooms: [canvas] [[aluminum] [SS] [PVC] jacket].
- .3 Concealed, indoors: canvas on valves, fittings. No further finish.
- .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
- .5 Outdoors: water-proof aluminum, ABS jacket.
- .6 Finish attachments: SS screws, bands at 150 mm on centre. Seals: wing closed.
- .7 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.07 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

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

END OF SECTION

1 GENERAL

1.01 SUMMARY

.1 Section Includes:
- .1 Procedures and cleaning solutions for cleaning mechanical piping systems.

1.02 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM E 202- 00 , Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

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

1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 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.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Instructions: submit manufacturer's installation instructions.
  - .1 Consultant will make available 1 copy of systems supplier's installation instructions.

1.04 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

2 PRODUCTS

2.01 CLEANING SOLUTIONS

.1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.

.2 Sodium carbonate: 0.40 kg per 100 L water in system.

.3 Low-foaming detergent: 0.01 kg per 100 L water in system.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 CLEANING HYDRONIC SYSTEMS

.1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.

.2 Cleaning Agency:
- .1 Retain qualified water treatment specialist to perform system cleaning.

.3 Cleaning procedures:
- .1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:
  - .1 Cleaning procedures, flow rates, elapsed time.
  - .2 Chemicals and concentrations used.
  - .3 Inhibitors and concentrations.
  - .4 Specific requirements for completion of work.
  - .5 Special precautions for protecting piping system materials and components.
  - .6 Complete analysis of water used to ensure water will not damage systems or equipment.

.4 Conditions at time of cleaning of systems:
- .1 Systems: free from construction debris, dirt and other foreign material.
- .2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.
- .3 Strainers: clean prior to initial fill.
- .4 Install temporary filters on pumps not equipped with permanent filters.
- .5 Install pressure gauges on strainers to detect plugging.

.5 Report on Completion of Cleaning:
- .1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

.6 Hydronic Systems:
- .1 Fill system with water, ensure air is vented from system.
- .2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).
- .3 Use water metre to record volume of water in system to +/- 0.5%.
- .4 Add chemicals under direct supervision of chemical treatment supplier.
- .5 Closed loop systems: circulate system cleaner at 60 degrees C for at least 36 h. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.
- .6 Flush velocity in system mains and branches to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.
- .7 Add chemical solution to system.
- .8 Establish circulation, raise temperature slowly to 82 degrees C minimum. Circulate for 12 h, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is

below 38 degrees C. Drain as quickly as possible. Refill with clean water. Circulate for 6 h at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

3.03 START-UP OF HYDRONIC SYSTEMS

.1 After cleaning is completed and system is filled:

- .1 Establish circulation and expansion tank level, set pressure controls.
- .2 Ensure air is removed.
- .3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.
- .4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.
- .5 Clean out strainers repeatedly until system is clean.
- .6 RE-Commission water treatment systems
- .7 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.
- .8 Repeat with water at design temperature.
- .9 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.
- .10 Bring system up to design temperature and pressure slowly.
- .11 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .12 Adjust pipe supports, hangers, springs as necessary.
- .13 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.
- .14 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.
- .15 Check operation of drain valves.
- .16 Adjust valve stem packings as systems settle down.
- .17 Fully open balancing valves (except those that are factory-set).
- .18 Check operation of over-temperature protection devices on circulating pumps.
- .19 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

END OF SECTION

1 GENERAL

1.01 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for electric and electronic control system for HVAC and include product characteristics, performance criteria, physical size, finish and limitations.

1.02 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

2 PRODUCTS

2.01 FLOW SWITCH

.1 Flow switch for Chiller system as indicated on drawings, pipe size as indicated, CSA Enclosure, rated at 16 A at 120 V. Maximum liquid temperature: 121 degrees C. Maximum liquid gauge pressure of 1034 kPa ambient temperature range 0 degrees C to 82 degrees C.

2.02 PRESSURE SWITCH

.1 Pressure switch for water at range to gauge pressure of 1034 kPa with auto manual reset, contacts open on rise. Maximum allowable gauge pressure of 1.2 MPa. Full load 16 A at 120 V, ULC rated.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for electric and electronic control systems installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.02 INSTALLATION

.1 Install master control device on chiller for operation of pumps, valves and VFDs.

.2 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior wall.

.3 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
- .1 ANSI/AWWA C111/A21.11- 06, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.2 American Society of Mechanical Engineers (ASME)
- .1 ASME B16.1- 10, Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- .2 ASME B16.3- 06, Malleable Iron Threaded Fittings: Classes 150 and 300.
- .3 ASME B16.5- 09, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard.
- .4 ASME B16.9- 07, Factory-Made Wrought Buttwelding Fittings.
- .5 ASME B18.2.1- 10, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange. Loded Head and Lag Screws (Inch Series).
- .6 ASME B18.2.2- 10, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).

.3 ASTM International
- .1 ASTM A 47/A 47M- 99(2009), Standard Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A 53/A 53M- 10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- .3 ASTM A 536- 84(2009), Standard Specification for Ductile Iron Castings.
- .4 ASTM B 61- 08, Standard Specification for Steam or Valve Bronze Castings.
- .5 ASTM B 62- 09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .6 ASTM E 202- 10, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

.4 CSA International
- .1 CSA B242- 05(R2011), Groove and Shoulder Type Mechanical Pipe Couplings.
- .2 CSA W48- 06, Filler Metals and Allied Materials for Metal Arc Welding.

.5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS)
- .1 MSS-SP-67- 2002a, 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- 08, Bronze Gate, Globe, Angle and Check Valves.
- .5 MSS-SP-85- 02, Gray Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for hydronic systems 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, Canada.
.2 Indicate on drawings:
.1 Components and accessories.

1.03 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for hydronic systems for incorporation into manual.
.1 Include special servicing requirements.

1.04 EXTRA STOCK MATERIALS

.1 Supply spare parts as follows where applicable:
.1 Valve seats: 1 minimum for every ten valves, each size. Minimum one.
.2 Discs: 1 minimum for every ten valves, each size. Minimum one.
.3 Stem packing: 1 minimum for every ten valves, each size. Minimum one.
.4 Valve handles: 2 minimum of each size.
.5 Gaskets for flanges: 1 minimum for every ten flanges.

1.05 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:
.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect hydronic systems from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 PIPE

.1 Steel pipe: to ASTM A 53/A 53M, Grade B , as follows:
.1 To NPS 6: Schedule 40.
.2 NPS 8 and over, 10.
.3 NPS 12 and over, 10 mm wall thickness.

2.02 PIPE JOINTS

.1 NPS 2 and under: screwed fittings with PTFE tape or lead-free pipe dope.

.2 NPS 2-1/2 and over: welding fittings and flanges to CSA W48 .

.3 Roll grooved: standard rigid coupling to CSA B242.

.4 Flanges: plain or raised face, slip-on weld neck to ANSI/AWWA C111/ A21.11.

.5 Orifice flanges: slip-on raised face, 2100 kPa.

.6 Flange gaskets: to ANSI/AWWA C111/ A21.11.

.7 Pipe thread: taper.

.8 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.

.9 Roll grooved coupling gaskets: type EPDM.

2.03 FITTINGS

.1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.

.2 Pipe flanges and flanged fittings:
- .1 Cast iron: to ASME B16.1, Class 125.
- .2 Steel: to ASME B16.5.

.3 Butt-welding fittings: steel, to ASME B16.9.

.4 Unions: malleable iron, to ASTM A 47/A 47M and ASME B16.3.

.5 Fittings for roll grooved piping: malleable iron to ASTM A 47/A 47M ductile iron to ASTM A 536.

2.04 VALVES

.1 Connections:
- .1 NPS 2 and smaller: screwed ends.
- .2 NPS 2-1/2 and larger: flanged or grooved ends.

.2 Gate valves: to MSS-SP-70 to MSS-SP-80 application: isolating equipment, control valves, pipelines :
- .1 NPS 2 and under:
  - .1 Mechanical Rooms: Class 125, rising stem, split wedge disc, as specified Section 23 05 23.01 - Valves – Bronze.
  - .2 Elsewhere: Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves – Bronze.
- .2 NPS 2-1/2 and over:
  - .1 Mechanical Rooms: rising stem, split wedge disc, lead free bronze trim, as specified Section 23 05 23.03 - Valves - Cast Steel.
    - .1 Operators: chain, manual, gear.
  - .2 Elsewhere: non-rising stem, solid wedge disc, lead free bronze trim, as specified Section 23 05 23.03 - Valves - Cast Steel.

.3 Butterfly valves: to MSS-SP-67 application: isolating cells or section of multiple component equipment (i.e. multi-section coils, multi-cell cooling towers):
- .1 NPS 2-1/2 and over: lug type grooved ends: as specified Section 23 05 23.05 – Butterfly Valves.

.4 Globe valves: to MSS-SP-80-85 application: throttling, flow control, emergency bypass :
- .1 NPS 2 and under:
  - .1 Mechanical Rooms: with PTFE disc, as specified Section 23 05 23.01 - Valves -

Bronze.

.2 Elsewhere: globe, with composition disc, as specified Section 23 05 23.03 - Valves – Bronze.

.2 NPS 2-1/2 and over:

.1 With composition lead free bronze disc, lead free bronze trim, as specified Section 23 05 23.03 - Valves - Cast Steel.

.5 Balancing, for TAB:

.1 Sizes: calibrated balancing valves, as specified this section.

.2 NPS 2 and under:

.1 Mechanical Rooms: globe, with plug disc as specified Section 23 05 23.01 - Valves - Bronze.

.2 Elsewhere: globe, with plug disc as specified Section 23 05 23.01 - Valves - Bronze.

.6 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.

.7 Bypass valves on gate glove valves NPS 8 and larger: NPS 3/4, Globe, with PTFE disc as specified Section 23 05 23.01 - Valves - Bronze.

.8 Swing check valves: to MSS-SP-71.

.1 NPS 2 and under:

.1 Class 125, swing, with composition disc, as specified Section 23 05 23.01 - Valves - Bronze.

.2 NPS 2-1/2 and over:

.1 Flanged Grooved ends: as specified Section 23 05 23.03 - Valves - Cast Steel.

.9 Silent check valves:

.1 NPS 2 and under:

.1 As specified Section 23 05 23.01 - Valves - Bronze.

.2 NPS 2-1/2 and over:

.1 Flanged Grooved ends: as specified Section 23 05 23.03 - Valves - Cast Steel.

.10 Ball valves:

.1 NPS 2 and under: as specified Section 23 05 23.01 - Valves - Bronze.

3 EXECUTION

3.01 EXAMINATION

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

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.02 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 05 - Installation of Pipe Work.

3.03 CIRCUIT BALANCING VALVES

.1 Install flow measuring stations and flow balancing valves as indicated.

.2 Remove handwheel after installation and when TAB is complete.

.3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

3.04 CLEANING, FLUSHING AND START-UP

.1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

3.05 TESTING

.1 For glycol systems, retest with ethylene propylene glycol to ASTM E 202, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

3.06 BALANCING

.1 Balance water systems to within plus or minus 5% of design output based on existing system measured design flows.

3.07 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.08 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by hydronic systems installation.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 ASME
- .1 ASME Boiler and Pressure Vessel Code (BPVC), Section VII- 2013.

.2 ASTM International
- .1 ASTM A 47/A 47M- 99(2009) , Standard Specification for Ferritic Malleable Iron Castings.
- .2 ASTM A 278/A 278M- 01(2011) , Standard Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F (350 degrees C).
- .3 ASTM A 516/A 516M- 10, Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.
- .4 ASTM A 536- 84(2009), Standard Specification for Ductile Iron Castings.
- .5 ASTM B 62- 09, Standard Specification for Composition Bronze or Ounce Metal Castings.

.3 CSA Group
- .1 CSA B51- 09, Boiler, Pressure Vessel, and Pressure Piping Code.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for expansion tanks, air vents, separators, valves, and strainers 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, Canada.

1.03 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for hydronic specialties for incorporation into manual.

