CITY OF HAMILTON

REQUEST FOR TENDERS

Contract Number: C13-20-24

General Contractor for Macassa Lodge Space and Domestic Hot Water (DHW) Heating Boilers Upgrade

Closes: 3:00 PM, Hamilton time
Tuesday, October 1, 2024

***** ELECTRONIC BID SUBMISSIONS ONLY *****

Procurement Section
Corporate Services Department

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Online documents:

Schedule of Prices

Specifications
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Form of Tender

COMMUNICATIONS

Revised: March 21,2023

Contract Number: C13-20-24

General Contractor for Macassa Lodge Space and Domestic Hot Water (DHW) Heating Boilers Upgrade

All questions related to this Request for Tenders (RFT) or for clarification on completing the Form of Tender shall be submitted through the Bidding System by clicking on the "Submit a Question" button for the specified Request for Tenders document and shall be directed to:

Vanja Tokic
Procurement Specialist

All questions related to this Request for Tenders (RFT) or any clarification with respect to this RFT must be made no later than **3 Business Days prior** to the closing date of this RFT in order that City staff may have sufficient time to respond. The City reserves the right to extend the deadline for questions if required regarding this RFT.

Written answers or clarifications to issues of substance shall be shared with all bidders and issued as part of the RFT in the form of an Addendum. **All bidders are advised that any Addenda issued will only be posted on the following website:**

https://hamilton.bidsandtenders.ca

It is the sole responsibility of each bidder to check the website for any and all Addenda that have been issued for this Request for Tenders.

City of Hamilton
Corporate Services Department
Procurement Section
Email: procurement@hamilton.ca

Vanja Tokic
Procurement Specialist
Email: Vanja.Tokic@hamilton.ca

REQUEST FOR TENDERS NOTICE

Contract Number: C13-20-24

General Contractor for Macassa Lodge Space and Domestic Hot Water (DHW) Heating Boilers Upgrade

Closes: 3:00 PM, Hamilton time
Tuesday, October 1, 2024

Only electronic bid submissions shall be accepted and received through the Bidding System by the closing date and time stated above.

There is no public opening for this Request for Tenders.

1.0 Scope of work

The scope of work to be undertaken for this project involves the supply and delivery of new space heating boilers and domestic water heaters, associated pumps, an air separator, piping, and all other related Work at Macassa Lodge located at 701 Upper Sherman Ave in Hamilton, Ontario.

Replacement of space heating boilers shall be done during non-heating season whereas replacement of domestic water heaters be done in two stages to always ensure uninterrupted water service to the Lodge. Please refer to Appendix A – Drawings and Specifications package in its entirety for full scope of Work.

2.0 CONTRACT REQUIREMENTS

Bidders are advised of the following contract requirements for this Request for Tenders:

2.1 Bid Security

Bid security: **$90,000.00**

The City will only accept a digital bid bond in an electronically verifiable and enforceable (e-Bond) format.

2.2 Performance and/or Labour and Material Payment Security

Successful Bidder to provide:

Performance security (bond only accepted): **50%** of the Base Bid Price.

Successful Bidder to provide:
Labour and Material Payment security (bond only accepted): **50%** of the Base Bid Price.

3.0 SITE MEETINGS

3.1 Optional Site Meeting

There is an optional site meeting scheduled.

Location: **Macassa Lodge**
701 Upper Sherman Ave, Hamilton, ON, L8V 3M7
Date: **Wednesday, September 18, 2024**
Time: **09:30am EST, Hamilton time**

All attendees are required to wear CSA approved hard hats and safety boots along with surgical masks, these masks will also be provided on-site. If an attendee does not have the required personal protection equipment, they may not be allowed to attend the site meeting.

4.0 TO OBTAIN DOCUMENTS

4.1 Free Preview of Request for Tenders Documents

A complete set of Request for Tenders documents may be viewed for free on the City of Hamilton's bid opportunities website **hamilton.bidsandtenders.ca.**

4.2 Purchase of Request for Tenders Documents

The Request for Tenders documents are available for online purchase only.

Online: **hamilton.bidsandtenders.ca**
Fee: $61.44 non-refundable, tax included + applicable bids&tenders™ fees

4.3 Accommodations for Bidders with Disabilities

In accordance with the Ontario Human Rights Code, Ontarians with Disabilities Act, 2001 (ODA) and Accessibility for Ontarians with Disabilities Act, 2005 (AODA), the City of Hamilton will accommodate for a disability, ensuring full and equitable participation throughout the bid process.

If a bidder requires this Request for Tenders in a different format to accommodate a disability, the bidder must contact the Tender Coordinator as soon as possible and in any event prior to the closing date. The Request for Tenders in the different format will be issued only to the requesting bidder and all Addenda will be issued in such different format only to the requesting bidder.

5.0 TRADE AGREEMENTS

This Request for Tenders is subject to the Canadian Free Trade Agreement (CFTA).

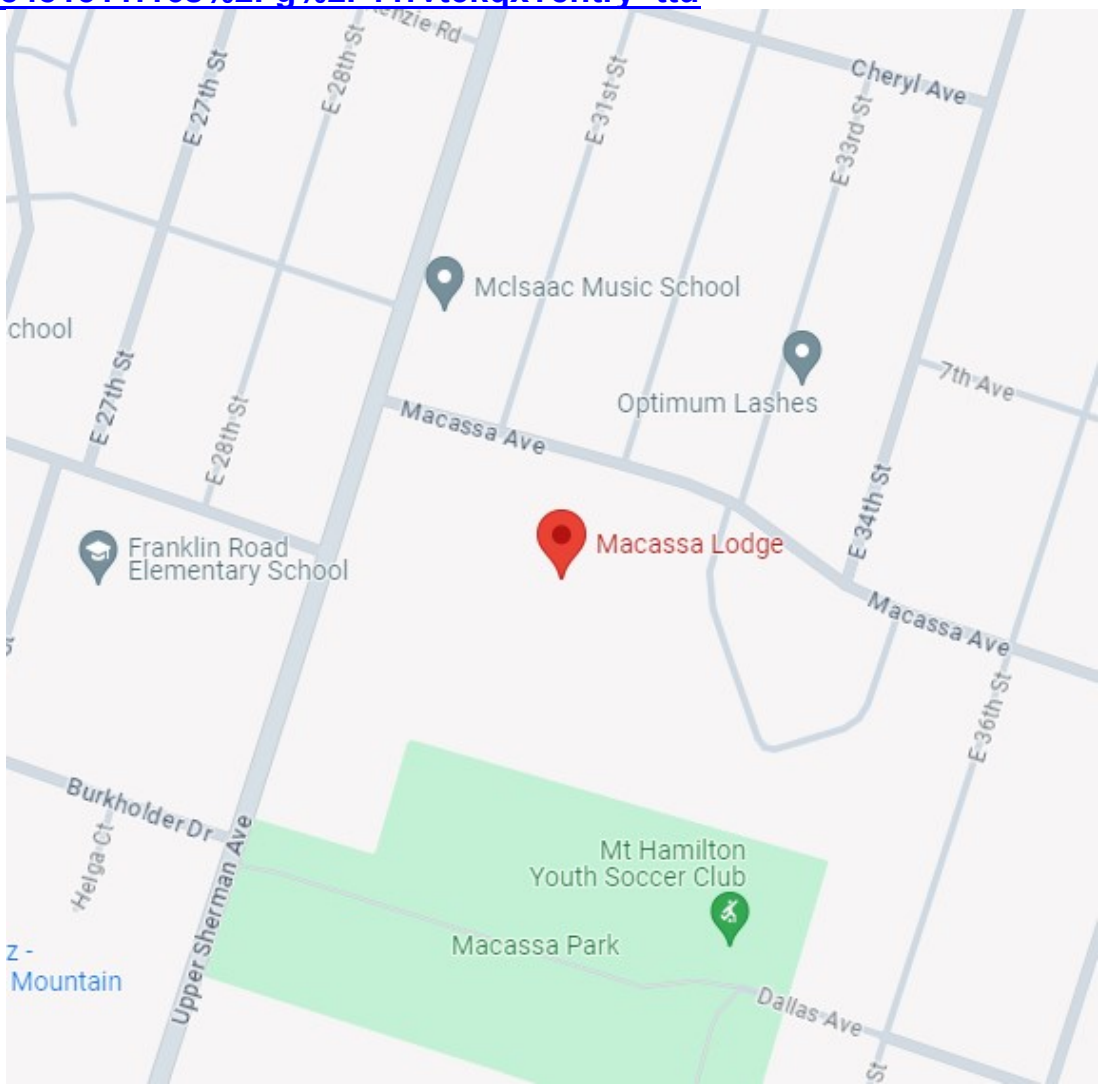
Procurement Manager
City of Hamilton

MAP LOCATION OF MACASSA LODGE

DISCLAIMER:
The following URL address and map have been provided for illustration purposes only and every effort has been made to ensure accuracy. The City of Hamilton cannot accept any responsibility for errors, omissions, or positional inaccuracy for this information.

Bidders must copy and paste the following URL address into a new web browser:

https://www.google.ca/maps/place/Macassa+Lodge/@43.2244898,-79.8487229,16.5z/data=!4m6!3m5!1s0x882c9bcb3d4f72ef:0xbe69019219e0dc6!8m2!3d43.2256797!4d-79.8481511!16s%2Fg%2F11rvt3kqx?entry=ttu



CITY OF HAMILTON

REQUEST FOR TENDERS

INSTRUCTIONS TO BIDDERS
Revised: October 7, 2022

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INSTRUCTIONS TO BIDDERS

Notice to prospective bidders: The Instructions set out herein define your obligations and limit your rights. Read carefully.

1 Interpretation

In these Instructions to Bidders,

1.1 the provisions shall be read with changes of gender, number or corporate status as the context may require;

1.2 a reference to any Act, by-law, rule, procedure or regulation shall be deemed to include a reference to any substitution or amendment thereof;

1.3 the headings to each section are inserted for convenience of reference only and do not form part of the Request for Tenders;

1.4 any reference to an officer of the City shall be construed to mean the person holding that office from time to time, the designate or deputy of that person, and shall be deemed to include a reference to any person holding a successor office or the designate or deputy of that person.

1.5 unless expressly stated to the contrary, the number of days shall be calculated by,

1.5.1 counting all days including Saturdays, Sundays and public holidays, provided, however, that if the final day of any period shall fall on a Saturday, Sunday or public holiday, then the final day shall be deemed to be the next day which is not a Saturday, Sunday or public holiday;

1.5.2 where “month” is referred to, it shall be a calendar month.

2 Definitions

Capitalized words and phrases used in these Instructions to Bidders, Supplementary Instructions to Bidders, and the Form of Tender shall have the following meanings, unless expressly stated otherwise.

“Addendum” means a written change issued to the Request for Tenders.

“Alternative” means anything for which bidders provide a price in a manner that gives the City options in determining the actual Work of the Contract and may include such items as an optional product, system, installation, method, design and requirement. The City shall not be obliged to purchase an Alternative when accepting a Bid, but may, at its discretion elect to purchase all, some or none of the Alternatives offered.

“Alternative Price” means the amount stipulated by the bidder for an Alternative, which can be stated as an addition, a deduction, or no change to the Base Bid Price. The Successful Bidder shall be obliged to adhere to the Alternative Price quoted in its Bid.

“Base Bid Price” means the amount stated in the Form of Tender by the bidder, for the Work without considering any Alternative or Alternative Price and includes all Provisional Items and Provisional Prices (if any).

“Bid” means a submission made by a bidder in response to the Request for Tenders.

“Bid Security” means the security submitted by a bidder with its Bid which provides financial protection to the City should the Successful Bidder not enter into the Contract or commence the Work following the issuance of a purchase order, and/or not provide the specified security required under the Contract.

“Bidding System” means the electronic system used by the City for the advertisement of public bid opportunities at the following website: https://hamilton.bidsandtenders.ca, and which is required to be used for all dissemination of information by or on behalf of the City and submissions from bidders for this Request for Tenders.

“Business Day” means a day which is not a Saturday, Sunday, public holiday or day when the administrative offices of the City are closed.

“City” means the City of Hamilton, and where an authority or discretion is conferred upon the City under the Request for Tenders, means the appropriate official of the City as designated or appointed under its governing by-laws, resolutions or policies from time to time.

“Contract” means the agreement by formal contract executed by both the City and the Successful Bidder, or by purchase order issued by the City, to perform the Work, including the supply and delivery of all labour, Goods, Services, equipment and incidentals necessary for the proper and satisfactory execution of the Work, and the fulfillment of all other contractual obligations and undertakings, all in accordance with the Request for Tenders, and any written supplementary agreements which form part of the Contract.

“Electronic Bidding” means a method of issuing this Request for Tenders and/or receiving Bids where the process of using and/or receiving Bids by internet is considered appropriate, and in particular includes the Bidding System operated by bids&tenders™ system operated by eSolutions Group, 455 Philip Street, Waterloo, Ontario N2L 3X2.

“Form of Tender” means the City’s forms entitled Form of Tender and Schedule of Prices and any other documents that are supplied as part of the Request for Tenders and which are to be completed and confirmed by the bidder and submitted back to the City in their entirety through the Bidding System.

“Good” means any product of any description required to be installed, supplied or consumed in order to complete the Work.

“Lump Sum Price” means an all inclusive one price that applies to a single item, or specific Service as set out on the Form of Tender.

“Procurement Manager” means the City’s Procurement Manager or his or her delegate or designate.

“Procurement Policy” includes those City procurement policies found at: https://www.hamilton.ca/build-invest-grow/buying-selling-city/bids-and-tenders/procurement-policy-by-law

“Procurement Section Office” means 28 James Street North, 4th Floor, Hamilton, Ontario L8R 1A1.

“Project Manager” means the person designated by the City to administer and oversee the Work.

“Provisional Item” means work or a portion of work the City may wish to have performed but which may be removed, at no additional cost to the City from the scope of the Work at any time. Where such item is removed, the City will deduct the relevant Provisional Price from the Base Bid Price after the award of the Contract.

“Provisional Price” means the amount stipulated by the bidder for a Provisional Item which is to be included in the Base Bid Price.

“Request for Tenders” means all of the following documents, and in the event of a conflict between them, each shall enjoy priority against the others (subject to any express term or condition to the contrary) in accordance with the following successive order:

(a) any Addendum;

(b) any Supplementary General Conditions or Supplementary Conditions;

(c) the General Conditions;

(d) the Specifications, with any Supplementary Specifications (if any) taking priority over the standard Specifications;

(e) any contract drawings;

(f) the Supplementary Instructions to Bidders

(g) these Instructions to Bidders;

(h) the standard form text of the Form of Tender as prescribed by the City;

(i) the sample Contract;

(j) any other documents that form a part of the Request for Tenders.

“Service” means a service of any description required in order to complete the Work, whether commercial, industrial, trade or otherwise, and includes all professional, technical and artistic service, and the transporting, acquiring, supplying, storing and otherwise dealing in a Good.

“Specifications**”** means all written or printed requirements and standards forming part of the Request for Tenders and pertaining to the method and the manner of performing the

Work or Service, to the scope of Work and to the quality of a Good to be furnished under the Contract.

“Stipulated Price” means a single, all inclusive, one price that applies to all of the Work.

“Successful Bidder” means the bidder to whom the City has awarded the Contract.

“Tender Coordinator” means the single point of contact for the Request for Tenders and will be the person named on the Communications page of the Request for Tenders.

“Tender Notice” means the public notification of the Request for Tenders.

“Total Contract Price” has the same meaning as Base Bid Price.

“Unit Price” means any component price as set out on the Form of Tender.

“Value Added Taxes” means such sum as shall be levied upon the Base Bid Price by the Federal or Provincial or Territorial Government and is computed as a percentage of the Base Bid Price and includes the Goods and Services Tax, the Quebec Sales Tax, the Harmonized Sales Tax, and any similar tax, the collection and payment of which have been imposed on the bidder by the tax legislation.

“Work” means the whole of the work, the supply and delivery of a Good, the delivery and performance of any Services, the total construction and related services, material, matters and things required to be completed, supplied, mentioned or referred to in performing or executing the work in full in accordance with the requirements set out in the Request for Tenders.

3 Guidelines Regarding Bid Irregularities

As a guide to the bidder, but without qualifying any rights and privileges reserved to the City, the bidders guidelines set out below is indicative of the manner in which discretion reserved by the City is to be exercised with respect to non-compliant Bids. However, the City shall not be liable to any bidder or other person where it elects to exercise a discretion, reserved privilege or right in a manner different from that indicated below. An irregularity that goes beyond the scope of the bidders Guidelines set out below shall be considered by the Procurement Manager.

BIDDERS GUIDELINES		
IRREGULARITY		**RESPONSE**
1.	Qualified or conditional Bid (A Bid restricted by a statement added to the Form of Tender or a covering letter or alterations to the Form of Tender).	Automatic rejection unless the Request for Tenders specifically permit such qualification or condition.
2.	A Bid received in a format not specified in the Request for Tenders such as hardcopy submission, fax, email, etc.	Automatic rejection.

BIDDERS GUIDELINES		
IRREGULARITY		**RESPONSE**
3.	A Bid received on documents other than those original documents supplied by the Bidding System.	Automatic rejection.
4.	Bid Security: Amount of Bid Security provided by bidder is insufficient, does not name correct Municipality as obligee, or no Bid Security is provided or is not otherwise in compliance with the Request for Tenders requirements.	Automatic rejection.
5.	Execution of Bid bond: Corporate seal or electronic signature of bidder, or both, are missing. Corporate seal or electronic signature of bonding company, or both, are missing.	Automatic rejection. Automatic rejection.
6.	Digital bid bond not provided or not an electronically verifiable and enforceable e-Bond.	Automatic rejection.
7.	Other irregularities.	An irregularity that goes beyond the scope of the Bidders Guidelines may be considered by the Procurement Manager.

4 Bid Submission and Form of Tender

4.1 Every Bid **shall**

4.1.1 be submitted on the City's prescribed Form of Tender in its entirety;

4.1.2 be completed in English;

4.1.3 have all of the required blank spaces provided on the Form of Tender completed by the bidder;

4.1.4 include all material, Goods, Services, equipment and labour, required to complete the Work; and

4.1.5 state all prices in Canadian funds, unless otherwise stipulated.

4.2 Electronic Bid submissions only, shall be accepted and received by the Bidding System, on or before the closing date and time stated in the Request for Tenders. A Bid submitted by mail, in person, fax, e-mail or other electronic means, other than through the Bidding System, will not be accepted.

4.3 Bidders shall have a Bidding System vendor account and must be registered as a plan taker for this Request for Tenders. Only plan takers will have access to download this Request for Tenders document, receive Addendum email

notifications, download Addendum and to submit their Bid electronically through the Bidding System.

If a bidder has obtained the Request for Tenders document from a third party, the onus is on the bidder to create a Bidding System vendor account and register as a plan taker for the bid opportunity.

4.4 Time is of the essence with respect to the submission of a Bid. It is the **sole** responsibility of each bidder to ensure that its Bid is received by the Bidding System on or before the closing date and time stated in the Request for Tenders document. The closing time shall be determined by the Bidding System web clock.

Bidders are advised that the timing of their Bid submission is based on when the Bid is RECEIVED by the Bidding System, not when a Bid is submitted by a bidder, as Bid transmission can be delayed in an "internet traffic jam" due to file transfer size, transmission speed, etc.

Bidders shall allow sufficient time to upload their Bid submission, including any attachments. Late Bid submission shall not be accepted by the Bidding System.

4.5 The Bidding System will send a confirmation email to the bidder advising that their Bid was submitted successfully. If an email confirmation is not received, contact technical support at bids&tenders™ via email: support@bidsandtenders.ca or by telephone 1-800-594-4798.

4.6 It is the exclusive responsibility of each bidder to submit a complete Bid in accordance with the Request for Tenders.

4.7 All documents prepared and work carried out by a bidder in preparing a Bid, and all oral presentations to the City in connection with a Bid, shall be without cost to the City, and neither the City's publication of a Request for Tenders nor the submission of a Bid shall be construed to oblige the City to award a Contract.

4.8 All words and phrases forming part of a Bid should be written out in full, and abbreviations should not be used.

4.9 No amendment may be made to a Bid after it has been submitted, except in the circumstances set out in Article 6.4 of these Instructions to Bidders.

5 Bid Security

5.1 Each bidder shall submit with its Bid a Bid Security in the form of a digital bid bond in an electronically verifiable and enforceable (e-Bond) format in the amount set out in the Supplementary Instructions to Bidders.

For additional information regarding e-Bonds, bidders should contact their surety company or visit the Surety Association of Canada website.

5.2 A scanned PDF copy of bonds, original certified cheque, bank draft, money order or any other format other than a digital bid bond is not acceptable and shall be rejected.

5.3 Bidders shall upload their Bid Security to the Bidding System, in the bid submission file labelled “Bid Bond”. All instructions and details for assessing authentication shall be included with the digital bond uploaded in the Bidding System.

5.4 A Bid Security shall, include such terms, be in a form, be executed appropriately and be provided by an issuer authorized to do business in the Province of Ontario, satisfactory to the City in its reasonable discretion.

5.5 When a Bid is accepted by the City, the Successful Bidder will enter into a Contract for the performance of the Work. The Successful Bidder will commence the Work, following the issuance of a purchase order or notice to proceed, and will give the specified security required under the Request for Tenders and the Contract within 10 Business Days of request by the City.

5.6 The digital bid bond will not be returned to the bidder.

5.7 The term of the Bid Security shall be for a minimum period of 90 days after the closing date of the Request for Tenders. Where the irrevocability period for a Bid is extended in accordance with Article 10.2 of these Instructions to Bidder, the bidder shall also ensure that the term of the Bid Security is extended for the same period of time as the irrevocability period.

5.8 A Bid submitted without the required Bid Security will be rejected by the City.

5.9 Each bidder that submits a Bid will be deemed to have acknowledged and agreed that the amount of the Bid Security required with respect to a Bid constitutes a genuine pre-estimate on the part of the City of the damages that will be suffered by the City as a result of a failure or refusal on the part of the Successful Bidder to enter into a Contract, to commence the Work following the issue of a purchase order or notice to proceed, and/or to give the specified security required under the Request for Tenders and the Contract.

5.10 In the event of a failure or refusal on the part of the Successful Bidder to enter into the Contract, to commence the Work following the issue of a purchase order or notice to proceed, and/or to give the specified security required under the Request for Tenders and the Contract, the City shall declare the Bid Security forfeited and the Successful Bidder may be held responsible at the City’s discretion for any increased costs or damages incurred by the City over and above the amount of that Bid Security.

5.11 In addition to the Reserved Privileges of the City set out at Article 16 of the Instructions to Bidders, the City may at its discretion, in the event of a failure, refusal or default on the part of the Bidder to enter into the Contract, to commence the Work following the issue of a purchase order or notice to proceed, and/or to give the specified security required under the Request for Tenders and the Contract, annul the award or terminate the Contract, accept the next lowest compliant Bid, advertise for new tenders, or carry out the Work in any manner deemed in the best interests of

the City. In such a case, if required by the City, the bidder shall pay the City the difference between the Base Bid Price and any greater sum that the City may be obligated to pay by reason of the failure, refusal or default of that bidder, including the cost of any advertisement for new tenders.

6 Addenda and Clarification of the Request for Tenders

6.1 The City reserves the right at any time prior to the award of the Contract,

6.1.1 to withdraw or cancel the Request for Tenders;

6.1.2 to extend the time for the submission of Bids; or

6.1.3 to modify the Request for Tenders,

by the publication of an Addendum, which shall become part of the Request for Tenders, and the City shall not be liable for any expense, cost, loss or damage incurred or suffered by any bidder (or any other person) as a result of its so doing.

6.2 Without limiting the City's right, Article 6.1 may apply to situations where no Bid is compliant or an insufficient number of bids have been received.

6.3 Any Addendum shall be posted on the following website and is sufficiently served upon any prospective bidder if so posted.

https://hamilton.bidsandtenders.ca

6.3.1 In addition to the above method of posting, the City may also notify prospective bidders of any Addendum by any other method it deems appropriate, including email, telephone, fax, courier, hand-delivery or by personal delivery. The need for additional notification and the method(s) to be used shall be in the absolute discretion of the City and notification shall be to the co-ordinates provided by the bidder to the City at the time it obtained the Request for Tenders from the City.

6.3.2 It is the sole responsibility of each bidder to check the website and ensure that it has received any and all Addenda issued by the City. Bidders shall confirm in the Form of Tender that they have received, examined and provided for all Addenda issued under the Request for Tenders. Bidders may in writing, seek confirmation of the number of Addenda issued under the Request for Tenders from the Tender Coordinator.

6.4 Where a bidder submits their Bid prior to the Request for Tenders closing date and time and an Addendum has been issued by the City, the Bidding System automatically **WITHDRAWS** the bidder's Bid submission and changes the Bid submission to an **INCOMPLETE STATUS** (**NOT accepted by the City**). The withdrawn Bid can be viewed by the bidder in the "**MY BIDS**" section of the Bidding System. The bidder is solely responsible to:

6.4.1 make any required adjustments to their Bid;

6.4.2 acknowledge all Addenda that have been issued for this Request for Tenders; and

6.4.3 ensure the re-submitted Bid is **RECEIVED** by the Bidding System before the closing date and time stated in the Request for Tenders.

6.5 All communication between a bidder and the City (including requests for information or clarification) **shall** be set down in writing and directed to the Tender Coordinator named in the Communications page.

6.6 Any request directed to the City with respect to Article 6.5 prior to the closing date of the Request for Tenders must allow sufficient time for a written response or clarification to be issued by the City prior to the closing date, should the City consider it necessary to issue such response or clarification.

6.7 A written response or clarification of substance shall be shared with each bidder and issued in the form of an Addendum.

6.8 The City shall not be bound by any oral:

6.8.1 instruction;

6.8.2 amendment or clarification of the Request for Tenders;

6.8.3 information; or

6.8.4 advice or suggestion,

provided by any member of the City's staff or consultant to the City concerning the Request for Tenders or the manner in which the Work is to be carried out and the bidder bears any and all risk in relying on such representation.

6.9 Bidders shall acknowledge receipt of any Addenda when submitting their Bid through the Bidding System. Bidders shall check a box for all Addenda and any applicable attachments that have been issued before a bidder can re-submit their Bid submission online.

7 Bidder Responsibilities

7.1 The Contract shall only be between the City and the Successful Bidder. Neither the City nor its consultant shall be construed to have any contractual relationship with the Successful Bidder's employees, subcontractors or material suppliers, or their respective employees or suppliers.

7.2 Each bidder shall be responsible for:

7.2.1 ensuring that it has conducted a thorough inspection of the site, has investigated and examined the Request for Tenders and any other

document made available to the bidder by the City and has delivered to the City any request for information in respect of all questions arising out of the foregoing inspections, investigations and examinations in respect to the site;

7.2.2 reviewing all drawings, reports, tests and other documents with respect to site, subsurface or otherwise concealed physical conditions which have been provided or made available to the bidder by the City in relation to the Request for Tenders and shall be responsible for any site, subsurface or otherwise concealed physical condition set out in or inferable from any such report; and

7.2.3 ensuring that they have conducted a sufficient and appropriate scope of inquiry into the manner, method(s) and magnitude of the work that is proposed in the Request for Tenders such that they have established a clear and full understanding of the work being undertaken and are able to fully appreciate the consequences of that work in preparing their Bid.

7.3 The cost of any Work which results from encountering any condition that is described in or properly inferable from the information referred to in Article 7.2 above shall be included in the bidder's Base Bid Price.

8 Opening of Bids

There is no public opening for this Request for Tenders. All Bids shall be electronically opened and posted on the Bidding System, https://hamilton.bidsandtenders.ca, following the closing date and time of the Request for Tenders. The name of the bidder and the Base Bid Price shall be posted for each Bid received.

9 Review of Bids & Bid Verification

9.1 Following the electronic opening, each apparently eligible Bid will be examined by the Procurement Manager to confirm that they are compliant and otherwise complete.

9.2 Unless expressly stated otherwise, the City shall apply a standard of substantial compliance against each Bid.

9.3 The City is not obliged to seek verification of any aspect of a Bid, however, the City may, if it determines that it is appropriate to do so under the circumstances, verify any aspect of any Bid received, at any time, in order to resolve an ambiguity in either the language used or any other vague or uncertain aspect of the Bid.

9.4 Such verification shall not alter the Bid, constitute negotiation or re-negotiation of the price or any other aspect of the Bid, and all correspondence with a bidder for the purposes of such verification shall be conducted through the Procurement Manager.

9.5 The review or verification of a Bid with a bidder shall not oblige the City to enter into a Contract with a particular bidder, nor shall it constitute an acceptance of a Bid.

9.6 All verification under this section shall form part of the Bid, be in writing, and be in a form satisfactory to the City.

10 Acceptance & Irrevocability of Bid

10.1 A Bid shall be irrevocable and open for acceptance by the City of Hamilton for a period of 90 days following the closing date and time of the Request for Tenders.

10.2 Where the City is unable to award a Contract prior to the expiry of the irrevocability period, the City may, on or prior to that expiry date, make a request to each of the compliant bidders to confirm, in writing, their willingness to hold their Bid prices, extend the term of their Bid Security and extend the irrevocability period for the specific period of time requested by the City.

11 Award of Contract

11.1 The City shall notify the Successful Bidder as soon as practicable after the award of the Contract. Despite any requirement for the formal execution of a Contract, the Contract shall be deemed to arise upon the award of the Contract to the Successful Bidder.

11.2 Where a Request for Tenders is awarded to a bidder in respect of the Work and in accordance with the provisions of the Request for Tenders and Bid, the bidder shall be required to either:

11.2.1 execute a Contract on the form set out in the Request for Tenders and approved by the City's Legal Services Division; or

11.2.2 where the form of Contract in Article 11.2.1 is not required they shall be assigned a contract number and the Request for Tenders and the Bid shall become the Contract in respect of the Work.

11.3 The award letter will identify documents required by the City prior to being able to issue a purchase order, the timeline for providing those documents to the City and the name of the Project Manager who will coordinate the start date for the Work.

11.4 The Base Bid Price for each compliant Bid received as well as the Contract award information may be obtained from the following website:

https://hamilton.bidsandtenders.ca

12 Conflict of Interest, Lobbying and Collusion

12.1 The City may reject any Bid submitted where a bidder is in contravention of the City's Procurement Policy with respect to conflict of interest.

12.2 Other than as expressly permitted or required in the Request for Tenders a bidder and their representative shall not, with respect to the Request for Tenders or the Work, make any public comment, respond to questions in a public forum, or carry

out any activities to publicly promote or advertise their qualifications, their Bid, or their interest in this competitive procurement process.

12.3 For greater certainty, a bidder shall not communicate with the City regarding this procurement except through the Tender Coordinator identified on the Communications page of the Request for Tenders who shall be the City's single point of contact for the bidder during this process.

12.4 The bidder acknowledges that this Bid is made without any connection, comparison of figures or arrangements with, or knowledge of, any other person making a Bid for the same work and is in all respects fair and without collusion or fraud.

13 Confidentiality

13.1 A bidder should be aware that all information submitted is being collected under authority of the Municipal Act, 2001, and may be used in the City's review of Bids and in the Contract that is entered into with the Successful Bidder. In this regard, the bidder should be aware that:

13.1.1 the bidder's name and Base Bid Price at a minimum will be made public. In addition, certain contractual information must be disclosed to Council and accordingly may become part of the public record; and

13.1.2 all correspondence, documentation and information provided by a bidder to the City as part of a Bid may be reproduced for the purposes of reviewing the bidder's Bid and/or for the purposes of an audit of the procurement process.

13.2 All such information is also subject to collection in accordance with the Municipal Freedom of Information and Protection of Privacy Act ("MFIPPA") and Personal Health Information Protection Act ("PHIPA") and City policies and procedures related to the collection and administration of such records. For greater particularity and direction regarding how such issues of confidentiality will be handled and may affect a bidder's rights, the bidder should reference the City's policies related to Freedom of Information on the City's website under the Office of the City Clerk at hamilton.ca. In preparing the Bid, the bidder should note the following:

13.2.1 a bidder may mark as confidential any scientific, technical, commercial, proprietary or similar confidential information contained in its Bid, the disclosure of which could cause it injury, excluding the Base Bid Price and its name. A bidder shall not identify the whole of a Bid as confidential. A watermark or rubber stamp imprint is suitable to identify confidential parts of a Bid.

13.3 All correspondence, documentation and information provided by the City, its employees, agents or representatives to any bidder in connection with, or arising out of the Request for Tenders remains the property of the City and must not be used for any purpose other than for replying to the Request for Tenders. Confidentiality of records and information of the City relating to the Work described in the Request for Tenders must be maintained at all times. If any proprietary or confidential

information belonging to, or in the care of, the City is disclosed to any bidder by the City's employees, agents, representatives and independent contractors, or any other person at the request of the City in connection with the Request for Tenders, the bidder shall:

13.3.1 safeguard all such information;

13.3.2 maintain in strict confidence and not reproduce or disclose any such information to any person except as required by law or as expressly permitted in advance by the City in writing;

13.3.3 return forthwith all such information as may be in documentary form or recorded electronically by the closing date and time; and

13.3.4 not use any such information for any purpose other than the purpose for which it was provided by the City or by any other person at the request of the City.

14 Withdrawal of Bids by Bidder

14.1 Withdrawal of a Bid after it has been submitted and received by the Bidding System, is permitted only prior to the closing date and time of the Request for Tenders.

14.2 Requests made after the closing date and time of the Request for Tenders to withdraw a Bid received by the Bidding System will be disregarded.

14.3 A Bid withdrawn prior to the closing date and time of the Request for Tenders may be revised and re-submitted at any time prior to that closing date and time. Bidders are solely responsible to ensure:

14.3.1 any required revisions are made to their Bid;

14.3.2 acknowledge all Addenda that have been issued for this Request for Tenders; and

14.3.3 ensure the re-submitted Bid is received by the Bidding System prior to the closing date and time of the Request for Tenders.

15 Price

15.1 No variation in Bid price(s) shall be permitted after the closing date and time of the Request for Tenders except where the City corrects an obvious computational or other mathematical error evident on the face of the Bid. Only extensions, subtotals and totals shall be corrected. No modification to individual prices, either Unit Price or Lump Sum Price, shall be made by the City.

15.2 Where the bidder is instructed to price the Work on a Stipulated Price basis only, no corrections to the Base Bid Price shall be made by the City.

15.3 The Base Bid Price must be quoted on an all-in basis and include the provision and delivery of all necessary labour, Goods, materials, warranty and maintenance requirements, Services, tools, equipment, supplies, utilities, levies and duties and other incidentals, and for performing all the Work and providing all Services contemplated under the Contract.

15.4 The Base Bid Price and all other prices quoted on the Form of Tender shall be exclusive of Value Added Taxes. All other taxes shall be included in the prices submitted for this Request for Tenders.

Where there is a variation due solely to an increase or decrease in the rate of applicable Value Added Tax from a Canadian taxing authority, beyond the control of the Successful Bidder, occurring after the time and date of submission of its Bid, the variation shall alter the price of the Bid only to the extent of the Value Added Tax increase or decrease. The Successful Bidder must prove to the satisfaction of the City that the Successful Bidder will not benefit in any way by reason of any increase to the Base Bid Price.

15.5 As various parts of the Work may or may not be exempt from Value Added Taxes, the bidder is required to refer to the Supplementary Instructions to Bidders for details, if any, respecting payment exemptions, rebates and Value Added Taxes.

16 Reserved Privileges of the City

The City shall have the following reserved privileges, which may be exercised or waived in its absolute discretion.

16.1 The City may reject a Bid on the following basis:

16.1.1 the City may reject any Bid, the lowest Bid or all Bids, may cancel the Request for Tenders or may cancel the Request for Tenders and require the submission of new Bids;

16.1.2 any extraordinary or unjustified disparity between the lowest Bid and the other Bids received by the City;

16.1.3 the need to avoid the use of unproven technology and methodologies;

16.1.4 the prior record of the bidder as a contractor to the City;

16.1.5 a Bid submitted by a person which in the opinion of the City or its professional advisors, does not possess the experience, or financial, technical, personnel or other resources that may reasonably be expected to be necessary in order to carry out the obligations that the bidder proposes to assume under the terms of its Bid.

16.2 Where the Contract is awarded to the lowest compliant bidder, the City may negotiate amendments to the Contract or to the Work to be done or Services or materials to be supplied under the Contract.

16.3 Where none of the Bids are compliant and in the opinion of the City it is impractical to reissue a new Request for Tenders, the City will reject all of the Bids and may permit Bids to be submitted without issuing a new Request for Tenders.

16.4 Where the Base Bid Price for the lowest compliant Bid received substantially exceeds the estimated procurement cost of the Work, the City may negotiate with the lowest compliant bidder for a reduction to the Base Bid Price.

16.5 The City maintains the right to verify any information provided or contained in any Bid.

16.6 The City reserves the ability to exercise the rights, privileges and authority contained in the Procurement Policy and procedures thereunder with respect to the Request for Tenders.

17 Notice to Proceed and Start Date

17.1 The City may issue a written notice to proceed to the Successful Bidder prior to the execution of any required Contract.

17.2 Work shall commence on the start date specified in the notice to proceed, unless otherwise agreed by the Successful Bidder and the City.

18 Applicable Law and Limit on Liability

18.1 The City shall not be liable, in any way, to the bidder for any delays, or costs associated with delays, in the Request for Tenders process.

18.2 The bidder agrees that,

18.2.1 any action or proceeding relating to the Request for Tenders process shall be brought in an Ontario court of competent jurisdiction and any such action or proceeding shall be issued at the Hamilton, Ontario office of that Court and for that purpose each party irrevocably and unconditionally attorns and submits to the jurisdiction of that Ontario court at Hamilton, Ontario;

18.2.2 it irrevocably waives any right to and will not oppose any Ontario action or proceeding relating to the Request for Tenders process on any jurisdictional basis, including forum non conveniens; and

18.2.3 it will not oppose, in any other jurisdiction, the enforcement against it of any judgment or order duly obtained from an Ontario court in Hamilton, Ontario as set out above.

18.3 If a bidder is required by applicable law to hold or obtain a licence, permit, consent or authorization to carry on an activity contemplated in its Bid, neither acceptance of the Bid nor execution of the Contract shall be considered to be approval by the City of carrying on such activity without the requisite licence, permit, consent or authorization.

18.4 The bidder agrees that if the City commits a material breach of the Request for Tenders (that is, a material breach of Contract A), the City's liability to the bidder and the aggregate amount of damages recoverable against the City for any matter relating to or arising from that material breach, whether based upon an action or claim in contract, warranty, equity, negligence, intended conduct or otherwise, including any action or claim arising from the acts or omissions, negligent or otherwise, of the City, shall be no greater than the Bid preparation costs that the bidder seeking damages from the City can demonstrate.

19 Accommodations for Bidders with Disabilities

19.1 In accordance with the Ontario Human Rights Code, Ontarians with Disabilities Act, 2001 (ODA) and Accessibility for Ontarians with Disabilities Act, 2005 (AODA), the City of Hamilton will accommodate for a disability, ensuring full and equitable participation throughout the bid process.

19.2 If a bidder requires this Request for Tenders in a different format to accommodate a disability, the bidder must contact the Tender Coordinator as soon as possible and in any event prior to the closing date. The Request for Tenders in the different format will be issued only to the requesting bidder and all Addenda will be issued in such different format only to the requesting bidder.

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

Revised: January 25, 2023

1. OPTIONAL SITE MEETING

There is an optional site meeting scheduled.

Location: **Macassa Lodge**
701 Upper Sherman Ave, Hamilton, ON, L8V 3M7
Date: **Wednesday, September 18, 2024**
Time: **09:30am EST, Hamilton time**

All attendees are required to wear CSA approved hard hats and safety boots along with surgical masks, these masks will also be provided on-site. If an attendee does not have the required personal protection equipment, they may not be allowed to attend the site meeting.

2. TAXES

There are no supplementary instructions regarding Value Added Taxes.

3. BID SECURITY

Bidders shall submit a Bid Security in accordance with Article 5 Bid Security of the Instructions to Bidders in the amount of not less than **$90,000.00.**

4. JOINT VENTURES

For greater certainty, a Bid must be submitted by a single entity as the Bidder. The City will not accept a Bid from a collection of entities jointly submitting as the Bidder. The single entity submitting the Bid must not be a special purpose company incorporated solely for the purpose of entering into a Contract with the City regarding the Work. The Bidder shall be expected to perform the Work either through itself, or through itself and any subcontractors.

5. RECORD AND REPUTATION

See the City of Hamilton Procurement Policy for specific requirements and obligations at: https://www.hamilton.ca/build-invest-grow/buying-selling-city/bids-and-tenders/procurement-policy-by-law

6. AWARD OF CONTRACT

Subject to the Reserved Privileges of the City set out in Article 16 of the Instructions to Bidders, the Contract shall be awarded to the compliant Bid with the lowest Base Bid Price.

7. SPECIFIED PRODUCTS OR SERVICES

Specified product or service by name, trade or company is regarded as the standard of quality required by the Specifications. **No alternates or substitutes will be considered prior to the award of the Contract**. After the award of the Contract, should the Successful Bidder want the City to approve an alternate or substitute for a specified product or service, the Successful Bidder shall make such request in writing to the City, which the City may consider, in its sole discretion. No alternate nor substitution for a specified product or service required by the Specifications shall be made by the Successful Bidder without the prior written approval of the City.

8. PROPOSED TIMELINES

Event	**Date**
Anticipated award date	October, 2024
Commencement of Work	**Approximately 4 weeks/day from award date**

9. POLICIES, REGULATIONS AND GUIDELINES

The Successful Bidder shall be aware of and adhere to all of the applicable City Policies and Legislation set out on the City of Hamilton website at: https://www.hamilton.ca/build-invest-grow/buying-selling-city/bids-and-tenders/procurement-policy-by-law

10. DECLARATION OF BIDDER COMPLIANCE WITH CITY BY-LAWS

Should the Bidder's declaration in its Form of Tender that it is in compliance with all City of Hamilton by-laws be untrue or incorrect, the City shall be entitled at its sole discretion to reject their Bid.

CCDC 2 - 2020
STIPULATED PRICE CONTRACT

A copy of the CCDC 2 – 2020 Stipulated Price Contract is not being reproduced for this RFT and the English version can be purchased at:

https://www.ccdc.org/documents/

Supplementary Conditions to Contract CCDC 2-2020
Dated: June 20, 2023

SC 1. GENERAL

These Supplementary Conditions presuppose the use of the Standard Construction Document CCDC 2-2020 Stipulated Price Contract, English version. These "Supplementary Conditions" void, supersede or amend the "Agreement", "Definitions" and "General Conditions" as hereinafter provided, as the case may be.

Where a Definition, a General Condition or paragraph of the Agreement or a General Conditions of the Stipulated Price Contract is deleted by these Supplementary Conditions, the numbering of the remaining Agreement, Definitions, General Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused, unless noted otherwise.

SC 2. AGREEMENT

1. Delete the words "*Ready-for-Takeover"* from paragraph 1.3 Article A-1 THE WORK and replace with "*Substantial Performance Date".*

2. Add new paragraph 1.4 to Article A-1 THE WORK, as follows:

   "1.4 Provide all the labour, material, equipment, machinery, *Products* and work including, without limitation, all *Commissioning* services required by the *Contract Documents* in order to fully complete and construct the *Work* and in accordance with, and satisfaction of all *Applicable Laws* including, without limitation, those relating to occupational health and safety and any and all obligations, responsibilities and duties required by or set in any site plan agreement or approval, attributable to the *Place of the Work* and/or the proposed development therein, and furnish efficient business and construction administration and superintendence consistent with the interests of the *Owner*."

3. Add documents to the existing list of *Contract Documents* in paragraph 3.1 of Article A-3 CONTRACT DOCUMENTS as follows:

   - Addenda, as issued
   - the Special Provisions
   - *Project* specific Supplementary Conditions to Contract CCDC 2-2020
   - Supplementary Conditions to Contract CCDC 2-2020
   - the *Form of Tender* as approved and accepted by the *Owner*
   - detailed *Contract Price* Breakdown or Lump Sum Breakdown of Base Bid Price
   - the *Specifications*
   - *Drawings*

4. Delete subparagraph 5.2.1 from Article A-5 PAYMENT in its entirety and replace with the following:

   "5.2.1 Should either party fail to make payments as they become due under the terms of the *Contract* or in an award by arbitration or court, interest at the rate prescribed by the Construction Act (Ontario) on such unpaid amounts shall also become due and payable until payment. Such interest shall be compounded on a monthly basis."

5. Add new paragraph 5.3 to Article A-5 PAYMENT as follows:

"5.3 In the event of loss or damage occurring where payment becomes due under the property and boiler insurance policies, payments shall be made to the *Contractor* in accordance with the provisions of GC 11.1 - INSURANCE."

6. Add to the end of paragraph 6.5, the following:

"The only *Notices in Writing* which will be delivered by electronic communication are applications for progress payment, applications for final payment, and notices of non-payment. All other *Notices in Writing* will be delivered by hand, by courier, by prepaid first class mail or by facsimile."

7. Delete Article A-7 LANGUAGE OF THE CONTRACT in its entirety.

8. Add new Article A-9 CONFLICT OF INTEREST as follows:

"ARTICLE A-9 CONFLICT OF INTEREST

9.1 The *Contractor*, all of the *Subcontractors*, and any of their respective advisors, partners, directors, officers, employees, and agents shall not engage in any activity or provide any services where such activity or the provision of such services creates a conflict of interest (actually or potentially, in the sole opinion of the *Owner*) with the provision of the *Work* pursuant to the *Contract*. The *Contractor* acknowledges and agrees that a conflict of interest includes the use of *Confidential Information* where the *Owner* has not specifically authorized such use.

9.2 The *Contractor* shall disclose to the *Owner*, in writing, without delay any actual or potential situation that may be reasonably interpreted as either a conflict of interest or a potential conflict of interest, including the retention of any *Subcontractor* or *Supplier* that is directly or indirectly affiliated with or related to the *Contractor*.

9.3 The *Contractor* covenants and agrees that it will not hire or retain the services of any employee or previous employee of the City of Hamilton where to do so constitutes a breach by such employee or previous employee of the *Owner*'s conflict of interest policy, as it may be amended from time to time.

9.4 A breach of this Article or a contravention of the *Owner*'s Procurement Policy, by the *Contractor*, any of the *Subcontractors*, or any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall entitle the *Owner* to terminate the *Contract*, in addition to any other rights and remedies that the *Owner* has in the *Contract*, in law, or in equity."

9. Add new Article A-10 CONFIDENTIALITY as follows:

"ARTICLE A-10 CONFIDENTIALITY

10.1 The *Contractor* agrees to ensure that it shall, both during or following the term of the *Contract*, maintain the confidentiality and security of all *Confidential Information* and *Personal Information*, and that it shall not directly or indirectly disclose, destroy, exploit, or use any *Confidential Information* or *Personal Information*, except where required by law, without first obtaining the written consent of the *Owner*. The *Contractor* may disclose any portion of the *Contract Documents* or any other information provided to the *Contractor* by the *Owner* to any *Subcontractor* or *Supplier* if the *Contractor* discloses only

such information as is necessary to fulfill the purposes of the *Contract* and the *Contractor* has included a commensurate confidentiality provision in its contract with the *Subcontractor* or *Supplier*. The *Contractor* acknowledges that it will comply with all requirements of the *Personal Information Protection and Electronic Documents Act*. The *Contractor* acknowledges that the *Owner* is bound by the provisions of the *Municipal Freedom of Information and Protection of Privacy Act ("MFIPPA")*. The *Contractor* further acknowledges that the *Owner* may be required to disclose any or all of the *Confidential Information* and *Personal Information* in the event that it is compelled to do so by law, through a request under *MFIPPA*, or by the rules of any applicable regulatory authority."

SC 3. DEFINITIONS

1. Add to the end of Definition *Consultant*, the following:

   "The term *Consultant* means the *Consultant* or the *Consultant*'s authorized representative."

2. Add to the end of Definition *Contractor*, the following:

   "The term *Contractor* means the *Contractor* or the *Contractor's* authorized representative as designated to the *Owner* in writing."

3. Add to the end of Definition *Owner*, the following:

   "The term *Owner* means the *Owner* or the *Owner's* authorized representative as designated to the *Contractor* in writing, but does not include the *Consultant*."

4. Add after "The *Work* means the total construction" in Definition *Work*, the following:

   ", *Products*, installation, C*ommissioning*, checkout, start-up testing"

5. Delete Definition *Working Day* in its entirety and replace with the following:

   "***Working Day*** means a day when the *Owner's* administrative offices are open, and does not include weekends or statutory holidays."

6. Add new Definitions as follows:

"Applicable Laws
Applicable Laws and applicable laws means all public laws, statutes, regulations, transactions, codes, acts, orders, by-laws, rules, judgements, decrees, treaties, *Governmental Consents*, notices, protocols, binding policies and guidelines, and requirements of all *Governmental Authorities*, which now or hereafter, may be applicable to and enforceable against the *Work* or any part thereof, including those relating to employment, zoning, building, life/safety, environment and health, and includes, where appropriate, any interpretation of a rule, statute, regulation, order, decree, treaty or other requirement having the force of law by any person having jurisdiction over it, or charged with its administration or interpretation.

As-Built Drawings
As-Built Drawings means the *Drawings* and *Specifications* revised by the *Contractor* during the *Work*, showing any and all changes or variations to the *Work* from the requirements of the *Drawings* and *Specifications*.

Authorities Having Jurisdiction
The phrase *Authorities Having Jurisdiction* or the term *Authorities* means those authorities having jurisdiction under *Applicable Laws* over the *Work* or parts thereof.

Commission
Commission means and *Commissioning* refers to the procedure which includes checking, balancing, testing, adjusting and measuring *Work* performed by the *Contractor* to demonstrate and verify to the *Owner* and *Consultant*, the satisfactory installation, operation and performance of all components of the *Work* and that the *Project* is ready for use.

Confidential Information
Confidential Information means all the information or material of the *Owner* that is of a proprietary or confidential nature, whether it is identified as proprietary or confidential or not, including but not limited to information and material of every kind and description such as *Drawings* which is communicated to or comes into the possession or control of the *Contractor* at any time, but *Confidential Information* shall not include information that:

(1) is or becomes generally available to the public without fault or breach on the part of the *Contractor*, including without limitation breach of any duty of confidentiality owed by the *Contractor* to the *Owner* or to any third party, but only after that information becomes generally available to the public;

(2) the *Contractor* can demonstrate to have been rightfully obtained by the *Contractor* from a third party who had the right to transfer or disclose it to the *Contractor* free of any obligation of confidence;

(3) the *Contractor* can demonstrate to have been rightfully known to or in the possession of the *Contractor* at the time of disclosure, free of any obligation of confidence; or

(4) is independently developed by the *Contractor* without use of any *Confidential Information*.

Construction Act
The Construction Act, R.S.O. 1990, Chapter C.30 is the legislation covering construction in Ontario and is also referred to throughout the *Contract* as the Payment Legislation.

Construction Costs
Construction Costs means the direct costs of all the elements of the *Work* or a change in the *Work* as the case may be. A cost that can be applied wholly to a particular item of the *Work*, or a change in the *Work*, should be considered part of the *Construction Costs*, excluding all *Value Added Taxes*, *Overhead Costs*, and profit.

Contemplated Change Order
Contemplated Change Order means a standard document issued to the *Contractor* by the *Consultant* on behalf of the *Owner*, requesting that the *Contractor* provide pricing for a change to the scope of the *Work*. Authorization of the *Contemplated Change Order* is formalized by a *Change Order* prior to the *Work* proceeding.

Fair Wage Policy
Fair Wage Policy means the City of Hamilton's Fair Wage Policy and Fair Wage Schedule available on the City of Hamilton's website at: https://www.hamilton.ca/build-invest-grow/buying-selling-city/bids-and-tenders/fair-wage-policy-fair-wage-schedule

Final Completion of the Work
Final Completion of the Work shall have been reached when the *Work* has previously been deemed substantially performed as defined in these *Contract Documents*, and all deficiencies and

incomplete *Work* have been completed and certified by the *Consultant*, prior to the release of final holdback monies on the *Project*.

Force Majeure
Force Majeure means a delay in the performance of the services occurring other than as a result of the deliberate act or negligence of either party respectively, and which:

(1) could not have been reasonably foreseen, and
(2) was caused by an event beyond the reasonable control of each party respectively, and
(3) for the sake of greater certainty, shall include any one or more of the following:
    (i) acts of God, His Majesty the King or His enemies;
    (ii) civil war, insurrections or riots;
    (iii) fires, floods, explosions, earthquakes, or serious accidents;
    (iv) unusually severe weather, epidemics, or quarantine restrictions;
    (v) governmental priorities or allocation regulations or orders affecting materials, labour, equipment and facilities;
    (vi) fuel shortages or freight embargoes;
    (vii) strikes or labour troubles causing cessation, slowdown, interruption of work or other similar events relating to a person other than the *Contractor* (or any *Subcontractor*) or to the *Owner*.

Financial difficulties experienced by the *Contractor* will not be considered an occurrence of a *Force Majeure* under the *Contract*.

Form of Tender
Form of Tender means the City's forms entitled Form of Tender and Schedule of Prices and any other documents that were supplied as part of the request for tenders/request for proposals for the *Contract*, and were completed and submitted by the *Contractor* back to the *Owner*.

Governmental Authority
Governmental Authority means any federal, provincial, or municipal government and any agency, authority, body, board or commission established by any of them. It includes the police and fire departments.

Governmental Consent
Governmental Consent means any license, right, permit, franchise, privilege, registration, direction, decree, consent, order, permission, approval, or authority to be issued or provided by, or written contract between the *Owner* and a *Governmental Authority*.

Overhead Costs
Overhead Costs means those costs that cannot be attributed to a single task of *Work* and are exclusive of *Construction Costs*, *Value Added Taxes*, and profit. *Overhead Costs* include both general and administrative costs of the *Contractor* or *Subcontractor* together with any and all *Project* specific or office costs of the *Contractor* or *Subcontractor*. Without limiting the generality of the foregoing, *Overhead Costs* include costs associated with general conditions, administration, head office, field office, management, supervision, coordination, scheduling, purchasing, security, health and safety, general labour, accommodation, subsistence, travel, storage, inventory, loading and unloading, computers and electronics, software, printing, general tools and equipment, standby costs and charges, vehicles, engineering, drafting, shop drawings, submittals, surveying, temporary facilities, traffic control, fire safety, sanitation, site clean-up, utilities and services, controls, insurance, bonding, heating, winterization, permits, inspection, regulatory fees, mobilization, demobilization, and other costs of a similar reasonable nature.

Personal Information

Personal Information has the same definition as in subsection 2(1) of *MFIPPA* and includes an individual's name, address, telephone number, and date of birth, whether recorded in printed form, on film, by electronic means, or otherwise and disclosed to the *Contractor*.

Request for Information (RFI)
Request for Information ("RFI") means a standard document typically issued by the *Contractor* to the *Consultant*, requesting a clarification of the scope of *Work* provided in the *Contract Documents*. The response to the RFI typically results in a formal *Supplemental Instruction* where there is no modification of the original scope of the *Work*, or a *Contemplated Change Order* from which the *Contractor* may provide pricing for the revision to the original scope of the *Work*.

Substantial Performance Date
Substantial Performance Date means the date by which the *Contractor* shall attain *Substantial Performance of the Work* as specified in Article A-1 – THE WORK.

Statutory Declaration
Statutory Declaration means the form of the statutory declaration to be delivered by the *Contractor* upon applications for progress payment, release of holdback and final payment, being CCDC 9A – 2001 Statutory Declaration (latest edition available)."

SC 4. GC 1.1 CONTRACT DOCUMENTS

1. Delete subparagraph 1.1.4 in its entirety.

2. Delete subparagraph 1.1.5.1 in its entirety and replace with the following:

".1 the order of priority of documents, from highest to lowest, shall be

- *Change Orders* and/or *Change Directives*
- the executed Agreement between the *Owner* and the *Contractor*
- detailed *Contract Price* breakdown or Lump Sum Schedule Breakdown
- the *Form of Tender* as approved and accepted by the *Owner*
- Addenda, as issued
- Special Provisions
- *Project* specific Supplementary Conditions
- Supplementary Conditions to Contract CCDC 2-2020
- Definitions
- the General Conditions of the Stipulated Price Contract
- the *Specifications*
- *Drawings"*

3. Delete "and shall remain the *Consultant's* property" from the first sentence of paragraph 1.1.10 and replace with the following:

"are not the *Contractor's* property"

SC 5. GC 1.2 LAW OF THE CONTRACT

1. Add new paragraphs 1.2.2 and 1.2.3 as follows:

"1.2.2 The *Contractor* agrees that:
.1 any action or proceeding relating to the *Contract* shall be brought in a court of

competent jurisdiction in the City of Hamilton and for that purpose each party irrevocably and unconditionally attorns and submits to the jurisdiction of that court;

.2 it irrevocably waives any right to and will not oppose any action or proceeding relating to the *Contract* on any jurisdictional basis, including forum non conveniens; and

.3 it will not oppose in any other jurisdiction, the enforcement against it, of any judgment or order duly obtained from a Hamilton court as set out above.

1.2.3 The *Contractor* shall comply with all municipal by-laws as they pertain to the City of Hamilton in respect of the operation of the *Contractor*'s business and the *Work*. Further, the *Contractor* shall, at all times that the *Contract* is in effect and upon request of the *Owner*, provide proof of compliance satisfactory to the *Owner*, at the *Contractor's* own cost. If the *Contractor* fails to do any of the foregoing, the *Contractor* shall be considered to be in default of the *Contract* in accordance with GC7.1.2 and the *Owner* shall be entitled at its sole discretion to terminate the *Contract* and to pursue any other legal recourse the *Owner* deems appropriate."

SC 6. GC 1.3 RIGHTS AND REMEDIES

1. Add to the beginning of paragraph 1.3.2, the following:

"Except with respect to the notice requirements set out in paragraphs 6.4.1, 6.5.4, and 6.6.1,"

2. Add new paragraph 1.3.3 as follows:

"1.3.3 All rights and remedies of the parties for any breach by the other party of its obligations under the *Contract* shall be cumulative and not exclusive or mutually exclusive alternatives, may be exercised singularly, jointly or in combination and shall not be deemed to be in exclusion of any other rights or remedies available to the non-breaching party under the *Contract* or otherwise at law or in equity or by statute."

SC 7. GC 1.4 ASSIGNMENT

1. Delete paragraph 1.4.1 in its entirety and replace with the following:

"1.4.1 The *Contractor* shall not assign the *Contract*, or any portion thereof, without the prior written consent of the *Owner*, which consent may not be unreasonably withheld. The *Owner* shall be entitled to assign the *Contract* to any person or other entity (the "Assignee"). Upon the assumption by the Assignee of the *Owner*'s obligations under the *Contract*, the *Owner* shall be released from its obligations arising under the *Contract*."

2. Add new paragraph 1.4.2 as follows:

"1.4.2 Neither the use of one or more *Subcontractors* to carry out part of the *Work*, nor the assignment of the whole or of any part of the *Contract* or the *Work* to be done under it shall relieve the *Contractor* of its obligations and liability to the *Owner*."

SC 8. GC 1.5 MUNICIPAL CONFLICT OF INTEREST

1. Add new general condition GC 1.5 MUNICIPAL CONFLICT OF INTEREST as follows:

"GC 1.5 MUNICIPAL CONFLICT OF INTEREST

1.5.1 The *Owner* may terminate the *Contract* where the *Contractor* is in contravention with the *Owner*'s Procurement Policy with respect to conflict of interest."

SC 9. GC 1.6 ENTIRE CONTRACT, AMENDMENTS TO BE IN WRITING

1. Add new general condition GC 1.6 ENTIRE CONTRACT, AMENDMENTS TO BE IN WRITING as follows:

"GC 1.6 ENTIRE CONTRACT, AMENDMENTS TO BE IN WRITING

1.6.1 The *Contract Documents* (including all properly authorized *Change Directives* and *Change Orders*) constitute the entire *Contract* between the parties. Each of the parties,

.1 acknowledges that it is not relying upon any representation, warranty, promise, instruction, advice or information received from the other party or from any employee or agent of the other party, except as set out in the *Contract Documents*;

.2 shall not rely at any time in the future on any representations, warranty, instruction, advice or information purportedly received from the other party or any employee or agent of the other party, except as set out in a properly authorized *Change Order*, *Change Directive* or in an amendment as provided under this section.

1.6.2 The *Contract* shall not be deemed to be or construed as having been amended as a result of any oral communication between the parties or as a result of any practice of the parties, but all amendments to the *Contract* shall be in writing and shall be signed by both parties, provided that any such amendment may be executed in counterpart form."

SC 10. GC 1.7 NON-DISCLOSURE AND NO COMMENT

1. Add new general condition GC 1.7 NON DISCLOSURE AND NO COMMENT as follows:

"GC 1.7 NON-DISCLOSURE AND NO COMMENT

1.7.1 The *Contractor* shall not disclose details relating to the *Contract*, *Work* or *Project* to any outside person not engaged in activities relating to the *Contract*, *Work* or *Project*, and shall restrain its employees from giving unauthorized information with respect thereto.

1.7.2 The *Contractor* shall refer all inquiries from whatever source relating to the works to be undertaken within the scope of the *Contract* to the *Consultant*."

SC 11. GC 1.8 OWNER'S ACCESS TO SITE

1. Add new general condition GC 1.8 OWNER'S ACCESS TO SITE as follows:

"GC 1.8 OWNER'S ACCESS TO SITE

1.8.1 The *Owner* shall have the right to enter and occupy the *Place of the Work* in whole or in part, for the purpose of placing fittings and equipment or for other uses before the issuance of the certificate of the *Substantial Performance of the Work*, where in the opinion of the *Consultant*, such entry and occupancy will not interfere unreasonably with the *Contractor*'s delivery of the *Work*.

1.8.2 Notwithstanding paragraph 1.8.1, the parties agree that during the term of the *Contract*, the *Owner* may inspect any and all aspects of the *Project*, at all reasonable times, for the purpose of ensuring that the *Contractor* is carrying out the *Work* and other obligations in accordance with the *Contract*."

SC 12. GC 1.9 PATENTS AND OTHER INTELLECTUAL PROPERTY

1. Add new general condition GC 1.9 PATENTS AND OTHER INTELLECTUAL PROPERTY as follows:

"GC 1.9 PATENTS AND OTHER INTELLECTUAL PROPERTY

1.9.1 Where the *Work* or *Project* to be carried out requires the installation or use of any patented or other protected intellectual property,

.1 belonging to the *Contractor*, the *Contract Price* shall be deemed to include the grant of a perpetual license from the *Contractor* to the *Owner* to make use of that intellectual property;

.2 belonging to any other person, the *Contractor* shall obtain and assign to the *Owner* a perpetual license from the owner thereof entitling the *Owner* to make use of that intellectual property, and the cost thereof shall be deemed to be included in the *Contract Price*."

SC 13. GC 2.1 AUTHORITY OF THE CONSULTANT

1. Delete from the end of paragraph 2.1.2, the following:

", the *Consultant* and the *Contractor*"

SC 14. GC 2.2 ROLE OF THE CONSULTANT

1. Add to the beginning of subparagraph 2.2.4 the following:

"After receipt of the *Contractor*'s invoices for payment,"

2. Delete from the beginning of paragraph 2.2.6, the following:

"Except with respect to GC5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER,"

3. Add to the end of paragraph 2.2.9, the following:

"and not more than forty-eight (48) hours after receipt of the written query unless otherwise agreed to by the parties."

4. Add after "with reasonable promptness" in paragraph 2.2.12, the following:

"but not more than five (5) *Working Days* after receipt of a written Request for Information from the *Contractor*"

5. Add after ", the *Consultant* does not guarantee" in the second sentence of paragraph 2.2.16, the following:

"to the *Contractor*"

6. Add to the end of paragraph 2.2.17, the following:

"The *Consultant* shall ensure that all such warranties and documents submitted for approval and for the *Owner's* records are in accordance with the *Contract Documents* prior to the documents being forwarded."

7. Delete from paragraph 2.2.18, the following:

"against whom the *Contractor* makes no reasonable objection and"

8. Add new paragraph 2.2.19 as follows:

"2.2.19 The *Consultant* will provide the *Contractor* in writing with bench marks and points of reference to be used by the *Contractor* in setting out the *Work*. The *Owner* will be responsible only for the correctness of the information so supplied. From these bench marks and points of reference the *Contractor* will do its own setting out. The setting out by the *Contractor* shall include but shall not be limited to the preparation of grade sheets, the installation of centre lines stakes, grades stakes, offsets and site rails."

SC 15. GC 2.3 REVIEW AND INSPECTION OF THE WORK

1. Add to end of paragraph 2.3.2, the following:

"Reasonable notice shall not be less than twenty-four (24) hours prior to the testing and inspection."

2. Add after "inspection reports relating to the *Work*" in paragraph 2.3.3, the following:

", and in any event no later than two (2) *Working Days* from the date of the inspection"

SC 16. GC 2.4 DEFECTIVE WORK

1. Add after "failing to conform to the *Contract Documents"* in paragraph 2.4.1, the following:

"at the *Contractor*'s expense"

2. Add new paragraphs 2.4.1.1, 2.4.1.2 as follows:

"2.4.1.1 The *Contractor* shall rectify, in a manner acceptable to the *Owner* and the *Consultant*, all defective work and deficiencies throughout the *Work*, whether or not they are specifically identified by the *Consultant*.

2.4.1.2 The *Contractor* shall prioritize and schedule the correction of any defective *Work* which, in the sole discretion of the *Owner*, adversely affects the day to day operation of the *Owner*."

SC 17. GC 3.1 CONTROL OF THE WORK

1. Add after "construction means, methods, techniques," in paragraph 3.1.2, the following:

"schedule,"

2. Add new paragraph 3.1.3, as follows:

"3.1.3 Prior to commencing individual procurement, fabrication and construction activities, the *Contractor* shall verify, at the *Place of the Work*, all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the *Work* and shall further carefully compare such field measurements and conditions with the requirements of the *Contract Documents*. Where dimensions are not included or exact locations are not apparent, the *Contractor* shall immediately notify the *Consultant* in writing and obtain written instructions from the *Consultant* before proceeding with any part of the affected work."

SC 18. GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

1. Delete subparagraphs 3.2.2.1, 3.2.2.3 and 3.2.2.4 in their entirety.

2. Add to the end of subparagraph 3.2.2.2, the following:

"; the *Contractor* acknowledges that, if the *Owner* does not enter into any other contracts for the Project, the *Contractor* is the "constructor" and the "employer" within the meaning of the *Occupational Health and Safety Act (Ontario)* and the *Contractor* undertakes to carry out the duties, obligations and responsibilities of the constructor and the employer with respect to the *Project*. In the event that the *Owner* enters into more than one contract for the *Project*, or when work is performed by the *Owner's* own forces, the *Owner* agrees to fulfill all of the duties, obligations and responsibilities required under the *Occupational Health and Safety Act (Ontario)*. Without restricting the generality of any other term or condition in the *Contract,* the *Contractor* shall indemnify and hold harmless the *Owner* from any liability for claims, damages or penalties, including reasonable legal fees to defend any offences, arising from the *Contractor's* failure to comply with the duties, responsibility and obligations of the constructor and the employer under the *Occupational Health and Safety Act (Ontario).*"

3. Delete from the subparagraph 3.2.3.2, the following:

"that are identified in the *Contract Documents*"

4. Add new subparagraph 3.2.3.5 as follows:

"3.2.3.5 Subject to General Condition 6.1.1 Owners Right to Make Changes and GC 9.4 - CONSTRUCTION SAFETY, where paragraph 3.2.4 of GC 3.2 - CONSTRUCTION BY OWNER OR OTHER CONTRACTORS applies, for the *Owner's* own forces and for other contractors performing work within the construction site limits identified in the *Contract Documents*, assume overall responsibility for compliance with all aspects of the applicable health and safety legislation in the *Place of the Work*, including all of the responsibilities of the constructor as that term is defined in the *Occupational Health and Safety Act.*"

SC 19. GC 3.4 CONSTRUCTION SCHEDULE

1. Delete paragraph 3.4.1 in its entirety and replace with the following:

"3.4.1 The *Contractor* shall:

.1 prior to the first application for payment, prepare and submit to the *Owner* and the *Consultant* for their review and acceptance, a construction schedule that indicates the timing of the activities of the *Work* and provides sufficient detail of the critical events and their inter-relationship to demonstrate the *Work* will be performed in conformity with the *Contract Time* and in accordance with the *Contract Documents.* The *Contractor* shall employ construction scheduling software, where required by the *Specifications,* that permits the progress of the *Work* to be monitored in relation to the critical path established in the schedule. The *Contractor* shall provide the schedule and any successor or revised schedules in both electronic format and paper copy. Once accepted by the *Owner* and the *Consultant*, the construction schedule submitted by the *Contractor* shall become the baseline construction schedule, and any errors or omissions within that construction schedule not captured by the *Owner* and or *Consultant* as part of schedule acceptance does not alleviate the *Contractor* of their responsibility to meet the *Contract Time* and the *Contractor* shall be required to make the necessary corrections to the schedule immediately to comply with the *Contract Time*;

.2 provide the expertise and resources, such resources including manpower and equipment, as are necessary to maintain progress under the accepted baseline construction schedule or any successor or revised schedule accepted by the *Owner* pursuant to GC 3.4 - CONSTRUCTION SCHEDULE;

.3 monitor the progress of the *Work* on a weekly basis relative to the baseline construction schedule, or any successor or revised schedule accepted by the *Owner* pursuant to GC 3.4 - CONSTRUCTION SCHEDULE, update the schedule on a monthly basis and advise the *Consultant* and the *Owner* in writing of any variation from the baseline or slippage in the schedule; and

.4 if, after applying the expertise and resources required under subparagraph 3.4.1.2, the *Contractor* forms the opinion that the variation or slippage in schedule reported pursuant to subparagraph 3.4.1.3 cannot be recovered by the *Contractor*, it shall, in the same notice, indicate to the *Consultant* and the *Owner* if the *Contractor* intends to apply for an extension of *Contract Time* as provided in PART 6 of the General Conditions - CHANGES IN THE WORK."

2. Add new paragraphs 3.4.2, 3.4.3, 3.4.4, 3.4.5, 3.4.6, 3.4.7, 3.4.8, 3.4.9 and 3.4.10 as follows:

"3.4.2 If, at any time, it should appear to the *Owner* or the *Consultant* that the actual progress of the *Work* is behind schedule or is likely to become behind schedule, or if the *Contractor* has given notice of such to the *Owner* or the *Consultant* pursuant to subparagraph 3.4.1.3, the *Contractor* shall take appropriate steps to cause the actual progress of the *Work* to conform to the schedule or minimize the resulting delay and shall produce and present to the *Owner* and the *Consultant* a recovery plan demonstrating how the *Contractor* will achieve the recovery of the schedule. If the *Contractor* intends to apply for a change in the *Contract Price* in relation to a schedule recovery plan, then the *Contractor* shall proceed in accordance with GC 6.5 – DELAYS.

3.4.3 Where a *Force Majeure* occurs, the *Consultant* shall determine the number of days (if any) to be allowed by reason thereof for the *Substantial Performance of the Work*.

3.4.4 An extension of time may be granted under this section by the *Consultant* where in the *Consultant's* reasonable opinion it is appropriate in all of the circumstances to do so;

.1 by reason of the occurrence of a *Force Majeure*;

.2 by reason of a *Change Directive* or *Change Order*;

.3 where the *Owner*, for any reason, directs that *Work* be discontinued; provided that,

(1) an extension under subparagraph 3.4.4.1 shall not entitle the *Contractor*

to any additional payment; and

(2) any other extension shall entitle the *Contractor* to additional overhead costs only to the extent that the *Consultant* is satisfied that such costs will increase by reason of the extension.

3.4.5 Any extension of time so granted shall not exceed the amount that is reasonably required. Requests for extension will be evaluated collectively, rather than on an individual *Change Directive* or *Change Order* basis, provided that the collective evaluation shall not be less frequently than at least once per quarter. There is no presumption that the time required to carry out a *Change Directive* or *Change Order* will necessarily extend the date of the *Substantial Performance of the Work* by the same length of time. Instead, the *Consultant* shall make an independent determination of whether an extension is required.

3.4.6 An extension of time under this section shall be for such time as the *Consultant* may prescribe as being fair and reasonable and the *Consultant* shall fix the terms on which the said extension may be granted.

3.4.7 An application for an extension of time as herein provided shall be made in writing by the *Contractor* to the *Consultant* through the *Change Order* process.

3.4.8 Any additional time granted for the completion of the *Contract* will be conditional upon the *Contractor* providing the *Owner* with evidence that all insurance, bonds or other securities, furnished to the *Owner* by the *Contractor*, have been increased and, if necessary, extended beyond the limit of the time extension.

3.4.9 Any extension of time that may be granted to the *Contractor* shall be so granted and accepted without prejudice to any rights of the *Owner* whatsoever under the *Contract* and all of such rights shall continue in full force and effect after the time limited in the *Contract* for the completion of the *Work*, and whenever in the *Contract* power and authority is given to the *Owner* or the *Consultant* or any person to take any action consequent upon the act, default, breach, neglect, delay, non-observance or non-performance by the *Contractor* in respect of the *Work* or *Contract*, or any portion thereof, such powers or authorities may be exercised from time to time and not only in the event of the happening of such contingencies before the time limited in the *Contract* for the completion of the *Work* but also in the event of the same happening after the time so limited in the case of the *Contractor* being permitted to proceed with the execution of the *Work* under an extension of time granted by the *Consultant*. In the event of the *Consultant* granting an extension of time, time shall continue to be deemed of the essence with respect to that extension.

3.4.10 Due to the time constraints regarding the *Project*, the *Contractor* shall maintain rigorous control of all elements of the *Work* for which the deadlines are indicated in the *Contract Documents*."

SC 20. GC 3.5 SUPERVISION

1. Delete paragraph 3.5.1 in its entirety and replace with the following:

"3.5.1 The *Contractor* shall furnish a competent and adequate staff, who shall be in attendance at the *Place of the Work* at all times, as necessary, for the proper administration, co-ordination, supervision and superintendence of the *Work*; organize the procurement of all materials and equipment so that they will be available at the time they are needed for the *Work*, and keep an adequate force of skilled workmen on the job to complete the

Work in accordance with all requirements of the *Contract Documents.* The appointed representatives shall not be changed except for valid reasons, at no additional cost to the *Owner*, and upon the *Contractor* obtaining the *Owner's* written consent, which consent will not be unreasonably withheld. Further, the *Contractor* shall not employ or continue to employ on the *Work* anyone to whom the *Owner* may reasonably object."

2. Add new paragraphs 3.5.3, 3.5.4, 3.5.5, 3.5.6, 3.5.7, 3.5.8 and 3.5.9 as follows:

"3.5.3 The *Contractor* shall at all times have at the *Place of Work*, a full-time and competent construction superintendent who shall be capable of reading and thoroughly understanding plans and specifications and of adequately communicating with the *Consultant* and its representatives and who also must be thoroughly experienced in the type of *Work* being performed, and who shall be the recipient of all instructions from the *Consultant* or its authorized representatives. No work of any kind shall be carried out by the *Contractor* or its *Subcontractors* during prolonged absence of the construction superintendent.

3.5.4 The construction superintendent shall have full authority to execute the orders or directions of the *Consultant* without delay, and to promptly provide such materials, equipment, tools, labour and incidentals as may be required. The *Contractor* shall provide a superintendent regardless of the amount of *Work* subcontracted.

3.5.5 The *Contractor* shall provide the *Consultant* with the telephone and the address of its appointed representative(s), who could be contacted on matters relating to the *Contract*, (e.g. urgent messages or emergencies), and who shall be available within reasonable notice, twenty-four (24) hours a day, seven (7) days a week, on matters relating to the *Contract*.

3.5.6 The *Owner* may, at any time during the course of the *Work*, request the replacement of the appointed representative(s), where the grounds for the request involve incompetent or disorderly conduct or conduct which jeopardizes the safety and security of the site or the *Owner's* operations. Immediately upon receipt of the request, the *Contractor* shall make arrangements to appoint an acceptable replacement at no additional cost to the *Owner*.

3.5.7 The *Contractor* shall cause each *Subcontractor* at all times while the *Work* is being carried out, to have a fully competent supervisor at the *Place of the Work*, who is thoroughly familiar with all aspects of the *Project* for which that *Subcontractor* is responsible.

3.5.8 The superintendent shall not be employed in any other capacity at the *Place of Work*. Where it is necessary to employ a superintendent in some other capacity, the *Consultant* shall approve the extent to which a labour time charge may be claimed by the *Contractor* or a *Subcontractor* in respect of that superintendent.

3.5.9 The *Contractor* acknowledges that the replacement of the construction superintendent or project team members will have significant impacts on the *Project* schedule and quality of the *Work*; therefore, all measures will be taken by the *Contractor* in order to maintain the original team assigned to the *Project*. Replacement of any team members will result in a possible delay to the *Project* and will be the responsibility of the *Contractor* to make-up any such delays."

SC 21. GC 3.6 SUBCONTRACTORS AND SUPPLIERS

1. Add to the end of paragraph 3.6.2, the following:

   "Failure on the part of the *Contractor* to indicate in writing such *Subcontractors* and *Suppliers* to the *Owner*, shall be deemed to be a failure or refusal to enter into the *Contract*."

2. Add to the end of paragraph 3.6.4, the following:

   "at the discretion of the *Consultant.*"

3. Add new paragraph 3.6.7 as follows:

   "3.6.7 The *Contractor* shall not change any of the *Subcontractors* or *Suppliers* proposed by the *Contractor* in writing and accepted by the *Owner* at the signing of the *Contract* without the *Owner's* written consent or execute any subcontracts for the performance of the *Work* without the *Owner's* prior written consent."

SC 22. GC 3.7 LABOUR AND PRODUCTS

1. Add new paragraphs 3.7.4, 3.7.5, 3.7.6, 3.7.7, 3.7.8, 3.7.9, 3.7.10, 3.7.11, 3.7.12, 3.7.13, 3.7.14 and 3.7.15 as follows:

   "3.7.4 The cost for overtime required beyond the normal *Working Day* to complete individual construction operations of a continuous nature, such as pouring or finishing of concrete or similar work, or work that the *Contractor* elects to perform at overtime rates without the *Owner* or the *Consultant* requesting it shall not be chargeable to the *Owner* and shall be at the sole cost and expense of the *Contractor*.

   3.7.5 The *Contractor* shall comply with all requirements set out in the *Fair Wage Policy*. The *Owner* has adopted the *Fair Wage Policy*, respecting contractors and subcontractors that must be adhered to on this *Project*.

   3.7.6 The *Contractor* shall comply in all respects with the *Fair Wage Policy* and is fully responsible for ensuring that all of its *Subcontractors* also comply in all respects with the *Fair Wage Policy*.

   3.7.7 All workers employed by the *Contractor* and its *Subcontractors* in connection with the *Work* or *Project* shall be paid or provided with wages, benefits and hours of work in accordance with the *Fair Wage Policy* which were in effect on the date of the closing of the request for tenders/request for proposals for the *Contract*.

   3.7.8 The *Contractor* is responsible for the safe on-site storage of *Products* and their protection (including *Products* supplied by the *Owner* and other contractors to be installed under the *Contract*) in such ways as to avoid dangerous conditions or contamination of the *Products* or other person or property and in locations at the *Place of the Work* to the satisfaction of the *Owner* and the *Consultant*. The *Owner* shall provide all relevant information on the *Products* to be supplied by the *Owner* within the *Contract Documents*.

   3.7.9 The *Contractor* shall neither permit nor allow underaged persons contrary to *Applicable Laws*, the introduction or use of alcoholic beverages or illegal narcotics on or about the *Place of the Work*.

3.7.10 At the request of the *Owner* or *Consultant*, the *Contractor* shall remove from the *Place of the Work*, any person (whether employed on the *Work* or not) who, in the opinion of the *Owner* or *Consultant*, is incompetent, intoxicated or otherwise impaired, or who is conducting himself (or herself) improperly, and the *Contractor* shall not permit any such person to remain on the *Place of the Work*, nor to return to the *Place of the Work* without the written approval of the *Owner* or *Consultant* as the case may be.

3.7.11 Where required by the *Consultant*, the *Contractor* shall furnish a complete written statement of the origin, composition and manufacture of all materials to be supplied by them, and shall furnish samples thereof for testing purposes, if so instructed by the *Consultant*.

3.7.12 The *Consultant*'s approval of changed materials shall not be considered as waiver of objection to the *Work* or materials at any subsequent time due to their failure to conform to the *Specifications*.

3.7.13 The *Contractor* shall furnish for the *Consultant*'s approval, such material tests, mock-ups, mix designs and tests of items and/or materials manufactured or fabricated off the *Place of the Work* as the *Consultant* may reasonably request.

3.7.14 Specified product by name, trade or company is regarded as the standard of quality required by the *Specifications*. No substitution shall be made by the *Contractor* without the prior written approval of the *Owner*.

3.7.15 By-law 07-170 (City of Hamilton Licensing Code) as amended from time to time, regulates the trade licensing process in Hamilton. The By-law regulates all businesses of plumbing, heating, ventilation and air-conditioning, drain laying and building repair. The City of Hamilton's Standards & Licensing Section is responsible for the licensing of contractors and masters. Licenses are issued to contractors and masters working in the above noted trades."

SC 23 GC 3.8 SHOP DRAWINGS

1. Delete the word "and" in subparagraph 3.8.3.2 and add the word "and" to the end of subparagraph 3.8.3.2.

2. Add new subparagraph 3.8.3.3 as follows:

".3 the *Contractor* shall ensure completeness and accuracy of all *Shop Drawings* in accordance with *the Contract Documents."*

3. Add new paragraphs 3.8.8, 3.8.9, 3.8.10, 3.8.11 and 3.8.12 as follows:

"3.8.8 Upon request of the *Contractor* or the *Consultant*, they shall jointly prepare a schedule of the dates for provision, review and return of *Shop Drawings*.

3.8.9 The *Contractor* shall provide *Shop Drawings* in the form specified, or if not specified, as directed by the *Consultant.*

3.8.10 *Shop Drawings* provided by the *Contractor* to the *Consultant* shall indicate by stamp, date and signature of the person responsible for the review that the *Contractor* has reviewed each one of them.

3.8.11 *Shop Drawings* which require approval of any legally constituted authority having

jurisdiction shall be provided to such authority by the *Contractor* for approval.

3.8.12 The *Contractor* shall provide revised *Shop Drawings* to correct those which the *Consultant* rejects as inconsistent with the *Contract Documents,* unless otherwise directed by the *Consultant.* The *Contractor* shall notify the *Consultant* in writing of any revisions to the *Shop Drawings* other than those requested by the *Consultant*."

SC 24. GC 3.9 DOCUMENT REVIEW

1. Add new general condition GC 3.9 DOCUMENT REVIEW as follows:

"GC 3.9 DOCUMENT REVIEW

1.9.1. The *Contractor* shall review the *Contract Documents* and shall report promptly to the *Consultant* any error, inconsistency or omission the *Contractor* may discover. Such review by the *Contractor* shall comply with the standard of care described in paragraph 3.14.1 of the *Contract*. Except for its obligation to make such review and report the result, the *Contractor* does not assume any responsibility to the *Owner* or to the *Consultant* for the accuracy of the *Contract Documents*. The *Contractor* shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the *Contract Documents*, which the *Contractor* could not reasonably have discovered. If the *Contractor* does discover any error, inconsistency or omission in the *Contract Documents,* the *Contractor* shall not proceed with the work affected until the *Contractor* has received corrected or missing information from the *Consultant*.