.3 Submit 5 copies of operation and maintenance manual.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:
- .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect hydronic specialties from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 AUTOMATIC AIR VENT

.1 Standard float vent: brass body and NPS 1/8 connection and rated at 690 kPa working pressure.

.2 Industrial float vent: cast iron body and NPS 1/2 connection and rated at 860 kPa working pressure.

.3 Float: solid material suitable for 115 degrees C working temperature.

2.02 PIPE LINE STRAINER

.1 NPS 1/2 to 2: bronze body to ASTM B 62, solder end screwed connections, Y pattern.

.2 NPS 2 1/2 to 12: cast steel body to ASTM A 278/A 278M, Class 30, cast iron body to ASTM A 278/A 278M, Class 30 flanged connections.

.3 NPS 2 to 12: T type with ductile iron body to ASTM A 536 malleable iron body to STM A 47M, grooved ends.

.4 Blowdown connection: NPS 1.

.5 Screen: stainless steel with 1.19 mm perforations.

.6 Working pressure: 860 kPa.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hydronic specialties installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Consultant.
- .2 Inform Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.02 APPLICATION

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

3.03 GENERAL

.1 Run drain lines and blow off connections to terminate above nearest drain.

.2 Maintain adequate clearance to permit service and maintenance.

.3 Should deviations beyond allowable clearances arise, request and Consultant's directive.

.4 Check shop drawings for conformance of tappings for ancillaries and for equipment operating weights.

3.04 STRAINERS

.1 Install at locations indicated on drawing on supply and return chilled water to and from chiller.

.2 Install in horizontal or down flow lines.

.3 Ensure clearance for removal of basket.

.4 Install ahead of each pump.

.5 Install ahead of each automatic control valve larger than NPS 1 and radiation except at radiation and as indicated.

3.05 AIR VENTS

.1 Install air and dirt separator at location indicated on the drawings.

.2 Install at high points of systems.

.3 Install gate valve on automatic air vent inlet. Run discharge to nearest drain or service sink.

3.06 EXPANSION TANKS

.1 Inspect and re-use existing expansion tank

.2 Adjust expansion tank pressure as required

.3 Install lockshield type valve at inlet to tank.

3.07 PRESSURE SAFETY RELIEF VALVES

.1 Run discharge pipe to terminate above nearest drain.

3.08 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE)
- .1 ANSI/ASHRAE/IES Standard 90.1-2010, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 CSA Group
- .1 CAN/CSA-B214-12, Installation Code for Hydronic Heating Systems.

.4 Electrical Equipment Manufacturers Association of Canada (EEMAC)

.5 National Electrical Manufacturers' Association (NEMA)
- .1 NEMA MG 1-2011, Motors and Generators.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedure].

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for pump, circulator, and equipment and include product characteristics, performance criteria, physical size, finish and limitations indicate point of operation, and final location in field assembly.

.3 Shop Drawings:
- .1 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories and controllers.

1.03 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for hydronic pumps for incorporation into manual.

.3 Submit 5 copies of operation and maintenance manual.

1.05 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:
- .1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect hydronic pumps from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 EQUIPMENT

.1 Size and select components to: CAN/CSA-B214.
.2 Supply and install as per performance indicated on plans and schedules

2.02 SPLIT-COUPLED VERTICAL INLINE PUMPS WITH INTEGRATED VFD AND CONTROLS

.1 The pumps shall be single stage, single or double suction type, vertical inline design with integrated controls.The seal shall be serviceable without disturbing the motor or the piping connections. The capacities and characteristics shall be as outlined in the plans and specifications. The complete pump unit shall be labeled with ETL listing certification that the product conforms to UL Std 778 and is certified to CSA Std C22.2 No.108.

.2 Pump casing shall be constructed of ASTM A48 class 30 cast iron with ANSI 125 / PN16 flanges for workingpressure below 175 psig (12 bar) at 150°F (66°C) and ASTM A536 ductile iron with ANSI 250 / PN25 flanges for working pressures to 375 psig (25 bar) at 150°F (66°C). The casing shall be hydrostatically tested to 150% maximum working pressure. The casing shall be radially split to allow removal of the rotating element without disturbing the pipe connections. The pump casing shall be drilled and tapped for gauge ports on both the suction and discharge connections and for a drain port at the bottom of the casing. The casing shall have an additional tapping on the discharge connection to allow for the installation of a seal flush line.

.3 The pump shall have a factory installed vent/flush line to insure removal of trapped air from the casing and mechanical seal cooling. The vent/flush line shall run from the seal chamber to the pump discharge.

.4 The impeller shall be bronze, fully enclosed type. The impeller shall be dynamically balanced to ANSI Grade G6.3 and shall be fitted to the shaft with a key. Two-plane balancing is required where installed impeller diameter is less than 6 times the impeller width.

.5 The pump shaft shall be stainless steel.

.6 The coupling is to be rigid spacer type constructed of high tensile aluminum alloy. The coupling is to be designed to be easily removed on site to reveal a space between the pump and motor shafts sufficient to remove all mechanical seal components for servicing and to be replaced without disturbing the pump or motor.

.7 The pump shall be fitted with an outside balanced type mechanical seal, with Viton elastomers and antimonycarbon (or resin-bonded carbon for potable water applications) vs. silicon carbide faces rated up to 250°F (121°C). A 316 stainless steel gland plate shall be provided with a factory installed flush line with manual vent.

.8 All split coupled pumps shall be provided with a lower seal chamber throttle bushing to ensure seals maintain positively cooling and lubrication.

.9 Supply in the flush line to the mechanical seal a 50 micron cartridge filter and sight flow indicator, to suit the working pressure encountered.

.10 The motor frame shall be NEMA TC type. Motor enclosure is to be ODP or TEFC with NEMA Premium Efficiency 12.12 rating. Acceptable motor insulation for variable speed operation is NEMA MG-1 Part

.11 The variable frequency drive & controls shall be rated UL Type 12 or UL Type 4X and be an integral component of the pumping unit with a 15 hp, TEFC, 575/3/60.

.12 The integrated VFD shall be of the VVC-PWM type providing near unity displacement power factor (cos Ø) without the need for external power factor correction capacitors at all loads and speeds. The VFD shall incorporate DC link chokes for the reduction of mains borne harmonic currents and to reduce the DC link ripple current thereby increasing the DC link capacitors lifetime. RFI filters will be fitted as standard to ensure the VFD meets low emission and

immunity requirements.

.13 VFD and motor protection shall include: motor phase to phase fault, motor phase to ground fault, loss of supply phase, over-voltage, under-voltage, motor over-temperature, inverter overload, over-current.

.14 For a quantity of pumps in a system of 2 to 4-maximum, including any standby, a factory supplied controller shall be added to a pumping unit and set up at the factory to operate in parallel mode. The pump controls which shall be linked on site by the contractor, will automatically stage the units, as appropriate, to maintain the best efficiency pumping and minimum operating cost. The standby unit will be brought into the rotation to exercise and equalize wear. The sequence of controls and staging points shall be submitted to the engineer for approval at the time of order.

.15 The VFD shall have the following additional features:

- .1 Control override for BAS/BMS control signal.
- .2 Manual pump control or closed loop PID control.
- .3 Programmable skip frequencies and adjustable switching frequency for noise and vibration control.
- .4 Auto alarm reset.
- .5 Four programmable digital inputs, two analog inputs, one programmable analog / digital output.
- .6 One volt-free contact.
- .7 One RS485 port for serial communications.
- .8 Standard serial communication protocols BACnet Native with optional; Modbus RTU, Johnson Controls Metasys N2, Siemens FLN.

3 EXECUTION

3.01 EXAMINATION

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

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative and Consultant of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.02 APPLICATION

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

3.03 INSTALLATION

.1 Install hydronic pumps to: CAN/CSA-B214.

.2 In line circulators: install as indicated by flow arrows.

- .1 Support at inlet and outlet flanges or unions.
- .2 Install with bearing lubrication points accessible.

.3 Base mounted type: supply templates for anchor bolt placement.

- .1 Include anchor bolts with sleeves. Place level, shim unit and grout.
- .2 Align coupling in accordance with manufacturer's recommended tolerance.
- .3 Check oil level and lubricate. After run-in, tighten glands.

.4 Ensure that pump body does not support piping or equipment.
- .1 Provide stanchions or hangers for this purpose.
- .2 Refer to manufacturer's installation instructions for details.

.5 Pipe drain tapping to floor drain.

.6 Install volute venting pet cock in accessible location.

.7 Check rotation prior to start-up.

.8 Install pressure gauge test cocks.

3.04 START-UP

.1 General:
- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements; supplemented as specified herein.
- .2 In accordance with manufacturer's recommendations.

.2 Procedures:
- .1 Before starting pump, check that cooling water system over-temperature and other protective devices are installed and operative.
- .2 After starting pump, check for proper, safe operation.
- .3 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.
- .4 Check base for free-floating, no obstructions under base.
- .5 Run-in pumps for 12 continuous hours minimum.
- .6 Verify operation of over-temperature and other protective devices under low- and no-flow condition.
- .7 Eliminate air from scroll casing.
- .8 Adjust water flow rate through water-cooled bearings.
- .9 Adjust flow rate from pump shaft stuffing boxes to manufacturer's recommendation.
- .10 Adjust alignment of piping and conduit to ensure true flexibility.
- .11 Eliminate cavitation, flashing and air entrainment.
- .12 Adjust pump shaft seals, stuffing boxes, glands.
- .13 Use VFD to adjust flow rates to pre-retrofit conditions measuring zone flows with and ultrasonic flow meter.
- .14 Measure pressure drop across strainer when clean and with flow rates as finally set.
- .15 Replace seals if pump used to degrease system or if pump used for temporary heat.
- .16 Verify lubricating oil levels.

3.05 PERFORMANCE VERIFICATION (PV)

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

.2 Verify that manufacturer's performance curves are accurate.

.3 Ensure valves on pump suction and discharge provide tight shut-off.

.4 Net Positive Suction Head (NPSH):

.1 Application: measure NPSH for pumps which operate on open systems and with water at elevated temperatures.
.2 Measure using procedures prescribed in Section 01 91 13 - General Commissioning (Cx) Requirements.
.3 Where procedures do not exist, discontinue PV, report to Consultant and await instructions.

.5 Multiple Pump Installations - Series and Parallel:
.1 Repeat PV procedures specified above for pump performance and pump BHP for combinations of pump operations.

.6 Mark points of design and actual performance at design conditions as finally set upon completion of TAB.

.7 Commissioning Reports: in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements reports supplemented as specified herein. Reports to include:
.1 Record of points of actual performance at maximum and minimum conditions and for single and parallel operation as finally set at completion of commissioning on pump curves.
.2 Record of VFD points of actual performance to meet pre-retrofit flow conditions.
.2 Use Report Forms specified in Section 01 91 13 - General Commissioning (Cx) Requirement]: Report Forms and Schematics.
.3 Pump performance curves (family of curves).

3.06 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

1 GENERAL

1.01 REFERENCES

.1 Air-Conditioning, Heating and Refrigeration Institute (AHRI)
- .1 AHRI-550/590-[03], Performance Rating of Water Chilling Packages Using the Vapor Compression Cycle.

.2 CSA International
- .1 CSA B52-05 SMART, Mechanical Refrigeration Code.

.3 Environment Canada, (EC)/Environmental Protection Services (EPS)
- .1 EPS 1/RA/2-1996, Environmental Code of Practice for Elimination of Fluorocarbons Emissions from Refrigeration and Air Conditioning Systems.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for modular scroll chillers and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Indicate:
  - .1 Equipment including connections, piping and fittings, valves, strainers, control assemblies and ancillaries, identifying factory and field assembled.
  - .2 Wiring as assembled and schematics.
  - .3 Dimensions, construction details, recommended installation and support, mounting bolt hole sizes and locations and point loads.
  - .4 Type of refrigerant used. .

1.03 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for modular scroll chillers for incorporation into manual.

.3 Data to include:
- .1 Description of equipment giving manufacturers name, model type and year, capacity and serial numbers.
- .2 Provide part load performance curves.
- .3 Details on operation, servicing and maintenance.
- .4 Recommended spare parts list.

1.04 DELIVERY, STORAGE AND HANDLING

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging,

labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 GENERAL

- .1 Provide 2 x 350 kW complete modular scroll type chiller package including: Chiller shall incorporate Scroll-type compressors and can consist of multiple 350 kW (70 ton) modules. Each refrigerant circuit shall consist of an individual compressor, common dual circuited condenser, dual circuited evaporator, thermal expansion valve, and control system. Each circuit shall be constructed to be independent of other circuits from a refrigeration and electrical stand-point. The multi-circuit chiller must be able to produce chilled water even in the event of a failure of one or more refrigerant circuits. Circuits shall not contain more than 24 lbs of R-410a refrigerant.
- .2 Chiller Modules shall be ETL listed in accordance with UL Standard 1995, CSA certified per Standard C22.2#236.
- .3 Chiller modules shall be AHRI certified.
- .4 Modules shall ship wired and charged with refrigerant. All modules shall be factory run tested prior to shipment on an AHRI certified or 3rd party verified test stand.
- .5 Compressors, heat exchangers, piping and controls shall be mounted on a heavy gauge, powder coated steel frame. Electrical controls, contactors, and relays for each module shall be mounted within that module.
- .6 Provide water-cooled liquid chiller with the capacity as scheduled on drawings.
- .7 Chiller shall be designed to operate using R-410a Refrigerant.
- .8 Chiller shall be designed for parallel evaporator water flow.
- .9 The liquid to be chilled will be water containing corrosion inhibitors.
- .10 Chiller shall be designed to operate using 575 volt, 3 phase, 60 Hz single point electrical power supply.

2.02 CHILLED AND CONDENSER WATER MAINS

- .1 Each module shall include supply and return mains for both chilled and condenser water. Cut grooved end connections are provided for interconnection to 200 mm diameter piping with grooved type couplings. Rolled grooved shall be unacceptable. Chilled water mains shall be insulated with 65 mm closed cell insulation. Water Mains shall be installed such that they are beneath any power or control wiring so as to insure for safe operation in the event of condensation or minor piping leaks. Each inlet water header shall incorporate a built in 30-mesh (maximum) in-line strainer system to prevent heat exchanger fouling and accommodate 100% flow filtration with a minimum surface area of 306 000 sq mm per module.

2.03 COMPRESSOR

.1 Each module shall contain two hermetic scroll compressors independently circuited and mounted to the module with rubber-in-shear isolators. Each system also includes high discharge pressure and low suction pressure manual reset safety cut-outs..

2.04 REDUNDANCY

.1 The modular chiller shall be designed for an N+1 (redundant) application. Factory installed water side isolation valves shall only allow flow through the number of modules at design conditions while always isolating flow to one module for reserve. Upon a failure of an operating module, the master controller shall automatically command the water valves to that module closed and command the valves to the redundant open. This sequence will require no additional field programming or BAS interface

2.05 EVAPORATOR AND CONDENSER

.1 Each evaporator and condenser shall be brazed plate heat exchangers constructed of 316 stainless steel; designed, tested, and stamped in accordance with UL 1995 code for 4480 kPa (g) refrigerant side working pressure and 2480 kPa (g) water side working pressure. Both the condenser and evaporator heat exchanger shall be mounted below the compressor, to eliminate the effect of migration of refrigerant to the cold evaporator with consequent liquid slugging on start-up. Condenser-side strainer system shall incorporate an automatic debris blow-down system for self-cleaning of the strainer system that is controlled and powered by the chiller.

2.06 TOTAL ACCESS DESIGN

.1 Isolation valves shall be installed between the heat exchangers and water supply mains for heat exchanger isolation and removal without the requirement to remove a module or shut down the entire chiller allowing for total access to all serviceable components.

2.07 CONTROL CENTRE

.1 To include:
- .1 Scheduling of the various compressors shall be performed by a microprocessor based control system (Master Controller). A new lead compressor is selected every 24 hours to assure even distribution of compressor run time.
- .2 The Master Controller shall monitor and report the following on each refrigeration system:
  - .1 Discharge Pressure Fault
  - .2 Suction Pressure Fault
  - .3 Compressor Winding Temperature
  - .4 Suction Temperature
  - .5 Evaporator Leaving Chilled Water Temp.
- .3 The Master Controller shall be powered by the chillers single point power connection and shall monitor and report the following system parameters:
  - .1 Chilled Water Entering and Leaving Temperature
  - .2 Condenser Water Entering and Leaving Temperature
  - .3 Chilled Water and Condenser Water Flow
- .4 An out of tolerance indication from these controls or sensors shall cause a “fault”

indication at the Master Controller and shutdown of that compressor with the transfer of load requirements to the next available compressor. In the case of a System Fault the entire chiller will be shut down. When a fault occurs, the Master Controller shall record conditions at the time of the fault and store the data for recall. This information shall be capable of being recalled through the keypad of the Master Controller and displayed on the Master Controller's 2 line by 40 character back-lit LCD. A history of faults shall be maintained including date and time of day of each fault (up to the last 20 occurrences).

.5 Individual monitoring of leaving chilled water temperatures from each refrigeration system shall be programmed to protect against freeze-up.

.6 The control system shall monitor entering and leaving chilled water temperatures to determine system load and select the number of compressor circuits required to operate. Response times and set points shall be adjustable. The system shall provide for variable time between compressor sequencing and temperature sensing, so as to fine tune the chiller to different existing building conditions.

.7 Chiller shall have a single point power connection and external inputs and outputs to be compatible with external equipment and sensors. Inputs/Outputs include:

- .1 Remote Start/Stop
- .2 Customer Alarm Relay
- .3 Customer Chilled/Load Limit Reset Signal
- .4 ECW to Mechanical Cooling Module
- .5 LCW from Mechanical Cooling Module
- .6 ECHW to Mechanical Cooling Module
- .7 LCHW from Mechanical Cooling Module
- .8 Power Phase Monitor
- .9 Chilled Water Flow Switch Input
- .10 Condenser Water Flow Switch Input
- .11 Full Load Indicator Relay
- .12 Condenser Pump Relay
- .13 Condenser flush Relay
- .14 Chilled Water Pump Relay

2.08 SINGLE POINT POWER CONNECTION

.1 Chiller shall be equipped with a pre-engineered genuine buss bar electrical system for single point power at a 5,000 amp SCCR. Where the equipment size exceeds the amp rating of the buss bar, multiple power connections may be applied. Pre-engineered system shall also incorporate individual module isolation circuit breakers for full redundancy and ability of a module to be taken off-line for repair while the rest of the modules continue to operate. Individual power feeds to each module shall be unacceptable.

2.09 SAFETIES, CONTROLS AND OPERATION

.1 Chiller safety controls system shall be provided with the unit (minimum) as follows:

- .1 Low evaporator refrigerant pressure
- .2 Loss of flow through the evaporator
- .3 Loss of flow through the condenser
- .4 High condenser refrigerant pressure
- .5 High compressor motor temperature

.6 Low suction gas temperature
.7 Low leaving evaporator water temperature

.2 Failure of chiller to start or chiller shutdown due to any of the above safety cutouts shall be annunciated by display of the appropriate diagnostic description at the unit control panel. This annunciation will be in plain English. Alphanumeric codes shall be unacceptable.

.3 The chiller shall be furnished with a Master Controller as an integral portion of the chiller control circuitry to provide the following functions:
.1 Provide automatic chiller shutdown during periods when the load level decreases below the normal operating requirements of the chiller. Upon an increase in load, the chiller shall automatically restart.
.2 Provisions for connection to automatically enable the chiller from a remote energy management system.
.3 The control panel shall provide alphanumeric display showing all system parameters in the English language with numeric data in English units.
.4 Each module shall contain a slave controller that will allow any module to run in the event of a master controller failure or loss of communication with the master controller via an on/off/manual toggle switch.

.4 Normal Chiller Operation:
.1 When chiller is enabled, the factory supplied Master Controller stages the chiller capacity from minimum to maximum as required by building load.
.2 The Chiller control system shall respond to Entering WaterTemperature (constant primary flow) or to Leaving Water Temperature (variable primary flow) and will have an integral reset based on entering water temperature to provide for efficient operation at part-load conditions.

.5 Power Phase Monitor:
.1 Provide a Power Phase Monitor on the incoming power supply to the chiller. This device shall prevent the chiller from operating during periods when the incoming power is unsuitable for proper operation.
.2 The Power Phase Monitor shall provide protection against the following conditions:
.1 Low Voltage (Brown-Out)
.2 Phase Rotation
.3 Loss of Phase
.4 Phase Imbalance

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for modular water chiller installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Departmental Representative and Consultant.
.2 Inform Departmental Representative and Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.

3.02 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including

product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.03 PIPING SYSTEM FLUSHING PROCEDURE

.1 Prior to connecting the chiller to the condenser and chilled water loop, the piping loops shall be flushed with a detergent and hot water (110-130° F) mixture to remove previously accumulated dirt and other organics. In old piping systems with heavy encrustation of inorganic materials consult a water treatment specialist for proper passivation and/or removal of these contaminants.

.2 During the flushing, a 30 mesh (max.) Y-strainers (or acceptable Equivalent) shall be in place in the system piping and examined periodically as necessary to remove collected residue. The use of on board chiller strainers shall not be acceptable. The flushing process shall take no less than 6 hours or until the strainers when examined after each flushing are clean. Old systems with heavy encrustation shall be flushed for a minimum of 24 hours and may take as long as 48 hours before the filters run clean. Detergent and acid concentrations shall be used in strict accordance with the respective chemical manufacturer's instructions. After flushing with the detergent and/or dilute acid concentrations the system loop shall be purged with clean water for at least one hour to ensure that all residual cleaning chemicals have been flushed out. Install unit as indicated, to manufacturers recommendations, and in accordance with EPS 1/RA/2.

3.04 CLEANING AND WATER TREATMENT

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.2 Supply water for both the chilled water and condenser water circuits shall be analyzed and treated by a professional water treatment specialist who is familiar with the operating conditions and materials of construction specified for the chiller's heat exchangers, headers and associated piping. Cycles of concentration shall be controlled such that recirculated water quality for modular chillers using 316 stainless steel brazed plate heat exchangers and carbon steel headers is maintained within the following parameters:

.1	pH	Greater than 7 and less than 9
.2	Total Dissolved Solids (TDS)	Less than 1000 ppm
.3	Hardness as CaCO3	30 to 500 ppm
.4	Alkalinity as Ca CO3	30 to 500 ppm
.5	Chlorides	Less than 200 ppm
.6	Sulfates	Less than 200 ppm

3.05 WARRANTY AND START-UP

.1 Manufacturer's Warranty: Manufacturer shall provide full parts-only warranty coverage for entire chiller for a period of one year. All parts shall be warranted against defects in material and workmanship. Similar parts-only coverage shall be provided for the chillers compressors for a period of five years. The warranty period shall commence either on the equipment start-up date or six months after shipment, whichever is earlier.

.2 Manufacturer shall provide the services of a Factory Authorized Service Engineer to provide complete start-up supervision. Factory Authorized Service Engineer shall also be

responsible for assembly of the chillers cabinetry package and electrical bus bar system. After start-up a Manufacturer's Representative shall provide a minimum of 8-hours of operator training to the owner's designated representative.

3.06 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by water chiller installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-12, Canadian Electrical Code, Part 1 (25th Edition), Safety Standard for Electrical Installations.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.3 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.4 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Language operating requirements: provide identification nameplates and labels for control items in English and French.

.3 Use one nameplate or label for each language both languages.

1.5 SUBMITTALS

.1 Submittals: in accordance with Section 00 10 00 – General Instructions.

.2 Product Data: submit WHMIS MSDS in accordance with Section 00 10 00 – General Instructions.

.3 Shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada

.4 Quality Control: in accordance with Section 00 10 00 – General Instructions.

.1 Provide CSA certified equipment and material.

.2 Submit test results of installed electrical systems and instrumentation.

.3 Permits and fees: in accordance with General Conditions of contract.