1.9.2 The *Contractor* shall follow the procedures as set forth in the *Contract Documents*. All requests are to be formal, written, and tracked, beginning with a *Request for Information* from the *Contractor*. If the *Request for Information* results in a change to the *Work* as specified in the *Contract Documents*, the *Consultant* will then issue a written request for *Change Order*, as set forth in GC 6 - CHANGES IN THE WORK.

1.9.3 If, at any time, the *Contractor* finds errors, inconsistencies, or omissions in the *Contract Documents* or has any doubt as to the meaning or intent of any part thereof, the *Contractor* shall immediately notify the *Consultant*, through a *Request for Information*. The *Contractor* shall not proceed with the work until the *Consultant* has responded to the *Request for Information*, and in dealing with such error, inconsistency or omission the *Contractor* shall co-operate with the *Owner* and the *Consultant* in good faith to resolve such errors, inconsistency or omission so as to avoid any increase in the *Contract Price* or delay in the progress of the *Work*. Neither the *Owner* nor the *Consultant* will be responsible for the consequences of any action of the *Contractor* based on oral instructions."

SC 25. GC 3.10 DOCUMENTS AT THE SITE

1. Add new general condition GC 3.10 DOCUMENTS AT THE SITE as follows:

"GC 3.10 DOCUMENTS AT THE SITE

3.10.1 The *Contractor* shall keep one copy of current *Contract Documents*, submittals, reports, and records of meetings at the *Place of the Work*, in good order and available to the *Owner* and the *Consultant*."

SC 26. GC 3.11 USE OF THE WORK

1. Add new general condition GC 3.11 USE OF THE WORK as follows:

"GC 3.11 USE OF THE WORK

3.11.1 The *Contractor* shall confine *Construction Equipment*, *Temporary Work*, storage of *Products*, waste products and debris, and operations of employees and *Subcontractors* to limits indicated by laws, ordinances, permits, or the *Contract Documents* and shall not unreasonably encumber the *Place of the Work*.

3.11.2 The *Contractor* shall not load or permit to be loaded any part of the *Work* with a weight or force that will endanger the safety of the *Work*.

3.11.3 The *Contractor* shall abide by and enforce directives and policies regarding signs, advertisements, safety procedures, fires and smoking at the *Place of the Wor*k as directed by the *Owner*."

SC 27. GC 3.12 CUTTING AND REMEDIAL WORK

1. Add new general condition GC 3.12 CUTTING AND REMEDIAL WORK as follows:

"GC 3.12 CUTTING AND REMEDIAL WORK

3.12.1 The *Contractor* shall perform the cutting and remedial work required to make the affected parts of the *Work* come together properly.

3.12.2 The *Contractor* shall co-ordinate the *Work* to ensure that the cutting and remedial work is kept to a minimum.

3.12.3 Should the *Owner*, the *Consultant*, other contractors or anyone employed by them be responsible for ill-timed work necessitating cutting or remedial work to be performed, the cost of such cutting or remedial work shall be valued as provided in GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES, GC 6.2 - CHANGE ORDER and GC 6.3 - CHANGE DIRECTIVE.

3.12.4 Cutting and remedial work shall be performed by specialists familiar with the Products affected and shall be performed in a manner to neither damage nor endanger the *Work*."

SC 28. GC 3.13 CLEANUP

1. Add new general condition GC 3.13 CLEANUP as follows:

"GC 3.13 CLEANUP

3.13.1 The *Contractor* shall maintain the *Work* in a safe and tidy condition and free from the accumulation of waste products and debris, other than that caused by the *Owner*, other contractors or their employees.

3.13.2 Before applying for *Substantial Performance of the Work* as provided in GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK, the *Contractor* shall remove waste products and debris, other than that resulting from the work of the *Owner*, other contractors or their employees, and shall leave the *Place of the Work* clean and suitable for use or occupancy by the *Owner*. The *Contractor* shall remove products, tools, *Construction Equipment*, and *Temporary Work* not required for the performance of the remaining work.

3.13.3 Prior to application for the final payment, the *Contractor* shall remove any remaining products, tools, *Construction Equipment*, *Temporary Work*, and waste products and debris, other than those resulting from the work of the *Owner*, other contractors or their employees.

3.13.4 The *Owner* shall have the right to set-off the cost of cleaning to the *Contractor* if it is not done within twenty-four (24) hours of written notice to clean and the *Owner* shall have the right to set-off the cost of damage to the *Place of the Work* caused by the *Contractor's, the Subcontractor's* or the *Supplier's* transportation in and out of the *Place of the Work* if not repaired within five (5) *Working Days* of written notice to repair or before final payment, whichever is earlier.

3.13.5 All material delivered to the *Place of the Work* shall be neatly stored or contained upon delivery only in areas as approved by the *Owner* or the *Consultant* and shall be secured and remain in the *Contractor's* control until installed.

3.13.6 The *Contractor* shall legally dispose forthwith of any debris and surplus material accumulated at the *Place of the Work*, and where requested, the *Contractor* shall provide to the *Consultant* a true copy of the original certificate approval from a waste management system and a true copy of the original certificate of approval from the place of disposal for all debris and surplus material disposed of by the *Contractor* under the *Contract*."

SC 29. GC 3.14 PERFORMANCE BY CONTRACTOR

1. Add new general condition GC 3.14 PERFORMANCE BY CONTRACTOR as follows:

"GC 3.14 PERFORMANCE BY CONTRACTOR

3.14.1 In performing its services and obligations under the *Contract*, the *Contractor* shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The *Contractor* acknowledges and agrees that throughout the *Contract,* the *Contractor's* obligations, duties and responsibilities shall be interpreted in accordance with this standard. The *Contractor* shall exercise the same standard of due care and diligence in respect of any *Products*, personnel, or procedures which it may recommend to the *Owner*.

3.14.2 The *Contractor* further represents, covenants and warrants to the *Owner* that:

.1 the personnel it assigns to the *Project* are appropriately experienced;

.2 it has a sufficient staff of qualified and competent personnel to replace any vacancy, subject to the *Owner's* approval, resulting from death, incapacity, removal or resignation; and

.3 there are no pending, threatened or anticipated claims that would have a material effect on the financial ability of the *Contractor* to perform its work under the *Contract*."

SC 30. GC 3.15 SECURITY

1. Add new general condition GC 3.15 SECURITY as follows:

"GC 3.15 SECURITY

3.15.1 The *Contractor* is responsible to provide and maintain the *Place of the Work* in a secure manner, free from public access, trespassing, or vandalism. This provision is to be maintained on a twenty-four (24) hours per day, seven (7) days per week basis and may require such items as fencing, hoarding, lighting, security guards or systems, and security cameras."

SC 31. GC 4.1 CASH ALLOWANCES

1. Add after "*Contractor's*," in paragraph 4.1.2, the following:

*"*and *Subcontractor's"*

2. Add new paragraph 4.1.8 as follows:

"4.1.8 The *Owner* reserves the right to call, or to have the *Contractor* call, for competitive bids for portions of the *Work* to be paid from cash allowances."

SC 32. GC 4.2 CONTINGENCY ALLOWANCE

1. Add new paragraphs 4.2.5 and 4.2.6:

"4.2.5 Any contingency allowance specified in the *Contract Documents*, the *Owner*'s Council resolution with respect to the *Contract*, or elsewhere, shall be deemed to be solely a budgetary authorization by the *Owner*. The *Contractor* shall have no right to draw upon any such contingency allowance for payment unless specifically authorized to do so by way of *Change Order*.

4.2.6 In the absence of a contingency allowance being shown on the *Contract Documents*, the *Contractor* is not to assume that there is one in place. The disclosure of any contingency allowances is at the discretion of the *Owner*."

SC 33. GC 4.3 PROVISIONAL AMOUNTS

1. Add new general condition GC 4.3 PROVISIONAL AMOUNTS as follows:

"GC 4.3 PROVISIONAL AMOUNTS

4.3.1 The *Contract Price* includes provisional items, if any, as stated in the *Contract Documents*.

4.3.2 The *Contractor* is not entitled to payment of any provisional items except for the extra or additional work carried out by the *Contractor*, as directed by the *Owner* and in accordance with the *Contract* and only to the extent of such extra or additional work and payment approved by the *Owner*.

4.3.3 The *Owner* reserves the right to delete from the *Contract Price* any of the provisional items identified in the *Form of Tender*, for credit at the price shown. All prices are inclusive of all duties and taxes applicable, except *Value Added Taxes*."

SC 34. GC 5.1 PROVISIONAL AMOUNTS

1. Delete GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER in its entirety.

SC 35. GC 5.2 APPLICATIONS FOR PAYMENT

1. Add to the end of paragraph 5.2.1, the following:

   "Applications for payment shall be in accordance with the Construction Act and made by way of a *Notice in Writing* delivered by electronic communication, or as may be otherwise agreed, to both the *Consultant* and the *Owner*."

2. Add to the end of paragraph 5.2.3, the following:

   "The *Contractor* shall review with the *Consultant* and the *Owner*, at a scheduled time, the percentage of work completed for each item indicated in the schedule of values. This procedure shall be complied with for each application for payment prior to submitting the formal application for payment."

3. Delete paragraph 5.2.5 in its entirety and replace with the following:

   "The schedule of values shall be made out in such form and supported by such evidence as the *Consultant* may reasonably direct and when accepted by the *Consultant*, shall be used as the basis for applications for payment, unless it is found to be in error."

4. Delete paragraph 5.2.7 in its entirety and replace with the following:

   "Each application for payment shall meet the requirements of a "proper invoice" as defined in the *Construction Act* (Ontario) if the *Contractor* includes the following:
   - a statement based on the schedule of values, which statement shall include the *Contract* number, *Project* name and purchase order number;
   - breakdown of approved *Change Orders* and percentage completed of each;.
   - a *Statutory Declaration* as required by paragraph 5.2.9;
   - any other requirement that the *Construction Act* (Ontario) prescribes for a proper invoice; and
   - evidence of compliance with workers' compensation legislation at the *Place of the Work* and after the first payment, a declaration by the *Contractor* as to the distribution made of the amounts previously received using document CCDC 9A 'Statutory Declaration'.

5. Add to the end of paragraph 5.2.8, the following:

   "Any *Products* delivered to the *Place of the Work* but not yet incorporated into the *Work* shall remain at the risk of the *Contractor* notwithstanding that title has passed to the *Owner* pursuant to General Condition 13.1 - OWNERSHIP OF MATERIALS."

6. Add new paragraphs 5.2.9, 5.2.10, 5.2.11, 5.2.12, 5.2.13, 5.2.14 and 5.2.15, as follows:

   "5.2.9 The *Contractor* must provide with each application of a proper invoice after the first, a *Statutory Declaration*, certifying that all accounts for all subcontract, construction machinery and equipment, materials, *Products*, labour and other indebtedness which may have been incurred by the *Contractor* and for which the *Owner* might in any way be held responsible have been paid in full or will be paid with the proceeds from such application for payment, except for amounts properly retained as holdback or as an identified amount in dispute.

   5.2.10 After the first application for payment and with each subsequent application for payment the *Contractor* shall submit evidence of compliance with the applicable

worker's compensation legislation at the *Place of the Work,* including payments due thereunder.

5.2.11 Subject to the *Construction Act* and all other *Applicable Laws*, the *Owner* will pay to the *Contractor* ninety percent (90%) of the amount shown on such application for payment, subject to any amount that is disputed, and where the *Owner* has received notice of a lien, an amount sufficient to satisfy the lien may be retained , less previous payments, less the amount of any liens or any written notice of a lien of which the *Owner* has notice, plus 25% for security for costs, less the maintenance security referred to in GC 12.3 – WARRANTY, and less any amounts that the *Owner* deems necessary to retain for its protection against claims or liabilities or for any claim or claims the *Owner* may have against the *Contractor* under the *Contract*, other contracts, or otherwise, and such payments shall not in any way be construed as, nor shall it constitute, an acceptance of all or any part of the *Work* or material under the *Contract*. Once the reason for the *Owner* being entitled to withhold payment of any amount has been rectified, the amount withheld due to that reason will be paid by the *Owner* to the *Contractor.*

5.2.12 Deviation or incomplete submissions with respect to the breakdown of approved *Change Orders* and percentage completed of each will require resubmission of the application for payment.

5.2.13 If any *Work* or item under the *Contract* is included by the *Contractor* in its progress claims as partially or fully completed, but it is not completed in accordance with *Drawings* or *Specifications*, or is not completed to the *Consultant*'s satisfaction, the *Consultant* shall omit the partial or total cost of such items from the certificates of payment and shall notify the *Contractor* in writing of its action and the reason for same, and shall withhold payments for such items, over, above and distinct from applicable construction lien holdbacks, until they are completed or corrected to its full satisfaction.

5.2.14 The *Consultant* and/or the *Owner* shall not be held responsible for any delays in payment due to a disagreement in the amounts shown by the *Contractor* on their payment application as submitted to the *Consultant* for review.

5.2.15 The *Contractor* shall not submit an application for payment between the period of December 14 to January 4, inclusive, in any year. The *Contractor* shall not submit an application for payment during any other reasonable period which the *Owner* advises the *Contractor* in writing due to downtime for payment system upgrades."

SC 36. GC 5.3 PAYMENT

1. Delete "10 calendar days" in subparagraph 5.3.1.1 and replace with "5 calendar days".

SC 37. GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK

1. Add to the beginning of paragraph 5.4.1:

"When the *Contractor* considers that the *Work* is substantially performed, or if permitted by the lien legislation applicable to the *Place of the Work* a designated portion thereof which the *Owner* agrees to accept separately is substantially performed, the *Contractor* shall, within one *Working Day*, deliver to the *Consultant* and to the *Owner* a comprehensive list of items to be completed or corrected, together with a written application for a review by the *Consultant* to establish *Substantial Performance of the Work* or substantial performance of the designated portion of the

Work. Failure to include an item on the list does not alter the responsibility of the *Contractor* to complete the *Contract*."

2. Delete paragraphs 5.4.2 and 5.4.3 in their entirety.

3. Add new paragraph 5.4.2 as follows:

"The prerequisites to attaining Substantial Performance includes but is not limited to the following:

.1 Evidence of compliance with the requirements for occupancy or occupancy permit as prescribed by the authorities having jurisdiction
.2 Final cleaning and waste removal at the time of applying for *Ready-for-Takeover,* as required by the *Contract Documents*.
.3 The delivery to the *Owner* of such operations and maintenance documents reasonably necessary for immediate operation and maintenance, as required by the *Contract Documents* .
.4 Make available a copy of the as-built drawings completed to date on site.
.5 Startup, testing required for immediate occupancy, as required by the *Contract Documents.*
.6 Ability to secure access to the *Work* has been provided to the *Owner,* if required by the *Contract Documents."*

4. Add to the end of paragraph 5.4.4, the following:

"and submit CCDC 9A 'Statutory Declaration' to state that all accounts for labour, subcontracts, *Products*, *Construction Equipment,* and other indebtedness which may have been incurred by the *Contractor* in the *Substantial Performance of the Work* and for which the *Owner* might in any way be held responsible have been paid in full, except for amounts properly retained as a holdback or as an identified amount in dispute."

5. Add after "Where legislation" in subparagraph 5.4.5, the following:

"and the Contract"

SC 38. GC 5.5 FINAL PAYMENT

1. Delete paragraph 5.5.1 in its entirety and replace with the following:

"5.5.1 When the *Contractor* considers that the *Work* is completed, the *Contractor* shall submit an application for final payment. The *Contractor's* application for final payment shall be accompanied by any documents or materials not yet delivered pursuant to paragraph 5.4.2 and, for purposes of the *Construction Act*, the remaining *Work* is valued at more than $5,000. The *Work* shall be deemed not to be performed until all of the aforementioned documents have been delivered. Application for final payment shall be made by way of *Notice in Writing* and shall be delivered by electronic communication to both the *Consultant* and the *Owner*. Application for final payment shall meet the requirements of a "proper invoice" as set out in paragraph 5.2.7."

2. Delete "10 calendar days" in paragraph 5.5.2 and replace with "5 calendar days".

3. Delete "5 calendar days after the issuance of a final certificate for payment" in paragraph 5.5.4 and replace with "the deadline prescribed by the *Construction Act* (Ontario)".

4. Add new paragraph 5.5.5 as follows:

"5.5.5 Prior to the release of the holdback for finishing work under the *Construction Act*, the *Contractor* shall submit:

.1 *Contractor's* written request for release of the holdback, including a statement that no written notices of lien have been received by it;

.2 a *Statutory Declaration*; and

.3 a final Workplace Safety & Insurance Board Clearance Certificate."

SC 39. GC 5.6 WITHHOLDING OF PAYMENT

1. Delete "or if" in paragraph 5.6.1 and replace with "and where".

SC 40. GC 5.8 LIENS

1. Add new general condition GC 5.8 LIENS as follows:

"GC 5.80 LIENS

5.8.1 In the event that a construction lien arising from the performance of the *Work* is claimed, the *Contractor* shall, if requested, undertake the *Owner's* defence of any subsequent lawsuit commenced in respect of the lien at the *Contractor's* sole expense.

5.8.2 Without limiting any of the foregoing, the *Contractor* shall indemnify the *Owner* for all costs (including, without limitation, legal fees on a solicitor and client basis) it may incur in connection with the claim for lien or subsequent lawsuit brought in connection with the lien, or in connection with any other claim or lawsuit brought against the *Owner* by any person that provided services or materials to the *Project* lands which constituted a part of the *Work*.

5.8.3 This GC 5.8 does not apply to construction liens claimed by the *Contractor*."

SC 41. GC 5.9 PAYMENT BY ELECTRONIC FUNDS TRANSFER

1. Add new general condition GC 5.9 PAYMENT BY ELECTRONIC FUNDS TRANSFER as follows:

"GC 5.9 PAYMENT BY ELECTRONIC FUNDS TRANSFER

5.9.1 The term "EFT" refers to electronic funds transfer and may also include the payment information transfer.

5.9.2 All payments by the *Owner* under the *Contract* shall be made by EFT as a direct deposit to a Canadian chartered bank, save and except where:

.1 the funds payable under the terms of the *Contract* are only payable in a single lump sum and not payable by installments or progress payments or otherwise than a single lump sum payment; or

.2 the *Owner* is unable to release one or more payments by EFT, in which case the *Contractor* shall agree to accept payment by cheque or some other mutually agreeable method of payment.

5.9.3 Mandatory Submission of the *Contractor*'s EFT Information

.1 The *Contractor* is required to provide the *Owner* with the information required for the *Owner* to make payment by EFT. A purchase order may not be issued to the *Contractor* without this requisite information.

.2 In the event that the EFT information changes, the *Contractor* shall be responsible for providing forthwith the updated information to the *Owner*.

.3 Where the *Contractor* provides changes to the EFT information more than once in a calendar year, the *Contractor* shall also pay any fee approved by the Council of the City of Hamilton for each additional change.

.4 If the EFT information changes after submission of correct EFT information, the *Owner* shall have thirty (30) calendar days within which to update the changed EFT information after its receipt by the designated officer to the extent payment is made by EFT.

5.9.4 Liability for Uncompleted or Erroneous Transfers

.1 If an uncompleted or erroneous transfer occurs because the *Owner* used the *Contractor*'s EFT information incorrectly, the *Owner* remains responsible for making a correct payment.

.2 If an uncompleted or erroneous transfer occurs because the *Contractor*'s EFT information was incorrect, or was revised within thirty (30) calendar days of the *Owner*'s release of the EFT payment transaction instruction, and

.3 Funds are no longer under the control of the *Owner*'s payment office, the *Owner* is deemed to have made payment and the *Contractor* is responsible for recovery of any erroneously directed funds and to comply with the Payment Legislation.

5.9.5 EFT and Timely Payment

A payment shall be deemed to have been made in a timely manner in accordance with the payment terms of the *Contract* if, in the *Owner*'s EFT payment transaction instruction released to its bank, the date specified for settlement of the payment is on or before the last date for due payment under the terms of the *Contract*, provided the specified payment date is a valid date when the *Owner's* bank is open for business.

5.9.6 Liability for Change of EFT Information by Financial Agent

The *Owner* is not liable for errors resulting from changes to EFT information provided by the *Contractor*'s financial agent."

SC 42. GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

1. Add new paragraph 6.1.3 as follows:

"6.1.3 The *Contractor* is not entitled to any compensation for loss or loss of anticipated profit as a result of the deletion of any major item or major part of an item."

SC 43. GC 6.2 CHANGE ORDER

2. Add after "in a form that can be reasonably evaluated" in subparagraph 6.2.1 and add "and is acceptable to the *Consultant".*

SC 44. GC 6.3 CHANGE DIRECTIVE

1. Delete subparagraph 6.3.6.3 in its entirety and replace with the following:

".3 The *Contractor's* fee shall be as specified in GC 6.7 - EXTRA WORK, CLAIMS PAYMENT FROM CONTINGENCY or as otherwise agreed by the parties."

2. Delete subparagraph 6.3.7 in its entirety and add the following:

"6.3.7 The cost of performing the work attributable to the *Change Directive* shall be limited to the actual cost of the following in as much as it contributes directly to the implementation of the *Change Directive:*

.1 salaries, wages and benefits paid to personnel in the direct employ of the *Contractor* while directly engaged in the *Work* attributable to the change under a salary or wage schedule agreed upon by the *Owner* and the *Contractor*, or in the absence of such a schedule, actual salaries, wages and benefits paid under applicable bargaining agreement, and in the absence of a salary or wage schedule and bargaining agreement, actual salaries, wages and benefits paid by the *Contractor* while directly engaged in the *Work* attributable to the change, for personnel
   (1) stationed at the *Contractor's* field office, in whatever capacity employed;
   (2) engaged in the preparation or review of *Shop Drawings,* fabrication drawings, and coordination drawings; or
   (3) engaged in the processing of changes in the *Work;*

.2 contributions, assessments or taxes incurred for such items as employment insurance, provincial or territorial health insurance, workers' compensation, and Canada or Quebec Pension Plan, insofar as such cost is based on wages, salaries or other remuneration paid to employees of the *Contractor* and included in the cost of the *Work* as provided in paragraph 6.3.7.1;

.3 travel and subsistence expenses of the *Contractor*'s personnel described in paragraph 6.3.7.1;

.4 all *Products* including cost of transportation thereof;

.5 materials, supplies, *Construction Equipment*, *Temporary Work*, exclusive of hand tools, including transportation and maintenance thereof, which are consumed in the performance of the *Work*; and cost less salvage value on such items used but not consumed, which remain the property of the *Contractor*;

.6 all tools and *Construction Equipment*, exclusive of hand tools used in the performance of the *Work*, whether rented from or provided by the *Contractor* or others, including installation, minor repairs and replacements, dismantling, removal, transportation, and delivery cost thereof;

.7 all equipment and services required for the *Contractor*'s field office;

.8 deposits lost;

.9 the amounts of all subcontracts provided however that the cost included in such amounts shall be limited to the actual costs of the items described in this paragraph 6.3.7 changing "*Contractor*" to "*Subcontractor*" as necessary;

.10 quality assurance such as independent inspection and testing services;

.11 charges levied by authorities having jurisdiction at the *Place of the Work*;

.12 royalties, patent licence fees and damages for infringement of patents and cost of defending suits therefor subject always to the *Contractor*'s obligations to indemnify the *Owner* as provided in paragraph 10.3.1 of GC 10.3 - PATENT FEES;

.13 any adjustment in premiums for all bonds and insurance which the *Contractor* is required, by the *Contract Documents*, to purchase and maintain;

.14 any adjustment in taxes, other than *Value Added Taxes*, and duties for which the *Contractor* is liable;

.15 charges for voice and data communications, courier services, expressage, transmittal and reproduction of documents, and petty cash items;

.16 incurred in relation to the performance of the *Work*;

.17 removal and disposal of waste products and debris; and

.18 safety measures and requirements not caused by the *Contractor* or anyone for whom it is responsible."

3. Delete paragraph 6.3.9 in its entirety and replace with the following:

"6.3.9 The *Contractor* shall keep full and detailed accounts and records, including all documents and invoicing from the *Contractor, Subcontractor* and *Supplier*, for the documentation of the cost of performing the *Work* attributable to the *Change Directive* and shall provide the *Consultant* with copies upon submission of any claim for costs related to the *Change Directive* as included in an application for payment."

4. Add to the end of paragraph 6.3.10, the following:

"The *Contractor* shall include all pertinent documentation as back-up with any claims for additional *Contract Time* and/or increase in *Contract Price* to the *Consultant* for review and approval."

5. Add after "proposed adjustment in the *Contract Time* from paragraph 6.3.12, the following:

"and/or *Contract Price*"

SC 45. GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

1. Add new paragraph 6.4.5 as follows:

"6.4.5 If the *Contractor* was given access to the *Place of the Work* prior to the submission of the bid on which the *Contract* was awarded, then the *Contractor* confirms that it carefully investigated the *Place of the Work* and, in doing so, applied to that investigation the degree of care and skill required by paragraph 3.14.1. In those circumstances, notwithstanding the provisions of paragraph 6.4.1, the *Contractor* is not entitled to an adjustment to the *Contract Price* or to an extension of the *Contract Time* for conditions which could reasonably have been ascertained by the *Contractor* by such careful investigation, or which could have been reasonably inferred from the material provided with the *Contract Documents*. In those circumstances, should a claim arise, the *Contractor* will have the burden of establishing that it could not have discovered the materially different conditions from a careful investigation, because of restrictions placed on its access or inferred the existence of the conditions from the material provided with the *Contract Documents*."

SC 46. GC 6.5 DELAYS

1. Delete paragraph 6.5.1 in its entirety and replace with the following:

"6.5.1 If the *Contractor* is delayed in the performance of the *Work* by an action or omission of the *Owner, Consultant* or anyone employed or engaged by the *Owner* directly, contrary to the provisions of the *Contract Documents,* then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor.* The *Contractor* shall be reimbursed by the *Owner* for reasonable costs incurred by the *Contractor* as the result of such delay, provided that the *Owner* shall not be liable for any other costs or damages whatsoever including, without limitation, any indirect, consequential, or special damages, such as loss of profits, loss of opportunity or loss of productivity resulting from such delay."

2. Delete the words "Ready-for-Takeover" in paragraph 6.5.2 and replace with "Substantial Performance".

3. Add to the end of paragraph 6.5.2, the following:

", provided that the *Owner* shall not be liable for any other costs or damages whatsoever including, without limitation, any indirect, consequential, or special damages, such as loss of profits, loss of opportunity or loss of productivity resulting from such delay."

4. Delete paragraph 6.5.3 in its entirety and replace with the following:

"6.5.3 If the *Contractor* is delayed in the performance of *Work* by *Force Majeure* then the *Contract Time* shall be extended for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor*. The extension of time shall not be less than the time lost as the result of the event causing the delay, unless the *Contractor* agrees to a shorter extension. The *Contractor* shall not be entitled to payment for costs incurred by such delays unless such delays result from actions by the *Owner, Consultant* or anyone employed or engaged by them directly, provided that the *Owner* shall in such instance, only be liable for reasonable costs incurred by the *Contractor* and shall not be liable for any other costs or damages whatsoever including, without limitation, any indirect, consequential, or special damages, such as loss of profits, loss of opportunity or loss of productivity resulting from such delay. Notwithstanding the foregoing, the *Contractor* shall use its best efforts to minimize the impact of such event upon the performance of the *Work* and *Contract Time.*

1. Subject to the foregoing, each party shall be excused from performance so long as the *Force Majeure* persists, and shall not be considered to be in default under this section, if and to the extent that its failure of, or delay in performance is due to that *Force Majeure*.
2. Where a *Force Majeure* remains in effect for more than ninety (90) calendar days, either party may terminate the *Contract* upon thirty (30) calendar days written notice to the other party, provided at the time when that notice is given the *Force Majeure* is then continuing.
3. While a *Force Majeure* subsists which prevents the *Contractor* from proceeding with the *Work* under the *Contract*, the *Owner* may engage an alternate contractor on an interim basis, and the *Work* and the *Contract Price* will be adjusted accordingly."

5. Add new paragraph 6.5.6 as follows:

"6.5.6 Where the *Project* is not totally completed within twenty (20) *Working Days* of the *Substantial Performance Date*, or at a time mutually agreed to by the parties, the *Owner* has the right to complete any remaining deficiencies or outstanding work and deduct the amount from monies that may be due or payable to the *Contractor."*

SC 47. GC 6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

1. Add new paragraph 6.6.7 as follows:

"6.6.7 The *Owner* may make claims against the *Contractor* arising out of the costs incurred for additional services provided by the *Consultant* resulting from the *Contractor's* failure to reasonably perform the *Work* in accordance with the terms and conditions of the *Contract*."

SC 48. GC 6.7 EXTRA WORK, CLAIMS, PAYMENT FROM CONTINGENCY

1. Add new general condition GC 6.7 EXTRA WORK, CLAIMS, PAYMENT FROM CONTINGENCY, as follows:

"GC 6.7 EXTRA WORK, CLAIMS, PAYMENT FROM CONTINGENCY.

6.7.1 When a change in the *Work* is proposed or required, the *Consultant* may, on behalf of the *Owner*, issue a *Contemplated Change Order* to the *Contractor*. The *Contractor* shall upon receipt of a *Contemplated Change Order* promptly present to the *Consultant* a method of adjustment or, pursuant to paragraph 6.7.2, an amount of adjustment for the *Contract Price*, if any, and the adjustment in the *Contract Time*, if any, for the proposed change in the *Work*.

6.7.2 When the *Contractor* submits an amount of adjustment in response to a *Contemplated Change Order* or a *Change Directive*, the following provisions shall apply:

.1 Where the scope of *Work* identified by the *Contemplated Change Order* or *Change Directive* involves an adjustment in the *Contract Price*, the *Contractor* shall express and calculate the adjustment in the form of a written quotation with supporting documentation, including documentation and detailed invoicing from *Subcontractors*, and *Suppliers*, acceptable to the *Consultant*, and to include an amount:

(1) representing the net change in *Construction Costs* of the *Work*, taking into account all credits and scope reductions resulting from the change;

(2) for *Overhead Costs* and profit calculated in accordance with paragraph 6.7.3; and,

(3) for *Value Added Taxes*.

.2 Where the scope of *Work* identified by the *Contemplated Change Order* or *Change Directive* involves an adjustment in the *Contract Time*, the *Contractor* shall express the number of *Working Days*, the reason and logic for the adjustment, and all the supporting documentation inclusive of a *Project* schedule identifying the impacted activities, their inter-relationship, and changes to the critical path.

.3 Notwithstanding any other provisions in the General Conditions or Supplementary Conditions of the *Contract*, it is the intention and agreement of the parties that the *Contractor's* submitted adjustment in *Contract Price*, if any, and the adjustment in *Contract Time*, if any, in response to a *Contemplated Change Order* or *Change Directive* shall be all-inclusive of any costs, claims, impacts, and liabilities of the *Contractor* and *Subcontractor*(s) whether known or unknown, direct or indirect, collective or cumulative.

.4 The *Consultant* and *Owner* are entitled to rely on the accuracy, completeness, and all-inclusive nature of the *Contractor*'s submitted adjustment(s), if any, in response to a *Contemplated Change Order* or *Change Directive*. Once a *Change Order* has been issued for the submitted adjustment(s) the *Contractor* shall not be entitled to any further claim or adjustment in the *Contract Price* or *Contract Time* associated, in part or whole, with the respective change.

6.7.3 Where an adjustment to the *Contract Price* and/or *Contract Time* is made for a change carried out by *Change Order* or *Change Directive*, the amount of *Overhead Costs* and profit for the *Contractor* and *Subcontractor* shall be calculated in accordance with the following provisions:

.1 Where a change in the *Work* is performed by the *Contractor's* own forces, *Overhead Costs* and profit shall not exceed an amount equal to 15% of the first $50,000.00 in additional *Construction Costs* and 5% thereafter;

.2 Where a change in the *Work* is performed by a *Subcontractor's* forces:

(1) The *Subcontractor's Construction Costs* for the change in the *Work* shall be all-inclusive to perform the change and be identified separate and apart from any *Value Added Taxes*, *Overhead Costs*, or profit of the *Subcontractor* or *Contractor*.
(2) The *Subcontractor's Overhead Costs* and profit shall not exceed an amount equal to 15% of the first $50,000.00 in additional *Construction Costs* and 5% thereafter; and
(3) The *Contractor's Overhead Costs* and profit shall not exceed an amount equal to 10% of the first $50,000 in additional *Subcontractor Construction Costs* and 5% thereafter;

.3 Where a change in the *Work* is performed both by the *Contractor's* own forces and a *Subcontractor's* forces the *Overhead Costs* and profit shall be calculated separately in accordance with paragraph 6.7.3.1 and 6.7.3.2 as the case may be, as applied proportionately to the total amount of change in *Construction Costs* being done by the *Contractor* and *Subcontractor*."

SC 49. GC 7.1 OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT

1. Add before "OR TERMINATE THE CONTRACT" in the title of GC 7.1, the following:

   "SUSPEND THE WORK"

2. Delete "however, if such cost of finishing the *Work* is less than the unpaid balance of the *Contract Price*, the *Owner* shall pay the *Contractor* the difference" from subparagraph 7.1.5.3.

3. Delete paragraph 7.1.6 in its entirety.

4. Add new paragraphs 7.1.6, 7.1.7, 7.1.8, 7.1.9 and 7.1.10 as follows:

   "7.1.6 In addition to its right to terminate the *Contract* set out herein, the *Owner* may terminate the *Contract* at any time for any other reason and without cause upon giving the *Contractor Notice in Writing* to that effect. In such event, the *Contractor* shall be entitled to be paid for all *Work* performed including reasonable profit, for loss sustained upon *Products* and *Construction Equipment*, and such other damages as the *Contractor* may have sustained as a result of the termination of the *Contract*, but in no event shall the *Contractor* be entitled to be compensated for any loss of profit on unperformed portions of the *Work*, or indirect, special, or consequential damages incurred.

   7.1.7 The *Owner* may suspend *Work* under the *Contract* at any time for any reason and without cause upon giving the *Contractor Notice in Writing* to that effect. In such event, the *Contractor* shall be entitled to be paid for all *Work* performed to the date of suspension and be compensated for all actual costs incurred arising from the suspension, including reasonable profit, for loss sustained upon *Products* and *Construction Equipment*, and such other damages as the *Contractor* may have sustained as a result of the suspension of the *Work*, but in no event shall the *Contractor* be entitled to be compensated for any indirect, special, or consequential damages incurred. In the event that the suspension continues for more than one hundred and eighty (180) calendar days, the *Contract* shall be deemed to be terminated and the provisions of paragraph 7.1.6 shall apply.

   7.1.8 In the case of either a termination of the *Contract* or a suspension of the *Work* under GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE

CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK, SUSPEND THE WORK OR TERMINATE THE CONTRACT or GC 7.2 - CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the *Contractor* shall use its best commercial efforts to mitigate the financial consequences to the *Owner* arising out of the termination or suspension, as the case may be.

7.1.9 Upon the resumption of the *Work* following a suspension under GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK, SUSPEND THE WORK OR TERMINATE THE CONTRACT or GC 7.2 - CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the *Contractor* will endeavour to minimize the delay and financial consequences arising out of the suspension.

7.1.10 The *Contractor's* obligation under the *Contract* as to quality, correction, and warranty of the *Work* performed by the *Contractor* up to the time of termination or suspension shall continue after such termination of the *Contract* or suspension of the *Work*."

SC 50. GC 7.2 CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT

1. Delete "20 *Working Days*" in paragraph 7.2.2 and replace with the following:

"ninety (90) *Working Days*"

2. Delete paragraph 7.2.3 in its entirety and replace with the following:

"7.2.3 The *Contractor* may give *Notice in Writing* to the *Owner,* with a copy to the *Consultant,* that the *Owner* is in default of the *Owner's* contractual obligations if:

.1 subject to the other terms and conditions of the *Contract* the *Owner* fails to pay the *Contractor* when due the amounts certified by the *Consultant* or awarded by adjudication, arbitration or court, except where the *Owner* has a bona fide claim for set-off, or

.2 the *Owner* fails to comply with the requirements of the *Contract* to a substantial degree and the *Consultant*, confirms by written statement to the *Contractor* and the *Owner,* that sufficient cause exists."

3. Delete paragraph 7.2.4 in its entirety and replace with the following:

"7.2.4 The *Contractor's Notice in Writing* to the *Owner* provided under paragraph 7.2.3 shall advise that if the default is not corrected within twenty (20) *Working Days* following the receipt of the *Notice in Writing,* the *Contractor* may, without prejudice to any other right or remedy the *Contractor* may have, suspend the *Work* until the default is corrected*,* provided, however, that in the event of such suspension, the provisions of paragraph 7.1.10 shall apply. If the *Contractor's Notice in Writing* to the *Owner* was given pursuant to paragraph 7.2.3, then, ninety (90) *Working Days* after the delivery of the *Notice in Writing*, the *Contractor* may terminate the *Contract,* provided, however, that in the event of such termination, the provisions of paragraph 7.1.10 shall apply."

4. Delete paragraph 7.2.5 in its entirety and replace with the following:

"7.2.5. If the *Contractor* terminates the *Contract* **by giving a *Notice in Writing* to the *Owner*** under the conditions set out above, the *Contractor* shall be entitled to be paid for all *Work* performed to the date of termination and be compensated for all actual costs

incurred arising from the suspension, including reasonable profit, for loss sustained upon *Products* and *Construction Equipment*, and such other damages as the *Contractor* may have sustained as a result of the termination of the *Work*, but in no event shall the *Contractor* be entitled to be compensated for any indirect, special or consequential damages incurred."

SC 51. GC 8.3 NEGOTIATION, MEDIATION AND ARBITRATION

1. Delete paragraphs 8.3.6, 8.3.7 and 8.3.8 in their entirety.

2. Add new paragraphs 8.3.6 and 8.3.7 as follows:

"8.3.6 When a dispute has not been resolved through negotiation or mediation, within ten (10) *Working Days* after the date of termination of the mediated negotiations under paragraph 8.3.5, either party may give a *Notice in Writing* to the other party and to the *Consultant* inviting the other party to agree to submit the dispute to be finally resolved by arbitration, pursuant to provisions of the *Arbitration Act, 1991*. If the other party wishes to accept the invitation to submit the dispute to arbitration, it shall so indicate by the delivery of a responding *Notice in Writing* within ten (10) *Working Days* of receipt of the invitation. If, within the required times, no invitation is made or, if made, is not accepted, either party may refer the dispute to the courts or to any other form of dispute resolution, including arbitration, which the parties may agree to use.

8.3.7 The determination of a matter by an adjudicator under the *Construction Act* (Ontario) may be submitted to arbitration or the courts or other form of dispute resolution as provided in section 8.3.6 at any time."

SC 52. GC 9.1 PROTECTION OF WORK AND PROPERTY

1. Delete "property adjacent to the *Place of the Work*" in paragraphs 9.1.1 replace with the following:

"property adjacent, in the vicinity of or proximate to the *Place of the Work*"

2. Delete subparagraph 9.1.1.1 in its entirety and replace with the following:

".1 errors in the *Contract Documents* which the *Contractor* could not have reasonably discovered applying the standard of care described in paragraph 3.14.1;"

3. Delete paragraph 9.1.2 in its entirety and replace with the following:

"9.1.2 Before commencing any work, the *Contractor* shall determine the locations of all underground utilities and structures indicated in the *Contract Documents* or reasonably apparent from the *Contract Documents*, or that are reasonably apparent from an inspection of the *Place of the Work* exercising the degree of care and skill described in paragraph 3.14.1."

4. Delete "property adjacent to the *Place of the Work*" in paragraphs 9.1.3 and replace with the following:

"property adjacent, in the vicinity of or proximate to the *Place of the Work*"

5. Add new paragraph 9.1.5 as follows:

"9.1.5 With respect to any damage to which paragraph 9.1.4 applies, the *Contractor* shall neither undertake to repair or replace any damage whatsoever to the work of other contractors, or to property adjacent, in the vicinity of or proximate to the *Place of the Work*, nor acknowledge that the same was caused or occasioned by the *Contractor*, without first consulting the *Owner* and receiving written instructions as to the course of action to be followed from either the *Owner* or the *Consultant*. Where, however, there is danger to life, the environment, or public safety, the *Contractor* shall take such emergency action as it deems necessary to remove the danger."

SC 53. GC 9.2 TOXIC OR HAZARDOUS SUBSTANCES

1. Delete paragraph 9.2.6 in its entirety and replace with the following:

"9.2.6 If the *Owner* and *Contractor* do not agree on the existence, significance of, or whether the toxic or hazardous substances were brought onto the *Place of the Work* by the *Contractor* or anyone for whom the *Contractor* is responsible, or whether any toxic or hazardous substances or materials already at the *Place of the Work* (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the *Contractor* or anyone for whom the *Contractor* is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the *Owner* or others, the *Owner* shall retain and pay for an independent qualified expert to investigate and determine such matters. The expert's report shall be delivered to the *Owner* and the *Contractor."*

2. Delete subparagraph 9.2.7.4 in its entirety and replace with the following:

"9.2.7.4 indemnify the *Contractor* from and against claims, demands, losses, costs, damages, actions, suits or proceedings made, suffered or brought by third parties arising out of or resulting from exposure to, or the presence of, toxic or hazardous substances for which the *Contractor* is not responsible under GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES at the *Place of Work*. This obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity set out in GC 13.1 – INDEMNIFICATION or that otherwise exist respecting a person or party described in this paragraph."