.4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Engineer.

1.6 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 00 10 00 – General Instructions.

.2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Engineer with schedule within 2 weeks after award of Contract.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance Section 00 10 00 – General Instructions Waste Management and Disposal.

1.8 SYSTEM STARTUP

.1 Instruct Engineer and operating personnel in operation, care and maintenance of systems, system equipment and components.

1.9 OPERATING INSTRUCTIONS

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Procedures to be followed in event of equipment failure.

.2 Other items of instruction as recommended by manufacturer of each system or item of equipment.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 00 10 00 – General Instructions.

.2 Do verification requirements in accordance with Section 00 10 00 – General Instructions.

2.2 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of [authority having jurisdiction] inspection authorities.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

Nameplates: lamicoid 3mm thick plastic engraving sheet, black white finish face, white] core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

.1 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 3 mm high letters unless specified otherwise.

.3 Wording to be approved by Engineer prior to manufacture. Allow for minimum of twenty-five (25) letters per nameplate.

.4 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO" as directed by Departmental Representative.

.5 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.6 Identify all receptacles and switches with P-Touch labels, black lettering on transparent tape, indicating source panel and circuit number. Labels to be located on front of device cover plate.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

2.10 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

2.11 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

2.12 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 specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.

- .1 Local switches: 1200 mm.
- .2 Wall receptacles:
  - .1 General: 300 mm.
  - .2 Above top of counters or counter splash backs: 175 mm.
- .3 Fire alarm stations: 1200 mm.
- .4 Fire alarm bells: 2100 mm.
- .5 Television outlets: As per Interior Design Drawings.
- .6 Clocks: As per Interior Design Drawings.

2.13 FIELD QUALITY CONTROL

.1 Load Balance:

- .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards.

.2 Conduct following tests in accordance with Section 00 10 00 – General Instructions.

- .1 Lighting and its control.
- .2 Systems: fire alarm system communications.
  - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Check resistance to ground before energizing.

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.4 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.

2.14 CLEANING

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

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

.1 Section 00 10 00 – General Instructions.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CAN/CSA-C22.2No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2No.65-93(R1999), Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)

.1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 00 10 00 – General Instructions.

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

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

.4 Divert unused wiring materials from landfill to metal recycling facility as approved by Engineer.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2No.65, with current carrying parts of copper alloy sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CSA C22.2No.65, with current carrying parts of copper alloy sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 NEMA to consist of:

.1 Connector body and stud clamp for stranded copper conductors.

.2 Stud clamp bolts.

.4 Clamps or connectors for armoured cable as required to: CAN/CSA-C22.2No.18.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

.2 Install mechanical pressure type connectors and tighten screws [with appropriate compression tool recommended by manufacturer]. Installation shall meet secureness tests in accordance with CSA C22.2No.65.

.3 Install fixture type connectors and tighten. Replace insulating cap.

.4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

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

1.2 DELIVERY, STORAGE AND HANDLING

.1 Packaging Waste Management: remove for reuse and return by manufacturer in accordance with Section 00 10 00 – General Instructions.

Part 2 Products

2.1 BUILDING WIRES AND GENERAL REQUIREMENTS

.1 Conductors: minimum size 12 AWG or larger, stranded, copper.

.2 Use stranded wire no smaller than No. 12 AWG for lighting and power and no smaller than No. 16 AWG for control wiring.

.3 Conductors shall be soft copper properly refined and tinned having a minimum conductivity of 98%.

.4 Copper conductors: size as indicated, with 300 V insulation of cross-linked thermosetting polyethylene material rated R90 XLPE, stranded for applications using wires sized No. 8 and larger

2.2 BX CABLE

.1 Use BX cable only under the following conditions:

.1 Wiring from a junction box to a recessed lighting fixture in suspended ceilings. Cable length not to exceed 1.5 m (5'), or

.2 Wiring or switches or 15 amp receptacles in partitions having removable wall panels, or

.3 When specifically called for on drawings.

2.3 CONTROL CABLES

.1 Type: LVT: 4 soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath : thermoplastic jacket.

.3 Insulation: PVC.

.4 Shielding: tape coated with paramagnetic material over each conductor pair .

Part 3 Execution

3.1 FIELD QUALITY CONTROL

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

.2 Perform tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.

.3 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section[26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.4 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

END OF SECTION

ISSUED
24/03/2016

BUILDING 20 - CHILLER REPLACEMENT
KW NEATBY, CEF BLDG 20

960 CARLING AVENUE, OTTAWA, ONTARIO

LIST OF DRAWINGS

LEGEND

SYMBOL	DESCRIPTION
CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
COND	CONDENSER WATER PIPING
	PIPING TO BE DEMOLISHED
	BUTTERFLY VALVE
	GATE VALVE
	BALL VALVE
	3-WAY CONTROL VALVE
	STRAINER
	PUMP
	CHECK VALVE
	PRESSURE REGULATING VALVE
AS-X	AIR AND DIRT SEPARATOR
ET-X	EXPANSION TANK
	FLOW SWITCH
	PRESSURE GAUGE
SP	SENSOR POCKET
	TEMPERATURE GAUGE
	PIPING CAP

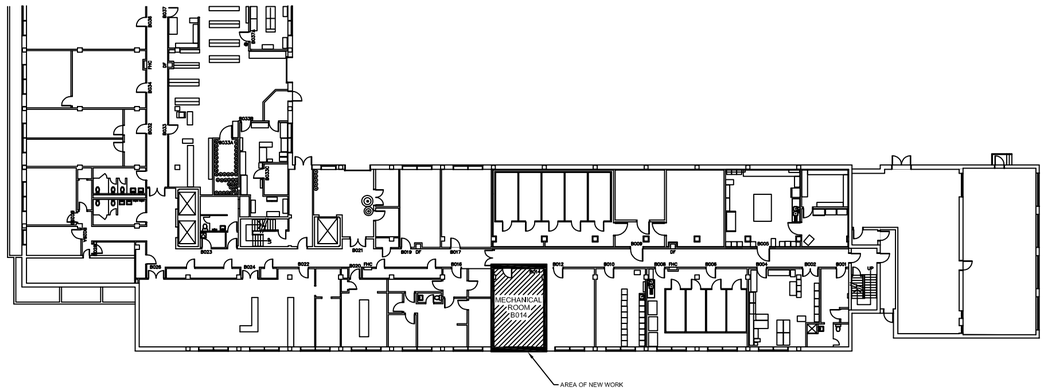
ABBREVIATION

PRV	PRESSURE REGULATING VALVE
CBV	CIRCUIT BALANCING VALVE
Vxx	VALVE ID NUMBER
CWS	CONDENSER WATER SUPPLY
CBV	CONDENSER WATER RETURN
CV	CONTROL VALVE

AREA OF CONSTRUCTION

N

PROJECT



PUMP SCHEDULE

ID	LOCATION	AREA AND/OR BLDG SERVED	SYSTEM AND/OR SERVICE	TYPE	CIRCULATING FLUID								ELECTRICAL MOTOR						REMARKS
					FLUID	FLOW		HEAD		TEMPERATURE		SP. GR.	MIN. % EFF	NOMINAL POWER		PHASE	VOLT	MAX RPM	SPEED CONTROL	
						GPM	[L/s]	FT	[kPa]	°F	[°C]			HP	[kW]					
P1	B14	BLDG 20	CHILLED WATER	VERT INLINE	CHILLED WATER	220	[14]	120	[1900]	50	[10]	1	70	15	[11]	3	575	3315	VFD	----
P2	B14	BLDG 20	CHILLED WATER	VERT INLINE	CHILLED WATER	220	[14]	120	[1900]	50	[10]	1	70	15	[11]	3	575	3315	VFD	----

NOTES
1. SEE SPECIFICATIONS FOR OTHER APPLICABLE ENGINEERING REQUIREMENTS.
2. PUMP TO HAVE A PACKAGED MOTOR MOUNTED INTEGRAL VFD AND CONTROLLER INSTALLED BY PUMP MANUFACTURER
3. PUMP AND VFD CONTROL, STATUS AND SAFETIES TO BE TIED BACK TO CHILLER MASTER CONTROLLER

MODULAR WATER COOLED CHILLER SCHEDULE

ID	LOCATION	AREA AND/OR BLDG SERVED	TYPE	CAPACITY		MAX kW/TON	MIN COP	MAX NPLV (kW/TON)	EVAPORATOR									CONDENSER								ELECTRICAL				REMARKS
									FLOW		EWT		LWT		MAX WPD		FOULING FACTOR	FLOW		EWT		LWT		MAX WPD		FOULING FACTOR	POWER	PHASE	VOLT	SPEED CONTROL	
				TONS	[kW]				GPM	[L/s]	°F	[°C]	°F	[°C]	FT	[kPa]		GPM	[L/s]	°F	[°C]	°F	[°C]	FT	[kPa]		MCA				
MOD1	B14	BLDG 20	MODULAR SCROLL	70	[20]	0.75	4.7	0.7	165	[10]	54	[12]	44	[7]	18	[54]	0.00010	200	[13]	75	[24]	85	[29]	18	[54]	0.00025	136	3	575	CONSTANT	SINGLE POINT POWER CONNECTION, R410A REFRIGERANT
MOD2	B14	BLDG 20	MODULAR SCROLL	70	[20]	0.75	4.7	0.7	165	[10]	54	[12]	44	[7]	18	[54]	0.00010	200	[13]	75	[24]	85	[29]	18	[54]	0.00025					

NOTES
1. SEE SPECIFICATIONS FOR OTHER APPLICABLE ENGINEERING REQUIREMENTS.
2. CHILLER TO COME COMPLETE WITH A MASTER CONTROLLER CAPABLE OF FULL STAND-ALONE SYSTEM CONTROL OF CHILLERS, PUMPS AND VALVES AND FUTURE BACNET INTEGRATION TO BAS
3. BOTH CHILLER TO HAVE A SINGLE POINT POWER CONNECTION, NO PARALLEL FEEDS ALLOWED
4. CHILLER TO BE SUPPLIED WITH AN AUTOMATIC FLUSH DOWN DEBRIS REMOVAL SYSTEM TO PREVENT HEAT EXCHANGER FOULING

Canada

Public Works and Government Services Canada | Travaux publics et services gouvernementaux Canada

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

revisions	description	date
3	ISSUED FOR TENDER	MAR 30/16
2	ISSUED FOR 99% REVIEW	MAR 24/16
1	ISSUED FOR 95% REVIEW	MAR 14/16

A detail no. / no. du detail
B location drawing no. / sur dessin no.
C drawing no. / dessin no.