3. Delete paragraph 9.2.8 in its entirety and replace with the following:

"9.2.8 If the *Owner* and *Contractor* agree or if the expert referred to in paragraph 9.2.6 determines that the toxic or hazardous substances were brought onto the place of the *Work* by the *Contractor* or anyone for whom the *Contractor* is responsible, that any toxic or hazardous substances or materials already at the *Place of the Work* (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the *Contractor* or anyone for whom the *Contractor* is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the *Owner* or others, the *Contractor* shall promptly at the *Contractor's* own expense:

.1 take all necessary steps, in accordance with applicable legislation in force at the *Place of the Work,* to safely remove and dispose the toxic or hazardous substances;

.2 make good any damage to the *Work,* the *Owner's* property or property adjacent to the place of the *Work* as provided in paragraph 9.1.3 of GC 9.1-

PROTECTION OF WORK AND PROPERTY;

.3 reimburse the *Owner* for reasonable costs incurred under paragraph 9.2.6; and as a result of the delay

.4 indemnify the *Owner* as required by GC 13.1 - INDEMNIFICATION."

SC 54. GC 9.4 CONSTRUCTION SAFETY

1. Delete GC 9.4. in its entirety and replace with the following:

"9.4.1 The *Contractor* shall be solely responsible for construction safety at the *Place of the Work* and for compliance with the rules, regulations, and practices required by the applicable construction health and safety legislation and shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the *Work*.

9.4.2 Prior to the commencement of the *Work*, the *Contractor* shall submit to the *Owner*:

.1 documentation setting out the *Contractor's* in-house safety programs; and

.2 a copy of the Notice of Project filed with the Ministry of Labour naming the *Contractor* as "constructor" under the *Occupational Health and Safety Act*.

9.4.3 The *Contractor* shall indemnify, defend and save harmless the *Owner*, its agents, officers, directors, employees, consultants, successors, appointees, and assigns from and against the consequences of any and all safety infractions committed by the *Contractor* under the *Occupational Health and Safety Act*, including the payment of legal fees and disbursements on a solicitor and client basis. Such indemnity shall apply to the extent to which the *Owner* is not covered by insurance, provided that the indemnity contained in this paragraph shall be limited to costs and damages resulting directly from such infractions and shall not extend to any consequential, indirect or special damages.

9.4.4 The *Owner* undertakes to include in its contracts with other contractors and in its instructions to its own forces the requirement that the other contractor or its own forces, as the case may be, comply with the policies and procedures of and the directions and instructions from the *Contractor* with respect to occupational health and safety and related matters. Prior to admission to the *Place of the Work*, the *Contractor* may, as a condition of admission, require any other contractor or the *Owner's* own forces to sign a written acknowledgement in the following form:

Acknowledgement

The undersigned acknowledges that the *Work* it will perform on behalf of the *Owner* requires it to enter a *Place of the Work* which is under the total control of a *Contractor* that has a contract with the *Owner*, pursuant to which the *Contractor* has assumed overall responsibility for compliance with all aspects of the applicable health and safety legislation, including all the responsibilities of the "constructor" under the *Occupational Health and Safety Act*, as well as responsibility to co-ordinate and schedule the activities of our *Work* with the *Work* of the *Contractor* under its contract. The undersigned agrees to comply with the *Contractor*'s directions and instructions with respect to health, safety, co-ordination, and scheduling and acknowledges that its failure to do so will be cause for termination of employment or of the undersigned's contract with the *Owner,* as the case may be. The undersigned also agrees to have the *Contractor* named as an additional insured on any commercial general liability insurance policy, where such insurance is required.

9.4.5 Without limiting any of the foregoing, prior to commencement of the *Work*, the *Contractor* shall have both a written occupational health and safety policy and program to implement that policy, and that all of its employees, *Subcontractors* and any other persons performing the *Work* shall be appropriately trained, licensed and certified, as required to perform the *Work*.

9.4.6 The *Contractor* and *Subcontractors* shall comply with the safety by-laws of the *Owner*, the *Employment Standards Act, Occupational Health and Safety Act* and all regulations thereunder, any other legislation governing construction or workplace safety, and all instructions issued by the *Consultant* or any inspector appointed by the Province of Ontario or City of Hamilton.

9.4.7 The *Contractor* shall be responsible for keeping the work free from trespassers and for protection of the work and the public from any loss or injury from commencement of the work to *Substantial Performance of the Work*.

9.4.8 The *Contractor* shall comply with all applicable occupational health and safety requirements in force during the time when *Work* is being carried out, and shall provide at the *Place of the Work*, such equipment and medical facilities as are necessary to furnish first aid to anyone who may be injured in connection with the *Work*.

9.4.9 Before commencing with any *Work*, the *Contractor*, the *Consultant* and the *Owner's* representative shall meet at the *Place of the Work*, and establish safe routes and routines for material deliveries, material storage locations, construction office location, and all other aspects of the execution of all *Work*.

9.4.10 The *Contractor* shall erect and maintain during construction, a dependable temporary fence, barricades, warning lights, and signage around the perimeter of the *Place of the Work*, all hazardous areas and excavations, and the *Consultant* may give reasonable directions to the *Contractor* as to the type and extent of the fence, barriers, warning lights, and signage needed.

9.4.11 The *Contractor* shall, at its own expense, shore up or otherwise securely support or protect any buildings, walls, fences, pavement, boulevards or other structures at the *Place of the Work*, and on the adjoining properties which may be endangered or which may cause injury during the *Work*, and in case of damage, disturbance or injuries to any such structures during and attributable, whether directly or indirectly, to any work under the *Contract*, or to any extra work entering into the *Contract*, the *Contractor* shall at its own expense, repair, rebuild or other wise make good all damage, injuries or disturbance to said structures and put all such structures in a condition the same as, or equal to, that existing previous to its beginning that work."

SC 55 GC 9.5 MOULD

1. Add to the end of subparagraph 9.5.2.3, the following:

"and incurred as a result of the delay"

2. Delete subparagraph 9.5.3.4 in its entirety and replace with the following:

"9.5.3.4 indemnify the *Contractor* from and against claims, demands, losses, costs, damages, actions, suits or proceedings made, suffered or brought by third parties arising out of or resulting from exposure to, or the presence of, mould for which the *Contractor* is not responsible under GC 9.5 – MOULD at the *Place of Work.* This obligation shall not be

construed to negate, abridge or reduce other rights or obligations of indemnity set out in GC 13.1 – INDEMNIFICATION or that otherwise exist respecting a person or party described in this paragraph."

SC 56 GC 10.1 TAXES AND DUTIES

1. Add to the end of paragraph GC 10.1.2 the following:

   "The *Contractor* must prove to the satisfaction of the *Owner* that the *Contractor* will not benefit in any way by reason of any increase to the *Contract Price*."

2. Add new paragraph 10.1.3 as follows:

   "10.1.3 Where the *Owner* is entitled to an exemption or a recovery of sales taxes, customs duties, excise taxes or *Value Added Taxes* applicable to the *Contract*, the *Contractor* shall, at the request of the *Owner*, assist with application for any exemption, recovery or refund of all such taxes and duties and all amounts recovered or exemptions obtained shall be for the sole benefit of the *Owner*. The *Contractor* agrees to endorse over to the *Owner* any cheques received from the federal or provincial governments, or any other taxing authority, as may be required to give effect to this paragraph."

SC 57 GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

1. Add to the beginning of paragraph 10.2.5, the following:

   "Subject to paragraph 3.4.1,"

SC 58 GC 10.3 PATENT FEES

1. Add before "hold the *Owner* harmless" in the second sentence of paragraph 10.3.1, the following:

   "indemnify and"

2. Add after "which was supplied to the *Contractor*" in paragraph 10.3.2, the following:

   "by the *Owne*r"

SC 59 GC 10.4 WORKERS' COMPENSATION

1. Add after the words "Prior to commencing the *Work*," in the first line of paragraph 10.4.1, the following:

   "and upon execution of the Agreement, again with each application for progress payment,"

2. Add new paragraph 10.4.2 as follows:

   "The *Contractor* shall ensure that each *Subcontractor* complies with the workers' compensation legislation at the *Place of the Work.* At any time during the term of the *Contract*, when requested by the *Owner*, the *Contractor* shall provide such evidence of compliance by the *Contractor* and *Subcontractors*."

SC 60 GC 11.1 INSURANCE

1. Delete GC 11.1 INSURANCE in its entirety and replace with the following:

"GC 11.1 INSURANCE

11.1.1 The *Contractor* shall obtain and maintain at its own expense, including the cost of any applicable deductible, the following policies of insurance.

.1 Commercial General Liability Insurance, written on IBC Form 2100 or its equivalent, including but not limited to bodily and personal injury liability, property damage, products liability, completed operations liability, owners & contractors protective liability, blanket contractual liability, premises liability, and contingent employer's liability coverage, having an inclusive limit of not less than $5,000,000 per occurrence. If a policy has an aggregate limit, the amount of the aggregate shall be double the required per occurrence limit. Coverage shall be included for injury/loss/damage, due to pollution arising from "hostile fires". To achieve the desired limit, Umbrella or Excess liability insurance may be used. Coverage shall be subject to the following:

(1) where the *Work* involves one or more of the following activities:

(i) the use of explosives for blasting;

(ii) vibration from pile driving or caisson work;

(iii) the removal or weakening of support of any property, building or land whether such support be natural or otherwise,

explosion, collapse and underground ("XCU") coverages shall be added by endorsement to the policy and noted on the certificate of insurance;

(2) where the *Work* provides for or contemplates the handling of asbestos, coverage shall not contain an asbestos exclusion and same shall be noted on the certificate of insurance. Alternatively, coverage may be provided under Contractors Pollution Liability Insurance providing coverage in an amount of not less than $1,000,000 per claim. Such Contractors Pollution Liability Insurance coverage shall remain in effect for 12 months following the completion of the *Work*.

(3) the policy shall include coverage for pollution from "hostile fires";

(4) unless otherwise approved by the *Owner*, the *Contractor's* deductible on the Commercial General Liability policy and, if applicable, Contractors Pollution Liability Insurance shall be not more than $100,000; and

(5) the insurance coverage shall remain in effect throughout the time that the *Contract* is in effect, including the warranty period.

.2 Standard Form Automobile Liability Insurance that complies with all requirements of the current legislation of the Province of Ontario, having an inclusive limit of not less than $5,000,000 per occurrence for third party liability, in respect of the use or operation of vehicles owned, operated or leased by the *Contractor* for the performance of the *Work* under the *Contract*. The insurance coverage shall remain in effect throughout the time that the *Contract* is in effect, including the warranty period. To achieve the desired limit, Umbrella or Excess liability insurance may be used;

.3 Non-Owned Automobile Liability Insurance in standard form having an inclusive limit of not less than $1,000,000 per occurrence, in respect of vehicles not owned by the *Contractor*, that are used or operated on its behalf for the performance of the *Work* under the *Contract.* The insurance coverage shall remain in effect throughout the time that the *Contract* is in effect, including the warranty period. To achieve the desired limit, Umbrella or Excess liability insurance may be used;

.4 Builders Risk Insurance which covers the *Place of Work* for the full amount of the *Contract Price* plus the full value of any optional features or other options that the *Owner* elects to order (but the *Owner* may require insurance up to the amount of

the replacement cost of any building or structure in, on, or upon which any *Work* is to be done under the *Contract*, where in the reasonable opinion of the *Owner* there is a sufficient risk of damage to the same). Such policy shall:

(1) apply to all risks of direct loss or damage (including theft and sinkhole) subject to the actual policy form;
(2) unless otherwise directed in writing by the *Owner*, or stipulated elsewhere herein, be in force and be maintained from the commencement date of the *Contract* until the day of issue of the certificate of *Substantial Performance of the Work;*
(3) apply to all *Products*, labour, equipment and supplies of every nature, the property of the *Owner* or *Contractor* or for which the *Owner* or *Contractor* may have assumed responsibility (whether on site or in transit), that is to be used in or pertaining to site preparation, and the erection, fabrication, construction, reconstruction, re-modeling or repair of any building, structure, other fixture or thing;
(4) include the installation, testing and any subsequent use of machinery and equipment, including boilers, pressure vessels or vessels under vacuum;
(5) include damage to the *Work* caused by an accident to or the explosion of any boiler or other pressure vessel or equipment forming part of the *Work*;
(6) include off-site storage, transit and installation risks;
(7) include flood and earthquake insurance;
(8) include coverage for loss of income, extra expense and/or expediting expense if such exposures exist;
(9) be subject to a waiver of coinsurance;
(10) permit use and occupancy of the *Project*, or any part thereof, where such use and occupancy is for the purposes for which the *Project* is intended upon completion;
(11) be endorsed to cover the interest of the *Owner* ;
(12) unless otherwise approved by the *Owner*, provide for a deductible of not more than $25,000; and
(13) provide that in the case of a loss or damage, payment shall be made to the *Owner* as their interest may appear. The *Contractor* shall act on behalf of the *Owner* for the purpose of adjusting the amount of such loss or damage payment with the insurer. When the extent of the loss or damage is determined, the *Contractor* shall proceed to restore the *Work*. Loss or damage shall not affect the rights and obligations of either party under the *Contract* except that the *Contractor* shall be entitled to a reasonable extension of *Contract Time.*

.5 Property Insurance with respect to loss or damage (including fire, theft, burglary, etc.) of the *Contractor's* own property and property in its care, custody and control, including its equipment, tools and stock, used in connection with the *Contract*.

11.1.2 All polices of insurance required under paragraph 11.1.1 shall,

.1 be recorded as being a primary policy and shall be in a form and issued by an insurance company satisfactory to the *Owner*, that is licensed to carry on business in Ontario;
.2 be maintained continuously during the course of carrying out the *Work*, or for such period of time as may be required after completion of the *Work* as deemed necessary by the *Owner*;
.3 except in the case of standard form automobile liability insurance and non-owned automobile liability insurance, include the *Owner* named as an additional insured, to the extent of the *Contractor's* obligations to the *Owner* under the *Contract Documents*;

.4 contain cross liability and severability of interest provisions, as may be applicable;
.5 preclude subrogation claims against the *Owner* and any other person insured under the policy; and
.6 provide that at least 30 days prior written notice (15 days in the case of standard form automobile liability insurance, and 10 days in the event of non-payment of premiums) shall be given to the *Owner* by the insurer before the insurer or *Contractor* takes any steps to cancel, terminate, fail to renew, amend or otherwise change or modify the insurance or any part thereof.

11.1.3 The *Contractor* shall be responsible for deductible amounts under all of the policies of insurance required under paragraph 11.1.1.

11.1.4 The *Owner* reserves the right to require the *Contractor* to purchase such additional insurance coverage as the *Owner* may reasonably require. The *Owner* reserves the right to request such higher limits of insurance or otherwise alter the types of coverage requirements due to material or significant change arising from such matters as the nature of the work, agreement value, industry standards, and availability of insurance, as the *Owner* may reasonably require from time to time. Where such a right is exercised by the *Owner,* the *Owner* will compensate the *Contractor* for any resulting increase in applicable insurance premiums only where the *Contractor* can establish to the satisfaction of the *Owner*, acting reasonably, that such increase in applicable insurance premiums for the insurance required pursuant to the *Contract* does not result from the actions or omissions, negligence, claims history or reassessment by the insurer of the insurable risk posed by the *Contractor*.

11.1.5 Any insurance coverage acquired under the *Contract* shall in no manner discharge, restrict or limit the liabilities assumed by the *Contractor* under the *Contract*. The dollar limit of insurance coverage shall not be limited to the *Contract Price*.

11.1.6 The *Contractor* shall pay all premiums on the policies as they become due provided that the *Owner* may pay premiums as they become due and deduct the amount thereof from monies due from the *Owner* to the *Contractor* should the *Contractor* fail to do so.

11.1.7 The *Contractor* shall deposit with the *Owner* such evidence of its insurance policies required under paragraph 11.1.1 at the time of execution of the Agreement and thereafter during the term of the *Contract*, no later than 20 *Working Days* prior to the renewal date of each applicable policy, a certificate of insurance originally signed by an authorized insurance representative confirming thereon relevant coverage information including but not limited to the *Contract* name and description, name of insurer, name of insurance broker, name of insured, name of additional insureds as may be applicable, commencement and expiry dates of coverage, dollar limits of coverage, deductible levels as may be applicable, cancellation/termination provisions; or at the *Owner's* election, a certified copy of the insurance policy or policies required under paragraph 11.1.1. The *Contractor* shall ensure that the certificate holder is identified on each certificate of insurance as the *Owner* at 71 Main Street West, Hamilton, Ontario L8P 4Y5, or at such other address as the *Owner* may advise in writing, and that all certificates, cancellation, nonrenewal or adverse change notices are mailed to that address.

11.1.8 The *Contractor* shall not do or omit to do anything that would impair or invalidate the insurance policies.

11.1.9 Delivery to and examination or approval by the *Owner* of any certificates of insurance or policies of insurance or other evidence of insurance does not relieve the *Contractor*

of any of its indemnification or insurance obligations under the *Contract*. The *Owner* is not under a duty either to ascertain the existence of or to examine such certificates of insurance or policies of insurance, nor to advise the *Contractor* in the event such insurance coverage is not in compliance with the requirements set out in the *Contract*.

11.1.10 The *Contractor* shall promptly investigate claims reported to the *Contractor* by a third party or by the *Owner*. The *Contractor* shall make contact with the claimant within forty-eight (48) hours of the *Contractor's* receipt of notice of a claim. The *Contractor* shall initiate an investigation of the claim immediately upon notice, and advise the claimant by letter of its position regarding resolution of the claim within twenty (20) *Working Days* of the notice. The *Contractor* shall include in its letter of resolution the reasons for its position. Failing acceptance of the resolution by the claimant of the proposed resolution, the *Contractor* agrees to report the claim to its insurer for further review and response to the claimant. Should the *Contractor* fail to follow this procedure, the *Owner* may investigate and resolve such claims, and offset the resultant costs against any monies due to the *Contractor*, from time to time, under the *Contract."*

SC 61 GC 11.2 CONTRACT SECURITY

1. Add new general condition GC 11.2 CONTRACT SECURITY

"GC 11.2 CONTRACT SECURITY

11.2.1 The *Contractor* shall, upon execution of the Agreement, provide to the *Owner*:

.1 a performance bond , in an amount equal to 50% of the *Contract Price*, covering the performance of the *Contract,* including the warranty period and the *Contractor's* requirements with respect to the correction of deficiencies, excluding all extended warranties; and

.2 a labour and material payment bond, in the form set out in the *Contract Documents*, in an amount equal to 50% of the *Contract Price* covering payment for labour, *Products*, or both.

11.2.2 The bonds referred to in paragraph 11.2.1 shall be issued by a duly licensed surety company authorized to transact the business of suretyship in the Province of Ontario, using the prescribed forms set out in the *Construction Act*, and shall be maintained in good standing until the fulfillment of the *Contract,* including the warranty period."

SC 62 GC 11.3 CERTIFICATE OF STATUS

1. Add new general condition GC 11.3 CERTIFICATE OF STATUS as follows:

"GC 11.3 CERTIFICATE OF STATUS

11.3.1 The *Contractor* shall, upon execution of the Agreement, provide to the *Owner* a certificate of status from the Companies and Personal Property Security Branch of the Ontario Ministry of Government Services, or other ministry acceptable to the *Owner,* which indicates that the *Contractor* is an existing corporation and has not been dissolved."

SC 63 GC 12.1 READY-FOR-TAKEOVER

1. Delete subparagraphs 12.1.1.2 through to 12.1.1.8.

2. Delete subparagraph 12.1.2 in its entirety.

3. Add after the words "the *Work* is *Ready-for-Takeover*," in the subparagraph 12.1.3, "and where the *Consultant* requests"

4. Delete the word "comprehensive" in subparagraph 12.1.3 and replace with "updated".

SC 64 GC 12.2 EARLY OCCUPANCY BY THE OWNER

1. Delete GC 12.2 EARLY OCCUPANCY BY THE OWNER in its entirety.

SC 65 GC 12.3 WARRANTY

1. Delete paragraph 12.3.1 in its entirety and replace with the following:

   "Except for extended warranties as described in paragraph 12.3.6, the warranty period under the *Contract* is one year from the date when *Substantial Performance of the Work* has been attained, unless the *Contract Documents* otherwise provide."

2. Add to the beginning of paragraph 12.3.2, the following:

   "Subject to paragraph 3.14.1,"

3. Delete "one year" from paragraph 12.3.3.

4. Delete "one year" from paragraph 12.3.4.

5. Delete "one year warranty period as described in paragraph 12.3.1" from paragraph 12.3.6 and replace with the following:

   "warranty period"

6. Add new paragraphs 12.3.7, 12.3.8, 12.3.9, 12.3.10, 12.3.11, 12.3.12, 12.3.13, 12.3.14, 12.3.15, 12.3.16, 12.3.17 and 12.3.18 as follows:

   "12.3.7 Any material or equipment requiring excessive servicing during the warranty period (or free maintenance period, if applicable) shall be considered defective and the warranty shall be deemed to take effect from the time that the defect has been corrected so as to cause excessive servicing to terminate. Where an extended warranty is provided beyond the warranty period, and any material or equipment requires excessive servicing during the first fifteen percent (15%) of the extended warranty period (or free maintenance period, if applicable) the material or equipment shall be considered defective and the extended warranty shall be deemed to take effect from the time that the defect has been corrected so as to cause excessive servicing to terminate.

   12.3.8 The final payment certificate shall not relieve the *Contactor* from its responsibility under this GC 12.3 – WARRANTY.

   12.3.9 Following *Substantial Performance of the Work*, and without limiting the *Contractor's* warranty under this GC 12.3 WARRANTY, the *Contractor* shall assign to the *Owner*, to the extent assignable the benefit of all warranties and guarantees relating to the *Work*. The assignment shall expressly reserve the right of the *Contractor* to make any claims under such warranties and guarantees and such assignment shall in no way prejudice any rights of or benefits accruing to the *Contractor* pursuant to such warranties and guarantees.

12.3.10 The *Contractor* shall provide to the *Owne*r for the duration of the warranty period, a maintenance security the value of which shall be derived from the following table:

CONTRACT PRICE		**VALUE OF MAINTENANCE SECURITY $**
FROM $	**TO$**	
Less than $100,000.00		4 % of final *Contract Price*
$100,000.00	$499,999.99	$4,000.00 on first $100,000.00 + 3.0% on next $399,999.99
$500,000.00	$999,999.99	$16,000.00 on first $500,000.00 + 2.4% on next $499,999.99
$1,000,000.00	$1,999,999.99	$28,000.00 on first $1,000,000.00 + 2.2% on next $999,999.99
$2,000,000.00	$3,999,999.99	$50,000.00 on first $2,000,000.00 + 2.0% on next $1,999,999.99
$4,000,000.00	$5,999,999.99	$90,000.00 on first $4,000,000.00 + 1.8% on next $1,999,999.99
$6,000,000.00	$9,999,999.99	$126,000.00 on first $6,000,000.00 + 1.5% on next $3,999,999.99
$10,000,000.00 or Greater		$186,000.00 on first $10,000,000.00 + 1% on balance

12.3.11 The maintenance security, which is at no time a part of the statutory holdback, shall be retained by the *Owner* in increments from monies that would otherwise be payable to the *Contractor*, commencing during the latter part of the period of construction, so that by the date of *Substantial Performance of the Work* the full value of the required maintenance security has been retained.

12.3.12 Except as otherwise provided hereunder, the maintenance security, less any deductions made therefrom as provided for in the *Contract*, shall be paid to the *Contractor* following the issuance by the *Consultant* of a final certificate at the end of the warranty period, provided that all defects and deficiencies in the *Work* have been corrected by the *Contractor*. No interest shall be payable to the *Contractor* on such funds withheld in accordance with 12.3.10.

12.3.13 The *Contractor* may apply in writing to the *Owner* at the time of *Substantial Performance of the Work* to substitute for the monies retained as the maintenance security an alternative maintenance security of equivalent or greater value comprising:

.1 one or more irrevocable letters of credit, or

.2 another readily negotiable security.

12.3.14 Acceptance of any such alternative shall be at the discretion of the *Owner.*

12.3.15 Following receipt and acceptance of any such alternative, the *Owner* shall release to the *Contractor* the monies previously retained for maintenance security purposes.

12.3.16 The *Owner* may, in its discretion, allow the total maintenance security to be made up in part of monies retained under the *Contract* and in part of an alternative maintenance security as indicated in paragraph 12.3.13 above provided that the total value of such

parts, as determined by the *Owner*, shall be not less than the required value as derived from the table set out in paragraph 12.3.10 above.

12.3.17 Such alternative maintenance security or the monies derived therefrom, less any deductions made as provided for in the *Contract*, shall be released to the *Contractor* following the issuance by the *Consultant* of the final certificate at the end of the warranty period.

12.3.18 The *Contractor* will be responsible for extended warranty periods on equipment and materials as outlined in the *Specifications*. Warranties shall be provided for all inclusive replacement including all costs for labour and materials upon failure. Warranties shall be provided irrespective of the standard manufacturers, *Suppliers* and vendors' warranties and are in addition to the standard construction warranty of one year for general construction, materials and equipment."

SC 66 GC 13.1 INDEMNIFICATION

1. Delete GC 13.1 INDEMNIFICATION in its entirety and replace with the following:

"GC 13.1 INDEMNIFICATION

13.1.1 The *Contractor* shall indemnify, defend, and hold the *Owner*, including its elected officials, officers, employees, agents, affiliates and representatives (collectively referred to as the "Indemnified Party") harmless against any and all claims, demands, costs (including legal costs on a substantial indemnity basis), penalties, fines, fees, royalties, damages (including indirect, special, remote, and/or consequential damages) and causes of action, including, without limitation, proprietary or personal injury (including death) that arise from, either directly or indirectly, or relate to,

(a) the *Contractor*, its officials, directors, officers, employees, agents, affiliates, partners (general or limited), joint venturers, contractors, *Subcontractors*, and other representatives (collectively referred to as the "Indemnifying Party"), under this *Contract*,

(i) negligently carrying out any obligation to which it is subject,
(ii) failing to carry out any obligation to which it is subject,
(iii) negligently exercising any right to which it is entitled, or,
(iv) exercising any right to which it is entitled in a manner which is inconsistent with the terms and conditions of this *Contract*,

or any combination thereof, except to the extent that the same are caused by the negligence or deliberate wrong-doing of the Indemnified Party, or

(b) any patent, trademark, copyright infringement or other breach of any intellectual property right of any person, for which the Indemnifying Party is responsible.

13.1.2 The *Owner* shall notify the *Contractor* upon receipt of any such claim or demand that it receives. No settlement shall be made nor consent to judgment given without prior written approval of *Contractor* and its insurers, which approval shall not be unreasonably withheld.

13.1.3 The rights to indemnity contained herein shall survive the early termination or expiry of this *Contract*.

13.1.4 The *Owner* may enforce the rights of indemnity conferred on any Indemnified Party under this GC 13.1 on their behalf and to the same extent as if they were parties to this *Contract*.

13.1.5 The rights to indemnity provided for in this GC 13.1 shall be deemed to be in addition to any rights with respect to insurance in favour of the Indemnified Party provided in this *Contract*."

SC 67 GC 13.2 WAIVER OF CLAIMS

1. Delete GC 13.2 WAIVER OF CLAIMS in its entirety.

SC 68 GC 14 MISCELLANEOUS

1. Add new PART 14 MISCELLANEOUS as follows:

"PART 14 MISCELLANEOUS
GC 14.1 OWNERSHIP OF MATERIALS

14.1.1 All *Work* and *Products* delivered to the *Place of the Work* by the *Contractor* shall be the property of the *Owner*. The *Contractor* shall remove all surplus or rejected materials when notified in writing to do so by the *Consultant*.

GC 14.2 REVIEW BY OWNER AND REVIEW BY CONSULTANT

14.2.1 Neither the *Owner's* and/or *Consultant's* receipt, review or approval of any documents of the *Work* nor the failure of the *Owner* and/or *Consultant's* to provide comments shall limit, waive or diminish the *Contractor's* obligations, responsibilities, duties or liabilities under the *Contract*. The review or approval by the *Owner* and/or *Consultant* is intended only to ascertain that the document or the performance of the *Contractor's* duties, liabilities, responsibilities, or obligations under the *Contract* including, without limitation, the *Work* generally meets the intention of the *Contract* and is not an assurance or confirmation of the adequacy, quality, fitness, suitability or correctness of the *Contractor's* obligations, responsibilities, duties and liabilities under the *Contract* including without limitation, the *Work*, for which the *Contactor* is solely responsible in accordance with the *Contract*.

GC 14.3 USE AND/OR OCCUPATION OF COMPLETED PORTIONS OF THE WORK

14.3.1 Upon the *Owners'* request, the *Owner* shall, at any time or times, have the right of occupying and/or using any part of parts of the *Work* (including, without limitation, for the purposes of installing and testing fittings and equipment), whether partially performed or entirely complete, or whether completed on schedule or not, before the completion of the *Work*.

14.3.2 In the event the *Owner* desires to exercise the privilege of occupancy and/or use of the *Work* as provided above, the *Contractor* shall co-operate with the *Owner* throughout in making available for the *Owners'* use such building services, as heating, ventilation, cooling, water, lighting, and telephone for the space or spaces to be occupied and/or used and if the equipment required to furnish such services is not entirely completed at the time the *Owner* desires to occupy and/or use the aforesaid space or spaces, the *Contractor* shall make every reasonable effort to complete same as soon as possible to

the extent that the necessary equipment can be put into operation and use and any extra costs beyond that originally required to complete the *Work* arising from such early occupancy and/or use shall be borne by the *Owner.*

14.3.3 In the event that the *Owner* exercises the privilege of occupancy and/or use of the *Work* as provided above, it agrees to do so, as not to materially interfere with the respective work of the *Contractor*, *Subcontractors* or *Suppliers* and under the understanding that the *Owner* will be occupying premises within a construction site which will require compliance with all normal construction site requirements including, without limitation, health and safety requirements.

14.3.4 It shall be understood, however, that the *Owner's* occupancy and/or use of such space or spaces of the *Work* shall not constitute the *Owner's* acceptance of any *Work*, material or equipment which are not in accordance with the requirements of the *Contract Documents*, nor affect the warranty period under the *Contract* nor relieve the *Contractor* from his obligations, duties, responsibilities and liabilities to complete the *Work*, nor for responsibility for loss or damage due to or arising out of defects in, or malfunctioning of, any *Work*, material or equipment, nor from any other unfulfilled duties, liabilities, obligation or responsibilities under the *Contract* nor from any other duty, liability obligation or responsibility under the *Contract* including, without limitation, the *Contractors'* warranty obligation. If however, damage results from any act by the *Owner*, the *Owner* shall assume its share of the responsibility for such damage.

GC 14.4 NON-INTERFERENCE

14.4.1 The *Contractor* acknowledges that the *Place of the Work* is and will continue to be occupied by the *Owner* and the *Owner* will continue to carry out its normal operations at the *Place of the Work*. The *Contractor* agrees to perform the *Work* in the least intrusive manner possible. Without limiting the generality of the foregoing, the *Contractor* acknowledges and agrees that it shall carry out its duties, responsibilities, and obligations under the *Contract* in such a manner so as not to disrupt or interfere with any of the *Owner's* or any third party's existing facilities and ongoing operations or activities or other operations located in the area adjacent to, in the vicinity of or proximate to the *Place of the Work*.

GC 14.5 LIQUIDATED DAMAGES

14.5.1 It is expressly agreed by the parties that if the date of *Substantial Performance of the Work* occurs later than the *Substantial Performance Date,* the *Contractor* shall pay to the *Owner* liquidated damages calculated as ONE THOUSAND DOLLARS ($1,000.00) for each *Working Day* that *Substantial Performance of the Work* extends beyond the *Substantial Performance Date.*

14.5.2 It is expressly agreed that it is difficult to calculate the damages which would result from the *Contractor*'s failure to attain *Substantial Performance of the Work* by the *Substantial Performance Date* and the parties agree that the liquidated damages are not intended to be penalties but rather represent the parties' best estimate of damages resulting from the delay.

14.5.3 The *Owner* may deduct any amount due under this paragraph from any monies that may be due or payable to the *Contractor* on any account whatsoever. The liquidated damages payable under this paragraph are in addition to and without prejudice to any other remedy, action or other right that may be available to the *Owner*.

GC 14.6 CONTRACTOR DISCHARGE OF LIABILITIES

14.6.1 In addition to the obligations assumed by the *Contractor* pursuant to General Condition 3.6 – SUBCONTRACTORS AND SUPPLIERS, the *Contractor* agrees to discharge all liabilities incurred by it for labour, materials, services, *Subcontractors* and *Products*, used or reasonably required for use in the performance of the *Work*, except for amounts withheld by reason of legitimate dispute which have been identified to the party or parties, from whom payment has been withheld.

GC 14.7 CONTRACTOR EVALUATION

14.7.1 In accordance with the *Owner's* policy for vendor performance evaluation, the *Owner* will evaluate the performance of the *Contractor* with respect to the *Work* using the following criteria:

.1 general responsiveness of the work relationship;
.2 conformity of the work done, materials supplied and provision of services with the description of *Project* and *Specifications*;
.3 general dependability and quality of all work done and any goods or services supplied;
.4 timely performance;
.5 general conformity with the reasonable expectations of the *Owner* under the terms of the *Contract* in their entirety;
.6 supervision of subcontractors and the maintenance of an orderly, neat and secure job site;
.7 accuracy of carrying out instructions.

14.7.2 Where a performance review is conducted at *Final Completion of the Work*, the *Contractor's* performance shall be ranked by the *Owner* at one of the following standards:

.1 Unacceptable (performance well below the general standard); or
.2 Satisfactory (performance in accordance of general standard).

14.7.3 Where at a performance review carried out prior to the completion of the *Contract*, one or more criteria of assessment are ranked as unacceptable:

.1 the parties shall agree at the time of the conduct of the review or within ten (10) *Working Days* thereafter, on the measures to be taken by the *Contractor* during the ensuing *Contract* review period to improve its performance to at least a good standard;
.2 within ten (10) *Working Days* of agreeing on those measures, the *Contractor* shall confirm in writing that the measures in question have been implemented.

14.7.4 Where the *Contractor* fails or refuses to implement measures as provided in paragraph 14.7.3, it shall be deemed to be in default under the *Contract*, and the *Owner* may take such remedies as provided for in the *Contract Documents* or are otherwise available at law or in equity.

14.7.5 Where the unsatisfactory performance of the *Contractor* is not corrected as required under this section, that performance may be taken into account by the *Owner* with respect to the award of any future contract to the *Contractor*.

GC 14.8 RECORDS/DAILY REPORTS/DAILY LOGS

14.8.1 The *Contractor* shall maintain and keep accurate *Project* records (which means all tangible records, documents, computer printouts, electronic information, books, plans, *Drawings*, *Specifications*, accounts or other information relating to the *Work*) in its head office in accordance with requirements of *Applicable Laws*, but in any event for not less than four (4) years from *Substantial Performance of the Work* or until all claims have been settled. During this time, the *Contractor* shall allow the *Owner* access to the *Project* records during normal business hours upon the giving of reasonable notice. The *Contractor* shall ensure that equivalent provisions to those provided herein are made in each subcontract and shall require the *Subcontractor*s and *Suppliers* to incorporate them into every level of contract thereunder for any part of the *Work*.

GC 14.9 ONTARIANS WITH DISABILITIES ACT, 2001 (ODA) AND THE ACCESSIBILITY FOR ONTARIANS WITH DISABILITIES ACT, 2005 (AODA)

14.9.1 The *Contractor* shall ensure that all of its employees, agents, volunteers and any *Subcontractors* comply with all applicable accessibility laws, regulations and by-laws, including but not limited to the Ontarians with Disabilities Act, 2001 (ODA), the Accessibility for Ontarians with Disabilities Act, 2005 (AODA), Ontario Regulation 429/07 (Accessibility Standards for Customer Service) and Ontario Regulation 191/11 (Integrated Accessibility Standards), during the term of the *Contract*.

14.9.2 Without limiting the generality of the foregoing, the *Contractor* shall ensure that all of its employees, agents, volunteers and any *Subcontractors* who, as part of the *Contract*:

(a) deal with members of the public or other third parties, or
(b) participate in developing policies, practices and procedures governing the provision of goods or services to members of the public or other third parties,

receive training about the provision of its goods or services to persons with disabilities. The *Contractor* shall ensure that such training includes, without limitation, a review of the purposes of the AODA and the requirements of Ontario Regulation 429/07.

14.9.3 Prior to commencing the *Work*, the *Contractor* shall provide a Statement of Acknowledgement to the City of Hamilton that it has read and understands the City of Hamilton's AODA Integrated Accessibility Standards and Customer Service Standard Handbook; that it has provided the training required by said Handbook; and that it will comply with the requirements of said Handbook and applicable accessibility laws, regulations and by-laws.

14.9.4 The *Owner* and the City of Hamilton reserve the right to inspect the *Contractor's* training records relating to Ontario Regulation 429/07 and Ontario Regulation 191/11, which must describe its training policy and summarize the training, including to whom the training has been given and when the training was given. The *Owner* and the City of Hamilton also reserve the right to require the *Contractor* to amend its training policies, practices and procedures if the *Owner* or the City of Hamilton deems the training is not compliant with the requirements of Ontario Regulation 429/07 and Ontario Regulation 191/11.

See City of Hamilton's AODA Integrated Accessibility Standards and Customer Service Standard Handbook at:

https://www.hamilton.ca/people-programs/equity-diversity-inclusion/accessibility-services/accessibility-guidelines-policies#policies-procedures

GC 14.10 SET-OFF

14.10.1 The parties agree that the *Owner* has the contractual right to set-off against any amounts owing by the *Owner* to the *Contractor* under this *Contract*, any amount owed to the *Owner* by the *Contractor*, whether such amount arises from this *Contract* or under any other contract between the *Owner* and the *Contractor*, irrespective of whether or not those contracts are related or arise at equity or law. This right of set-off shall be subject to the Construction Act, as applicable.

14.10.2 The costs to the *Owner* of sending or publishing any notice or document required by the Construction Act shall constitute damages to the *Owner* and may be retained by the *Owner* in accordance with its set-off rights."

Project Specific Supplementary Conditions to Contract CCDC 2-2020
Dated: January 26, 2023

These Project Specific Supplementary Conditions presuppose the use of the Standard Construction Document CCDC 2-2020 Stipulated Price Contract, English version. These "Project Specific Supplementary Conditions" void, supersede or amend the "Agreement", "Definitions", "General Conditions" and "Supplementary Conditions" as hereinafter provided, as the case may be.

GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

Where a General Condition or paragraph of the General Conditions of the Stipulated Price Contract is deleted by these Project Specific Supplementary Conditions, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the numbering of the deleted item will be retained, unused, unless noted otherwise.

PSSC 1. GC 3.4 CONSTRUCTION SCHEDULE

1. Add new paragraph 3.4.11 to SC19 of the Supplementary Conditions as follows:

   "3.4.11 The *Work* under this *Contract* must achieve *Substantial Performance of the Work* by **August 15, 2025.**

PSSC 2. GC 3.8 SHOP DRAWINGS

1. Add after "SHOP DRAWINGS" in the title of GC 3.8, the following:

   "AND OTHER SUBMITTALS"

2. Add new paragraph 3.8.13 as follows:

   "3.8.13 As the *Work* progresses, the *Contractor* shall keep a complete and accurate record of all changes or deviations from the *Contract Documents* and *Shop Drawings*, indicating the *Work* as actually installed. At the completion of the *Work*, the *Contractor* shall certify by endorsement thereof, that each of the revised prints of the *Drawings* and *Specifications* are complete and accurate. Prior to the *Contractor*'s application for final payment, the record *Drawings* and *Specifications*, arranged in proper order, indexed and endorsed, and in the following form, shall be delivered to the *Owner*, namely:
   .1 three (3) complete sets of reproducible final versions of the *As-Built Drawings*; and
   .2 three (3) copies of the final versions of the *As-Built Drawings* in digital format in both AutoCAD and PDF formats (latest version of software)."

PSSC 3. GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK

1. Delete paragraph 5.4.3 in its entirety and replace with the following:

   "5.4.3 Prior to the issuance of the certificate of *Substantial Performance of the Work*, the *Contractor*, in consultation with the *Consultant*, shall establish reasonable dates for finishing the *Work* and correcting deficiencies."

2. Add new paragraphs 5.4.7, 5.4.8, 5.4.9, 5.4.10.and 5.4.11 as follows:

   "5.4.7 Within seven (7) calendar days of receiving a copy of the certificate of *Substantial Performance of the Work* signed by the *Consultant*, the *Contractor* shall publish a copy of the certificate in accordance with the *Construction Act*) and shall provide to the *Consultant* and the *Owner* the date of publication and the name of the construction trade newspaper in which the publication occurred. If the *Contractor* fails to comply with this provision, the *Owner* may publish a copy of the certificate and charge the *Contractor* with the costs so incurred.

5.4.8 In addition to the prerequisites identified in paragraph 5.4.2, prior to submitting its written application for *Substantial Performance of the Work*, the *Contractor* shall submit to the *Consultant* all:

.1 guarantees;
.2 warranties;
.3 certificates;
.4 testing and balancing reports;
.5 distribution system diagrams;
.6 spare parts;
.7 operations and maintenance manuals which shall consist of three (3) hard copies and three (3) digital copies (on CD or DVD) and shall be well-organized and tabbed for ease of reference;
.8 samples;
.9 existing reports and correspondence from *Authorities Having Jurisdiction* in the *Place of the Work*; and

other materials or documentation required to be submitted under the *Contract*, together with written proof acceptable to the *Owner* and the *Consultant* that the *Work* has been substantially performed in conformance with the requirements of all *Governmental Authority* and utility authorities having jurisdiction in the *Place of the Work*.