project / projet
CHILLER REPLACEMENT

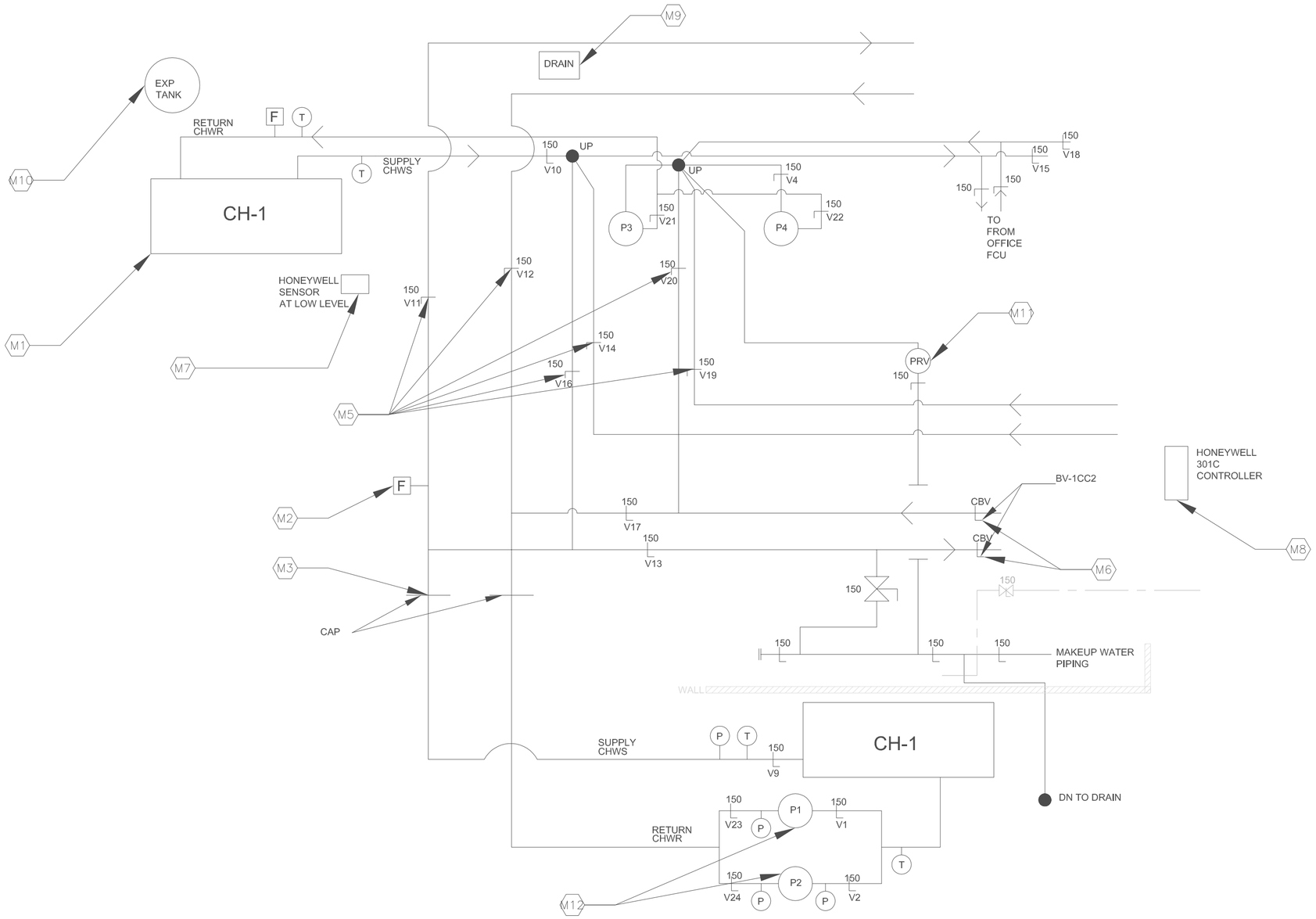
960 Carling Avenue, Ottawa, On, K1A 0C5

drawing / dessin
TITLE PAGE

Designed By	A.M.	Conçu par
Date	2016/03/03	(yyyy/mm/dd)
Drawn By	J.H.	Dessiné par
Date	2016/03/12	(yyyy/mm/dd)
Reviewed By	A.M.	Examiné par
Date	2016/03/14	(yyyy/mm/dd)
Approved By	A.M.	Approuvé par
Date	2016/03/23	(yyyy/mm/dd)
Tender		Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

MCE15/A645

Drawing no. / No. du dessin



GENERAL NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRAWING M2 FOR DEMOLITION PHASING INSTRUCTIONS.
2. VALVE ID IS FOR REFERENCE/XREF PURPOSES ONLY. ACTUAL VALVE IDs MAY DIFFER ON SITE.

DRAWING NOTES:

- M1 EXISTING CHILLER 1&2 TO BE DEMOLISHED. MODIFY HK-PAD TO SUIT NEW CHILLER. DEMOLISH ALL VALVES, PREASSURE GAUGES AND THERMOSTATS.
- M2 EXISTING FLOW SWITCH TO REMAIN
- M3 CAP CHILLER PIPING AT LOCATION SHOWN.
- M4 EXISTING PUMPS P3 & P4 TO BE DEMOLISHED.
- M5 EXISTING VALVES V10, V11, V12, V14, V16, V18, V19, & V20 TO REMAIN.
- M6 EXISTING CIRCUIT BALANCING VALVES TO REMAIN.
- M7 EXISTING HONEYWELL 201T SENSOR TO BE DEMOLISHED.
- M8 EXISTING HONEYWELL 301C CONTROLLER TO REMAIN.
- M9 EXISTING DRAIN TO REMAIN .
- M10 EXSTING EXPANSION TANK TO BE RELOCATED AS PER M3.
- M11 EXISTING PRESSURE REGULATING VALVE TO BE DEMOLISHED.
- M12 EXISTING P1&P2 TO BE DEMOLISHED.

Canada

Public Works and Government Services Canada / Travaux publics et services gouvernementaux Canada

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

revisions	description	date
3	ISSUED FOR TENDER	MAR 30/16
2	ISSUED FOR 99% REVIEW	MAR 24/16
1	ISSUED FOR 95% REVIEW	MAR 14/16

A detail no., no. du detail
B location drawing no., sur dessin no.
C drawing no., dessin no.

project / projet

CHILLER REPLACEMENT

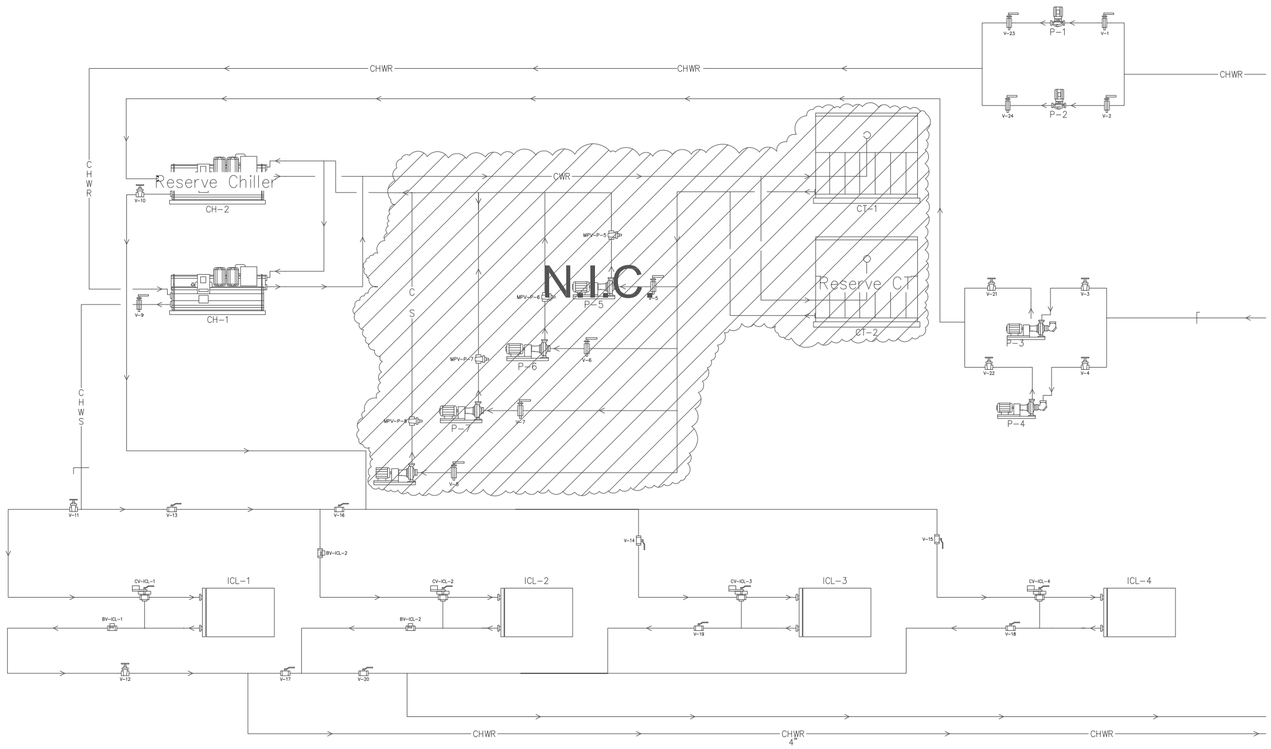
960 Carling Avenue, Ottawa, On, K1A 0C5

drawing / dessin

HVAC - CHILLER - DEMOLITION

Designed By / Conçu par	A.M.	
Date	2016/03/03	(yyyy/mm/dd)
Drawn By / Dessiné par	J.H.	
Date	2016/03/12	(yyyy/mm/dd)
Reviewed By / Examiné par	A.M.	
Date	2016/03/14	(yyyy/mm/dd)
Approved By / Approuvé par	A.M.	
Date	2016/03/23	(yyyy/mm/dd)
Tender		Soumission
Project Manager		Administrateur de projets
Project no. / No. du projet	MCE15/A645	
Drawing no. / No. du dessin	M-1	

PWGSC A2 (594x420)



DRAWING NOTES:

M1 EXISTING CONDENSER WATER SYSTEM TO REMIAN.

PHASING NOTES:

1. SHUTDOWN FULL SYSTEM FOR INSTALLATION OF NEW ISOLATION VALVES V-1,2,3 NEW. CONTRACTOR TO COORDINATE WITH AGCAN FACILITY STAFF AND PROVIDE ANY TEMPORARY COOLING REQUIRED FOR LAB AND IT ROOMS.
2. ISOLATE AND DRAIN CH-2, P-3, P-4 USING V-10, V-1NEW AND CONDENSER BRANCH ISOLATION VALVES.
3. CH-1, P-1,P-3, TO OPERATE DURING CONSTRUCTION OF NEW CHILLED WATER SYSTEM.
4. DEMOLISH CHILLER 2, P-3, P-4 AND ASSOCIATED PIPING ELECTRICAL AND CONTROLS AS PER DRAWINGS.
5. EXTEND CONCRETE PADS TO SUITE NEW CHILLERS AND PUMPS AS SHOWN ON DRAWINGS.
6. INSTALL NEW MODULAR CHILLER AND PUMPS, INCLUDING PIPING AND NEW MAKE-UP WATER AS PER DRAWINGS.
7. CONNECT NEW ELECTRICAL AND CONTROLS AS PER DRAWINGS.
8. ISOLATE CH-1, P-1, P-2 AT V-2NEW AND V-3NEW AS WELL AS CONDENSER WATER PIPING AT BRANCH ISOLATION VALVES OFF HEADER.
9. START-UP AND COMMISSION NEW MODULAR CHILLER AND PUMPS. BALANCE SYSTEM AS REQUIRED.
10. DEMOLISH CH-1, P-1, P-2 INCLUDING PIPING TO IOLATION VALVES, ELECTRICAL BACK TO PANEL AND CONTROLS AS SHOWN IN DRAWINGS.
11. CAP EXISTING CHILLED WATER AND CONDENSER WATER PIPES AT VALVES V-2NEW, V-3NEW, AND CONDENSER BRANCH ISOLATION VALVES OFF HEADER.

GENERAL NOTES:

1. VALVE ISOLATION SHALL BE XREFERENCED WITH DEMOLITION DRAWING M-1.
2. CONTRACTOR TO COORDINATE ALL SHUT-DOWNS AND ANY REQUIRED SUPPLEMENTAL COOLING WITH AG.CAN. STAFF PRIOR TO COMMENCING ANY DEMOLITION WORK.
3. PRIOR TO COMMENCING DEMOLITION CONTRACTOR SHALL TAKE FLOW MEASUREMENTS OF THE CHILLER AND 4 ZONE BRANCHES.