5.4.9 Where the *Contractor* is unable to deliver the documents and materials described in paragraph 5.4.2 and 5.4.8, then, provided that none of the missing documents and materials interferes with the use and occupancy of the *Project* in a material way, the failure to deliver shall not be grounds for the *Consultant* to refuse to certify *Substantial Performance of the Work*. If the *Contractor* fails to deliver any of the materials required in subparagraphs 5.4.8.7 or 5.4.8.8, the *Consultant* may retain a reasonable amount or, where applicable, the amount specified in the Project Specific Supplementary Conditions from the payment of holdback under General Condition 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK. Should any documents or materials not be delivered in accordance with paragraph 5.4.2 by the earlier of sixty (60) calendar days following publication of the certificate of *Substantial Performance of the Work* and the submission of the *Contractor's* application for final payment under paragraph 5.5.1 of GC 5.5 – FINAL PAYMENT, then the amount previously retained pursuant to this provision shall be forfeited to the *Owner* as compensation for the damages deemed to have been incurred by the *Owner*, and not as a penalty, arising from the failure to deliver the documents or materials, and the *Contract Price* shall be reduced accordingly.

5.4.10 Together with the submission of its written application for *Substantial Performance of the Work*, the *Contractor* shall submit to the *Consultant* and to the *Owner* a *Statutory Declaration* setting forth in reasonable detail any then outstanding and unresolved disputes or claims between the *Contractor* and any *Subcontractor* or *Supplier,* including any claims allegedly arising from delay, which are, directly or indirectly, related to any then outstanding or anticipated disputes or claims between the *Contractor* and the *Owner,* and this disclosure shall, at a minimum:

.1 identify the parties involved;
.2 identify the amount in dispute;
.3 provide a brief statement summarizing the position of each party;
.4 include copies of any correspondence or documents in support of either party's position;
.5 include copies of any documents of any court or arbitration process related to the matter;
.6 identify the dispute or claim between the *Contractor* and the *Owner* to which the matter relates; and
.7 include a copy of any written agreement or a summary of any oral agreement between the parties related to resolution of the matter.

The disclosure requirements detailed herein are of a continuing nature and survive completion of the *Work*. Accordingly, the *Contractor* shall supplement the information provided with the original *Statutory Declaration* with additional materials pertaining to new or

existing disputes or claims, as they become available. The *Contractor* shall not be entitled to recover from the *Owner* any amount pertaining to any claim or dispute referred to in this paragraph, if the provisions of this paragraph have not been fully complied with. For greater certainty, the *Contractor* is not obliged to make the aforementioned disclosure with respect to any dispute or claim that is not related to or does not touch upon any then outstanding and unresolved dispute or claim between the *Contractor* and the *Owner*.

5.4.11 Prior to the issuance of the certificate of *Substantial Performance of the Work,* the *Commissioning* of the *Work* must be successfully completed and the associated submittals evidencing same must be provided by the Contractor to the *Consultant* in order for the *Consultant* to verify that the *Project* is ready to use and/or is being used for its intended purpose."

PSSC 4. GC 5.10 WITHHOLDING OF PAYMENT

1. Add new paragraph 5.10.1 as follows:

5.10.1 The *Consultant* may withhold from the *Contractor*, a minimum of FIVE THOUSAND DOLLARS ($5,000.00) from any final payments pending submission and approval of all *Project* close-out documentation including operations & maintenance manuals, *As-Built Drawings*, warranty information, training of staff, and confirmation of any materials to be left on-site for future repairs."

PSSC 5. FAIR WAGE POLICY

1. All references to the *Fair Wage Policy* shall only apply to the *Contract* where the *Contract Price* is FIVE HUNDRED THOUSAND DOLLARS ($500,000.00) or greater.

PSSC 6. GC 11.1 INSURANCE

1. Delete GC 11.1.1.4 as set out in SC60 of the Supplementary Conditions and replace with the following:

.4 Property Installation Floater (All Risks) Insurance in an amount to adequately insure the *Contractor's* ownership interest in equipment and materials. The coverage shall provide for the full replacement value of the property, repairs, additions or equipment being installed, handled, or stored on or off premises awaiting installation and while in transit.

If the Property Installation Floater (All Risks) Insurance does not provide transportation coverage, separate Motor Truck Cargo or Transportation (All Risks) Insurance is to be provided for materials or equipment transported in the *Contractor's* vehicles or others hired by the *Contractor* from place of receipt to building sites or other storage sites."

PSSC 7. GC 11.1 INSURANCE

1. Add new paragraph 11.1.1.6 to SC60 of the Supplementary Conditions as follows:

.6 Contractor's Pollution Liability having an inclusive limit of not less than $1,000,000 per occurrence to insure the *Contractor's* liability for third-party claims caused by pollution events arising out of operations performed by or on behalf of the insured in the performance of the *Work* under the *Contract.* The insurance coverage shall remain in effect throughout the time that the *Contract* is in effect, including the warranty period."

PSSC 8. GC 13.5 LIQUIDATED DAMAGES

1. 13.5.1 and replace with the following:

"FIVE HUNDRED DOLLARS ($500.00)"

Appendix A Specifications and Drawings

Specification for

Macassa Lodge Space & Domestic Hot Water (DHW) Heating Boilers Upgrade

At

701 Upper Sherman Ave

Hamilton, ON

Tender No: C13-20-24

May 2024

Prepared On Behalf Of:

City of Hamilton

Hamilton

Prepared by:

EFFICIENCY ENGINEERING .COM
A Kontrol Technologies Company

Cambridge, Ontario

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1.0 GENERAL

1.1 REFERENCES
- .1 Canadian Construction Documents Committee (CCDC)
  - .1 CCDC 2-2020: Stipulated Price Contract.
- .2 Terminology
  - .1 Throughout this document several contact people, personnel, or labels are used and shall be defined as follows:
    - .1 Engineer or Consultant: Efficiency Engineering Inc.
    - .2 Owner – City of Hamilton

1.2 RELATED SECTIONS
- .1 Section 01 14 00 – Work Restrictions

1.3 WORK COVERED BY CONTRACT DOCUMENTS
- .1 See Drawings outlining the Work and additional Bid Documents.

1.4 CONTRACT METHOD
- .1 Construct Work under stipulated price contract, CCDC-2-2020.
- .2 Assume role and responsibility as Constructor as defined in the Occupational Health and Safety Act and fulfill all associated obligations.
- .3 Employ subcontractors assigned as identified in this document.

1.5 WORK BY OTHERS
- .1 Co-operate with Subcontractors in carrying out their respective works and carry out instructions from Consultant, Engineers, and Owner's Representative.
- .2 Co-ordinate Work of Subcontractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Engineer, in writing, any defects which may interfere with proper execution of Work.

1.6 WORK SEQUENCE
- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction.
- .2 Co-ordinate Progress Schedule to achieve the required completion stages.
- .3 Maintain fire access/control throughout the duration of the Work.

1.7 MILESTONES
- .1 Refer to Section 00 01 01

1.8 CONTRACTOR USE OF PREMISES
- .1 Limit use of premises for Work, for storage, and for access in designated areas only as applicable to allow:
  - .1 Owner and tenant occupancy.

.2 Storage may be provided, but cannot be counted on for the purposes of Bidding. Where available on-site storage shall be coordinated with the Owner's Site Representative prior to commencement of the Work.

.2 Co-ordinate use of premises under direction of Owner or Consultant as directed during the Pre-Construction Meeting.

.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 the Engineer.

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

1.9 OWNER OCCUPANCY

.1 Owner and tenants will occupy premises during entire construction period for execution of normal operations.

.2 Co-operate with Owner and tenants in scheduling operations to minimize conflict and to facilitate Owner usage.

1.10 EXISTING BUILDING OPERATIONS AND SERVICES

.1 Conform to requirements of Section 01 14 00 – Work Restrictions for requirements of service interruptions, and minimizing impact on existing building operations.

1.11 DOCUMENTS REQUIRED

.1 Maintain at job site, one copy each document as follows:

.1 Building Permit and Permit Drawings
.2 Ministry of Labour Notice of Project
.3 Contract Drawings.
.4 Specifications.
.5 Addenda.
.6 Reviewed Shop Drawings.
.7 List of Outstanding Shop Drawings.
.8 Change Orders.
.9 Other Modifications to Contract.
.10 Field Test Reports.
.11 Copy of Approved Work Schedule.
.12 Health and Safety Plan and Other Safety Related Documents.

1.12 QUALITY CONTROL

.1 Regulatory Requirements

.1 Materials and workmanship shall be in accordance with requirements and recommendations of applicable rules, regulations, standards and codes as specified hereunder. All products shall bear a certification label of CSA, CGA, TSSA, ULC, or ESA, as applicable.

.1 ESA Electrical Safety Code (Canadian Electrical Code and Electrical Safety Authority Supplements)
.2 Canadian Standards Association (CSA)
.3 Underwriter's Laboratories of Canada (ULC)
.4 Ministry of Health (MOH)
.5 Ontario Building Code (OBC)
.6 Ontario Fire Code (OFC)
.7 Boards, Services, Companies or other Authorities having jurisdiction
.8 Technical Standards and Safety Authority (TSSA)

.2 Project Manager
.1 The Contractor shall assign an experienced and competent project manager who shall be responsible for this project from beginning to completion. This person shall act as the Owner's and Engineer's contact to the Contractor, and shall not be changed without significant reason and prior notification and agreement of the Owner.

.3 Inspection of the Work
.1 The Owner or Engineer shall be entitled to inspect the Work at any time. Prior to completion of the Work or installation of pipe insulation, the Contractor shall request that the Engineer inspect the Work.

.4 Labour
.1 The Work shall be performed by persons experienced and skilled in the Work. The Contractor shall provide effective supervision of the Work. The hours of work, wages paid, terms of employment, and working conditions shall conform to labour agreements and all applicable legislation and guidelines issued from time to time by the Ontario Ministry of Labour and governing authorities.
.2 The Contractor may assign or subcontract any part of the Contract. However, all subcontractors and their contribution shall be clearly identified upon award of Contract. After award of the Contract, the Contractor shall neither assign nor sub-contract any part of the Contract without the prior written consent of the Engineer. Every subcontract entered into by the Contractor shall adopt all of the terms and conditions of the Contract.
.3 The Contractor shall be responsible to the Owner for the acts and omissions of its subcontractors and suppliers, and of persons directly or indirectly employed by them. Nothing contained in the Contract shall create any contractual relationship between any Subcontractor or supplier and the Owner.

.5 Materials Supplied
.1 The Contractor shall supply only new materials and components for the Work. Used, re-manufactured, or rebuilt components shall not be used except as expressly permitted herein.
.2 Products shall be provided with complete documentation. Undocumented products must be tagged and accepted by the Engineer prior to installation. Do not install undocumented products without such acceptance.
.3 All products and materials shall be new, clean, and free of defects, damage and corrosion.
.4 Ship and store products and materials in a manner that will protect them from damage, weather, and entry of debris. Do not install damaged items, but take immediate steps to obtain replacement or repair.

.6 Changes in the Work
  .1 Change orders shall be issued and fees adjusted only where the Owner makes a significant change in the project scope as outlined herein. Extras shall not be granted due to the Contractor's unfamiliarity with the site, or due to the Contractor's lack of thorough investigation prior to bid submission. Any additions to the Work under this contract shall conform to all construction standards and conditions laid out herein, whether or not such conditions are expressly stated in the Owner's acceptance of the addition(s).
  .2 The Contractor shall not proceed with Work in addition to the Contract Documents until the formal change process has been completed.
  .3 Refer to the Supplementary Conditions included in the Tender documents for further details regarding changes in the Work.

1.13 HEALTH AND SAFETY REQUIREMENTS
.1 File Notice of Project with Provincial authorities prior to beginning of Work and post notice at the site as required.
.2 Perform site specific safety hazard assessment related to project.
.3 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.
.4 Engineer may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
.5 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.
.6 Comply with Ontario Health and Safety Act, R.S.O.
.7 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province.
.8 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
.9 Contractor's site Supervisor shall complete a hot work permit for each day where work will involve welding, cutting, and other activities that generate heat and sparks which could present a fire hazard. Refer to Tender documents for a copy of the hot work permit that will be required to be filled out. Also coordinate with Owner's Building Attendant to arrange for fire alarm system settings.

2.0 PRODUCTS
.1 Section not used.

3.0 EXECUTION

.1 Section not used.

End of 01 11 00

01 14 00 – Work Restrictions

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 This Section specifies administrative procedures associated with connecting to existing services and special scheduling requirements for the project.

1.2 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.3 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Owner and Consultant to facilitate work as stated.

.2 Maintain existing services to building and provide for personnel and vehicle access.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Owner's Site Representative, where available, will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean, otherwise the Contractor will be responsible to clean it and will lose the use of this amenity.

.5 Use only service elevators in building for moving materials. Personnel may use other elevators at off-peak traffic times.

.1 Protect walls of passenger elevators prior to use where freight elevators do not exist.

.2 Accept liability for damage, safety of equipment and overloading of existing equipment.

.6 Closures: protect work temporarily until permanent enclosures are completed.

1.4 CONTINUITY OF SERVICE

.1 Where equipment and systems are normally required to operate through the course of the Work, notify the Owner and Consultant at least 72 hours in advance for necessary interruption of mechanical or electrical service throughout course of Work.

.2 Keep duration of interruptions to a minimum.

1.5 SPECIAL REQUIREMENTS

.1 Carry out noise, dust, debris, or odour-generating Work Monday to Friday from 9:00 to 18:00 only.

.2 Submit schedule in accordance with Project requirements, identifying the interruption periods.

.3 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.4 Keep within limits of Work and avenues of ingress and egress.

.5 Contractor vehicle parking and delivery vehicle and staging areas shall be coordinated by the Contractor with Owner's Site Representative.

.6 Deliver materials outside of peak traffic hours 8:00 to 10:00 and 16:00 to 18:00 unless otherwise approved by the Owner's Site Representative.

.7 Fire Alarm Bypass

.1 Where bypass of the Fire Alarm panel or any zoned section is required to execute the Work, the Contractor shall coordinate such Work with the Owner's Site Representative and shall provide the necessary labour to provide fire watch during the affected periods.

1.6 BUILDING SMOKING ENVIRONMENT

.1 Smoking is not permitted in any area of the building or in any interior court yards without direct access to leave the property.

.2 Smoking is not permitted within 9 metres of the building.

.3 The Contractor's personnel choosing to smoke at any location on the property further than 9 metres from the building shall properly dispose of all cigarette butts, waste, or packing in a designated receptacle or off of the property.

2.0 PRODUCTS

.1 Section not used.

3.0 EXECUTION

.1 Section not used.

End of 01 14 00

01 29 00 – Payment Procedures

1.0 GENERAL

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2020, Stipulated Price Contract.

1.2 APPLICATIONS FOR PROGRESS PAYMENT

.1 Refer to CCDC 2-2020 GC 5.2.

.2 Make applications for payment on account monthly as Work progresses.

.3 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date. The Contractor shall not attempt to pre-bill for Work expected to be completed between the invoice issue date and expected payment date. All Work included in the progress draw must be complete on the day the invoice is issued.

.4 Submit to Consultant, at least 14 days before first application for payment. Schedule of values for parts of Work, aggregating total amount of Contract Price, to facilitate evaluation of applications for payment.

.5 Provide WSIB certificate with each Application for Progress Payment.

1.3 SCHEDULE OF VALUES

.1 Refer to CCDC 2 2020 GC 5.2.

.2 Provide schedule of values in an electronic spreadsheet format supported by evidence, and upon acceptance by the Engineer shall be used as basis for applications for payment.

.3 Include statement based on schedule of values with each application for payment.

.4 Support claims for products delivered to Place of Work but not yet incorporated into Work by such evidence as Engineer may reasonably require to establish value and delivery of products.

1.4 PROGRESS PAYMENT

.1 Refer to CCDC 2 2020 GC 5.2.

.2 Consultant will issue to Owner, no later than 10 days after receipt of an application for payment, certificate for payment in amount applied for or in such other amount as Engineer determines to be due. If Engineer amends application, written notice will be given stating reasons for amendment.

.3 Submit proof of workers' compensation clearance with each application for payment.

1.5 SUBSTANTIAL PERFORMANCE OF WORK

.1 Prepare and submit to Consultant comprehensive list of items to be completed or corrected and apply for a review by Engineering disciplines to establish Substantial Performance of Work.

.2 No later than 14 days after receipt of list and application, Engineer will review Work to verify validity of application, and no later than 7 days after completing review, will notify Contractor if Work or designated portion of Work is substantially performed.

.1 Upon successful declaration of Substantial Performance of Work or designated portion of Work Engineer will state the date of Substantial Performance of Work in reference to the Contract Documents in the certificate.

.3 Immediately following issuance of certificate of Substantial Performance of Work, in consultation with Engineer establish reasonable date for finishing Work.

1.6 PAYMENT FOR PRODUCTS STORED OFF SITE

.1 *Owner* may, due to extraordinary circumstances and at *Owner*'s sole discretion, make payments for *Products* delivered to and stored at a location other than *Place of the Work*, subject to:

.1 a request submitted by *Contractor* in writing, with appropriate justification, and

.2 whatever conditions *Owner* or *Consultant* may establish for such payments, as required to protect *Owner*'s interests.

1.6 PAYMENT OF STATUTORY HOLDBACK

.1 After issuance of certificate of Substantial Performance of Work:

.1 Submit application for payment of holdback amount.

.2 After receipt of application for payment, upon expiry of the 60 day Statutory Lien Period, and providing all deficiencies and remaining work have been completed, the Engineer will issue certificate for payment of holdback amount.

.3 Amount authorized by certificate for payment of holdback amount is due and payable on day following expiration of holdback period stipulated in lien legislation applicable to Place of Work. Owner may retain out of holdback amount sums required by law to satisfy liens against Work or, if permitted by lien legislation applicable to Place of Work, other third party monetary claims against Contractor which are enforceable against Owner.

.4 If portions of the Work remain outstanding on the date that the Statutory Holdback amount becomes due, the Engineer will assess the Work and will recommend an amount to the Owner that should be retained as a Performance Holdback.

1.7 FINAL PAYMENT

.1 Refer to CCDC 2 2020 GC 5.7.

.2 Submit application for final payment when Work is completed.

.3 Engineer will, no later than 10 days after receipt of application for final payment, review Work to verify validity of application. Engineer will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.

.4 Engineer will issue final certificate for payment when application for final payment is found valid.

2.0 PRODUCTS

.1 Section not used.

3.0 EXECUTION

.1 Section not used.

End of 01 29 00

01 33 00 – Submittal Procedures

1.0 GENERAL

1.1 RELATED SECTIONS
- .1 01 78 00 – Closeout Submittals
- .2 01 91 51 – Operations and Maintenance Manual

1.2 ADMINISTRATIVE
- .1 Submit to Engineer 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 Imperial units.
- .4 Review submittals prior to submission to Engineer. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Engineer, 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 coordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Engineer's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer’s review.
- .10 Keep one reviewed copy of each submission on site with all other required site Project Documents.

1.3 SHOP DRAWINGS AND PRODUCT DATA
- .1 Refer to CCDC 2-2020, the Supplementary Conditions to Contract CCDC 2-2020, and the Project Specific Supplementary Conditions to Contract CCDC 2-2020 included in the Tender documents.
- .2 As defined in CCDC 2-2020, the term "Shop Drawings" includes 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.
- .3 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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 7 days for Engineer's review of each submission.
- .5 Adjustments made on shop drawings by Engineer are not intended to change Contract Price or Contract Time. If adjustments affect value or schedule of Work, state such in writing to prior to proceeding with Work.
- .6 Make changes in Shop Drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in triplicate, containing:

.1 Date.
.2 Project title and number.
.3 Building Name and Address
.4 Contractor's name and address.
.5 Identification and quantity of each shop drawing, product data and sample.
.6 Other pertinent data.

.8 Submissions include:
.1 Date and revision dates.
.2 Project title and number.
.3 Name and address of:
.1 Subcontractor.
.2 Supplier.
.3 Manufacturer.
.1 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
.2 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.

.9 Where documentation lists multiple models or other similar equipment the submission must identify the exact model and optional features submitted. Submittals failing to identify the exact specific features will be considered rejected. The Contractor shall resubmit and the associated time delays will not be cause to extend the project completion dates.

.10 After Engineer's review, distribute copies.

.11 Preferred Submission Method:
.1 The Contractor may choose to submit shop drawings electronically. This method of submission is accepted in the interest of time and to reduce the amount of paper consumed.
.2 The Contractor shall attempt to submit as many Shop Drawings to Engineer at the same time as possible, provided it doesn't cause delays or impact the project schedule.

.12 Alternate Acceptable Submission Method:
.1 Submit three (3) hardcopy prints of shop drawings for each requirement requested in specification Sections and as Engineer may reasonably request.

.13 Upon request additional submittals of manufacturer's literature or written declarations of performance shall be provided.
.1 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Engineer.
.2 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Engineer.

.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.

.3 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Engineer.

.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.

.4 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Engineer.

.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.

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

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

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

.14 Delete information not applicable to project.

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

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

1.4 CERTIFICATES

.1 Immediately after award of Contract, submit requested documentation by Owner, including but not limited to Workplace Safety and Insurance Board clearance certificate and certificates of insurance.

1.5 STARTUP AND OPERATIONAL REPORTS

.1 Manufacturer's startup and operational testing and balancing reports shall be included in the Operations and Maintenance Manual as identified in Section 01 91 51 – Operations and Maintenance Manual. However, they shall be provided to the Engineer for review as soon as possible after completing the test or startup procedure.

.2 Submit to Engineer all equipment startup, test, balancing, and any other operating reports within 14 days of completion of startup or testing activity.

.3 Such reports will be accepted electronically for the initial submission.

2.0 PRODUCTS

.1 Section not used.

3.0 EXECUTION

.1 Section not used.

End of 01 33 00

01 61 00 – Common Product Requirements

1.0 GENERAL

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)
  .1 CCDC 2-2020, Stipulated Price Contract.
.2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
.4 If there is question as to whether products or systems are in conformance with applicable standards, Engineer reserves right to have such products or systems tested to prove or disprove conformance.
.5 Cost for such testing will be borne by the Contractor.

1.2 QUALITY

.1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
.2 Acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
.3 Defective products will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
.4 Should disputes arise as to quality or fitness of products, decision rests strictly with Engineer based upon requirements of Contract Documents.
.5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Engineer of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
.2 In event of failure to notify Engineer at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Engineer reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
.3 Store products subject to damage from weather in weatherproof enclosures.
.4 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.5 Remove and replace damaged products at own expense and to satisfaction of Engineer.
.6 Touch-up damaged factory finished surfaces to Engineer's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION
.1 Pay costs of transportation of products required in performance of Work.

1.6 MANUFACTURER'S INSTRUCTIONS
.1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
.2 Notify Engineer in writing, of conflicts between specifications and manufacturer's instructions, so that Engineer will establish course of action.
.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Engineer to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK
.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.
.2 Do not employ anyone unskilled in their required duties. Engineer reserves right to require dismissal from site, workers deemed incompetent or careless.

1.8 CONCEALEMENT
.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
.2 Before installation inform Engineer if there is interference.

1.9 REMEDIAL WORK
.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

2.0 PRODUCTS

.1 Section not used.

3.0 EXECUTION

.1 Section not used.

End of 01 61 00

01 73 29 – Cutting and Patching

1.0 GENERAL

1.2 SCOPE OF WORK

.1 This Section shall apply for openings required in existing construction or where sleeves for mechanical services have been omitted in new construction in error.

.2 Include for all cutting and patching for all mechanical services for holes and openings with dimensions up to 200mm (8 in.) in size and related patching.

2.0 PRODUCTS

2.1 MATERIALS

.1 All products and materials required for Work under this and related sections shall be of a quality and type consistent and compatible with existing building materials affected by the cutting and patching activities.

.2 All services and materials used for the cutting and patching shall be carried out by professional workers experienced in the cutting and patching work to be done.

3.0 EXECUTION

3.1 INSTALLATION

.1 Locate all openings in non-structural elements requiring cutting and patching in cooperation with Division 23 and 26 requiring the openings.

.2 Cut all openings no larger than is required for the services.

.3 Locate all openings in structure elements requiring cutting and patching and conduct a full-depth scan of the affected building structure prior to cutting or core drilling of existing structure. Make adjustments to location of openings as required to minimize cutting of rebar and completely avoid electrical conduit.

.1 Cut holes through slabs only.

.2 Do not cut holes through beams.

.3 Holes to be cut are 200mm (8 in.) diameter or smaller only.

.4 Maintain at least 100mm (4 in.) clear from all beam faces. Space at least 3-hole diameters on Centre.

.5 For holes that are required closer than 25% of slab span from the supporting beam face, use cover meter above the slab to clear slab top bars.

.6 For holes that are required within 50% of slab span, use cover meter underside of slab to clear slab bottom bars.

.4 Perform coring, drilling, and any other loud Work carrying the potential to impact building operations at a time acceptable to the Owner.

.5 Patch all openings after services have been installed to match the surrounding finishes, including colour-matched painting.

END OF 01 73 29

01 74 03 – Cleaning Requirements

1.0 GENERAL

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2020, Stipulated Price Contract.

1.2 PROJECT CLEANLINESS

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

.2 Remove all waste materials from site at daily regularly scheduled times or dispose of as directed by the Owner. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 The Owner's existing on-site waste and recycling containers shall not be used for collection of waste materials and debris from the Work.

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

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

.7 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.8 Use only non-toxic, and non-hazardous cleaning materials, and 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.

1.3 PROTECTION OF FINISHES AND EQUIPMENT

.1 Fixtures, equipment, and all existing finishes shall be properly protected from damage during the construction period and shall be cleaned and polished in accordance with manufacturer's directions.

.2 Cover and protect all existing carpet, walls, door frames, and all other finishes that may be damaged by the Work or in delivering equipment to the location of Work.

.3 Motors and equipment bearings shall be protected with plastic sheets, tied or taped in place.

.4 Aluminum fin heating or cooling elements shall be protected with cardboard covers.

.5 During construction protect all services and equipment from dirt and debris, by using temporary caps over the open ends of pipes, ductwork, and equipment connections.

.6 All equipment installed or stored on site shall be maintained in accordance with manufacturers recommended instructions (i.e. rotate shafts on fans, pumps, etc).

.7 Refinish and restore to the original condition and appearance all mechanical equipment which has sustained damage to the manufacturer's prime and finish coats of enamel or paint. Materials and workmanship shall be equal to the manufacturers original.

1.4 SHIFT REQUIREMENTS OCCUPIED SPACES

.1 During and at the end of each shift of Work the Contractor shall perform the following to protect existing finishes, fixtures, and furnishings.

.1 Cover and protect all desks, furniture, fixtures, et al from debris or damage with a 6 mil polyethylene tarpaulin or other suitable means.

.2 Limit moving of furniture to only those locations where it is absolutely necessary to complete the Work. If any object is move ensure that it is restored to its exact original location.

.3 Vacuum or sweep and mop clean all floors made dirty or covered in debris by the Work at the end of each shift.

1.5 FINAL CLEANING

.1 Refer to CCDC 2-2020, the Supplementary Conditions to Contract CCDC 2-2020, and the Project Specific Supplementary Conditions to Contract CCDC 2-2020 included in the Tender documents.

.2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.4 Prior to final review remove surplus products, tools, construction machinery and equipment.

.5 Remove waste products and debris other than that caused by Owner.

.6 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.

.7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls floors.

.8 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.10 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.11 Failure to clean – should cleaning by contractor not be sufficient or acceptable to Engineer or Owner, especially regarding paths of travel, Owner may engage a cleaning service to perform cleaning and deduct costs for such cleaning from sums owed to the Contractor.

1.6 WASTE MANAGEMENT

.1 Separate and dispose of construction waste in compliance as required, including Owner requirements, applicable laws, regulations, orders and ordinances, codes, standards, and practices, including waste management and environmental laws.

2.0 PRODUCTS

.1 Section not used.

3.0 EXECUTION

.1 Section not used.

End of 01 74 03

01 77 00 – Closeout Procedures

1.0 GENERAL

1.1 RELATED SECTIONS
- .1 01 33 00 – Submittal Procedures
- .2 01 78 00 – Closeout Submittals

1.2 INSPECTION AND DECLARATION
- .1 The Engineer shall be retained by the Owner for detailed Performance Verification activities.
- .2 The Work shall be complete and the Operation and Maintenance manual shall be submitted for review prior to scheduling the Performance Verification.
- .3 The contractor shall be required to demonstrate and confirm the operation of all systems and associated controls.
- .4 The contractor shall be on hand during these commissioning activities along with any sub-contractors relevant to the project.
- .5 Submit documentation in accordance with Section 01 78 00 – Closeout Submittals.
- .6 Substantial Performance shall not be declared until the Work is complete and the Owner's demonstration is complete.

2.0 PRODUCTS

- .1 Section not used.

3.0 EXECUTION

- .1 Section not used.

End of 01 77 00

01 78 00 – Closeout Submittals

1.0 GENERAL

1.1 SUMMARY

.1 The information outlined in this section is required as a part of the closeout procedures. Substantial Performance of Work shall not be declared until all documents, items or tasks listed in this section have been received, revised as necessary and approved by the Owner.

1.2 RELATED SECTIONS

.1 01 33 00 – Submittal Procedures
.2 01 77 00 – Closeout Procedures

1.3 SUBMITTALS

.1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
.2 Copy will be returned after final inspection with Engineer's comments.
.3 Revise content of documents as required prior to final submittal.
.4 Provide a full as-built package.
.5 Adhere to additional requirements of Section 01 33 00 – Submittal Procedures.

1.3 EQUIPMENT AND SYSTEMS

.1 Each item of Equipment and each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. 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 instruction and sequences. Include regulation, control, stopping, shut-down, and emergency 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 schedule.
.7 Include sequence of operation and installed control diagrams by controls manufacturer.
.8 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

1.4 WARRANTIES AND BONDS

.1 Provide Warranty Letter for all equipment as outlined in individual sections as first section in the 'Project Record Document' binder.
.2 The Warranty Letter shall include a description of the equipment, identification numbers, date equipment or system was put in service, the date the warranty will expire, and a description of the equipment, systems, or services provided by the warranty.
.3 Warranty tags: at time of installation, each warranted item shall be tagged with a durable, oil and water resistant tag attached with copper wire that indicates the following information.
    .1 Type of product/material, Model Number, Serial Number.

.2 Warranty Period, Date of Installation
.3 Construction Contractor and Installer's Initials.

2.0 PRODUCTS
.1 Section not used.

3.0 EXECUTION
.1 Section not used.

End of 01 78 00

01 79 00 – Demonstration and Training

1.0 GENERAL

1.1 RELATED SECTIONS
- .1 01 78 00 – Closeout Submittals.
- .2 01 91 51 – Operations and Maintenance Manual

1.2 DESCRIPTION
- .1 This section is intended to provide a brief overview of operating and maintenance conditions of the equipment and systems to the Owner's personnel.
- .2 Owner will coordinate the attendance of their personnel to attend the session.

1.3 CONDITIONS FOR DEMONSTRATIONS
- .1 Equipment has been inspected and put into operation in accordance with this Specification.
- .2 This shall not take place until the Owner has received the documentation submitted in accordance with Section 01 78 00 – Closeout Submittals.

1.4 DEMONSTRATION AND INSTRUCTIONS
- .1 Demonstrate startup, operation, control, adjustment, troubleshooting, seasonal changeover of controls, servicing, and maintenance of each item of equipment.
- .2 Operation of each fan, control valve, or pump unit shall be demonstrated to the satisfaction of the Owner and Consultant. Satisfaction will be deemed to mean performance that is consistent with the specification, sequences of operation and design intent.
- .3 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .4 Review contents of manual in detail to explain aspects of operation and maintenance.
- .5 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.5 TIME ALLOCATED FOR INSTRUCTIONS
- .1 Provide for a four hour on-site session to cover the demonstration and instructions listed above to cover the general comments.
- .2 Provide sufficient time in addition to the general comments to provide specific instruction and demonstration of the performance and proper operating conditions as outlined in this document.
- .3 Training shall be provided for all systems prior to the Final Completion date for all equipment and systems.
- .4 Training sessions shall be videotaped by the Contractor's Representative and copies provided to the Owner.

2.0 PRODUCTS
- .1 Section not used.

3.0 EXECUTION
- .1 The Contractor shall provide training sessions on-site and as soon as possible after Substantial Performance of the Contract. The person providing the training shall be someone involved with

the programming and completely familiar with the job. Exact training dates and times shall be arranged with the Owner.

End of 01 79 00

01 91 51 – Operations and Maintenance Manual (OMM)

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 This section is limited to portions of the Operations and Maintenance Manual provided to the Owner by the Contractor.

.2 Related Sections:

.1 01 33 00 – Submittal Procedures

.2 01 78 00 – Closeout Submittals

.3 Acronyms:

.1 OMM - Operations and Maintenance Manual.

.2 Cx - Commissioning.

.3 HVAC - Heating, Ventilation and Air Conditioning.

.4 PI - Product Information.

.5 PV - Performance Verification.

.6 TAB - Testing, Adjusting and Balancing.

.7 WHMIS - Workplace Hazardous Materials Information System.

1.2 GENERAL REQUIREMENTS

.1 Standard letter size paper 8.5 x 11" or where appropriate use 11 x 17" doubly folded.

.2 Methodology used to facilitate updating.

.3 Drawings, diagrams and schematics to be professionally developed.

.4 Electronic copy of data to be in a PDF unsecured format or alternate format accepted and approved by Engineer.

1.3 GENERAL INFORMATION

.1 Complete list of names, addresses, telephone and fax numbers of contractor, sub-contractors that participated in delivery of project.

.2 Summary of mechanical, electrical, and control systems installed and commissioned.

.1 Including sequence of operation as finalized after commissioning is complete.

.3 Information on operation and maintenance of mechanical systems and equipment installed and commissioned.

.4 Completed commissioning checklists, initial and any subsequent re-testing Performance Verification results.

1.4 CONTENTS

.1 As-built project record drawings and specifications.

.2 Completed Permits and Final Inspection Reports from all authorities having jurisdiction, including but not limited to final inspection and conformance letter from Engineer.

.3 Completed Certificate of Substantial Performance

.4 Include original manufacturer's brochures and written information on products and equipment installed on this project.

.5 Record and organize for easy access and retrieval of information contained in OMM.

.6 Include completed PI report forms, Start-up Reports, TAB reports, data and information from other sources as required.
.7 Inventory directory relating to information on installed systems, equipment and components.
.8 Approved project shop-drawings, product and maintenance data.
.9 Manufacturer's data and recommendations relating: manufacturing process, installation, commissioning, start-up, O&M, shutdown and training materials.
.10 Inventory and location of spare parts, special tools and maintenance materials.
.11 Warranty information.
.12 Inspection certificates with expiration dates, which require on-going re-certification inspections.
.13 Maintenance program supporting information including:
    .1 Recommended maintenance procedures and schedule.
    .2 Information to removal and replacement of equipment including, required equipment, points of lift and means of entry and egress.

1.5 SUPPORTING DOCUMENTATION
.1 Provide Engineer supporting documentation relating to installed equipment and system, including:
    .1 General:
        .1 Finalized commissioning plan.
        .2 WHMIS information manual.
        .3 Approved "as-built" drawings and specifications.
        .4 Procedures used during commissioning.
        .5 Cross-Reference to specification sections.
    .2 Mechanical:
        .1 Installation permits, inspection certificates.
        .2 Piping pressure test certificates.
        .3 Ducting leakage test reports.
        .4 TAB and PV reports.
        .5 Charts of valves and steam traps.
        .6 Copies of posted instructions.
    .3 Electrical:
        .1 Installation permits, inspection certificates.
        .2 TAB and PV reports.
        .3 Electrical work log book.
        .4 Charts and schedules.
        .5 Locations of cables and components.
        .6 Copies of posted instructions.
    .4 Building Automation Controls:
        .1 PV reports.
        .2 I/O Checkout worksheets.
        .3 Commissioning reports.
        .4 Points lists.
        .5 System and equipment schematics.
        .6 Locations of panels, controllers and field devices.
        .7 Copies of posted instructions.
        .8 Sensor calibration reports.

.9 Alarm settings.
.10 Sequences of operation written in plain English and the written code.

2.0 PRODUCTS

2.1 STATIONERY
.1 OMM shall be submitted in one (1) 'D' ring white binder with transparent plastic sleeves in the front, back and along the spine to insert title or cover pages.
.2 Each section shall be separated using dividers with type-written indication to the contents of each section.
.3 Provide a table of contents at the front of the binder with type-written contents associated to each section.

3.0 EXECUTION

3.1 APPROVALS
.1 Once the OMM is complete and fully assembled the Contractor shall submit for review and approval by the Engineer.
.2 Submission at this stage will be accepted either in a single fully assembled PDF document or as a single hard copy.
.3 Written comments, markups, notes, or acceptance will be provided within 7 days of receiving.
.4 Revisions or corrections to the OMM shall be made as soon as possible upon notification.

3.2 FINAL SUBMISSION
.1 The final submission, with corrections as noted in the Engineer's review, shall be made within 14 days of receipt of the required corrections.
.2 One (1) hard copy of the binder shall be delivered to the Owner's site representative at the building where the Work was completed.

End of 01 91 51

07 84 00 – Fire Stopping

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 This Section specifies specific construction consisting of any device intended to close off an opening or penetration during a fire and/or materials that fill an opening in a wall or floor assembly where penetration is by cables, cable trays, conduits, ducts, pipes and any poke through termination device, such as electrical outlet boxes along with their means of support through the wall or the floor opening.

.2 Related Sections:

.1 23 05 05 – Installation of Pipework.

1.2 REFERENCES

.1 Refer to the latest edition of codes and standards listed below adopted by the authority having jurisdiction.

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

.1 Material Safety Data Sheets (MSDS).

.3 Underwriter's Laboratories of Canada (ULC)

.2 ULC-S115, Fire Tests of Fire stop Systems.

1.3 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

.4 Tightly Fitted; (ref: NBC Part 3.1.9.1.1 and 9.10.9.6.1): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.

.1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit WHMIS MSDS - Material Safety Data Sheets

.3 Shop Drawings:

.1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.

.2 Construction details should accurately reflect actual job conditions.
.3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and suitable application and/or exclusions.

1.5 DELIVERY, STORAGE, AND HANDLING
.1 Packing, shipping, handling, and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions.
.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

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

3.0 EXECUTION

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

3.2 PREPARATION
.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
.1 Ensure that substrates and surfaces are clean, dry and frost free.
.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

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

3.4 SEQUENCES OF OPERATION
.1 Proceed with installation only when submittals have been reviewed in accordance with Section 01 33 00 – Submittals.
.2 Install floor fire stopping before interior partition erections.
.3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
.4 Mechanical pipe insulation: certified fire stop system component.
.1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL
.1 Inspections: notify local building inspector when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

3.6 CLEANING
.1 Proceed in accordance with Section 01 74 03 - Cleaning.
.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
.3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE
.1 Fire stop and smoke seal at:
.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
.2 Edge of floor slabs at curtain wall and precast concrete panels.
.3 Top of fire-resistance rated masonry and gypsum board partitions.
.4 Intersection of fire-resistance rated masonry and gypsum board partitions.
.5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
.6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
.7 Openings and sleeves installed for future use through fire separations.
.8 Around mechanical and electrical assemblies penetrating fire separations.

.9 Rigid ducts: greater than 129 cm (50 in): fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF 07 84 00

`21 05 01 – Common Work Results for Mechanical

1.0 GENERAL

1.1 REFERENCES

.1 Section not used.

1.2 SUBMITTALS

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

.2 Shop drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

.4 Closeout Submittals:

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

.2 Operation and maintenance manual approved by, and final copies deposited with, the Engineer before final inspection.

.3 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

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

.4 Operation instruction for systems and component.

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

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.4 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

.6 Approvals:

.1 Submit an electronic copy, fully assembled, bookmarked, and flattened in PDF of draft Operation and Maintenance Manual to Engineer for approval. Submission of individual data will not be accepted unless directed by the Engineer.
.2 Make changes as required and re-submit as directed by the Engineer and Owner.

.7 Additional data:
.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:
.1 Provide prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
.2 Use red colour waterproof ink or a different colour waterproof ink for each service where additional detail is required.
.3 Make available for reference purposes and inspection.

.9 As-built drawings:
.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize As-Built Red Line Markup Drawings and submit to the Engineer.
.2 The Engineer will provide generation and delivery of As-Built drawings to the Owner in electronic format.
.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

1.3 MAINTENANCE
.1 Provide spare parts, special tools, and consumable components only for the equipment and systems as indicated in dedicated Specification Sections.

1.4 DELIVERY, STORAGE, AND HANDLING
.1 Packing, shipping, handling, and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of at an approved disposal facility in a safe and legal manner.

2.0 PRODUCTS
.1 Section not used.

3.0 EXECUTION

3.1 PAINTING, REPAIRS, AND RESTORATION
.1 Do painting in accordance with industry best practices to suit the application, existing finishes, and colour palette.
.2 Prime and touch up marred finished paintwork to match original.
.3 Restore to new condition, finishes which have been damaged.

3.2 CLEANING
.1 Clean interior and exterior of all systems including strainers cleanouts and traps.
.2 Comply with additional requirements outlined in Section 01 74 03 – Cleaning Requirements.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.2 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 1.2 – Submittals.

.3 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.

.4 Schedule site visits, to review Work, as directed in Part 1.3 – Quality Assurance.

3.4 DEMONSTRATION

.1 Demonstrate the operation and use of the equipment and systems only as and where indicated in dedicated Specification Sections.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Comply with additional requirements outlined in Section 01 79 00 – Demonstration and Training.

3.5 PROTECTION

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

End of 21 05 01

21 07 19 – Thermal Insulation for Piping

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes thermal insulation for piping and piping accessories in commercial type applications.

1.2 REFERENCES

.1 All codes. and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 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).

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

.1 ASTM B 209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.

.2 ASTM C 335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C 411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C 533, Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C 547, Mineral Fiber Pipe Insulation.

.7 ASTM C 795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C 921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.4 Canadian General Standards Board (CGSB)

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

.2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.5 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.

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

.1 Material Safety Data Sheets (MSDS).

.7 Manufacturer's Trade Associations

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

.8 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC ss:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.4 SUBMITTALS

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

.2 Shop drawings to show:

.1 Mounting arrangements and installation requirements.

.2 Product characteristics, performance criteria, and limitations.

.3 Material Safety Data Sheets.

.4 Testing and certification results.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: specialist with suitable experience in performing work of this Section.

.2 Fire and smoke rating in accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of at an approved disposal facility in a safe and legal manner.

2.0 PRODUCTS

2.1 FORMED MINERAL FIBER WITH VAPOUR BARRIER TO 200°C

.1 Application: for piping, valves, press joint couplings, fittings, and brazed-plate heat exchangers on hydronic heating system.

.2 Material: CGSB 51 GP 9M rigid mineral fiber sleeving for piping.

.3 Thermal Conductivity "k" shall not exceed 0.034 W/m°C at 24°C mean temperature when tested in accordance with ASTM C335. Thickness as per following table, in inches. Runouts refers to individual terminal units not exceeding 12 ft.

Max Fluid Temp. °C (°F)	Runouts up to 2" diameter	Nominal Pipe Inch Diameter (in. NPS)			
		1 and less	1¼ to 2	2½ to 4	5 and over
66-95 (151-200)	1.0	1.5	1.5	2.0	2.0
50-65 (121-150)	1.0	1.0	1.0	1.5	1.5
36-49 (96-120)	1.0	1.0	1.0	1.5	1.5
11-35 (51-95)	0.5	0.5	1.0	1.5	1.5
1-10 (30-50)	0.5	0.5	1.0	1.0	1.5
Condensate Returns	0.5	0.5	1.0	1.0	1.0
Dom.CW	0.5	0.5	1.0	1.0	1.0

.4 Fastenings:
  .1 Self-adhesive aluminum tape ULC labelled for less than 25 flame spread and less than 50 smoke developed.
  .2 Contact adhesive: quick setting for seams and joints.
  .3 Tape: self-adhesive PVC.
.5 On applications below 120°C, rigid phenolic insulation of an equal or greater insulating value may be accepted as alternate with Engineer's approval, with same jacket and labels.

2.2 REMOVABLE PREFABRICATED INSULATION
.1 Application: expansion joints, triple-duty valves, balancing valves, brazed-plate heat exchangers, and plate-and-frame heat exchangers
.2 Design: custom made to permit movement of expansion joints, to permit periodic removal and replacement without damage to adjacent insulation, and to fit securely
.3 Insulation
  .1 Fabricated to fit components
  .2 Thickness to match application
  .3 Expanded closed-cell flexible elastomeric
.4 Adhesive: Manufacturer's recommended adhesive
.5 Finish: Painted to match surrounding pipe jacket, using manufacturer's recommended paint.

2.3 PVC JACKETS
.1 Application: for piping straight lengths, piping elbows, valves, press joint couplings, fittings, and brazed-plate heat exchangers on hydronic heating system.
.2 White PVC jacket 0.38 mm minimum thickness, c/w fluid and flow direction labels.
.3 Fastenings standard to manufacturer.
.4 Meeting 25 flame spread and 50 smoke development ratings.

2.4 ALUMINUM JACKETS

.1 Application: for piping straight lengths, piping elbows, valves, press joint couplings, fittings where located outside along walls or on the roof.
.2 Complies with ASTM B-209.
.3 Thickness: 0.016", c/w pebbled finish and fluid and flow direction labels.

3.0 EXECUTION

3.1 GENERAL

.1 Work shall be performed by contractor whose principal business is that of commercial and industrial insulating.
.2 Apply insulation after required tests have been completed and approved by Engineer. Surfaces shall be clean and dry during application of insulation and finishes.
.3 Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations and as specified.
.4 Vapor barriers and insulation to be unbroken over full length of pipe, duct or equipment surface, without penetration for hangers, standing duct seams and without interruption at sleeves, pipe and fittings and supports.
.5 Install insulation with smooth and even surfaces.
.6 On piping with insulation and vapor barrier, install high density insulation under hanger shield. Maintain integrity of vapor barrier over full length of pipe without interruption at sleeves, fittings and supports.

3.2 PIPE INSULATION

.1 Install in accordance with ANSI/NFPA 90A and ANSI/NFPA 90B.
.2 Seal and finish exposed ends and other terminations with insulating cement.
.3 Flanges and unions at equipment valves and other components requiring regular maintenance, install insulation and finish to permit easy disassembly and replacement without damage to adjacent insulation and finishes.
.4 Secure pipe insulation by tape at each end and centre of each section, but not greater than 36" on centers.
.5 Where approved alternate insulation is used, follow manufacturer's recommended installation procedures.
.6 Insulation is not required for:
    .1 Chrome plated piping, valves, and fittings
    .2 Runouts to plumbing fixtures
    .3 Pump and circulator bodies

3.3 PVC PIPE JACKETS

.1 Apply to all new insulated pipe in accordance with CGSB 51 GP 53M.
.2 Fitting covers, one piece, premoulded to match.
.3 Fastenings standard to manufacturer.

3.4 ALUMINUM PIPE JACKETS

.1 Apply to all new insulated pipe on the roof or along exterior walls.
.2 Install according to manufacturer's recommendations.

3.5 REMOVABLE PREFABRICATED INSULATION

.1 Assemble as per manufacturer's recommendations

.2 Use velcro straps to hold sections securely in place and to allow easy removal

End of 21 07 19

22 11 16 – Domestic Water Piping

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Use this Section for: (1) copper incoming domestic water service, up to NPS 2 1/2, (2) all hard drawn copper domestic hot and cold water services inside building, (3) soft copper buried tubing outside building (i.e. between potable water source and meter inside building).

.2 This Section assumes that buried copper tubing is "soft" in long lengths with no buried joints.

.2 Related Sections:

.1 21 05 01 – Common Work Results for Mechanical

1.2 REFERENCES

.1 All referenced codes, standards, and additional documents shall be deemed to indicate the most recent version accepted by industry practices and the authority having jurisdiction.

.2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)

.1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.

.2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.

.3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

.4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.3 ASTM International Inc.

.1 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM B 88M, Standard Specification for Seamless Copper Water Tube (Metric).

.4 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)

.1 ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.5 Canada Green Building Council (CaGBC)

.1 LEED Canada-NC Version 1.0, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Package For New Construction and Major Renovations.

.2 Rating System Addenda for New Construction and Major Renovations LEED Canada-NC Version 1.0.

.3 LEED Canada-CI Version 1.0, LEED (Leadership in Energy and Environmental Design): Green Building Rating System Reference Guide For Commercial Interiors.

.6 Canadian Standards Association (CSA International)

.1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.

.7 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

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

.1 Material Safety Data Sheets (MSDS).

.9 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.1 MSS-SP-67-[02a], Butterfly Valves.

.2 MSS-SP-70-[06], Gray Iron Gate Valves, Flanged and Threaded Ends.
.3 MSS-SP-71-[05], Gray Iron Swing Check Valves, Flanged and Threaded Ends.
.4 MSS-SP-80-[03], Bronze Gate, Globe, Angle and Check Valves.
.10 National Research Council (NRC)/Institute for Research in Construction
.1 NRCC 38728, National Plumbing Code of Canada (NPC).
.11 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

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

1.4 QUALITY ASSURANCE
.1 Quality Assurance: in accordance with industry accepted installation procedures and best practices as well as in accordance with authorities having jurisdiction.

2.0 PRODUCTS

2.1 PIPING
.1 Domestic hot, cold and recirculation systems, within building.
.1 Above ground: copper tube, hard drawn, type L: to ASTM B 88M.
.2 Buried or embedded: copper tube, soft annealed, type L: to ASTM B 88M, in long lengths and with no buried joints.

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

2.3 JOINTS
.1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.
.2 Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.
.3 Solder: 95/5 tin copper alloy.
.4 Teflon tape: for threaded joints.
.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.
.6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.4 GATE VALVES

.1 NPS 2 and under, soldered:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc.

.2 NPS 2 and under, screwed:

.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc.

.3 NPS 2-1/2 and over, in mechanical rooms, flanged:

.1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim.

.4 NPS 2-1/2 and over, other than mechanical rooms, flanged:

.1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet.

2.5 GLOBE VALVES

.1 NPS2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet.

.2 Lockshield handles: where indicated.

.2 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc.

.2 Lockshield handles: where indicated.

2.6 SWING CHECK VALVES

.1 NPS 2 and under, soldered:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as.

.2 NPS 2 and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.

.3 NPS 2-1/2 and over, flanged:

.1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, [regrind] [renewable] seat, bronze disc, bolted cap.

2.7 BALL VALVES – BASE COST OF WORK

.1 NPS 2 and under except boiler isolation valves, screwed:

.1 Class 150.

.2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle.

.2 NPS 2 and under except boiler isolation valves, soldered:

.1 To ANSI/ASME B16.18, Class 150.

.2 Bronze body, chrome plated brass ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors as.

2.8 BUTTERFLY VALVES

.1 NPS 2-1/2 and over, lug:
  .1 To MSS-SP-67, Class 200.
  .2 Cast iron body, ductile iron chrome plated disc, stainless steel stem, EPT liner.
  .3 Operator:
    .1 NPS 6 and under: lever handle.
    .2 NPS 8 and over: gear operated.
.2 NPS 2-1/2 and over, grooved ends:
  .1 Class 300, bubble tight shut-off, bronze body.
  .2 Operator:
    .1 NPS 4 and under: lever handle.
    .2 NPS 6 and over: gear operated.

3.0 EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

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

3.3 VALVES

.1 Isolate equipment, fixtures and branches:
  .1 NPS 2 and under: ball valves.
  .2 NPS 2-1/2 and over: butterfly valves.
  .3 Where indicated provide globe or lockshield globe valves in lieu of ball or butterfly valves as listed above.
.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 PRESSURE TESTS

.1 Test pressure: greater of 1.5 times maximum system operating pressure or 125 psig (860 kPa).

3.5 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then flush for additional 2 h.

3.6 PRE-STARTUP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.
.2 Verify that system can be completely drained.
.3 Ensure that pressure booster systems are operating properly.
.4 Ensure that air chambers, expansion compensators are installed properly.

3.7 DISINFECTION

.1 NOT USED.

3.8 STARTUP

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

3.9 PERFORMANCE VERIFICATION

.1 Scheduling:
  .1 Verify system performance after pressure and leakage tests and flushing are completed, and Certificate of Completion has been issued by authority having jurisdiction.
.2 Procedures:
  .1 Verify that flow rate and pressure meet Design Criteria.
  .2 Perform TAB in accordance with Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.
  .3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
  .4 Verify performance of temperature controls.
  .5 Verify compliance with safety and health requirements.

.3 Reports:
  .1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.
  .3 Provide TAB report in accordance with Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

3.10 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 01 - Installation of Pipework.

End of 22 11 16

22 42 01 – Plumbing Specialties and Accessories

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 This Section specifies materials and installation for plumbing specialties and accessories.

.2 Related Sections:

.1 22 13 17 – Drainage Waste and Vent Piping – Cast Iron and Copper

1.2 REFERENCES

.1 All referenced codes, standards, and additional documents shall be deemed to indicate the most recent version accepted by industry practices and the authority having jurisdiction.

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

.1 ASTM A 126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.

.3 American Water Works Association (AWWA).

.1 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.

.2 AWWA C701, Cold Water Meters-Turbine Type for Customer Service.

.3 AWWA C702-1, Cold Water Meters-Compound Type.

.4 Canadian Standards Association (CSA International).

.1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.

.2 CSA-B79, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.

.3 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

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

.4 Material Safety Data Sheets (MSDS).

.6 Plumbing and Drainage Institute (PDI).

.1 PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.

.2 PDI-WH201, Water Hammer Arresters Standard.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.

.2 Indicate dimensions, construction details and materials for specified items.

.3 Submit WHMIS MSDS indicating VOC's for adhesive and solvents during application and curing.

.3 Shop Drawings:

.1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details and accessories.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturers' Field Reports: manufacturers' field reports specified where specified.

.7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, include:
.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
.2 Details of operation, servicing and maintenance.
.3 Recommended spare parts list.

1.4 QUALITY ASSURANCE
.1 Quality Assurance: in accordance with industry accepted installation procedures and best practices as well as in accordance with authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING
.1 Packing, shipping, handling, and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions.
.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 BACKFLOW PREVENTERS
.1 Preventers: to CSA-B64 Series, application as indicated
.1 Reduced pressure principle type for makeup water connections to closed loop systems c/w vacuum breaker and air gap drained to nearest floor drain or as indicated.
.2 Double check valve assembly for building service mains.

2.2 PRESSURE REGULATORS
.1 Capacity: as indicated.
.2 Inlet and outlet pressures: as indicated.
.3 Up to NPS 1-1/2 bronze bodies, screwed: to ASTM B 62.
.4 NPS 2 and over, semi-steel bodies, Class 125, flanged: to ASTM A 126, Class B.
.5 Semi-steel spring chambers with bronze trim.

2.3 WATER MAKEUP ASSEMBLY
.1 Complete with reduced pressure principle type backflow preventer, pressure gauge on inlet and outlet, pressure reducing valve to CSA B356, pressure regulator and ball or gate valves on inlet and outlet.
.2 Provide additional auxiliaries as indicated.

2.4 STRAINERS
.1 125 psig (860 kPa), Y type with 20 mesh, monel, bronze or stainless steel removable screen, approved for use with potable water.
.2 NPS 2 and under, bronze body, screwed ends, with brass cap.
.3 NPS 2-1/2 and over, cast iron body, flanged ends, with bolted cap.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada the Provincial or Territorial Building Code, and the local authority having jurisdiction. Where conflicts are encountered in the regulatory body the more stringent requirement shall prevail.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 BACKFLOW PREVENTERS

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.

.2 Pipe discharge to terminate over nearest drain or service sink.

3.4 WATER MAKEUP ASSEMBLY

.1 Install with full sized valved bypass around pressure regulator.

.2 Pipe discharge from relief valve to nearest floor drain.

.3 Provide additional auxiliaries as indicated.

3.5 STRAINERS

.1 Install with sufficient room to remove basket.

3.6 STARTUP

.1 General:

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

.2 Timing: start-up only after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Water treatment systems operational.

.3 Provide continuous supervision during start-up.

3.7 TESTING AND ADJUSTING

.1 General:

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

.2 Timing:

.1 After start-up deficiencies rectified.

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

.3 Application tolerances:

.1 Pressure at fixtures: +/- 10 psig (70 kPa).

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

.4 Adjustments:

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

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

.5 Vacuum breakers, backflow preventers, backwater valves:

.1 Test tightness, accessibility for O&M of cover and of valve.
.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
.3 Verify visibility of discharge from open ports.

.6 Pressure regulators, PRV assemblies:
.1 Adjust settings to suit locations, flow rates, pressure conditions.

.7 Strainers:
.1 Clean out repeatedly until clear.
.2 Verify accessibility of cleanout plug and basket.
.3 Verify that cleanout plug does not leak.

.8 Training:
.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O&M Personnel, supplemented as specified.
.2 Demonstrate full compliance with Design Criteria.

End of 22 42 01

23 05 05 – Installation of Pipework

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for piping and fittings for hydronic systems.

.2 Related Sections:

.1 21 07 19 – Thermal Insulation for Piping

.2 23 05 17 – Pipe Welding

.3 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).

.1 ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).

.3 American Society for Testing and Materials International, (ASTM).

.1 ASTM A 276, Specification for Stainless Steel Bars and Shapes.

.2 ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.

.3 ASTM B 283-99a, Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).

.4 ASTM B 505/B 505M, Specification for Copper-Base Alloy Continuous Castings.

.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).

.1 MSS-SP-25, Standard Marking System for Valves, Fittings, Flanges and Unions.

.2 MSS-SP-110, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

.5 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

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

.1 Material Safety Data Sheets (MSDS).

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of at an approved disposal facility in a safe and legal manner.

2.0 PRODUCTS

2.1 COPPER PIPING, FITTINGS AND VALVES - HYDRONIC SYSTEMS

.1 NOT USED.

2.2 STEEL PIPING, FITTINGS AND VALVES - HYDRONIC SYSTEMS

.1 Pipe: Steel pipe to ASTM A53, Grade B, Schedule 40.

.2 Pipe Joints

.1 NPS 2 and under: screwed fittings with Teflon tape.

.2 NPS 2 1/2 and over: welding fittings and flanges to CSA W47.1 and CSA W47.1S1.

.3 Flanges: plain or raised face.
.4 Orifice flanges: slip on raised face, Class 300.
.5 Grooved mechanical pipe couplings, fittings, valves and other grooved components may be used as an option to welding, threading or flanged methods on hydronic heating, chilled water, condenser, glycol, vent, relief and above ground drain piping from equipment. All grooved components shall conform to local code approval.
.6 Grooved mechanical rigid couplings shall be of the angle pattern bolt pad type, and shall provide system support and hanging requirements in accordance with ANSI B31.1, ANSI B31.4. Style 77 or 75 coupling shall be used where system flexibility is desired. Noise and vibration reduction at mechanical equipment connections is achieved by installing three style 77 or 75 flexible couplings near the vibration source
.7 Roll grooved: standard or rigid coupling to CSA B242 and as appropriate to pipe material, wall thickness, pressures, size and method of joining.
.8 Flange gaskets: to ANSI/AWWA C111/A21.11.
.9 Pipe thread taper.
.10 Bolts and nuts: to ANSI B18.2.1 and ANSI/ASME B18.2.2.

.3 Fittings
.1 Screwed fittings: malleable iron, to ANSI/ASME B16.3, Class 150.
.2 Pipe flanges and flanged fittings:
.1 Cast iron: to ANSI/ASME B16.1, Class 125.
.2 Steel: to ANSI/ASME B16.5.
.3 Butt welding fittings: steel, to ANSI/ASME B16.9.
.4 Unions: malleable iron, to ASTM A47M and ANSI/ASME B16.3.
.5 Fittings for rolled grooved piping: malleable iron to ASTM A47M or ductile iron to ASTM A536.

.4 Valves – Base Cost of Work
.1 Ball Valves
.1 NPS 2 and under except for boiler and bypass piping isolation valves regardless of their size, screwed: MSS SP 110, 600 WOG, bronze or brass body, full port chrome plated solid ball, double O ring or teflon packing, teflon seats, and steel handle.
.2 Manufacturer: Kitz 58, Toyo 5044A, MAS B-3, Apollo 70-100, or approved equivalent by American Valve.
.3 NPS 2 ½ and over, as well as all boiler and bypass piping isolation valves regardless of their pipe size: high quality flanged ball valve with corrosion resistance and PFA fused solid iron ball conforming to local code requirements. Manufacturer: American Valve 4000 or approved equivalent by Apollo Valves, or WATTS.
.1 NPS 2 1/2 and over, lever up to 6 inch. A126 class B cast iron body.
.2 PFA fused solid ball.
.3 Blow out proof stainless steel stem.
.4 Face-to-Face and flanged dimensions conform to ANSI B16.10.
.5 Lockable in full open or closed positions.
.6 ISO mounting pad for easy actuation.
.7 Adjustable length /removable handles to fit into areas of limited space.
.8 Full port through 6".
.9 Certified to meet the requirements of: NSF/ANSI 61 and NSF/ANSI 372, MSS SP-72, ANSI B16.10.

.10 Ratings: 125 psi WSP, 353°F

.2 Butterfly Valves

.1 NOT USED.

.3 Swing Check Valves

.1 NPS 2 and under, screwed: to MSS SP 80, Class 125, bronze body, bronze swing disc, screw in cap, regrindable seat.

.2 Manufacturer: Kitz 22, Toyo 236, or approved equivalent by American Valve.

.3 NPS 2 1/2 and up, flanged: to MSS SP 71, Class 125, cast iron body, FF flange, renewable seat, bronze disc, bolted cap.

.4 Manufacturer: Kitz 78, Toyo 435, or approved equivalent by American Valve.

.5 Grooved 2"-4": Horizontal installation. Working pressure to 300 psi (2065 kPa). Ductile iron body, ASTM A-395, grade 65-45-15, and ASTM A-536, Grade 65-45-12, and 316 stainless steel clapper. EPDM, Nitrile or optional Viton Bumper & Bonnet seals. Stainless steel wetted parts.

.6 Grooved 4"-14": Black enamel painted ductile iron body, ASTM A-395, grade 65-45-15, and ASTM A-536, Grade 65-45-12, ductile iron disc, elastomer encapsulated suited for the intended service, stainless steel spring and shaft, welded-in nickel seat, 300 psi (2065 kPa). Valve inlet is drilled, with venturi-like taps and plugged for flow kit (included with valve). Twin taps on both sides of valve for meter connections and flow measurement.

.4 Silent Check Valves

NOTE: Do not use directly on discharge of reciprocating compressor.

.1 NPS 2 and under: Class 125, 200 WOG, bronze or brass body, stainless steel spring, tefon or bronze disc.

.2 Manufacturer: MAS 700, Kitz 36, or approved equivalent by American Valve.

.3 NPS 2-1/2 and over: Class 125, 200 WOG, cast iron wafer body, center guided shaft, stainless steel spring, bronze disc.

.4 Manufacturer: Mueller steam 101 MAP, 105 MAP (Globe Style), or approved equivalent by American Valve.

2.3 HYDRONIC SPECIALTIES

.1 Automatic Air Eliminators

.1 Cast iron body and NPS 3/4" connection and rated at 150 psi working pressure. Stainless steel float suitable for 240°F working temperature.

.2 Manufacturer: Spirax Sarco 13W, Armstrong, TLV

.2 Pipe Line Strainer

.1 NPS 1/2 to 2: y-type, cast bronze body, threaded connections, solid retainer cap with straight thread and gasket, 20 mesh stainless steel screen, blowdown connection and pressure 125 psi WSP at 400°F.

.2 NPS 2 1/2 to 12: y-type, cast iron body, flanged connections, iron retainer cap and gasket, stainless steel screen with 1/16" perforation, straight threads and tapped for closure plug, blowoff outlet and pressure Class 125, WSP 125 psi at 450°F.

.3 Grooved: 300 PSI (2065 kPa) Y-Type Strainer shall consist of ductile iron body, ASTM A-395, grade 65-45-15, and ASTM A-536, Grade 65-45-12, Type 304 stainless steel cylindrical removable baskets with 1/16" (1,6mm) diameter perforations and 41% open area 2"-3"

(DN50-DN80) strainer sizes or 1/8" (3,2mm) diameter perforations and 40% open area 4"-12" (DN100-DN300) strainer sizes.

.3 Direct Reading Thermometers
  .1 Industrial variable angle type, liquid filled, 12" scale length. Design point to be at mid point of scale or range.
  .2 Thermometer wells for copper pipe shall be copper or bronze and for steel pipe shall be brass or stainless steel.
  .3 Acceptable manufacturers: Trerice, Winters, WIKA.
.4 Pressure Gauges
  .1 4½" dial type having 1/2 of 1% accuracy unless otherwise specified. Provide snubber for pulsating operation, diaphragm assembly for corrosive service, gasketted pressure relief back with solid front and bronze stop cock. Shall be oil filled for high vibration applications.
.5 Circuit Balancing Valves
  .1 Bronze body up to 2" sweat and threaded and cast iron body 2 1/2" to 4" flanged connections. Teflon seats, calibrated nameplate with tamper resistant field adjustable memory stop, schrader style pressure ports and drain port. Pressure/temperature rating ½"- 2": 250psi/250°F, 2 1/2" to 4": Class 125.
  Manufacturer: TA Hydronics, S.A. Armstrong, WATTS.
.6 Low Water Cut-offs
  .1 Up to 2 ½ " NPT side tapping.
  .2 Mechanical or Electronic acceptable.
  .3 Manual reset required.
  .4 Must be connected independent of the automation system.
  .5 Must be hardwired to shut down primary loop circulation pumps and boilers.
  .6 Connection point: primary loop as indicated in drawings.
  .7 Acceptable standard is McDonnell and Miller, TACO, XYLEM.
.7 Control Accessories
  .1 All thermal wells as indicated on layout and/or schematic piping drawings shall be supplied by the Building Automation Contractor and installed by the Mechanical/Piping Contractor.
  .2 All control valves shall be supplied and installed by the Mechanical/Piping Contractor, unless otherwise indicated.

2.4 PIPE SLEEVES
.1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation

3.0 EXECUTION

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

3.2 CONNECTIONS TO EQUIPMENT
.1 In accordance with manufacturer's instructions unless otherwise indicated.
.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible and run along edges to concrete pads or equipment so as to NOT present a tripping hazard.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 AIR VENTS

.1 Install manual air vents 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 and drain does NOT present a tripping hazard.

3.6 DIELECTRIC COUPLINGS

.1 General: compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

3.7 PIPEWORK INSTALLATION

.1 Screwed fittings jointed with Teflon tape.

.2 Protect openings against entry of foreign material.

.3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 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.

.6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.9 Install, except where indicated, to permit separate thermal insulation of each pipe.

.10 Group piping wherever possible and as indicated.

.11 Ream pipes, remove scale and other foreign material before assembly.
.12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
.13 Provide for thermal expansion as indicated.
.14 Valves:
.1 Install in accessible locations.
.2 Remove interior parts before soldering.
.3 Install with stems above horizontal position unless otherwise 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 otherwise specified.
.7 Install butterfly valves between weld neck flanges to ensure full compression of liner.
.15 Check Valves:
.1 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.
.2 Install silent check valves in lieu of swing check valves where spacing does not allow.

3.8 HYDRONIC SPECIALTIES
.1 Control accessories
.1 Coordinate the installation location of all sensor wells with K3D Inc. prior to installing.
.2 Install all control valves with unions and isolation valves at all ports. Install with full size bypass and isolation valve across all two-way valves and across A-AB port on all three-way valves unless otherwise indicated.

3.9 SLEEVES
.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.
.2 Material: schedule 40 black steel pipe.
.3 Construction: foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.
.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
.5 Installation:
.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
.2 Other floors: terminate 25 mm above finished floor.
.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
.6 Sealing:
.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
.2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
.4 Ensure no contact between copper pipe or tube and sleeve.

3.10 ESCUTCHEONS
.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.
.3 Sizes: outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.11 PREPARATION FOR FIRE STOPPING

.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 - Fire Stopping.
.2 Uninsulated unheated pipes not subject to movement: No special preparation.
.3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging fires topping material or installation.
.4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.12 FLUSHING OUT OF PIPING SYSTEMS

.1 Before start-up, clean interior of piping systems supplemented as specified in relevant mechanical sections.
.2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.13 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.
.2 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
.3 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
.4 Conduct tests in presence of Engineer where indicated.
.5 Submit pressure test results upon completion of satisfactory results. Indicate date pressure test completed, time started, time completed, pressure at start, pressure at completion, description of piping section tested. Where multiple section tests are completed, provide results in a tabular format.
.5 Pay costs for repairs or replacement, retesting, and making good.
.6 Insulate or conceal work only after submission of test results and acceptance by the Engineer or Owner.

3.14 EXISTING SYSTEMS

.1 Connect into existing piping systems at times as indicated or acceptable to the Owner.
.2 Be responsible for damage to existing plant by this work.
.3 Ensure daily clean-up of existing areas.

End of 23 05 05

23 05 13 – Common Motor Requirements for HVAC & Plumbing Equipment

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Electrical motors, drives and guards for mechanical equipment and systems.

.2 Supplier and installer responsibility indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

.3 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 22 and 23. Refer to Division 26 for quality of materials and workmanship.

.2 Related Sections:

.1 23 21 23 – Hydronic Pumps

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)

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

.3 Electrical Equipment Manufacturers' Association Council (EEMAC)

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

.5 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.3 Closeout Submittals

.1 Provide maintenance data for motors, drives and guards for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

1.5 WARRANTY

.1 Provide a minimum one-year parts and labor warranty on all components.

2.0 PRODUCTS

2.1 GENERAL

.1 Provide CSA approved and ULC listed, packaged factory assembled components.

.2 Motors: high efficiency, in accordance with ASHRAE 90.1.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 Motors under or equal to 373 W (1/2 HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.3 Motors larger than 373 W (1/2 HP): EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof or totally enclosed fan cooled, ball bearing, maximum temperature rise 40°C (72°F), 3 phase, voltage as indicated, unless otherwise indicated.

.4 Each motor shall have sufficient starting torque to start the driven equipment and to accelerate it to full speed within 10 seconds.

.5 Motors to be controlled from variable frequency drives shall be rated for inverter duty and shall have Class H windings and Class F insulation and be rated by the manufacturer for the associated drive. See Section 23 05 14 – Variable Frequency Motor Controllers for related requirements.

.6 Motor connection boxes shall be located on side of motor most easily accessible for maintenance and remote from belts, gears or driven equipment. If boxes are factory installed on wrong side of motor they shall be relocated.

.7 Each multi-speed motor and associated switching device shall be circuited such that the overload device in the starter protects the motor on each step of the multi-speed switch. As an alternative to this requirement, the motor may have integral overload protection. Multi- speed motors shall be single winding variable torque for 50% motor speed reduction and double winding, two speed for all other speed reductions.

.8 All motors 22.4 kW (30 hp) and larger shall have heat detector protection embedded in the windings for connection into the motor control circuit. Protection shall be Siemens thermistor.

.9 All motors 74.6 kW (100 hp) and larger shall be suitable for reduced voltage starting, delta- wye.

.10 Motor enclosures shall be as follows:

- .1 If protected from the weather and entraining moisture, use open drip-proof, service factor 1.15.
- .2 Motors located in air streams shall be selected to operate satisfactorily at maximum temperature and moisture levels of surrounding air.
- .3 For all other locations, use totally-enclosed fan-cooled, service factor 1.0.
- .4 Use explosion proof motors where scheduled.

.11 High efficiency motors shall be T frame, A.C., three phase, meet or exceed the Ontario Hydro Enermark Motor Efficiency Levels as tested to either CSA 390M-1985 or IEEE-112B and be approved under the Canadian Electrical Safety Code:

- .1 High efficiency motors shall be used on all fans and pumps having motors 0.75 kW (1 hp) or larger.

.12 Contractor to confirm voltage on-site prior to ordering motors.

.13 Acceptable products: Baldor, Leeson, US Motors, Westinghouse, General Electric, or equivalent.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Engineer for temporary use. Work will only be accepted when specified motor is installed

2.4 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.
.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.
.3 For motors under 7.5 kW (10 HP): standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.
.4 For motors 7.5 kW (10 HP) and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.
.5 Correct size of sheave determined during commissioning.
.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
.7 Motor slide rail adjustment plates to allow for centre line adjustment.
.8 Supply one set of spare belts for each set installed. Handover to site staff.

2.5 DRIVE GUARDS

.1 Provide guards for unprotected drives.
.2 Guards for belt drives;
  .1 Expanded metal screen welded to steel frame.
  .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
  .3 38 mm dia holes on both shaft centres for insertion of tachometer.
  .4 Removable for servicing.
.3 Provide means to permit lubrication and use of test instruments with guards in place.
.4 Install belt guards to allow movement of motors for adjusting belt tension. -
.5 Guard for flexible coupling:
  .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
  .2 Securely fasten in place.
  .3 Removable for servicing.
.6 Unprotected fan inlets or outlets:
  .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
  .2 Net free area of guard: not less than 80% of fan openings.
  .3 Securely fasten in place.
  .4 Removable for servicing.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Fasten securely in place.
.2 Make removable for servicing, easily returned into, and positively in position.

3.3 FIELD QUALITY CONTROL

.1 Provide written report indicating amperage reading of each phase, final sheave and belt sizes.

.2 Comply with additional requirements in Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

End of 23 05 13

23 05 29 – Hangers and Supports for HVAC Piping and Equipment

1.0 GENERAL

1.1 SUMMARY
- .1 Section Includes:
  - .1 Concrete housekeeping pads, hangers and supports for mechanical piping, ducting and equipment. This section does not include seismic restraint or vibration and noise isolation.
- .2 Related Sections:
  - .1 23 05 05 – Installation of Pipework
  - .2 23 57 00 – Heat Exchangers for HVAC

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME)
  - .1 ANSI/ASME B31.1, Power Piping.
- .3 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A 125, Specification for Steel Springs, Helical, Heat-Treated.
  - .2 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .3 ASTM A 563, Specification for Carbon and Alloy Steel Nuts.
- .4 Factory Mutual (FM)
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  - .1 MSS SP 58, Pipe Hangers and Supports - Materials, Design and Manufacture.
  - .2 ANSI/MSS SP69, Pipe Hangers and Supports - Selection and Application.
  - .3 MSS SP 89, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .7 Underwriter's Laboratories of Canada (ULC)

1.3 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 MSS SP 58. ASME B31.1 or
  - .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.

1.3 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 Submit manufacturer's printed product literature, specifications and datasheet for heating, ventilation and air conditioning distribution piping and ductwork.

.2 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit shop drawings and product data for following items:
.1 Bases, hangers and supports.
.2 Connections to equipment and structure.
.3 Structural assemblies.
.4 Installation instructions.
.5 Deflection under applied load.

1.4 DELIVERY, STORAGE, AND HANDLING
.1 Packing, shipping, handling, and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions.
.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of at an approved disposal facility in a safe and legal manner.

2.0 PRODUCTS

2.1 GENERAL
.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP 58.
.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS
.1 Finishes:
.1 Apply at least one coat of corrosion resistant primer paint to ferrous supports, site fabricated work and uninsulated steel pipe for natural gas distribution.
.2 Prime and touch up marred finished paint work to match original.
.3 Restore to new condition damaged finishes on new materials
.4 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.
.5 In conditions where corrosion is likely or as indicated adhere to the following additional requirements.
.1 Pipe hangers and supports: galvanized after manufacture.
.2 Use hot dipped galvanizing process.
.2 Upper attachment structural: suspension from lower flange of I-Beam:
.1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
.2 Rod: 9 mm UL listed.
.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers UL listed.
.3 Upper attachment structural: suspension from upper flange of I-Beam:

.1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip UL listed.
.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.

.4 Upper attachment to concrete:
.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
.2 Concrete inserts: wedge shaped body with knockout protector plate UL listed.

.5 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.

.6 Pipe attachments: material to MSS SP 58:
.1 Attachments for steel piping: carbon steel.
.2 Attachments for copper piping: copper plated black steel.
.3 Use insulation shields for hot pipework.
.4 Oversize pipe hangers and supports to accommodate insulation as specified.

.7 Use an adjustable clevis for steel and cast iron pipework at ambient temperatures, when hot pipework horizontal movement is expected to be no greater than 25 mm, or where the hanger rod is longer than 300 mm.
.1 Adjustable clevis: material to MSS SP 69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
.2 Ensure "U" has hole in bottom for rivetting to insulation shields.

.8 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP 69.

.9 U-bolts: carbon steel to MSS SP 69 with 2 nuts at each end to ASTM A 563.
.1 Finishes for steel pipework: black.
.2 Finishes for copper, glass, brass or aluminum pipework: black with formed portion plastic coated.

.10 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

2.3 RISER CLAMPS

.1 Steel or cast iron pipe: galvanized carbon steel to MSS SP 58, type 42, UL listed.
.2 Copper pipe: carbon steel copper plated to MSS SP 58, type 42.
.3 Bolts: to ASTM A 307.
.4 Nuts: to ASTM A 563.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:
.1 64 kg/m^3 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.

2.5 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A 125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
.3 Provide upper and lower factory set travel stops.
.4 Provide load adjustment scale for field adjustments.
.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 VARIABLE SUPPORT SPRING HANGERS
.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.
.3 Variable spring hanger complete with factory calibrated travel stops.
.4 Steel alloy springs: to ASTM A 125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 EQUIPMENT ANCHOR BOLTS AND TEMPLATES
.1 Provide templates to ensure accurate location of anchor bolts.

2.8 HOUSEKEEPING PADS
.1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads a minimum of 150 mm larger than equipment.
.2 Concrete: to 30 MPa or in accordance with manufacturer’s instruction to suit the weight distribution of equipment being installed.

2.9 OTHER EQUIPMENT SUPPORTS
.1 Fabricate equipment supports from structural grade steel, adequately sized for the application. Submit fabrication drawing indicating load distribution and total load bearing capacity. Comply with additional requirements of Division 05.

2.10 PLATFORMS AND CATWALKS
.1 Comply with Division 05 Requirements.

3.0 EXECUTION

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

3.2 INSTALLATION
.1 Install in accordance with:
.1 Manufacturer's instructions and recommendations.

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

3.3 HANGER SPACING

.1 Plumbing piping: to Provincial Code.
.2 Fire protection: to applicable fire code.
.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.
.4 Copper piping: up to NPS 1/2: every 1.5 m.
.5 Within 300 mm of each elbow.
.6 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

Maximum Pipe Size (NPS)	Maximum Spacing Steel	Maximum Spacing Copper
Up to 1-1/4	2.1 m	1.8 m
1-1/2	2.7 m	2.4 m
2	3.0 m	2.7 m
2-1/2	3.6 m	3.0 m
3	3.6 m	3.0 m
3-1/2	3.9 m	3.3 m
4	4.2 m	3.6 m
5	4.8 m	
6	5.1 m	
8	5.7 m	
10	6.6 m	
12	6.9 m	

.7 Pipework greater than NPS 12: to MSS SP 69

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

End of 23 05 29

23 05 53.01 – Mechanical Identification

1.0 GENERAL

1.1 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 Related Sections:

.1 All Division 21, 22, and 23 Sections as applicable.

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 Canadian Gas Association (CGA)

.1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

.4 National Fire Protection Association (NFPA)

.1 NFPA 13, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14, Standard for the Installation of Standpipe and Hose Systems.

1.3 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.

.2 Manufacturer’s Installation Instructions: Indicate attachment or hanging and support methods, joining procedures.

.3 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements:

.1 Color Coding: ANSI Z535.1 (latest edition) shall take precedence over any discrepancies in determining proper color code identification.

.2 Conform to the standards established in ANSI A13.

.3 Comply with OHSA standards.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 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, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size #	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 characters per line.

.4 Locations:

.1 Terminal cabinets, control panels: use size #5.

.2 Equipment in Mechanical Rooms: use size #9.

.3 Bypass piping valves (“Normally Open” / “Normally Closed”): use size #6

2.2 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.

2.3 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Natural gas: to CSA/CGA B149.1.

.2 Propane gas: to CSA/CGA B149.1.

.3 Fuel oil: to CAN/CSA B139ON.

.4 Sprinklers: to NFPA 13.

.5 Standpipe and hose systems: to NFPA 14.

.6 Health care facilities: all piping, wiring, and medical gas to follow CAN/CGSB-24.3.

2.4 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 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 for legends, arrows: to following table

Background colour:	Legend, Arrows:
Yellow	Black
Green	White
Red	White

.8 Background colour marking and legends for piping systems:

Contents:	Background colour marking:	Legend:
City Water	Green	CITY WATER
Hot Water Supply	Yellow	HEATING SUPPLY
Hot Water Return	Yellow	HEATING RETURN
High Temp HW Supply	Yellow	HTHW HTG. SUPPLY
High Temp HW Return	Yellow	HTHW HTG. RETURN
Low Temp HW Supply	Yellow	LTHW HTG. SUPPLY
Low Temp HW Return	Yellow	LTHW HTG. RETURN
Glycol Heating Supply	Yellow	GLYCOL HTG. SUPPLY
Glycol Heating Return	Yellow	GLYCOL HTG. RETURN
Make-up Water	Green	MAKE-UP WTR.
Domestic Hot Water Supply	Yellow	DOM. HW SUPPLY
Domestic HW Recirculation	Yellow	DOM. HW RECIRC.
Domestic Cold Water Supply	Green	DOM. CW SUPPLY
Sanitary Drain	Green	SAN
Plumbing Vent	Green	SAN VENT
Natural Gas	Yellow	NAT. GAS _____ PSI/KPA
Gas Regulator Vent	Yellow	GAS VENT
Sprinklers	Red	SPRINKLERS

2.5 IDENTIFICATION OF DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contras

2.6 VALVES, VAV, CONTROLLERS, ET AL

.1 Brass tags with 12 mm stamped identification data.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

.3 Provide 25 mm round sticker in Green or Red on T-bar ceiling or ceiling access hatch indicating location of valves concealed above ceilings.

2.7 CONTROLS COMPONENTS

.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.

3.0 EXECUTION

3.1 INSPECTION

.1 Do not proceed with the work of this section until conditions detrimental to the proper and timely completion of the work have been corrected in an acceptable manner.

.2 Verify surfaces are clean and dry before application of identification signage.

3.2 INSTALLATION

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

.2 Nameplates:

.1 Locations: in conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs: provide for nameplates on hot and/or insulated surfaces.

.3 Protection: do not paint, insulate or cover.

.3 Piping and ductwork:

.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.

.4 Valves, VAV, Controllers, Et Al

.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 Place brass tags or nameplates in locations easily visible within the space at normal eye level or as otherwise directed by the Engineer or Owner.

.3 Install one copy of flow diagrams, valve schedules mounted in control cabinets. Laminate and affix or affix plastic sleeve to inside of door panel. Provide one copy in each operating and maintenance manual.

.4 Number valves in each system consecutively.

.5 Indicate all of the following information:

.1 Equipment Identification name and number

.2 System affiliation (ie AHU number, etc)

.3 Voltage and phase

.4 Power source identification (circuit and panel number)

End of 23 05 53.01

23 09 33 – Electric and Electronic Control System for HVAC

1.0 GENERAL

1.1 SUMMARY
- .1 Section includes:
  - .1 Materials and installation procedures for electric heating and cooling controls.
- .2 Related Sections:
  - .1 23 82 39 – Unit Heaters

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

1.3 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.
    - .1 Submit one copy of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality assurance submittals: submit the 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.