Canada

Public Works and Government Services Canada / Travaux publics et services gouvernementaux Canada

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

revisions	description	date
3	ISSUED FOR TENDER	MAR 30/16
2	ISSUED FOR 99% REVIEW	MAR 24/16
1	ISSUED FOR 95% REVIEW	MAR 14/16

A detail no. / no. du detail
B location drawing no. / sur dessin no.
C drawing no. / dessin no.

project / projet

CHILLER REPLACEMENT

960 Carling Avenue, Ottawa, On, K1A 0C5

drawing / dessin

HVAC - CHILLER - DEMOLITION

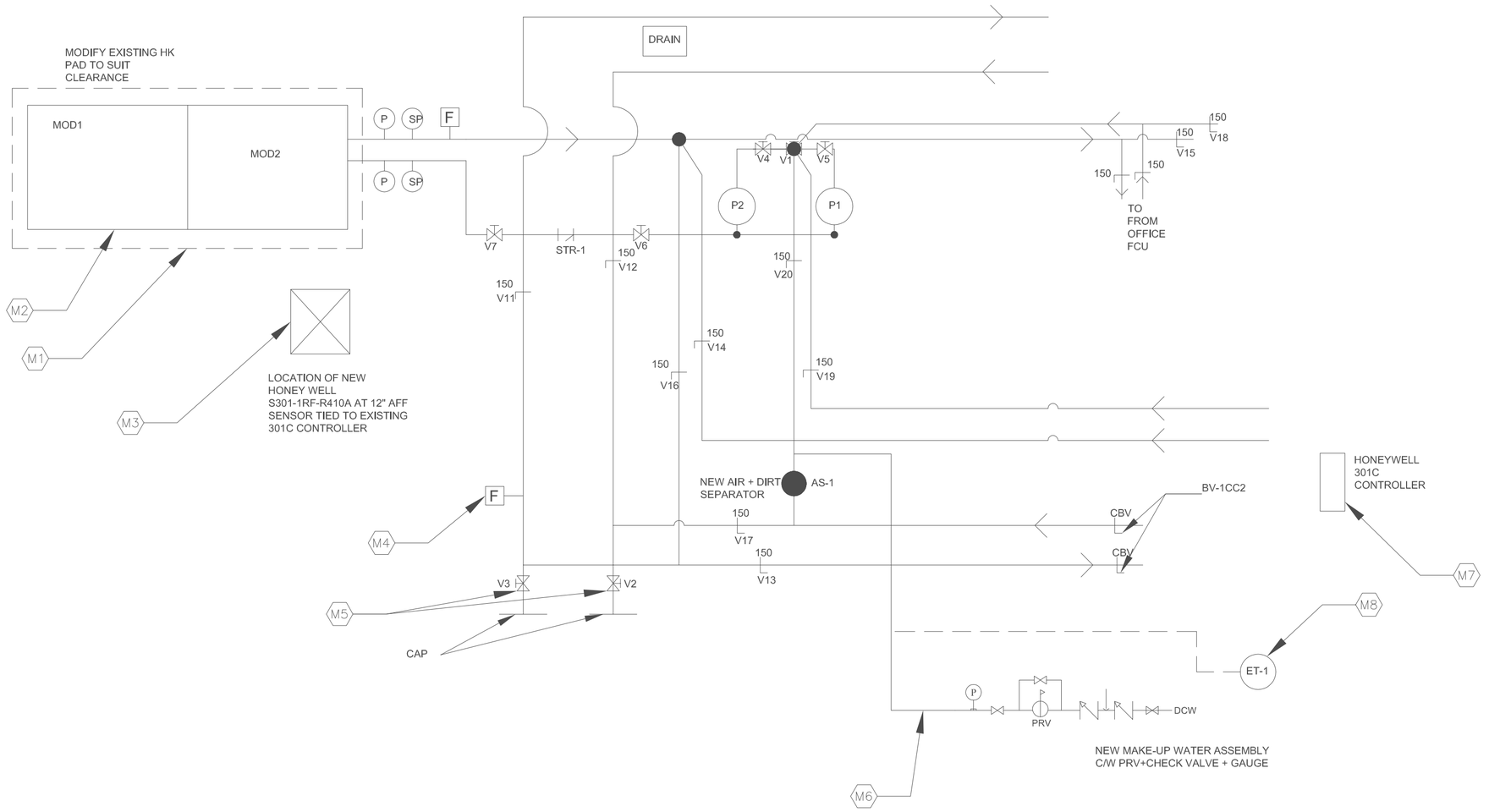
Designed By	A.M.	Conçu par
Date	2016/03/03	(yyyy/mm/dd)
Drawn By	J.H.	Dessiné par
Date	2016/03/12	(yyyy/mm/dd)
Reviewed By	A.M.	Examiné par
Date	2016/03/14	(yyyy/mm/dd)
Approved By	A.M.	Approuvé par
Date	2016/03/23	(yyyy/mm/dd)
Tender		Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

MCE15/A645

Drawing no. / No. du dessin

M-2

PWGSC A2 (594x420)



GENERAL NOTES:

1. THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING DRAWING M–4.

DRAWING NOTES:

M1. MODIFY EXISTING HK PAD TO SUIT NEW CHILLER'S CLEARANCES. CONTRACTOR ENGAGE THE SERVICES OF A STRUCTURE ENGINEER TO DESIGN NEW PADS AND SUBMIT FOR REVIEW PRIOR TO COMMENCING ANY WORK .

M2. PROVIDE NEW MODULAR CHILLER, CHILLER TO HAVE TWO MODULES RATED FOR 70 TONS OF REFRIGERATION EACH, WITH A COOLING C.O.P OF 4.7. SEE SCHEDULE AND SPECS FOR TECHNICAL REQUIREMENTS.

M3. PROVIDE NEW HONEYWELL S301–1RF–R410A SENSOR TIED TO EXISTING 301C CONTROLLER.

M4. EXISTING FLOW SWITCH TO REMAIN.

M5. PROVIDE NEW VALVES V3&V2 AT LOCATION SHOW.

M6. PROVIDE NEW MAKE–UP WATER ASSEMBLY AND CONNECT EXISTING DCW PIPE. C/W PRV+ CHECK VALVE + GAUGE.

M7. EXISTING HONEYWELL 301 CONTROLLER TO REMAIN. CONNECT TO NEW HONEYWELL S301–1RF–R410A SENSOR.

M8. RE–USE EXISTING EXPANSION TANK AND CONNECT TO MAKE–UP WATER ASSEMBLY.

Canada

Public Works and Government Services Canada | Travaux publics et services gouvernementaux Canada

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

revisions	description	date
3	ISSUED FOR TENDER	MAR 30/16
2	ISSUED FOR 99% REVIEW	MAR 24/16
1	ISSUED FOR 95% REVIEW	MAR 14/16

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

CHILLER REPLACEMENT

960 Carling Avenue, Ottawa, On, K1A 0C5

drawing / dessin

HVAC - CHILLER - NEW

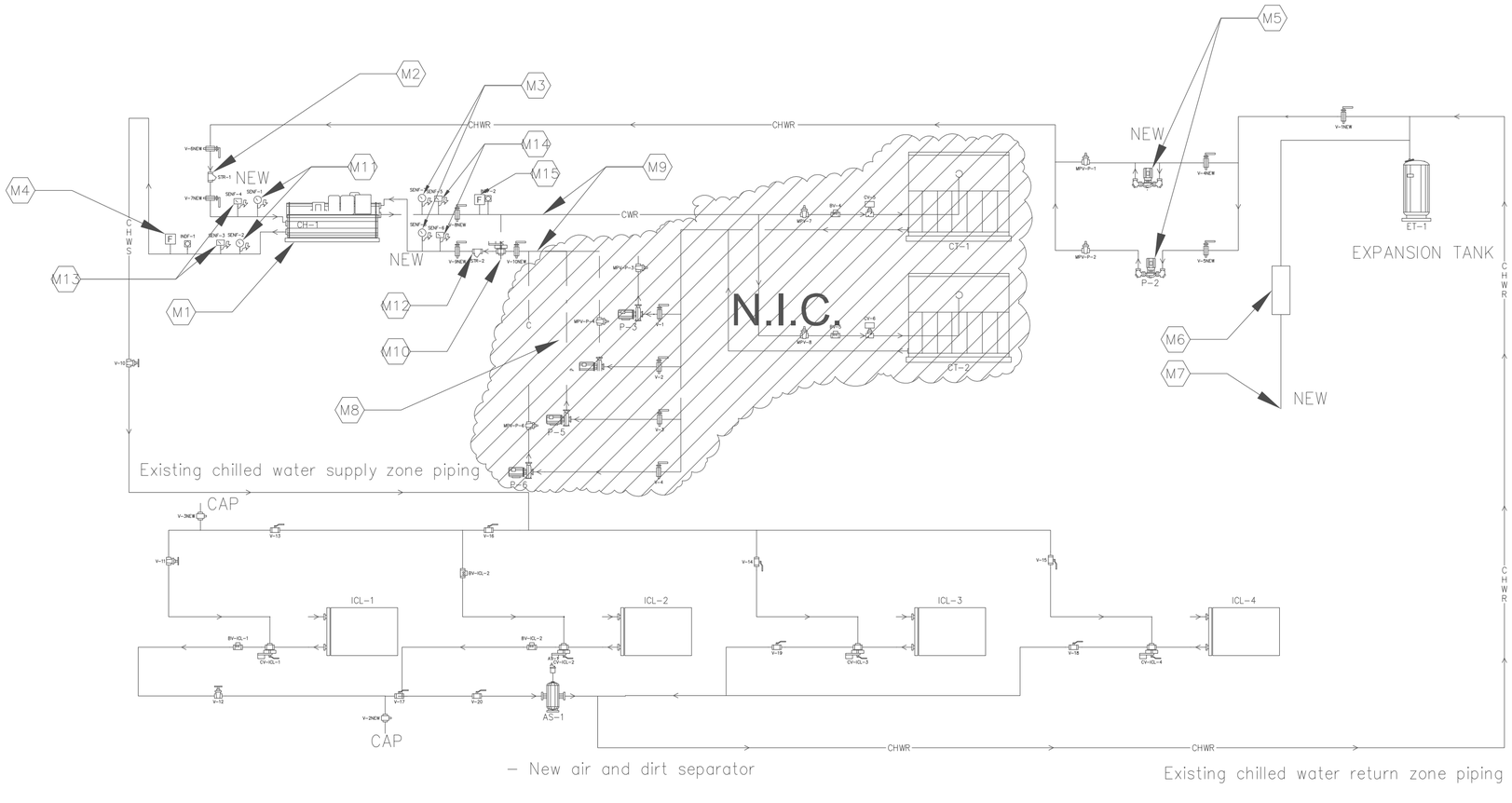
Designed By	A.M.	Conçu par
Date	2016/03/03	(yyyy/mm/dd)
Drawn By	J.H.	Dessiné par
Date	2016/03/12	(yyyy/mm/dd)
Reviewed By	A.M.	Examiné par
Date	2016/03/14	(yyyy/mm/dd)
Approved By	A.M.	Approuvé par
Date	2016/03/23	(yyyy/mm/dd)
Tender		Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

MCE15/A645

Drawing no. / No. du dessin

M-3

PWGSC A2 (594x420)



DRAWING NOTES:

M1 PROVIDE NEW MODULAR CHILLER, CHILLER TO HAVE TWO MODULES RATED FOR 70 TONS OF REFRIGERATION EACH, WITH A COOLING C.O.P OF 4.7.

M2 PROVIDE A FINE MESH Y–STRAINER ON CHWR INLET OF NEW CHILLER UNIT.

M3 CONTRACTOR TO PROVIDE PRESSURE GAUGES AND INSTALL AS SHOWN.

M4 PROVIDE A FLOW SWITCH AND INSTALL ON CHWS AND WIRE BACK TO CHILLER MASTER CONTROLLER.

M5 PROVIDE NEW CHILLER PUMPS P1&P2 RATED FOR 167.4 GPM AND 118.3 FT OF HEAD. PUMPS TO BE C/W TRIPLE DUTY, CHECK VALVES, & FLEX CONNECTIONS). ONE PUMP IS INTENDED TO BE IN CONSTANT OPERATION, THE SECOND IS A RESERVE PUMP. C/W VARIABLE FLOW DRIVER SIZED FOR 220 GPM AT 120 FT HEAD EACH.

M6 PROVDE NEW MAKEUP WATER ASSEMBLY WITH C/W PRESSURE REGULATING VALVE, CHECK VALVE & GUAGES.

M7 PROVIDE DCW FEED TO NEW MAKEUP WATER ASSEMBLY FROM EXISTING DCW LINE IN MECHANICAL ROOM.

M8 EXISTING CONDENSER WATER SYSTEM TO REMAIN.