1.4 DELIVERY, STORAGE, AND HANDLING
- .1 Packing, shipping, handling, and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
- .2 Storage and Protection
  - .1 Store materials indoors.
  - .2 Store and protect materials from exposure to construction debris, dust, or damage. Provide protection against damage as required or for prolonged periods of storage.
- .3 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 ELECTRONIC STAND-ALONE CONTROLLERS
- .1 Low voltage, wall-mounted controller, for modulating control of control valves, with:
  - .1 Easy-to-use graphic interface.
  - .2 Internal time clock scheduler.
  - .3 Modulating output.
  - .4 Equal to Honeywell T775M.

2.2 THERMOSTAT (LOW VOLTAGE)

.1 Low voltage wall thermostat:

.1 For use on 24 V circuit at 1.5 A capacity.

.2 Temperature setting range: 5°C to 30°C.

.3 Provide with control transformer sized to suit the application

.4 Provide with control relay where required and not provided as part of the equipment being controlled.

2.4 WATER FLOW SWITCH

.1 Flow switch measurement range and full load current rating to suit the application or as indicated. Pipe size as indicated, CSA Enclosure. Maximum liquid temperature: 121°C. Maximum liquid gauge pressure of 1034 kPa ambient temperature range 0°C to 82°C.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 On outside walls, mount thermostats on bracket or insulated pad 25mm away from exterior wall.

.2 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

.3 Service room heating thermostats

.1 Mount thermostat on wall or surface mounted electrical box.

.2 Wire thermostat to heating device terminals.

.3 Adjust dial to setpoint of 17 °C or as indicated.

.4 Confirm heating stages on and off.

3.3 FIELD QUALITY CONTROL

.1 The Contractor shall demonstrate the specified control actions to the satisfaction of the Owner and Engineer.

.2 Settings shall be adjusted and control actions shall be re-demonstrated at the request of and to the satisfaction of the Owner and Engineer.

3.4 CLEANING

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

.2 Comply with additional requirements described in other sections.

END OF 23 09 33

23 11 23 – Facility Natural Gas Piping

1.0 GENERAL

1.1 SUMMARY
- .1 Section Includes:
  - .1 This Section specifies piping, valves and fittings, installation and testing for gas fired equipment, and is based on service from outlet of gas meter or propane storage tank into building.
- .2 Related Sections:
  - .1 26 32 13.16 – Natural Gas Engine Driven Generator Sets

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 American Society of Mechanical Engineers (ASME)
  - .1 ASME B16.5, Pipe Flanges and Flanged Fittings.
  - .2 ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ASME B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
  - .4 ASME B18.2.1, Square and Hex Bolts and Screws Inch Series.
- .3 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A 47/A 47M, Standard Specification for Ferritic Malleable Iron Castings.
  - .2 ASTM A 53/A 53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
  - .3 ASTM B 75M, Standard Specification for Seamless Copper Tube [Metric].
  - .4 ASTM B 837, Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
- .5 Canadian Standards Association (CSA)/Canadian Gas Association (CGA)
  - .1 CAN/CSA B149.1HB, Natural Gas and Propane Installation Code Handbook.
  - .2 CAN/CSA B149.2, Propane Storage and Handling Code.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

1.3 WELDERS
- .1 Welders to be certified in accordance with API 1104 and CSA W47.1 and CSA W47.1S1.

1.4 SUBMITTALS
- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Indicate on manufacturer’s catalogue literature following: valves and regulators.
  - .3 Submit WHMIS MSDS in accordance with Hazardous Materials requirements. Indicate VOC's for adhesive and solvents during application and curing.

.2 Test Reports: submit pressure and leak test results from licensed fitter indicating compliance with Specifications for specified performance characteristics and physical properties.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:
  .1 Deliver, store and handle in accordance with manufacturer's written instructions.
.2 Storage and Protection
  .1 Store materials indoors.
  .2 Store and protect materials from exposure to construction debris, dust, or damage. Provide protection against damage as required or for prolonged periods of storage.
.3 Waste Management and Disposal:
  .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 STEEL PIPING

.1 Pipe: to API 5L, schedule 40.
.2 Fittings, 2-1/2" or larger: welded type, carbon steel, seamless or resistance weld. Wall thickness to be same as corresponding pipe size.
.3 Fittings, 2" or smaller: screw type, carbon steel, with appropriate thread compound. Wall thickness to be same as corresponding pipe size.
.4 Aboveground Joints:
  .1 Threaded, 2" or smaller: threaded joints using appropriate compound for product being handled.
  .2 Welded, 2-1/2" or larger: conform to provincial, federal and municipal regulations or requirements of CSA W47.1 and CSA W47.1S1.
.5 Corrosion and product protection:
  .1 Protect piping against external corrosion by painting.

2.2 VALVES

.1 Steel without copper bearing alloy: to API 68. Class 150, 1 MPa.
.2 NPS 1 1/2 and smaller: Use ball valves with teflon seat.
.3 Gate valves NPS 2 and larger: to ASTM A216/A216M, Grade WCB, carbon steel, OS&Y, flanged ends.
.4 Plug valves socket weld or flanged ends: Class 300, 2 MPa, bolted bonnet, tapered plug and seat, carbon steel body and trim with plug, teflon lining.
.5 Glands and valve seats: materials resistant to conveyed fluid.
.6 Rising stem or other indicating valves: where necessary, to establish visually whether valves are open or shut.

2.3 PRESSURE REGULATOR

.1 NOT USED.

3.0 EXECUTION

3.1 ANCHORS AND GUIDES

.1 Install anchors and guides at following points:

.1 At changes of pipe sizes.

.2 At branch line take offs.

.3 At changes of piping directions.

.4 At all terminal points.

.5 Elsewhere as indicated.

3.2 SUPPORTS AND EXPANSION

.1 Above-ground piping: prevent excessive vibration and stress on adjacent equipment.

.2 Support in accordance with CAN/CSA B149.1.

.3 Install with expansion offset loops in accordance with CAN/CSA B149.1.

3.3 SLEEVES

.1 Install where pipes pass through walls or floors. Firestop around pipes.

3.4 LOCATION OF PIPEWORK

.1 General: locate so that it will not constitute hazard to personnel, buildings or equipment.

.2 Combustible liquids or gases pipework:

.1 Do not install in service tunnels or pedestrian traffic areas.

.2 Locate above-ground where it enters building. Provide with outside control valves at point of entry.

3.5 INDOOR INSTALLATION

.1 Install to approval of authority having jurisdiction.

.2 Take most direct route possible or practicable.

.3 Support overhead or locate in trenches which contain no other services.

.4 Install overhead piping close to ceiling or beams or along walls, where possible. Support from building structure at least 1800 mm from floor.

.5 Steel frame buildings: use bolted clips or pipe hangers attached to flanges with retaining strap.

.6 Concrete ceilings: use through bolts or poured-in-place expansion shields.

.7 Hanger spacing:

.1 As indicated in CAN/CSA B149.1 – Natural Gas and Propane Installation Code.

.2 Design to prevent lateral movement.

.8 Exposed risers: protect against mechanical damage by installing:

.1 Adjacent to walls or pilasters.

.2 Between flanges of steel columns.

.3 Guards.

.9 Install loops or swing connections to compensate for pipe movement.

.10 Do not jeopardize fireproofing of any structural elements or fire separations.

3.6 VALVES

.1 Install valves to control flow and to isolate equipment at following locations:

.1 All loading and unloading connections;

.2 Each branch line at point of connection to main line;

3.7 WELDING

.1 Do work in accordance with API 1104. Use oxyacetylene process.
.2 Make joints in accordance with manufacturer's recommendations.
.3 Use bevelling machine to produce bevel cuts.
.4 Welds: full penetration. Use welding sockets for joints NPS 2 or smaller, conforming to ANSI/ASME B16.11.
.5 Make branch connections with welding tees or forged branch outlet fittings.
.6 Leave welds uncovered until inspected and approved by Engineer.
.7 Replace welds which fail to meet API 1104 requirements.

3.8 TESTING

.1 Prior to testing, remove foreign matter, flush piping and equipment using compressed air.
.2 Pressure test with air to at least 1.5 times maximum operating pressure. Submit certificate of tests and test results to Engineer.
.3 Test piping systems with compressed air to 700 kPa. Hold pressure for 24 h.
.4 Should there be loss of pressure, soap test each weld and screw connection or use tracer gas with compressed air as directed by Engineer.
.5 Repeat repair and testing until system tightness is established and pressure test is successful.

END OF 23 11 23

23 21 14 – Hydronic Specialties

1.0 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 This section includes material and installation requirements for

.2 Related sections:

.1 22 42 01 – Plumbing Specialties and Accessories

.2 23 05 05 – Installation of Pipework

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 American Society of Mechanical Engineers (ASME)

.1 ASME, Boiler and Pressure Vessel Code.

.3 ASTM International Inc.

.1 ASTM A 47/A 47M, Standard Specification for Ferritic Malleable Iron Castings.

.2 ASTM A 278/A 278M, 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, Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.

.4 ASTM A 536, Standard Specification for Ductile Iron Castings.

.5 ASTM B 62, Standard Specification for Composition Bronze or Ounce Metal Castings.

.4 Canadian Standards Association (CSA International)

.1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.

.2 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code, Supplement #1.

1.3 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 expansion tanks, air vents, separators, valves, and strainers, and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.

.3 Manufacturer’s Installation Instructions: Indicate hanging and support methods, joining procedures.

.4 Project Record Documents: Record actual locations of flow controls.

.5 Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

1.5 WARRANTY

.1 Provide a one (1) year parts and service warranty.

2.0 PRODUCTS

2.1 DIAPHRAGM TYPE EXPANSION TANK

.1 Not used.

2.2 AIR VENT

.1 Industrial manual vent: cast iron body and NPS 1/2 connection and rated at 1035 kPa working pressure.
.2 Solid material suitable for 115 degrees C working temperature.
.3 Install with ball valve isolation.

2.3 MAGNETIC AIR & DIRT SEPARATOR - IN-LINE

.1 Manufacturers:
  .1 BoilerMagXT;
  .2 Magna Clean.
  .3 Watts
.2 Performance:
  .1 Magnetic Performance: 9,000 Gauss high strength
  .2 Temperature: 41F to 212F
  .3 Operating Pressure: 145 PSI
  .4 Drain Valve: 1-1/4 inch NPT
.3 Materials / Construction:
  .1 Housing: 304 grade stainless steel
  .2 Tube Cartridge: 316 grade stainless steel
  .3 Other parts: 304 grade stainless steel
  .4 Surface finish: Internal: bead blast, External: powder coated
  .5 Sealing: Viton o-ring
.4 Provide with automatic air vent

2.4 PIPE LINE STRAINER

.1 NPS 1/2 to 2: bronze body to ASTM B 62, connections to match piping, Y pattern.
.2 NPS 2 1/2 to 12: cast steel body to ASTM A 278/A 278M, Class 30, connections to match piping.
.3 Blowdown connection: NPS 3/4.
.4 Screen: stainless steel with 1.19 mm perforations.
.5 Working pressure: 1035 kPa.

2.5 SUCTION DIFFUSER

.1 Body: cast iron with connections to match piping.

.2 Strainer: with built-in, disposable 1.19 mm mesh, low pressure drop screen and NPS 3/4 blowdown connection.
.3 Permanent magnet particle trap.
.4 Full length straightening vanes.
.5 Pressure gauge tappings.
.6 Adjustable support leg.

3.0 EXECUTION

3.1 APPLICATION

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

3.2 GENERAL

.1 Run drain lines to terminate above nearest drain; route lines to limit the instances of trip hazards.
.2 Maintain adequate clearance to permit service and maintenance.
.3 Should deviations beyond allowable clearances arise, request and follow Engineer's directive.
.4 Check shop drawings for conformance of tappings for ancillaries and for equipment operating weights.

3.3 STRAINERS

.1 Install in horizontal or down flow lines.
.2 Ensure clearance for removal of basket.
.3 Install ahead of each pump and where indicated.
.4 Install ahead of each terminal unit.
.5 Once pipe system cleaning is complete, remove startup screen.

3.4 AIR VENTS

.1 Install at high points of systems.
.2 Install gate valve on automatic air vent inlet.
.3 For glycol vents, run discharge back to fill system or 5-gallon pail placed near the vent using copper or plastic tubing.

3.5 EXPANSION TANKS

.1 Install specialties in accordance with manufacturer’s instructions.
.2 Where large air quantities can accumulate, provide enlarged air collection standpipes.
.3 Air separator and expansion tank to be installed on the suction side of the system pumps. Expansion tank to be tied into system piping in close proximity to air separator and system fill line.
.4 Pipe rigid drain line to nearest floor drain. Where expansion tank does not have a drain pipe block and bleed connection with hose bibb between expansion tank and system isolation valve.

3.6 PRESSURE SAFETY RELIEF VALVES

.1 Run discharge pipe to terminate above nearest drain.

3.7 SUCTION DIFFUSERS

.1 Install on inlet to pumps where indicated.

3.8 AIR AND COMBINATION AIR AND DIRT SEPARATORS

.1 Install specialties in accordance with manufacturer's instructions.

.2 Provide manual air vents at system high points and as indicated.

END OF 23 21 14

23 21 23 – Hydronic Pumps

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for hydronic pumps.

.2 Related Sections:

.1 23 05 13 – Common Motor Requirements for HVAC & Plumbing Equipment

.2 23 05 14 – Variable Frequency Motor Controllers

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE)

.1 Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.3 Canadian Standards Association (CSA International)

.1 CSA-B214, Installation Code for Hydronic Heating Systems.

.4 National Electrical Manufacturers' Association (NEMA)

.1 NEMA MG 1, Motors and Generators.

1.3 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 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.

.2 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.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit shop drawings to indicate project layout and dimensions; indicate:

.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.

.3 Submit product data of pump curves for review showing point of operation. For pumps operating in parallel, submit shop drawings showing both single and parallel pump operation.

.4 Pump volute shall be sized for a maximum of 17 fps velocity. When a pump cannot meet this requirement the manufacturer shall clearly indicate this on the shop drawing and include a written explanation as to why the particular pump has been selected.

.5 Design pump operating efficiency is indicated on schedules. When a pump cannot meet or exceed the design efficiency, the manufacturer shall clearly indicate this on the shop drawing and include a written explanation as to why the particular pump has been selected.

.6 Indicate piping, valves and fittings shipped loose by packaged equipment supplier, showing their final location in field assembly

1.4 SCHEDULES

.1 Specific pump selections are shown on schedules on drawings. Where schedules are in conflict with these specifications, the schedule shall take precedence.

.2 Pumps for potable water service shall be as indicated in applicable clauses herein except they shall be fabricated with bronze body and bronze impeller.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 GENERAL

.1 Acceptable manufacturers:

.1 Armstrong Fluid Technology

.2 ITT Bell & Gossett

.3 Grundfos

.4 Taco Hydronics

.5 Paco Pumps

.2 Motor shall be in conformance with Section 23 05 13 – Common Motor Requirements for HVAC Equipment.

.3 Select motors to be non-overloading over the entire pump curve.

.4 Bearings shall be grease or oil lubricated type. Permanently lubricated bearings are not acceptable.

.5 Pump volute sized for a maximum of 17 fps velocity.

.6 For heating systems with operating temperatures greater than 82.2°C. (180°F.) and for condenser water systems, use Tungsten Carbide seals.

2.2 IN-LINE CIRCULATORS

.1 Volute: cast iron radially split with flanged tapped ports design suction and discharge connections.

.2 Maximum operating temperature 250°F and maximum operating pressure 175 psig.

.3 Cast bronze impeller, centrifugal type, dynamically and hydraulically balanced.

.4 Cupro-nickel shaft sleeve, replaceable bearing cartridge, flexible coupler and standard mechanical seal.

.5 Motor shall be open-drip proof enclosure, NEMA standard and resilient mount.

.6 Where indicated, provide inverter-duty motors designed for use with variable frequency motor drives. Standard or normal high-efficiency motors will not be accepted in these situations.

2.3 VERTICAL IN-LINE PUMP

.1 Not used.

2.4 CONTROLS

.1 Not used.

3.0 EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Install hydronic pumps to: 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 as indicated for this purpose.

.2 Refer to manufacturer's installation instructions for details.

.5 Increasers and reducers on pump suction and discharge shall be of a gradual increase or reduction to prevent unnecessary turbulence or noise. Horizontal increasers and reducers shall be eccentric fittings. Vertical increasers and reducers shall be concentric fittings

.6 Install volute venting pet cock in accessible location.

.7 Check rotation prior to start-up.

.8 Install pressure gauge test cocks as indicated.

3.3 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 all safeties and 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 Measure pressure drop across strainer when clean and with flow rates as finally set.
.14 Replace seals if pump used to degrease system or if pump used for temporary heat.
.15 Verify lubricating oil levels.

End of 23 21 23

23 51 00 – Breeching, Chimneys and Stacks

1.0 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Materials, accessories and installation for breechings, chimneys and stacks.

.2 All products furnished under this Section shall conform to the requirements of The National Fuel Gas Code, ANSI Z223.1/NFPA-54 where applicable and shall comply with and be listed to UL 1738, the U.S. Standard for Venting Systems for Gas-Burning Appliances, Category II, III, and IV and ULC-S636-95, the Canadian Standard for Type BH gas vent systems. Components coming in direct contact with products of combustion shall carry the appropriate UL or cUL labels.

.3 Whether drawings indicate natural draft or pressurized flue, flue vents shall be designed to withstand corrosive effects of flue gas condensation.

.4 Seal all joints to prevent condensate leakage.

.5 Make provision for draining flue condensate to a floor drain.

.2 Related Sections:

.1 23 52 01 – Domestic Water Heaters

.2 23 52 02 – Heating Boilers

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

.3 Underwriters' Laboratories of Canada (ULC)

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

.1 Material Safety Data Sheets (MSDS).

1.3 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 Submit manufacturer's printed product literature, specifications and datasheet for heating, ventilation and air conditioning distribution piping and ductwork.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit shop drawings to indicate project layout and dimensions; indicate:

.1 Methods of sealing sections.

.2 Methods of expansion.

.3 Details of thimbles.

.4 Bases/Foundations.

.5 Supports.

.6 Guy details.

.7 Rain caps.

.8 Drain Connections
.9 Transition Sections
.10 Penetrations and Flashing
.11 Materials: venting, gaskets, and sealants

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements
.1 Work to be performed in compliance with TSSA.
.2 The Contractor shall assume all liability to properly size and install the systems specified under this section in accordance with specific requirements of associated combustion appliances and in accordance with all local codes.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions.
.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

1.6 WARRANTY

.1 The manufacturer shall warrant the Positive Pressure Vent System against defects in material and workmanship for a period of 15 years from the date of the original installation. Any portion of the vent repaired or replaced under the warranty shall be warranted for the remainder of the original warranty period.

2.0 PRODUCTS

2.1 POSITIVE OR NEUTRAL PRESSURE VENT, CATEGORY II, III, OR IV METALLIC SINGLE WALL

.1. The vent shall be of the single wall, factory-built type, designed for use in conjunction with Category II, III, or IV condensing or non-condensing gas fired appliances or as specified by the heating equipment manufacturer.
.2 Maximum continuous flue gas temperature shall not exceed 550°F (288°C).
.3 Vent shall be listed for a maximum positive pressure rating of 6" w.c. and shall have passed at 15" w.c.
.4 The vent system shall be continuous from the appliance's flue outlet to the vent termination outside the building. All systems components shall be UL/cUL listed and supplied by the same manufacturer.
.5 The vent shall be constructed from AL29-4C ® or UNS S44735 stainless steel, with a min. wall thickness of .016" for 3" through 7"dia. vents, .019" for 8" through 12" dia. vents and .024" for 14" and 16" dia. vents.
.6 All systems components such as vent supports, roof or wall penetrations, terminations, appliance connectors and drain fittings required to install the vent system shall be UL listed and provided by the vent manufacturer.
.7 All systems components shall include a factory-installed gasket to render the vent air and water tight when the male/female ends are pushed together as per manufacturer's instructions, or shall be sealed on site using a manufacturer-approved field-installed sealant.

.8 All systems components shall include a factory installed, internal mechanical locking band for fastening and securing all vent components against each other.
.9 Vent layout shall be designed and installed in compliance with manufacturer's installation instructions and all applicable local codes.
.10 Product: ProTech Systems Inc., Security Chimneys, Z-Vent, Metal-Fab Inc. or approved equal.

2.2 POSITIVE OR NEUTRAL PRESSURE VENT, CATEGORY II, III, OR IV METALLIC DOUBLE WALL
.1. The vent shall be of the double wall, factory-built type, designed for use in conjunction with Category II, III, or IV condensing or non-condensing gas fired appliances or as specified by the heating equipment manufacturer.
.2 Maximum continuous flue gas temperature shall not exceed 550°F (288°C).
.3 Vent shall be listed for a maximum positive pressure rating of 6" w.c. and shall have passed at 15" w.c.
.4 The vent system shall be continuous from the appliance's flue outlet to the vent termination outside the building. All systems components shall be UL/cUL listed and supplied by the same manufacturer.
.5 The vent shall be constructed from AL29-4C ® or UNS S44735 stainless steel, with a min. wall thickness of .016" for 3" through 7"dia. vents, .019" for 8" through 12" dia. vents and .024" for 14" and 16" dia. vents.
.6 All systems components such as vent supports, roof or wall penetrations, terminations, appliance connectors and drain fittings required to install the vent system shall be UL listed and provided by the vent manufacturer.
.7 All systems components shall include a factory-installed gasket to render the vent air and water tight when the male/female ends are pushed together as per manufacturer's instructions, or shall be sealed on site using a manufacturer-approved field-installed sealant.
.8 All systems components shall include a factory installed, internal mechanical locking band for fastening and securing all vent components against each other.
.9 Vent layout shall be designed and installed in compliance with manufacturer's installation instructions and all applicable local codes.
.10 Product: FasNSeal W2 by ProTech Systems Inc., Z-Vent, Security Chimneys, or approved equal.

2.3 POSITIVE OR NEUTRAL PRESSURE VENT, CATEGORY II, III, OR IV CPVC SINGLE WALL
.1. The vent shall be of the CPVC schedule 40 single wall, factory-built type, designed for use in conjunction with Category II, III, or IV condensing or non-condensing gas fired appliances or as specified by the heating equipment manufacturer.
.2 The vent system material shall be selected such that the maximum continuous flue gas temperature of the associated boiler shall not exceed the vent system rating.
.3 Vent shall be listed for a maximum positive pressure rating of 6" w.c. and shall have passed at 15" w.c.
.4 The vent system shall be continuous from the appliance's flue outlet to the vent termination outside the building. All systems components shall be UL/cUL listed and supplied by the same manufacturer.
.5 The vent shall be constructed from CPVC.
.6 All systems components such as vent supports, roof or wall penetrations, terminations, appliance connectors and drain fittings required to install the vent system shall be UL listed and provided by the vent manufacturer.

.7 All systems components shall include a factory-installed gasket to render the vent air and water tight when the male/female ends are pushed together as per manufacturer's instructions, or shall be sealed on site using a manufacturer-approved field-installed sealant.
.8 All systems components shall include a factory installed, internal mechanical locking band for fastening and securing all vent components against each other.
.9 Vent layout shall be designed and installed in compliance with manufacturer's installation instructions and all applicable local codes.

2.4 ACCESSORIES
.1 Cleanouts: bolted, gasketted type, full size of breeching, where indicated.
.2 Barometric dampers: double acting, 70% of full size of breeching area.
.3 Hangers and supports: in accordance with recommendations of Sheet Metal and Air Conditioning Contractors National Association Inc. (SMACNA).
.4 Rain cap.
.5 Expansion sleeves with heat resistant caulking, held in place according to flue manufacturer's recommendations.
.6 Drip leg on flue breeching: Stainless steel, same material as general flue construction.

3.0 EXECUTION

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

3.2 INSTALLATION
.1 Follow manufacturer's, TSSA and SMACNA installation recommendations for shop fabricated components.
.2 Route vent system to maintain minimum clearance to combustibles as specified by the manufacturer.
.3 Vent Installation shall conform to the manufacturer's installation instructions, its UL listing and state/provincial/local codes
.4 Suspend breeching at 1.5m centres and at each joint.
.5 Support chimneys at bottom, roof and intermediate levels as indicated.
.6 If dampers or fans are installed in conjunction of the vent system, such equipment shall be supported independently from the vent system. Protect vent system from twisting or movement due to fan torque or vibration.
.7 Install thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney. Pack annular space with heat resistant caulking.
.8 Install cones and flashings on chimneys penetrating roofs, as indicated. Seal flashings to surrounding roof around chimney penetrations to match surrounding and ensure a weather tight seal.
.9 Provide counter flashing from chimney to curb where chimneys pass through existing and new openings in roof. Flashing to be constructed from 316 Stainless Steel.
.10 Install rain caps and cleanouts, as indicated.
.11 Provide a drip leg on the low point of the breeching at the back of each boiler, c/w 1" corrosion-resistant line to floor drain and p-trap.
.12 Inspect and clean the vent system and breechings before the final connection to the appliances.

.13 Provide double wall or insulate venting up to a height of 8 feet AFF.

End of 23 51 00

23 52 01 – Domestic Water Heaters

1.0 GENERAL

1.1 SUMMARY
- .1 Section Includes:
  - .1 This Section specifies heating boiler units including fire tube, cast iron, coil tube hot water, electric, steam boilers, gas or oil burners their installation and commissioning.
- .2 Related Sections:
  - .1 23 11 23 – Facility Natural Gas Piping
  - .2 23 51 00 – Breeching, Chimneys, and Stacks

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 American Boiler Manufacturer's Association (ABMA)
- .3 American National Standards Institute (ANSI)
  - .1 ANSI Z21.13/CSA 4.9, Gas-Fired Low-Pressure Steam and Hot Water Boilers.
- .4 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME)
  - .1 ANSI/ASME Boiler and Pressure Vessel Code, Section IV.
- .5 Canadian Gas Association (CGA)
  - .1 CAN1-3.1, Industrial and Commercial Gas-Fired Package Boilers.
  - .2 CAN/CSA-B149.1, Natural Gas and Propane Installation Code.
- .6 Canadian Standards Association (CSA International)
  - .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
- .7 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .9 Technical Safety and Standards Authority (TSSA)

1.3 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 Submit manufacturer's printed product literature, specifications and datasheet for heating, ventilation and air conditioning distribution piping and ductwork.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit shop drawings to indicate project layout and dimensions; indicate:
    - .1 General arrangement showing terminal points, instrumentation test connections.
    - .2 Clearances for operation, maintenance, servicing, tube cleaning, tube replacement.
    - .3 Foundations with loadings, anchor bolt arrangements.
    - .4 Piping hook-ups.
    - .5 Equipment electrical drawings.
    - .6 Burners and controls.
    - .7 All miscellaneous equipment.

.8 Flame safety control system.
.9 Breeching and stack configuration.
.10 Stack emission C0, 0, N0x, S0, stack temperature and smoke density of flue gases at standard operating conditions.
.11 Compliance with relevant standards and certifications.
.3 Engineering data to include:
.1 Boiler efficiency at 25%, 50%, 75%, 100% of design capacity.
.2 Radiant heat loss at 100% design capacity.

1.4 QUALITY ASSURANCE
.1 Regulatory Requirements
.1 Work to be performed in compliance with TSSA.
.2 The Contractor shall assume all liability to properly size and install the systems specified under this section in accordance with specific requirements of associated combustion appliances and in accordance with all local codes.

1.5 DELIVERY, STORAGE, AND HANDLING
.1 Packing, shipping, handling, and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions.
.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

1.6 WARRANTY
.1 One (1) year warranty for all parts.
.2 Five (5) year warranty for heat exchanger against failure due to defects in material or workmanship.
.3 Life-time warranty for the heat exchanger due to thermal shock.

2.0 PRODUCTS

2.1 GENERAL
.1 The boiler shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. The boiler shall have a fully welded 316L stainless steel interior with a carbon steel shell fire tube heat exchanger. There shall be a single pressure vessel. Multiple pressure vessels are not acceptable.

2.2 CONSTRUCTION
.1 The boiler shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides.
.2 The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal.
.3 One burner/flame observation ports shall be provided. The single burner shall be a premix design constructed of high temperature stainless steel with a woven Fecralloy outer covering to provide modulating firing rates.

2.3 GAS CONNECTION

.1 The boiler shall be supplied with a dual valve body gas valve with two safety shut offs and regulator and be equipped with a pulse width modulation blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency.
.2 The boiler shall operate in a safe condition with gas supply pressures as low as 4 inches of water column on Natural and as low as 8 inches of water column on Propane.

2.4 CONTROLS
.1 The boiler shall utilize a 24 VAC control circuit and components. The control system shall have a display for boiler set-up, boiler status, and boiler diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket.
.2 The boiler shall be equipped with a temperature/pressure gauge; high limit temperature control with manual reset; ASME certified pressure relief valve set for 50 psi (standard); outlet water temperature sensor (dual thermistor); return water temperature sensor; outdoor air sensor, flue temperature sensor (dual thermistor); high and low gas pressure switches, low water cut off with manual reset, blocked drain switch and a condensate trap for the heat exchanger condensate drain.
.3 The boiler shall also have an interior service light to provide illumination to the boiler's interior space.
.4 Vertical Vent with Room Air system with a vertical rooftop termination of the vent with the combustion air drawn from the interior of the building. The flue shall be Stainless Steel sealed vent material terminating at the rooftop with the manufacturers specified vent termination. The boiler total combined exhaust venting length shall not exceed 150 equivalent feet. Foam Core pipe is not an approved material for exhaust piping.

2.5 VENTING
.1 The boiler shall be supplied with a dual valve body gas valve with two safety shut offs and regulator and be equipped with a pulse width modulation blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency.
.2 The boiler shall operate in a safe condition with gas supply pressures as low as 4 inches of water column on Natural and as low as 8 inches of water column on Propane.
.3 The boiler shall be capable of at least equivalent 150ft venting.

3.0 EXECUTION

3.1 AUXILIARIES
.1 Provide for each boiler and to meet ANSI/ASME requirements:
.1 Relief valves: ANSI/ASME rated, set as indicated or as appropriate for system pressure, to release entire boiler capacity, piped to floor drain.
.2 Pressure gauge: minimum 90 mm diameter complete with shut-off cock.
.3 Outlet thermometer: 115 mm diameter range 10 to 120 °C.
.4 Low-water cut-off with visual and audible alarms, interlocked to burner control.
.5 Isolating ball or rising stem gate valves: supply and return connections.
.6 Drain valve, piped to floor drain.
.7 One set of cleaning tools.
.8 For low water volume boilers, flow switch with visual alarm, interlocked to burner control.

3.2 INSTALLATION

.1 Install in accordance with ANSI/ASME Boiler and Pressure Vessels Code Section IV, regulations of Province having jurisdiction, except where specified otherwise, and manufacturers recommendations.

.2 Contractor shall receive curbside delivery of boilers, coordinated with boiler supplier.

.3 Make all required piping connections to all inlets and outlets recommended by boiler manufacturer.

.4 Maintain clearances as indicated or if not indicated, as recommended by manufacturer for operation, servicing and maintenance without disruption of operation of any other equipment or system.

.5 Pipe hot water relief valves full size to nearest drain.

.6 Natural gas fired installations - in accordance with CAN/CGA-B149.1.

.7 Coordinate control interface with external control systems and equipment.

3.3 MOUNTING AND ACCESSORIES

.1 Safety valves and relief valves:

.1 Run separate discharge from each valve.

.2 Terminate discharge pipe as indicated.

.3 Run drain pipe from each valve outlet and drip pan elbow to above nearest drain.

.2 Structural steel base, lifting lugs.

.3 Install boiler on new concrete housekeeping pad.

.1 Bolt boiler securely to concrete pad.

.2 Mount unit level on rubber isolation pads at four corners, minimum ¼" deflection

3.5 START-UP

.1 Start-up, adjustments, and performance tests shall be completed.

.2 Provide Engineer at least 24 hours notice prior to inspections, tests, and demonstrations. Submit written report of inspections and test results.

.3 Contractor may use boilers for test purposes prior to acceptance and commencement of warranty period.

.4 Contractor shall arrange with boiler Supplier for labour, materials and instruments required for tests.

.5 Contractor shall arrange and pay Supplier to supervise installation, perform start-up adjustments and check electrical wiring. Contractor shall also provide two follow-up service visits.

.6 Contractor shall provide a letter from the Supplier stating boiler control check out has been completed, burners have been adjusted, barometric dampers have been adjusted, and systems are operating in accordance with specified requirements, c/w written report of inspections and test results. The written report shall include the following at a minimum. Incomplete reports will not be accepted and will require that the startup adjustment and testing is repeated until complete reports are provided.

.1 Installation address, startup date, and startup contact information.

.2 Startup technician license number.

.3 Boiler model and serial number

.4 Burner model and serial number

.5 Relief valve model, size, and pressure setting

.6 Inlet, gas train, and manifold gas pressures for both low and high fire.

.7 Input gas firing rate (MBH) for both low and high fire.
.8 CO2, O2, and CO percentages in flue gas for both low and high fire (min and max fire for modulating burners).
.9 Stack temperature, combustion efficiency, and leaving water temperature at both low and high fire (min and max fire for modulating burners).
.10 Date- and time-stamped printouts from the flue gas analyzer used. Handwritten values alone will not be accepted.
.11 Confirmation of safety controls: high limit, high limit manual reset, operating control, modulation control, flow switch, low water cutoff, low gas pressure, high gas pressure, combustion air flow.
.12 Confirmation that internal operating controls have been set up to interface and operate correctly with external controls included in the Work or in other concurrent projects.

.7 Supplier shall demonstrate correct boiler operation to Owner's Representative.

3.6 TEMPORARY USE BY CONTRACTOR

.1 Contractor may use boilers only after written approval from Owner's Representative.
.2 Contractor must monitor and record performance continuously. A log of maintenance activities must be kept.
.3 Contractor must refurbish to as-new condition before final inspection and acceptance.

End of 23 52 01

23 52 02 – Space Heating Boilers

1.0 GENERAL

1.1 SUMMARY
- .1 Section Includes:
  - .1 This Section specifies heating boiler units including fire tube, cast iron, coil tube hot water, electric, steam boilers, gas or oil burners their installation and commissioning.
- .2 Related Sections:
  - .1 23 11 23 – Facility Natural Gas Piping
  - .2 23 51 00 – Breeching, Chimneys, and Stacks

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 American Boiler Manufacturer's Association (ABMA)
- .3 American National Standards Institute (ANSI)
  - .1 ANSI Z21.13/CSA 4.9, Gas-Fired Low-Pressure Steam and Hot Water Boilers.
- .4 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME)
  - .1 ANSI/ASME Boiler and Pressure Vessel Code, Section IV.
- .5 Canadian Gas Association (CGA)
  - .1 CAN1-3.1, Industrial and Commercial Gas-Fired Package Boilers.
  - .2 CAN/CSA-B149.1, Natural Gas and Propane Installation Code.
- .6 Canadian Standards Association (CSA International)
  - .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
- .7 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .9 Technical Safety and Standards Authority (TSSA)

1.3 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 Submit manufacturer's printed product literature, specifications and datasheet for heating, ventilation and air conditioning distribution piping and ductwork.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit shop drawings to indicate project layout and dimensions; indicate:
    - .1 General arrangement showing terminal points, instrumentation test connections.
    - .2 Clearances for operation, maintenance, servicing, tube cleaning, tube replacement.
    - .3 Foundations with loadings, anchor bolt arrangements.
    - .4 Piping hook-ups.
    - .5 Equipment electrical drawings.
    - .6 Burners and controls.
    - .7 All miscellaneous equipment.

.8 Flame safety control system.
.9 Breeching and stack configuration.
.10 Stack emission C0, 0, N0x, S0, stack temperature and smoke density of flue gases at standard operating conditions.
.11 Compliance with relevant standards and certifications.
.3 Engineering data to include:
.1 Boiler efficiency at 25%, 50%, 75%, 100% of design capacity.
.2 Radiant heat loss at 100% design capacity.

1.4 QUALITY ASSURANCE
.1 Regulatory Requirements
.1 Work to be performed in compliance with TSSA.
.2 The Contractor shall assume all liability to properly size and install the systems specified under this section in accordance with specific requirements of associated combustion appliances and in accordance with all local codes.

1.5 DELIVERY, STORAGE, AND HANDLING
.1 Packing, shipping, handling, and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions.
.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

1.6 WARRANTY
.1 One (1) year warranty for all parts.
.2 Ten (10) year warranty for heat exchanger against failure due to defects in material or workmanship.
.3 Life-time warranty for the heat exchanger due to thermal shock.
.4 Five (5) year warranty for the burner against failure due to defects in material or workmanship.

2.0 PRODUCTS

2.1 GENERAL
.1 The boiler shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. The boiler shall have a fully welded 316L stainless steel interior with a carbon steel shell fire tube heat exchanger. There shall be a single pressure vessel. Multiple pressure vessels are not acceptable. Fire Tube shall be of the Wave Fire Tube design and capable of transferring 16,000 to 20,000 Btu’s per tube. A liquid impact die shall be used to form the Wave Fire Tube. There shall be no banding material, bolts, gaskets or "O" rings in the heat exchanger construction. The Wave Fire Tube shall be robotically welded to the tube sheets. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. Pressure drop shall be no greater than 6.5 psi at 180 gpm. The condensate collection basin shall be constructed of welded 316L stainless steel. The complete heat exchanger assembly shall carry a ten (10) year limited warranty.

2.2 CONSTRUCTION

.1 Boiler shall be natural gas fired, fully condensing, and fire tube design. The boiler shall be factory-fabricated, factory-assembled, and factory-tested, fire-tube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.

.2 Heat Exchanger: The heater exchanger shall bear the ASME "H" stamp for 160 psi working pressure and shall be National Board listed. The heat exchanger shall be constructed of a fully welded 316L stainless steel interior with a carbon steel shell and of fire tube design. Fire tube shall be of the Wave Fire Tube design and capable of transferring 16,000 to 20,000 Btu's per tube. The Wave Fire Tube shall be manufactured via a liquid impact process. The Wave Fire Tube shall have an OD = 1.654" and a wall thickness = 0.039". The top and bottom tubesheets shall have a minimum thickness = ¼" (1000-2000) or 3/8" (2500 - 6000). There shall be no overlapping welds with the Wave Fire Tube to tubesheet welds. The heat exchanger shall be designed for a single-pass water flow to limit the water side pressure drop. There shall be no banding material, bolts, gaskets or "O" rings in the heat exchanger design. Cast iron, aluminum, or copper tube or water tube boilers will not be accepted.

.3 Condensate Collection Basin: Fully welded 316L stainless steel.

.4 Intake Filter and Dirty Filter Switch: Boiler shall include an intake air filter with a factory installed air pressure switch. The pressure switch will alert the end user on the screen of the boiler that the intake filter is dirty and needs to be changed.

.5 Pressure Vessel: The pressure vessel shall be in accordance with ASME Section IV pressure vessel code. The pressure vessel shall be designed for a single-pass water flow to limit the water side pressure drop. Pressure drop shall be no greater than 6.5 psi at 180 gpm. The pressure vessel shall contain a volume of water no less than:

Input MBH	Water Content
999	77 gallons
1,500	94 gallons
1,999	111 gallons
2,500	157 gallons
3,000	156 gallons
3,999	201 gallons
4,999	254 gallons
6,000	304 gallons

.6 Burner: Natural gas, forced draft single burner premix design. Operation of the burner shall not exceed that of 5.7% oxygen level or 40% excess air. The burner shall be high temperature stainless steel with a woven Fecralloy outer covering to provide modulating firing rates. The burner shall be capable of the stated gas train turndown without loss of combustion efficiency. The burner shall be removable from the boiler without removing the gas/air manifold.

.7 Blower: Boiler shall be equipped with a pulse width modulating blower system to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency. The burner firing sequence of operation shall include pre-purge, firing, modulation, and post-purge operation.

.8 Motors: Comply with requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

.9 Combustion System Gas Train: The boiler shall be supplied with a dual body gas valve with regulator and shall be capable of the following minimum turndowns:

Input MBH	Turndown	Minimum Input	Maximum Input
999	20:1	50,000	999,000
1,500	25:1	60,000	1,500,000
1,999	25:1	80,000	1,999,000
2,500	20:1	125,000	2,500,000
3,000	20:1	150,000	3,000,000
3,999	20:1	200,000	3,999,000
4,999	20:1	250,000	4,999,000
6,000	20:1	300,000	6,000,000

Combustion system shall integrate air and gas dampers along with a variable speed fan to control fuel/air ratio. Systems that rely solely on only one or two methods to adjust the fuel/air ratio shall not be permitted.

.10 Ignition: Spark ignition with 100 percent main-valve shutoff with electronic flame supervision. Boilers using a pilot for ignition and/or UV scanners for flame supervision shall be deemed unacceptable.

.11 High Altitude: The boiler shall operate at altitudes above sea level. US installations above 2,000 feet shall reference NFPA 54 for de-rate information. Canadian installations above 2,000 feet shall follow all applicable local codes and regulations.

.12 Casing:

.1 Jacket: Heavy gauge primed and painted steel jacket with snap-in closures. Jacket panels shall be fully removal; the front door and side panels shall not require tools for removal. The jacket shall be mounted on a steel base with a minimum thickness = ¼".

.2 Control Compartment Enclosures: NEMA 250, Type 1A.

.3 Insulation: Minimum ½ inch thick, mineral fiber insulation surrounding the heat exchanger.

.4 Combustion-Air Connections: Inlet and vent duct collars.

.5 Clearances: Boilers shall feature zero (0) clearance to combustibles. Boilers shall have the ability to be placed side by side in multiples with no clearance in between if necessary. Local codes should be considered.

.6 Rigging and Placement: Boiler shall include lifting lugs and fork truck accessibility for rigging.

.7 Characteristics and Capacities:

.1 Heating Medium: Hot water.

.2 Design Water Pressure Rating: 160 psi working pressure.