M9 MODIFY EXISTING 3"Ø CWS &CWR FEEDS TO SUITE NEW CHILLER CONNECTIONS.

M10 PROVIDE NEW 3 WAY CONTROL VALVE AT LOCATION SHOWN AND CONNECT TO CHILLER MASTER CONTROLLER.

M11 PROVIDE PRESSURE TAPS INSTALLED BY MANUFACTURER ON CHWS & CHWR PIPES.

M12 PROVIDE A FINE MESH Y–STRAINER ON CWS INLET OF NEW CHILLER UNIT.

M13 PROVIDE ½" SENSOR POCKET INSTALLED AT 30" FROM CHILLER ON CHWS AND CHWR PIPING.

M14 PROVIDE ½" SENSOR POCKET INSTALLED AT 30" FROM CHILLER ON CWS AND CWR PIPING.

M15 PROVIDE A NEW FLOW SWITCH AND INSTALL ON CWR PIPING & WIRE BACK TO CHILLER MASTER CONTROLLER.

GENERAL NOTES:

1. NEW CHILLED WATER SYSTEM TO OPERATE STAND–ALONE OFF CHILLER WATER CONTROLLER. PUMPS AND SAFETY DEVICE SHALL BE TIED TO MASTER CONTROLLER.
2. REBALANCE SYSTEM USING VFD PUMPS AND VALVES TO MATCH THE EXISTING FLWO RATES MEASURED.
3. CONTRACTOR TO PROVIDE FACTORY START–UP AND VERIFICATION OF THE NEW MODULAR CHILLER.

Canada

Public Works and Government Services Canada | Travaux publics et services gouvernementaux Canada

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

revisions	description	date
3	ISSUED FOR TENDER	MAR 30/16
2	ISSUED FOR 99% REVIEW	MAR 24/16
1	ISSUED FOR 95% REVIEW	MAR 14/16

A detail no., no. du detail
B location drawing no., sur dessin no.
C drawing no., dessin no.

project / projet
CHILLER REPLACEMENT

960 Carling Avenue, Ottawa, On, K1A 0C5

drawing / dessin
HVAC - CHILLER - NEW SCHEMATIC

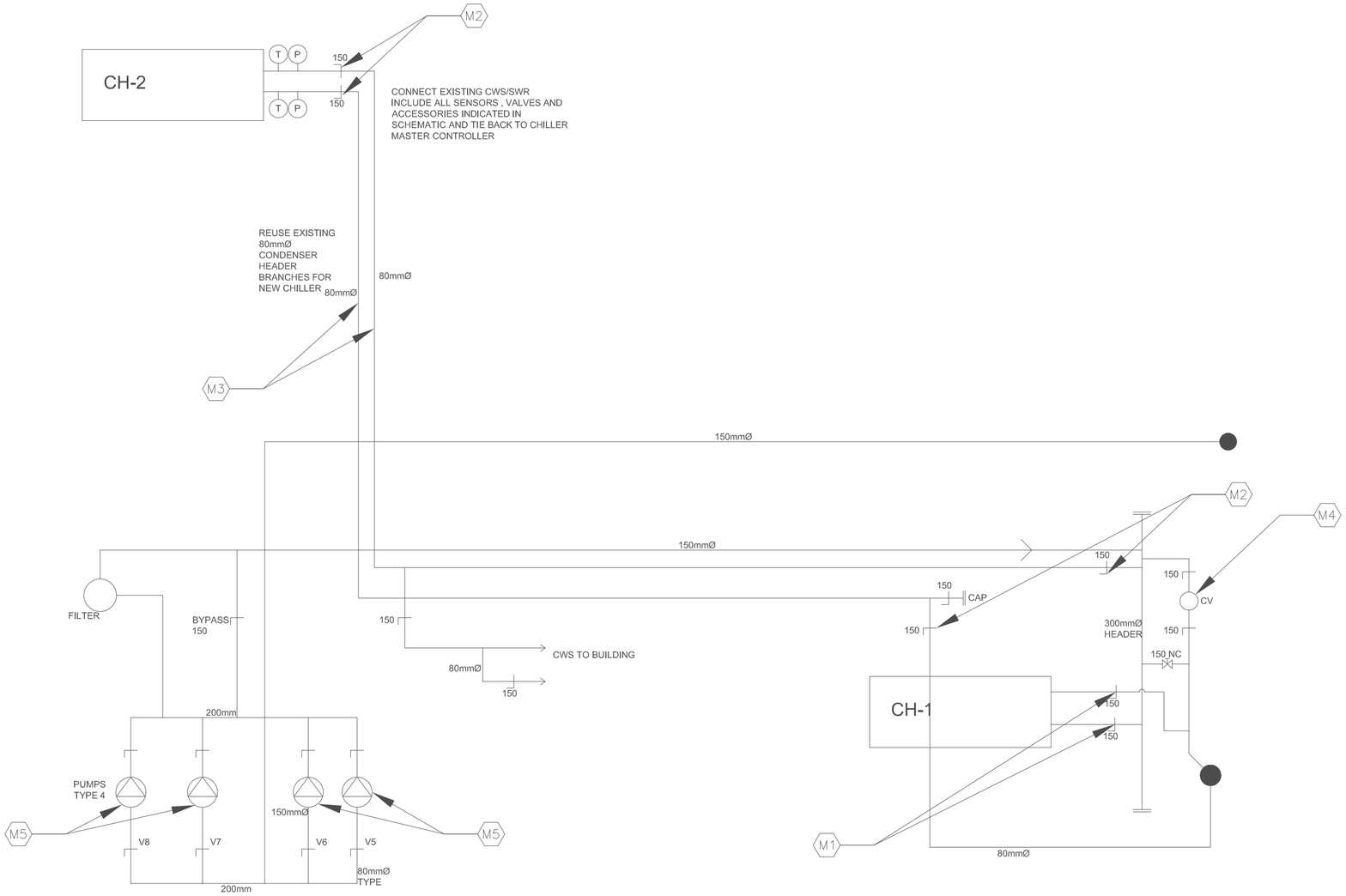
Designed By	A.M.	Conçu par
Date	2016/03/03	(yyyy/mm/dd)
Drawn By	J.H.	Dessiné par
Date	2016/03/12	(yyyy/mm/dd)
Reviewed By	A.M.	Examiné par
Date	2016/03/14	(yyyy/mm/dd)
Approved By	A.M.	Approuvé par
Date	2016/03/23	(yyyy/mm/dd)
Tender		Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

MCE15/A645

Drawing no. / No. du dessin
M-4

PWGSC A2 (594x420)

NEW DRAIN FOR AUTOMATIC
CONDENSER FILTER FLUSH SYSTEM



DRAWING NOTES:

M1 ISOLATE CHILLER 1 THEN CAP OFF HEADERS.

M2 ISOLATION VALVES FOR CHILLER 2, ISOLATE CH–2 THEN CAP OFF HEADERS.

M3 REUSE EXISTING 3"ø CONDENSER WATER BRANCH FOR NEW CHILLER.

M4 EXISTING CONTROL VALVE IS NON OPERABLE BUT SHALL REMAIN.

M5 ALL EXISTING CONDENSER PUMPS TO REMAIN.

Canada

Public Works and Government Services Canada | Travaux publics et services gouvernementaux Canada

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

revisions	description	date
3	ISSUED FOR TENDER	MAR 30/16
2	ISSUED FOR 99% REVIEW	MAR 24/16
1	ISSUED FOR 95% REVIEW	MAR 14/16

A detail no. no. du detail
B location drawing no. sur dessin no,
C drawing no. dessin no.

project / projet
CHILLER REPLACEMENT

960 Carling Avenue, Ottawa, On, K1A 0C5

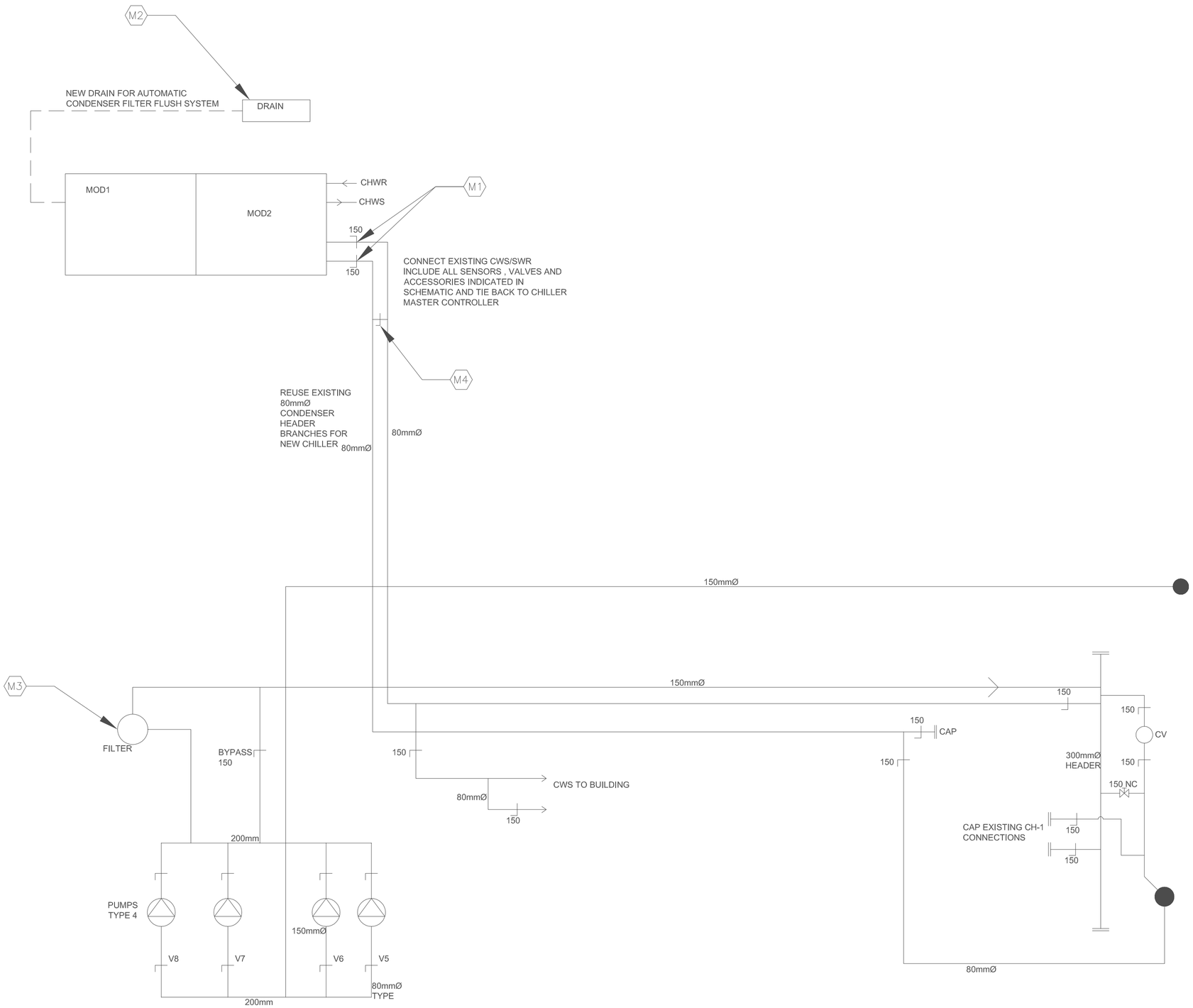
drawing / dessin
HVAC - CONDENSER SYSTEM - DEMOLITION

Designed By	A.M.	Conçu par
Date	2016/03/03	(yyyy/mm/dd)
Drawn By	J.H.	Dessiné par
Date	2016/03/12	(yyyy/mm/dd)
Reviewed By	A.M.	Examiné par
Date	2016/03/14	(yyyy/mm/dd)
Approved By	A.M.	Approuvé par
Date	2016/03/23	(yyyy/mm/dd)
Tender		Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

MCE15/A645

Drawing no. / No. du dessin
M-5

PWGSC A2 (594x420)



DRAWING NOTES:

M1 CONNECT EXISTING CWS/CWR PIPING TO NEW CHILLER & INCLUDE ALL SENSORS, VALVES AND ACCESSORIES INDICATED IN SCHEMATIC AND TIE BACK TO CHILLER MASTER CONTROLLER. REFER TO DRAWING M-4 FOR DETAILS.

M2 PROVIDE NEW DRAIN FOR AUTOMATIC CONDENSER WATER FILTER FLUSH DOWN SYSTEM. TIED TO EXISTING FLOOR DRAIN IN MECHANICAL ROOM.

M3 EXISTING FILTER TO REMAIN.

M4 PROVIDE NEW 3 WAY CONTROL VALVE TO BE INSTALLED AND TIED BACK TO CHILLER MASTER CONTROLLER.

PWGSC A2 (594x420)

Canada

Public Works and Government Services Canada / Travaux publics et services gouvernementaux Canada

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

revisions	description	date
3	ISSUED FOR TENDER	MAR 30/16
2	ISSUED FOR 99% REVIEW	MAR 24/16
1	ISSUED FOR 95% REVIEW	MAR 14/16

A detail no. no. du detail
B location drawing no. sur dessin no.
C drawing no. dessin no.

project / projet

CHILLER REPLACEMENT

960 Carling Avenue, Ottawa, On, K1A 0C5

drawing / dessin

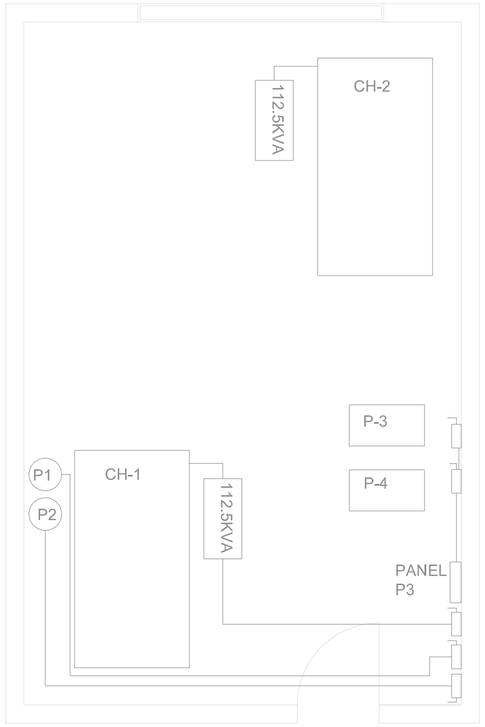
HVAC - CONDENSER SYSTEM - NEW

Designed By	A.M.	Conçu par
Date	2016/03/03	(yyyy/mm/dd)
Drawn By	J.H.	Dessiné par
Date	2016/03/12	(yyyy/mm/dd)
Reviewed By	A.M.	Examiné par
Date	2016/03/14	(yyyy/mm/dd)
Approved By	A.M.	Approuvé par
Date	2016/03/23	(yyyy/mm/dd)
Tender		Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

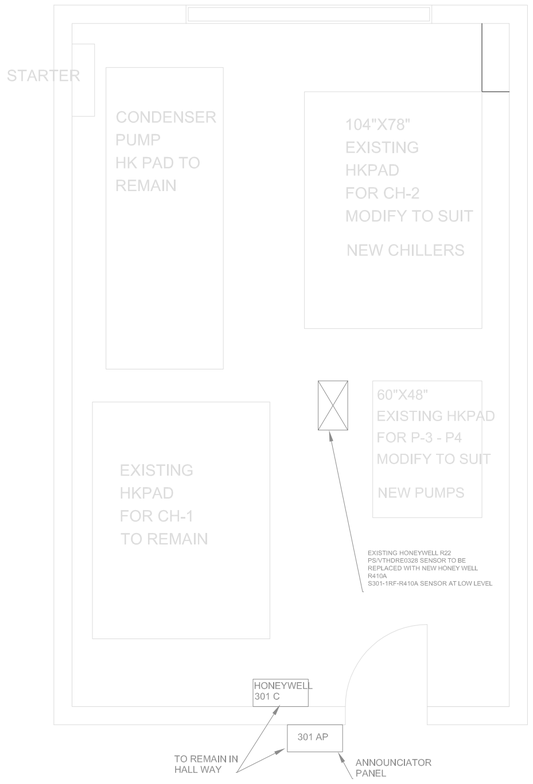
MCE15/A645

Drawing no. / No. du dessin

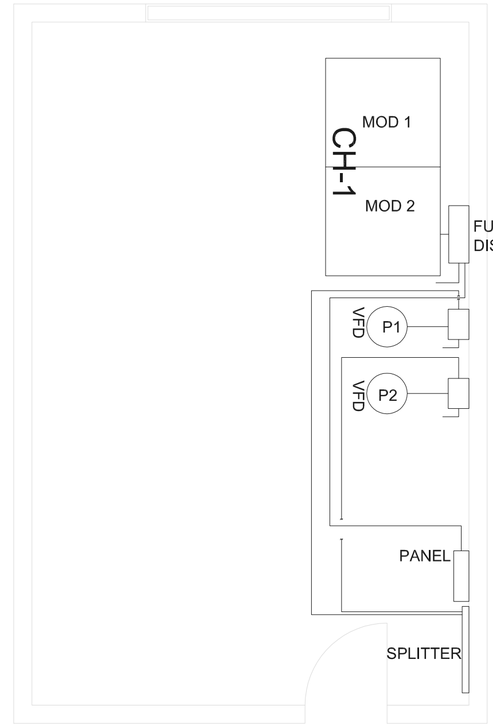
M-6



1 E-1 POWER - DEMOLITION
SCALE: N.T.S.



2 E-1 REFRIGERANT LEAK DETECTION
SCALE: N.T.S.



3 E-1 POWER - NEW CONSTRUCTION
SCALE: N.T.S.

Canada

Public Works and Government Services Canada / Travaux publics et services gouvernementaux Canada

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

revisions	description	date
3	ISSUED FOR TENDER	MAR 30/16
2	ISSUED FOR 99% REVIEW	MAR 24/16
1	ISSUED FOR 95% REVIEW	MAR 14/16

A detail no. / no. du detail
B location drawing no. / sur dessin no.
C drawing no. / dessin no.

project / projet
CHILLER REPLACEMENT

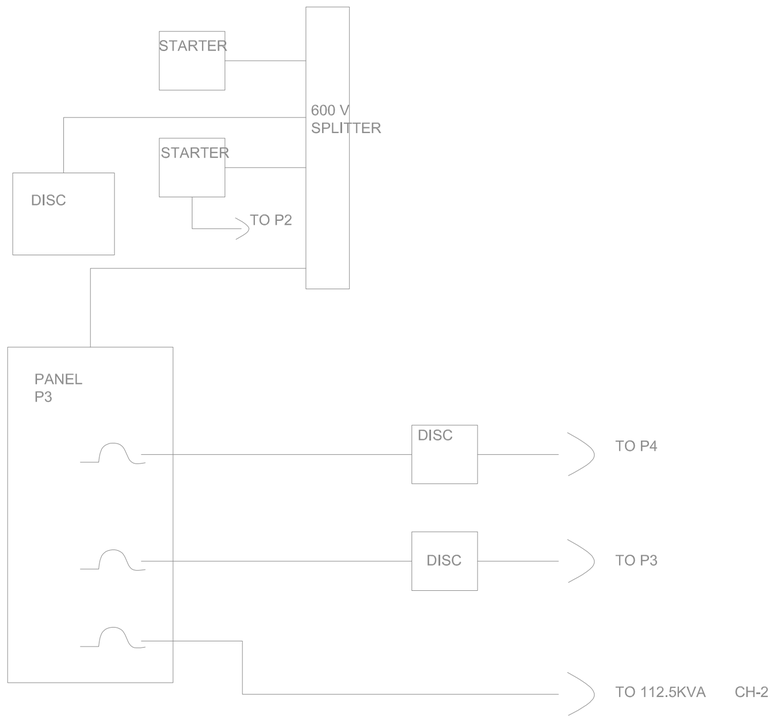
960 Carling Avenue, Ottawa, On, K1A 0C5

drawing / dessin
POWER, DATA, LIGHTING, AND LIFE SAFETY

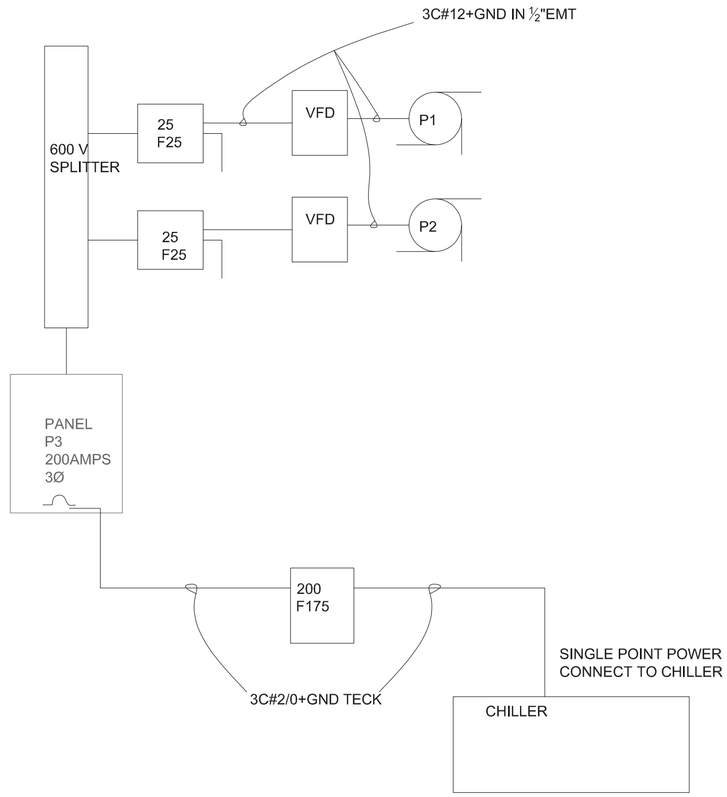
Designed By	A.M.	Conçu par
Date	2016/03/03	(yyyy/mm/dd)
Drawn By	J.H.	Dessiné par
Date	2016/03/12	(yyyy/mm/dd)
Reviewed By	A.M.	Examiné par
Date	2016/03/14	(yyyy/mm/dd)
Approved By	A.M.	Approuvé par
Date	2016/03/23	(yyyy/mm/dd)
Tender		Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

MCE15/A645

Drawing no. / No. du dessin
E-1



1 E-2 POWER SINGLE LINE - DEMOLITION
SCALE: N.T.S.



2 E-2 POWER SINGLE LINE - NEW CONSTRUCTION
SCALE: N.T.S.

Canada

Public Works and Government Services Canada / Travaux publics et services gouvernementaux Canada

Contractor to verify all dimensions & conditions on site and immediately notify the engineer of all discrepancies.

revisions	description	date
3	ISSUED FOR TENDER	MAR 30/16
2	ISSUED FOR 99% REVIEW	MAR 24/16
1	ISSUED FOR 95% REVIEW	MAR 14/16

A detail no. / no. du detail
B location drawing no. / sur dessin no.
C drawing no. / dessin no.

project / projet
CHILLER REPLACEMENT

960 Carling Avenue, Ottawa, On, K1A 0C5

drawing / dessin
POWER, DATA, LIGHTING, AND LIFE SAFETY

Designed By	A.M.	Conçu par
Date	2016/03/03	(yyyy/mm/dd)
Drawn By	J.H.	Dessiné par
Date	2016/03/12	(yyyy/mm/dd)
Reviewed By	A.M.	Examiné par
Date	2016/03/14	(yyyy/mm/dd)
Approved By	A.M.	Approuvé par
Date	2016/03/23	(yyyy/mm/dd)
Tender		Soumission
Project Manager		Administrateur de projets
Project no.		No. du projet

MCE15/A645

Drawing no. / No. du dessin
E-2

PWGSC A2 (594x420)