.3 Safety Relief Valve Setting: 50 psig

.4 Minimum Water Flow Rate:

Input MBH	Minimum Flow
999	18 gpm
1,500	25 gpm
1,999	25 gpm
2,500	25 gpm
3,000	25 gpm
3,999	45 gpm
4,999	50 gpm
6,000	60 gpm

.13 Oxygen Sensor

.1 An O2 sensor shall be standard equipment with this boiler. The O2 sensor shall be made by a top automotive supplier and is only available through Lochinvar. The O2 sensor shall be located in the combustion chamber. Boilers with O2 sensors placed elsewhere on the unit shall not be permitted. Boilers that utilize an air pump to direct combustion samples past the O2 sensor are not permitted.

2.3 TRIM

.1 Safety Relief Valve:

.1 Size and Capacity: 50 lb. System pressures should be confirmed. Custom relief valve sizes can be ordered.

.2 Description: Fully enclosed steel spring with adjustable pressure range and positive shutoff; factory set and sealed.

.2 Pressure Gage: Minimum 3-1/2 inch diameter. Gage shall have normal operating pressure about 50 percent of full range.

.3 Drain Valves: Minimum NPS 3/4 or nozzle size with hose-end connection.

.4 Condensate Trap: Factory supplied condensate trap with condensate trap blocked drain sensor.

2.3 CONTROLS

.1 Refer to Division 23 Section "Instrumentation and Control for HVAC."

.2 Boiler controls shall feature the following standard features:

.1 10" LCD capacitive touch screen display with 1280 x 800 resolution displaying status, modulation percentage, setpoints, and sensor data at a minimum on the home screen. Additional information such as history and parameters can be accessed via the touchscreen display without the need for navigation buttons. A screen saver mode shall be available with the display.

.2 Variable Speed Boiler Pump Control: Boiler may be programmed to send a 0-10V DC output signal to an ECM or VFD boiler pump to maintain a designed temperature rise across the boiler heat exchanger. The boiler shall be able to operate in this mode with a minimum temperature rise of 20 degrees F and a maximum temperature rise of 60 degrees F. Project specific temperature rise shall be 20 degrees F.

.3 Password Security: Boiler shall have a password security code for the Installer to access adjustable parameters.

.4 Outdoor air reset: Boiler shall calculate the set point using a field installed, factory supplied outdoor sensor and a 4 point adjustable reset curve.

.5 Pump exercise: Boiler shall energize any pump it controls for an adjustable time if the associated pump has been off for a time period of 24 hours.

.6 Ramp delay: Boiler may be programmed to limit the firing rate based on six limits steps and six time intervals.

.7 Boost function: Boiler may be programmed to automatically increase the set point a fixed number of degrees (adjustable by installer) if the setpoint has been continuously active for a set period of time (time adjustable by installer). This process will continue until the space heating demand ends.

.8 Domestic hot water priority: Boiler shall make the domestic hot water call for heat a priority over any space heating call and adjust the boiler setpoint to the domestic hot water boiler setpoint.

.9 Domestic hot water modulation limiting: Boiler may be programmed to limit the maximum domestic hot water firing rate to match the input rating of the indirect tank coil.

.10 Domestic hot water night setback: Boiler may be programmed to reduce the domestic hot water tank set point during a certain time of the day.

.11 PC port connection: Boiler shall have a micro USB port allowing the connection of PC boiler software.

.12 Time clock: Boiler shall have an internal time clock with the ability to time and date stamp lock-out codes and maintain records of runtime.

.13 Service reminder: Boiler shall have the ability to display a yellow colored service notification screen based upon months of installation, hours of operation, and number of boiler cycles. All notifications are adjustable by the installer.

.14 Five pump control: Boiler shall have the ability to control the boiler pump, system pump, domestic hot water pump, domestic hot water recirculation pump, and the bypass pump.

.15 Anti-cycling control: Boiler shall have the ability to set a time delay after a heating demand is satisfied allowing the boiler to block a new call for heat. The boiler will display an anti-cycling blocking on the screen until the time has elapsed or the water temperature drops below the anti-cycling differential parameter. The anti-cycling control parameter is adjustable by the installer.

.16 Night setback: Boiler may be programmed to reduce the space heating temperature set point during a certain time of the day.

.17 Freeze protection: Boiler shall turn on the boiler and system pumps when the boiler water temperature falls below 45 degrees. When the boiler water temperature falls below 37 degrees the boiler will automatically turn on. Boiler and pumps will turn off when the boiler water temperature rises above 43 degrees.

.18 Isolation valve control: Boiler shall have the ability to control a 2-way motorized control valve. Boiler shall also be able to force a fixed number of valves to always be energized regardless of the number of boilers that are firing.

.19 BMS integration with 0-10V DC input: The Control shall allow an option to Enable and control set point temperature or control firing rate by sending the boiler a 0-10V input signal.

.20 Data logging: Boiler shall have non-volatile data logging memory including last 10 lockouts, hours running, recycling reporting, and ignition attempts and should be able to view on boiler screen.

.21 Interior service light: Boiler shall feature an LED service light to provide additional illumination to the interior of the boiler.

.3 The boiler shall have a built in Cascade controller to sequence and rotate lead boiler to ensure equal runtime while maintaining modulation of up to 8 boilers of different btu inputs without utilization of an external controller. The factory installed, internal cascade controller shall include:

.1 Lead lag: The Control module shall minimize the number of boilers firing to achieve the heating load.

.2 Efficiency optimization: The Control module shall allow multiple boilers to fire at minimum firing rate in lieu of Lead/Lag.

.3 Front end loading: The Control modulate shall have the ability to communicate with other Lochinvar boilers featuring the SmartTouch™ and Smart System™ control platforms. This allows for a combination of units that feature condensing and non-condensing operation if so desired.

.4 Rotation of lead boiler: The Control module shall change the lead boiler every hour for the first 24 hours after initializing the Cascade. Following that, the leader will be changed once every 24 hours.

.5 Redundancy: The Control module shall have a built in feature to continue operating with follower boilers if the Lead boiler is not operational.

.4 Boiler operating controls shall include the following devices and features:

.1 Set-Point Adjust: Set points shall be adjustable.

.2 Operating Pressure Control: Factory wired and mounted to cycle burner.

.3 Sequence of Operation: Factory installed controller to modulate burner firing rate to maintain system water temperature in response to call for heat.

.4 Sequence of Operation: Electric, factory-fabricated and factory-installed panel to control burner firing rate to reset supply-water temperature inversely with outside-air temperature. At 10 deg F outside-air temperature, set supply-water temperature at 180 deg F; at 60 deg F outside-air temperature, set supply-water temperature at 140 deg F.

.5 Burner Operating Controls: To maintain safe operating conditions, burner safety controls limit burner operation.

.1 High Temperature Limit: Automatic and manual reset stops burner if operating conditions rise above maximum boiler design temperature. Limit switch to be manually reset on the control interface.

.2 Low-Water Cutoff Switch: Electronic probe shall prevent burner operation on low water. Cutoff switch shall be manually reset on the control interface.

.3 Blocked Inlet Safety Switch: Manual-reset pressure switch field mounted on boiler combustion-air inlet.

.4 High and Low Gas Pressure Switches: Pressure switches shall prevent burner operation on low or high gas pressure. Pressure switches to be manually reset on the control interface.

.5 Proof of Closure Valve (FCB 6000 only): Proof of closure valve (POC) shall prevent the boiler from firing if the POC valve seat is detected open. Upon a call for heat, once the POC valve seat is proven to be closed, the pre-purge cycle will begin and the POC valve will begin to open.

.6 Blocked Drain Switch: Blocked drain switch shall prevent burner operation when tripped. Switch to be manually reset on the control interface.

.7 Low air pressure switch: Pressure switches shall prevent burner operation on low air pressure. Switch to be manually reset on the control interface.

.8 Audible Alarm: Factory mounted on control panel with silence switch; shall sound alarm for any lockout conditions.

.6 Building Automation System Interface: Factory installed Modbus and BACnet MSTP gateway interface to enable building automation system to monitor, control, and display boiler status and alarms.

.1 BACnet IP and LonWorks gateways are available as optional equipment.

.7 Software Update: The control shall have the ability to receive updates in the field without hardware component replacement. This update can be performed via USB flash drive, internet connection, or via wireless connection. This service shall be provided at no additional and/or annual cost to the owner.

.8 CON•X•US Remote Connect: Integral remote connectivity technology that allows a mobile device to monitor and control boiler functionality. Internet connection is available on the Crest via Wi-Fi

or hardwired Ethernet connection. This service shall be provided at no additional and/or annual cost to the owner.

.9 RealTime O2 Trim™: Boiler shall provide real time trimming of O2 while the boiler is operational. Free air calibration of the sensor shall occur after every combustion cycle. The O2 value shall also auto correct for conditions such as barometric pressure, air temperature, fuel content, and altitude. O2 information shall be displayed in real time via a gauge on both the boiler touchscreen as well as the CON•X•US Remote Connect Application.

.1 The following methods of fuel/air trim shall be integrated into the system: Feed Forward Temperature and Barometric pressure shall be measured to determine the appropriate atmospheric conditions present. Commissioned Trim: When commissioning the unit 9 pre-set points will be fine-tuned by the installer. These settings will be used to optimize the fuel/air ratio across the operation range of the boiler. In addition, a separate ignition point will be commissioned as well to ensure proper fuel/air mix. Learned Trim: As the boiler operates the controls will log the air temperature and barometric pressure along with the target fuel/air ratio. As these air temperature and barometric pressure settings reoccur the controls will initially return to the optimal setting based on its learned trim. Feed Back: Once all of the above methods have taken place the O2 sensor shall provide “feedback” to confirm if the optimal fuel/air ratio has been reached.

.2 The boiler shall use the direct wet O2 measurement as the feedback loop. Boilers that use a dry O2 reading or a 0-10V signal to control the fuel/air ratio are not permitted.

.3 The RealTime O2 Trim is active whenever the boiler is running regardless of the time of day. Boilers that actively trim only during select periods of the day shall not be permitted.

.4 Boiler shall have the ability for the user to adjust combustion system to optimal fuel/air ratio via the on-board touchscreen. Boilers that utilize an external display to calibrate the combustion system shall not be permitted.

.5 Systems that utilize only a feedback operation to accurately trim the O2 shall not be permitted.

2.4 CONTROLS

.1 Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 26 Sections.

.2 Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

.3 Electrical Characteristics:

.1 See Drawings

.2 Voltage

120V/1PH - FCB/OCB 1000 through 2000
208V/3PH - FCB/OCB 2500 through 3000
480V/3PH – FCB/OCB 4000 through 6000

.3 Frequency: 60 Hz

.4 Factory supplied 208V, 480V or 600V transformers are available for optional voltage.

2.5 VENTING

.1 The boiler shall be supplied with a dual valve body gas valve with two safety shut offs and regulator and be equipped with a pulse width modulation blower system, to precisely control the fuel/air mixture to provide modulating boiler firing rates for maximum efficiency.
.2 The boiler shall operate in a safe condition with gas supply pressures as low as 4 inches of water column on Natural and as low as 8 inches of water column on Propane.
.3 Exhaust flue must be Category IV approved stainless steel sealed vent material from one of the approved manufacturers listed in the Installation and Operation manual. Boilers exhaust vent length must be able to extend up to 150 equivalent feet.
.4 Intake piping for all models must be of approved material as listed in the Installation and Operations manual. Boilers intake pipe length must be able to extend up to 150 equivalent feet.
.5 Boiler venting and intake piping configuration shall be installed per one of the approved venting methods shown in the Installation and Operation manual.
.6 Boiler shall come standard with a flue sensor to monitor and display flue gas temperature on factory provided LCD display.
.7 Boilers using common venting must contact the factory for sizing.
.8 Refer to manufacturer's Installation and Operations manual for detailed venting instructions and approved vent manufacturers.

3.0 EXECUTION

3.1 AUXILIARIES

.1 Provide for each boiler and to meet ANSI/ASME requirements:
  .1 Relief valves: ANSI/ASME rated, set as indicated or as appropriate for system pressure, to release entire boiler capacity, piped to floor drain.
  .2 Pressure gauge: minimum 90 mm diameter complete with shut-off cock.
  .3 Outlet thermometer: 115 mm diameter range 10 to 120 °C.
  .4 Low-water cut-off with visual and audible alarms, interlocked to burner control.
  .5 Isolating ball or rising stem gate valves: supply and return connections.
  .6 Drain valve, piped to floor drain.
  .7 One set of cleaning tools.
  .8 For low water volume boilers, flow switch with visual alarm, interlocked to burner control.

3.2 INSTALLATION

.1 Install in accordance with ANSI/ASME Boiler and Pressure Vessels Code Section IV, regulations of Province having jurisdiction, except where specified otherwise, and manufacturers recommendations.
.2 Contractor shall receive curbside delivery of boilers, coordinated with boiler supplier.
.3 Make all required piping connections to all inlets and outlets recommended by boiler manufacturer.
.4 Maintain clearances as indicated or if not indicated, as recommended by manufacturer for operation, servicing and maintenance without disruption of operation of any other equipment or system.
.5 Pipe hot water relief valves full size to nearest drain.
.6 Natural gas fired installations - in accordance with CAN/CGA-B149.1.
.7 Coordinate control interface with external control systems and equipment.

3.3 MOUNTING AND ACCESSORIES

.1 Safety valves and relief valves:
  .1 Run separate discharge from each valve.
  .2 Terminate discharge pipe as indicated.
  .3 Run drain pipe from each valve outlet and drip pan elbow to above nearest drain.
.2 Structural steel base, lifting lugs.
.3 Install boiler on new concrete housekeeping pad.
  .1 Bolt boiler securely to concrete pad.
  .2 Mount unit level on rubber isolation pads at four corners, minimum ¼" deflection

3.5 START-UP

.1 Start-up, adjustments, and performance tests shall be completed.
.2 Provide Engineer at least 24 hours notice prior to inspections, tests, and demonstrations. Submit written report of inspections and test results.
.3 Contractor may use boilers for test purposes prior to acceptance and commencement of warranty period.
.4 Contractor shall arrange with boiler Supplier for labour, materials and instruments required for tests.
.5 Contractor shall arrange and pay Supplier to supervise installation, perform start-up adjustments and check electrical wiring. Contractor shall also provide two follow-up service visits.
.6 Contractor shall provide a letter from the Supplier stating boiler control check out has been completed, burners have been adjusted, barometric dampers have been adjusted, and systems are operating in accordance with specified requirements, c/w written report of inspections and test results. The written report shall include the following at a minimum. Incomplete reports will not be accepted and will require that the startup adjustment and testing is repeated until complete reports are provided.
  .1 Installation address, startup date, and startup contact information.
  .2 Startup technician license number.
  .3 Boiler model and serial number
  .4 Burner model and serial number
  .5 Relief valve model, size, and pressure setting
  .6 Inlet, gas train, and manifold gas pressures for both low and high fire.
  .7 Input gas firing rate (MBH) for both low and high fire.
  .8 CO2, O2, and CO percentages in flue gas for both low and high fire (min and max fire for modulating burners).
  .9 Stack temperature, combustion efficiency, and leaving water temperature at both low and high fire (min and max fire for modulating burners).
  .10 Date- and time-stamped printouts from the flue gas analyzer used. Handwritten values alone will not be accepted.
  .11 Confirmation of safety controls: high limit, high limit manual reset, operating control, modulation control, flow switch, low water cutoff, low gas pressure, high gas pressure, combustion air flow.
  .12 Confirmation that internal operating controls have been set up to interface and operate correctly with external controls included in the Work or in other concurrent projects.
.7 Supplier shall demonstrate correct boiler operation to Owner's Representative.

3.6 TEMPORARY USE BY CONTRACTOR

.1 Contractor may use boilers only after written approval from Owner's Representative.

.2 Contractor must monitor and record performance continuously. A log of maintenance activities must be kept.

.3 Contractor must refurbish to as-new condition before final inspection and acceptance.

End of 23 52 02

25 01 11 – EMCS: Start-up, Verification, and Commissioning

1.0 GENERAL

1.1 RELATED SECTIONS
- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 78 00 - Closeout Submittals.
- .3 Section 01 79 00 - Demonstration and Training.
- .4 Section 23 52 02 – Heating Boilers.

1.2 DEFINITIONS
- .1 EMCS definition: Energy Monitoring and Control System.
- .2 AEL: ratio between total test period less any system downtime accumulated within that period and test period.
- .3 Downtime: results whenever EMCS is unable to fulfill required functions due to malfunction of equipment defined under responsibility of EMCS contractor. Downtime is measured by duration, in time, between time that Contractor is notified of failure and time system is restored to proper operating condition. Downtime not to include following:
  - .1 Outage of main power supply in excess of back-up power sources, provided that:
    - .1 Automatic initiation of back-up was accomplished.
    - .2 Automatic shut-down and re-start of components was as specified.
  - .2 Failure of communications link, provided that:
    - .1 Controller automatically and correctly operated in stand-alone mode.
    - .2 Failure was not due to failure of any specified EMCS equipment.
  - .3 Functional failure resulting from individual sensor inputs or output devices, provided that:
    - .1 System recorded said fault.
    - .2 Equipment defaulted to fail-safe mode.
    - .3 AEL of total of all input sensors and output devices is at least 99% during test period.

1.3 DESIGN REQUIREMENTS
- .1 Review Contract Documents including original design Specifications and any and all Site Instructions or Change Orders to confirm up to date design and operational criteria.
- .2 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.

1.4 SUBMITTALS
- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures and 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.
- .2 Final Report: submit report to Consultant.
  - .1 Include measurements, final settings and certified test results.
  - .2 Bear signature of commissioning technician and supervisor
  - .3 Report format to be approved by Consultant before commissioning is started.
  - .4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Consultant in accordance with Section 01 78 00 - Closeout Submittals.
  - .5 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

1.5 CLOSEOUT SUBMITTALS

.1 Provide documentation, O&M Manuals, and training of O&M personnel for review of Consultant before interim acceptance in accordance with Section 01 78 00 - Closeout Submittals.

1.6 PRE-COMMISSIONING

.1 Not used.

1.7 COMMISSIONING

.1 Upon completion of the Pre-Commissioning, EMCS vendor shall provide staff and materials for the commissioning activities. This includes:

.1 Provision of all testing apparatus in use by the vendor to test and calibrate or verify calibration of control system and all other apparatus for which the vendor has control or calibration responsibility.

.2 Review test procedures and provide software enhancements to accommodate testing methods.

.3 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by Consultant, and Owner's Project Manager or Designated Representative.

.2 General commissioning

.1 Confirm all user adjustable control points.

.2 Confirm all trending control points.

.3 Confirm all alarms being generated.

.3 Boiler plant commissioning

.1 Confirm boilers and pumps are controlled and monitored by BAS.

.2 Confirm boilers are disabled when seasonal status is "Cooling".

.3 Adjust glycol loop temperature set point and verify boilers stage and modulate accordingly.

.4 Confirm pumps lead/lag operation.

.4 Domestic water heating

.1 Adjust the time of the day schedule and confirm domestic hot water return circulator starts when building is occupied.

.2 Confirm that circulator runs for minimum 15 minutes before verifying DHWR temperature and turns off for 15 minutes once DHWR temperature reaches setpoint.

.3 Confirm that the domestic hot water supply temperature is monitored, and alarm generated if temperature exceeds 58°C.

2.0 PRODUCTS

.1 Section noy used.

3.0 EXECUTION

3.1 PROCEDURES

.1 **The existing EMCS is provided and maintained by Airon and is now known as BGIS ITS. Retain BGIS ITS Canada LTD to connect new boilers and pumps to the existing EMCS, commission and update the graphics. Contact info:**

.1 Tanya Mead, 905-331-6555, BASestimating@bgis.com

.2 Commission integrated systems using procedures prescribed by Consultant and or as specified within. It is the EMCS vendor's responsibility to coordinate with others to ensure a Control representative familiar with the programming and set-up of the integrated system being present to ensure all BACnet communication points are properly configured and visible to the EMCS including Read/Write privileges and that the specified sequence and integration is operating as intended.

3.2 FACTORY TESTING

.1 Not used.

3.3 COMMISSIONING

.1 Testing the actual system installed on site shall be done in order to demonstrate the full functionality of the EMCS to the Owner's, Consultant's and/or Owner's Commissioning Agent's satisfaction. The Vendor shall supply the instruments, specialized tools and labour for the necessary adjustments in order to obtain the specified system performance.

.2 Commissioning shall include both point-to-point (**Functional**) testing and control sequence verification (**Performance Testing).**

.3 After receipt of all system documentation (as supplied by this vendor) by the Owner and/or Owner's Authorized Representative, notify the Owner 10 working days before testing begins.

3.4 FUNCTIONAL TESTING

.1 Verify operation, location and proper identification of all power sources, including circuit breakers and control equipment power transformers.

.2 Start/stop points:

.1 Issue start and stop commands from the local operator workstation (LOWS). Verify that controlled equipment responds appropriately and that the stat/stop status is accurately reflected at the (LOWS).

.3 Analog points:

.1 Analog inputs and outputs shall be verified at both extremes of their ranges and at the midpoint. Verify tight shutoff and full opening of the dampers and valves.

.4 Digital points:

.1 Verify that both commanded conditions (on/off, open/closed, etc.) and device status are accurately reflected at the LOWS.

.5 Fan and pump failure alarms:

.1 Test by turning off the motor at the Hand/Off/Auto (HOA) switch and observing the run-state indication at the operator station.

.6 Temperature points:

.1 Verify accuracy of sensors by comparing temperature values with the reading of an independent measuring device located in the same space or flow. Test liquid temperature sensors as installed in piping thermo wells to verify effectiveness of heat conducting compound.

.7 Pressure points:

.1 Verify accuracy of sensors by comparing displayed pressure with the reading of an independent measuring device located in the same flow stream. Retain the services of the balancer as required to confirm reading.

.8 Control valves:

.1 Verify tight shutoff by comparing water or air temperature entering and leaving the heat transfer device.

.9 Operator response and sequencing:

.1 Demonstrate that sequenced or modulated valves and dampers position accurately in response to changed conditions. Ensure that the positioned response accurately follows anticipated and specified control behavior. Ensure that the petition of multiple operators provides simultaneous modulation of damper or valve assemblies.

.10 Control signal stability (general):

.1 Demonstrate the control loops are tuned so that the output does not change until the controlled system has time to respond to the last output signal.

.11 Control signal stability (response to step input):

.1 Demonstrate that control loops are tuned so that they are stable without excessive hunting following a step input of not less than 20% of the operating/reset range of the controlled variable.

.12 Control signal stability (floating point devices):

.1 Verify that minimum pulse output duration is no less than the value required to assure repositioning to the controlled device.

.13 Demonstrate the capability of the controls system to execute the complete sequence of operation as given in the mechanical controls design documents.

.14 Verify tight shut-off of all actuated control valves (for 3-way valves, demonstrate capacity for 100% by-pass of coil).

.15 Failure modes:

.1 Verify all stand-alone operation by disconnecting communication lines between stand-alone control units and verifying continued operation.

.2 Disconnect and reapply 120 VAC Local Operation Station (LOWS) power to confirm proper power recovery from power failure.

.3 Disconnect and reconnect DDC controller power to confirm proper power recovery from power failure.

3.5 PERFORMANCE TESTING

.1 Using the graphical interface at Local operator workstation (LOWS), and in conjunction with CA, verify the operation and functionality of the following:

.2 Override test: Verify manual override capability for start/stop and modulated points types.

.3 Control logic

.1 Exercise all control logic packages.

.2 Check response to change in set-point and/or key control parameters.

.4 Supervisory functions

.1 Verify content of time clock schedules.

.2 Verify alarm's reporting capabilities including; establishing alarm limits, alarm priorities (i.e. – Critical, Maintenance, Energy, Out of Range, etc.), routing priorities.

.3 Demonstrate alarm routing functionality by triggering each different type of alarm and verifying that the system properly routed the alarm to the appropriate email and recorded in historical files, etc.

.4 Set-up and demonstrate trending and verify the location of data storage for historical trending.

.5 Verify Global commands.

3.6 CONTROLLER / CONTROLLER SYSTEM FAILURE MODE TESTING

.1 Verify all stand-alone operation by disconnecting communication lines between stand-alone control units and verifying continued operation.

.2 Disconnect and reapply 120 VAC Local Operation Station (LOWS) power to confirm proper power recovery from power failure.

.3 Disconnect and reconnect controller power (to each controller) to confirm proper power recovery from power failure.

3.7 DEMONSTRATION

.1 Demonstration is not a part of Start-Up/Commissioning or training and shall be done independently and only after completion of both tasks.

.2 Demonstrate to Consultant and Owner the operation of systems including a thorough review of the sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lockouts in accordance with Section 01 79 00 - Demonstration and Training.

3.8 ACCEPTANCE OF WORK

.1 The real end of work shall occur when all demolition, installations, programming and graphics are complete, and the Contractor has completed (their own) initial Functional and Performance Based testing and made arrangements with the Commissioning Agent to establish a date for commissioning. Any know deficiencies to that point of the project shall be documented by the contractor (on Provisional Acceptance Form) and then scheduled for completion prior to the start of Commissioning

.2 The provisional acceptance shall follow the real end of the work and shall signal the contractor's readiness for the start of Commissioning.

.3 All inspections, meetings, tests, etc. associated with the work acceptance shall be done by comparing the work with the specifications and the concordance and discordance documents. If there is ambiguity in the specifications or in the concordance and discordance document, the provisions in the specifications and the Consultant's opinion shall prevail. It is the Vendor's responsibility to detect any difference between the specification and the system to be supplied.

End of 25 01 11

26 05 00 – Common Work Results for Electrical

1.0 GENERAL

1.1 SUMMARY
- .1 Section includes:
  - .1 This section includes material and installation items common to all of Division 26.
- .2 Related Sections
  - .1 All of Division 26

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA C22.1, Canadian Electrical Code, Part 1.
  - .2 CSA C22.2, Wiring Products
  - .3 CAN/CSA-C22.3 No. 1, Overhead Systems.
  - .4 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .3 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
  - .1 EEMAC 2Y-1, Light Gray Colour for Indoor Switch Gear.
- .4 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
  - .1 IEEE SP1122, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
- .5 Electrical Safety Authority (ESA)
  - .1 Ontario Electrical Safety Code
  - .2 Ontario Electrical Safety Code - Bulletins

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 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.5 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
  - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
  - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
.4 Submit to authority having jurisdiction in accordance with authority's requirements.
.3 Quality Control:
.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 and in accordance with Authority Having Jurisdiction.
.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 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction.
.2 Site Meetings:
.1 In accordance with Division 01.
.2 Division 26, 27, 28 representatives must be in attendance at site meetings.

1.7 DELIVERY, STORAGE, AND HANDLING
.1 Packing, shipping, handling, and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions.
.2 Waste Management and Disposal:
.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 MATERIALS AND EQUIPMENT
.1 Provide material and equipment in accordance with Section 01 61 00 – Common Product Requirements.
.2 Material and equipment to be CSA certified or equivalent acceptable to the ESA – see ESA Bulletin 2-7-.
.3 Factory assemble control panels and component assemblies.

2.2 WARNING SIGNS
.1 Warning Signs: in accordance with requirements of authority having jurisdiction.
.2 Decal signs, minimum size 175 x 250 mm.

2.3 WIRING TERMINATIONS
.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.4 EQUIPMENT IDENTIFICATION
.1 Identify electrical equipment with [nameplates] [and] [labels] as follows:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, white colour core with lettering accurately aligned and engraved into core, mechanically attached with self-tapping screws. Face colour shall be black for normal power and red for emergency power.

.2 Sizes as follows:

Namplate 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 6 mm high letters unless specified otherwise.

.3 Allow for minimum of twenty-five (25) letters per nameplate and label.

.4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.5 Identify equipment with Size 3 labels.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, 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.

2.7 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	Green	Blue
Systems	Red	
Fire Alarm	Red	Blue
Emergency Voice	Red	Yellow
Other Security Systems		

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Colour to be light gray to EEMAC 2Y-1.

3.0 EXECUTION

3.1 INSTALLATION

.1 Do complete installation in accordance with Ontario Electrical Safety Code except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

.3 Refer to ESA Bulletin 12-25- for removal of abandoned wiring.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.4 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 Panelboards: as required by Code or as indicated.

3.6 COORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.7 FIELD QUALITY CONTROL

.1 Conduct following tests in accordance with Division 01

.1 Power generation and distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.4 Systems: fire alarm system, communications.

.2 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

End of 26 05 00

26 05 20 – Wire and Box Connectors (0-1000V)

1.0 GENERAL

1.1 SUMMARY
- .1 Section includes:
  - .1 Materials and installation for wire and box connectors.
- .2 Related Sections
  - .1 26 05 21 – Wires and Cables (0-1000V)

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2 CSA C22.2 No.65, Wire Connectors.
- .3 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .4 National Electrical Manufacturers Association (NEMA)

1.3 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
  - .1 Provide fuse performance data characteristics for each fuse type and size above 15 A. Performance data to include: average melting time-current characteristics.

1.4 DELIVERY, STORAGE, AND HANDLING
- .1 Packing, shipping, handling, and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 MATERIALS
- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper or aluminum sized to fit copper or aluminum conductors respectively as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to NEMA

3.0 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 C22.2 No.65.
.3 Install fixture type connectors and tighten. Replace insulating cap.
.4 Install bushing stud connectors in accordance with NEMA.

End of 26 05 20

26 05 21 – Wires and Cables (0-1000V)

1.0 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 This section includes material and installation for wire and cables within buildings from 0-1000 Volts. This Section does not include fire rated building wiring to ULC S139 and CSA C83, marine, hazardous, mining, instrumentation, communication and fire alarm wiring.

.2 Related Sections

.1 26 05 00 – Common Work Results for Electrical

.2 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 Canadian Standards Association (CSA International).

.1 CSA C22.1, Canadian Electrical Code, Part I

.2 CSA C22.2, Canadian Electrical Code, Part II – General Requirements

.3 Electrical Safety Authority

.1 Ontario Electrical Safety Code

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit product data in accordance with submittal requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Jacketted or as indicated.

.3 Neutral supported cable: 3 phase insulated conductors of Copper and one neutral conductor of Copper steel reinforced, size as indicated. Type NSF-2 flame retardant rated 600 V.

.3 Provide other cable with insulation as indicated.

.4 Flame spread ratings of cable to be suitable for installation in noncombustible construction per OESC and OBC.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00 – Common Work Results for Electrical.
.2 Conductors:
  .1 Grounding conductor: copper or as otherwise indicated.
  .2 Circuit conductors: copper or as otherwise indicated, size as indicated.
.3 Insulation:
  .1 Cross-linked polyethylene XLPE.
  .2 Rating: 600 V or 1000 V where indicated.
.4 Inner jacket: polyvinyl chloride material.
.5 Armour: interlocking aluminum.
.6 Overall covering: thermoplastic polyvinyl chloride, compliant to Ontario Building Code classification. Provide for direct-burial applications or where corrosive agents or moist environments exist as indicated.
.7 Fastenings:
  .1 One hole zinc straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
  .2 Channel type supports for two or more cables at 3000 mm centers.
  .3 Threaded rods: 6 mm diameter to support suspended channels.
.8 Connectors:
  .1 Watertight
  .2 Explosion-proof approved for TECK cable where indicated.
.9 Flame spread ratings of cable to be suitable for installation in noncombustible construction per OESC and OBC.

2.3 MINERAL INSULATED CABLES
.1 Conductors: solid bare soft-annealed copper, size as indicated.
.2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.
.3 Outer covering: annealed seamless copper sheath, Type M1 rated 600 V, 250 degrees C.
.4 Overall covering: thermoplastic polyvinyl chloride, compliant to Ontario Building Code classification. Provide for direct-burial applications or where corrosive agents or moist environments exist as indicated.
.5 Two hour fire rating.
.6 Connectors:
  .1 Watertight, field installed, and approved for MI cable.
  .2 Explosion-proof where indicated.
.7 Termination kits: field installed approved for MI cable.
.8 Flame spread ratings of cable to be suitable for installation in noncombustible construction per OESC and OBC.

2.4 ARMOURED CABLES
.1 Conductors: insulated, copper, size as indicated.
.2 Type: AC90.
.3 Armour: interlocking type fabricated from aluminum strip.
.4 Connectors: anti short connectors.
.5 Flame spread ratings of cable to be suitable for installation in noncombustible construction per OESC and OBC.

2.5 CONTROL CABLES

.1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath: thermoplastic jacket and armour of closely wound aluminum wire.

.2 Type: low energy 300 V control cable: solid annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: PVC.

.2 Shielding: tape coated with paramagnetic material over each group of conductors.

.3 Overall covering: interlocked armour of copper strip.

.3 Flame spread ratings of cable to be suitable for installation in noncombustible construction per OESC and OBC.

3.0 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.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Install cable in trenches in accordance with CAN/CSA C22.1 – Canadian Electrical Code, Part 1 and the Ontario Electrical Safety Code.

.2 Install cable in conduit or electro-metallic tubing in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

.3 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors - (0-1000 V).

.4 Cable Colour Coding: to Section 26 05 00 – Common Work Results for Electrical.

.5 Conductor length for parallel feeders to be identical.

.6 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.7 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.

.8 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.9 Install separate bond wire in EMT runs – do not rely on EMT as a bonding conductor.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows.

.1 In conduit or electro-metallic tubing in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

3.4 INSTALLATION OF TECK 90 CABLE

.1 Group cables wherever possible on channels.

.2 Install cable exposed in service space, securely supported by straps, hangers, or staples.

3.5 INSTALLATION OF MINERAL INSULATED CABLES

.1 Install cable concealed, securely supported by staples, straps, or hangers.

.2 Support 2 hour fire rated cables at 1 m intervals.

.3 Make cable terminations by using factory-made kits.
.4 Cable terminations: use thermoplastic sleeving over bare conductors.
.5 Where cables are buried in cast concrete or masonry, sleeve for entry and exit of cables.
.6 Do not splice cables unless indicated.

3.6 INSTALLATION OF ARMOURED CABLES
.1 Group cables wherever possible on channels.

3.7 INSTALLATION OF ALUMINUM SHEATHED CABLES
.1 Group cables wherever possible on channels.

3.8 INSTALLATION OF CONTROL CABLES
.1 Install control cables in conduit or in plenums where cable carries the appropriate rating and where permitted.
.2 Ground control cable shield.

End of 26 05 21

26 05 22 – Connectors and Terminations

1.0 GENERAL

1.1 SUMMARY
- .1 Section includes:
  - .1 Materials and installation for connectors and terminations.
- .2 Related Sections
  - .1 26 05 21 – Wires and Cables (0-1000V)

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 Canadian Standards Association (CSA International).
  - .1 CSA C22.1, Canadian Electrical Code, Part I
  - .2 CSA C22.2, Canadian Electrical Code, Part II – General Requirements
- .3 Electrical Safety Authority
  - .1 Ontario Electrical Safety Code

1.3 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
  - .1 Submit product data in accordance with submittal requirements.

1.4 DELIVERY, STORAGE, AND HANDLING
- .1 Packing, shipping, handling, and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
  - .2
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

1.5 CERTIFICATES
- .1 Obtain inspection certificate of compliance covering high voltage stress coning from inspection authority and include it with Operation & Maintenance Manuals.

2.0 PRODUCTS

2.1 CONNECTORS AND TERMINATIONS
- .1 Compression connectors to CSA C22.2 No. as required sized for conductors.
- .2 Contact aid for aluminum cables where applicable.
- .3 No junctions shall be used for cable installed in trenches.

3.0 EXECUTION

3.1 INSTALLATION
- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2 No.41.

End of 26 05 22

26 05 28 – Grounding Secondary

1.0 GENERAL

1.1 RELATED SECTIONS
- .1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
  - .1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.
- .3 Canadian Standards Association, (CSA International)

1.3 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate waste materials for recycling and dispose of in a safe and legal manner.

1.4 PACKING, SHIPPING, HANDLING, AND UNLOADING
- .1 Deliver, store and handle in accordance with manufacturer’s written instructions.

2.0 PRODUCTS

2.1 EQUIPMENT
- .1 Clamps for grounding conductor to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, soft annealed.
- .3 Rod electrodes: copper clad steel 19 mm dia by 3 m long.
- .4 Grounding conductors: bare stranded copper, soft annealed.
- .5 Insulated grounding conductors: green.
- .6 Ground bus: copper, complete with insulated supports, fastenings, connectors.
- .7 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

3.0 EXECUTION

3.1 INSTALLATION GENERAL
- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
.5 Use mechanical connectors for grounding connections to equipment provided with lugs.
.6 Soldered joints not permitted.
.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
.9 Install separate ground conductor to outdoor lighting standards.
.10 Install grounding resistance bank.
.11 Install zig-zag grounding transformer [on line side of main interrupter].
.12 Connect building structural steel and metal siding to ground.
.13 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
.14 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
.15 Ground secondary service pedestals.

3.2 ELECTRODES
.1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
.2 Install water meter shunt.
.3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
.4 Install rod electrodes and make grounding connections.
.5 Bond separate, multiple electrodes together.
.6 Use size 2/0 AWG copper conductors for connections to electrodes.

3.3 SYSTEM AND CIRCUIT GROUNDING
.1 Install system and circuit grounding connections to neutral on secondary side of transformers only.

3.4 EQUIPMENT GROUNDING
.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.5 GROUNDING BUS
.1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.7 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
  .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
  .2 Sound, fire alarm, intercommunication systems as indicated.

3.9 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of owner and engineer and local authority having jurisdiction over installation.
.3 Perform tests before energizing electrical system.
.4 Disconnect ground fault indicator during tests.

END OF 26 05 28

26 05 29 – Hangers and Supports for Electrical Systems

1.0 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 This Section specifies U shape support channels either surface mounted, suspended or set in poured concrete walls and ceilings.

.2 Related Sections

.1 26 05 21 – Wires and Cables (0-1000V)

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 Canadian Standards Association (CSA International).

.1 CSA C22.1, Canadian Electrical Code, Part I

.2 CSA C22.2, Canadian Electrical Code, Part II – General Requirements

.3 Electrical Safety Authority

.1 Ontario Electrical Safety Code

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit product data in accordance with submittal requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted or suspended to suit the site conditions.

3.0 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to solid masonry, tile and plaster surfaces with nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.

.1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.

.2 Two-hole steel straps for conduits and cables larger than 50 mm.

.3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.

.1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

.2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 3 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

End of 26 05 29

26 05 31 – Splitters, Junction, Pull Boxes and Cabinets

1.0 GENERAL

1.1 SUMMARY
- .1 Section includes:
  - .1 Materials and labour for all splitters, junction boxes, pull boxes and electrical cabinets. Splitters are referenced to comply with CSA C22.2 No. 76, and junction and pull boxes are referenced to comply with CSA C22.2 No. 40.
- .2 Related Sections
  - .1 26 05 21 – Wires and Cables (0-1000V).

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 Canadian Standards Association (CSA International).
  - .1 CSA C22.1, Canadian Electrical Code, Part 1
- .3 Electrical Safety Authority
  - .1 Ontario Electrical Safety Code

1.3 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 datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE, AND HANDLING
- .1 Packing, shipping, handling, and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 SPLITTERS
- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs with connection blocks to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES
- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on turned edge covers.

2.3 CABINETS

.1 Construction: welded sheet steel with hinged door, latch, lock and 2 keys.

.2 Type to OESC and as per Contractor's preference and ease of installation.

3.0 EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINET INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 – Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name, ID number, voltage and phase.

End of 26 05 31

26 05 32 – Outlet Boxes, Conduit Boxes and Fittings

1.0 GENERAL

1.1 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA C22.1, Canadian Electrical Code, Part 1, 20th Edition.

1.2 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit samples for floor box in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE AND HANDLING
- .1 Deliver, store and handle in accordance with manufacturer's written instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 OUTLET BOXES AND CONDUIT BOXES GENERAL
- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 GALVANIZED STEEL OUTLET BOXES
- .1 One-piece electro-galvanized construction.
- .2 Single or multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48mm.
- .4 102mm square or octagonal outlet boxes for lighting fixture outlets.
- .5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

2.3 MASONRY BOXES
- .1 Electro-galvanized steel masonry single or multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

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

2.5 FLOOR BOXES

.1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex or single receptacles. Minimum depth: 73 mm for receptacles and communication outlets.

.2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for the specific conduit. Minimum size: 73 mm deep.

2.6 OUTDOOR BOXES

.1 Provide weather-proof enclosure and cover plate in accordance with CAN/CSA C22.1 Section 26-702.

2.7 CONDUIT BOXES

.1 Cast FS or FD boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.8 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

.1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.9 FITTINGS GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

2.10 SERVICE FITTINGS

.1 'High tension' receptacle fitting made of 2 piece stainless steel with housing finish for receptacles. Bottom plate with two knockouts for centered or offset installation. 12 x 102 mm extension piece as indicated.

.2 Pedestal type 'low tension' fitting made of 2 piece stainless steel with housing finish to accommodate amphenol jack connectors.

3.0 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Outdoor boxes

.1 Provide 15 A circuit with GFI receptacle installed with weather-proof box and cover within 7.5 metres of all rooftop HVAC or power generation equipment.

.2 All roof-mounted, outdoor conduit serving such receptacles shall be weather-proof and adequately supported and protected against damage.

.3 Alternately, the electrical contractor can elect to coordinate with the mechanical contractor to have all HVAC or power generation equipment provided with an unpowered receptacle, if the HVAC or power generation equipment is available with an unpowered receptacle as a factory-option, and power the receptacle from a separate dedicated circuit separate from the HVAC or power generation equipment's main or other electrical service feeds.

.7 Identify systems for outlet boxes as required.

END OF 26 05 32

26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings

1.0 GENERAL

1.1 SUMMARY

.1 Section includes:
- .1 This section specifies rigid and flexible fasteners, fittings and installation.

.2 Related Sections
- .1 26 05 21 – Wires and Cables (0-1000V)
- .2 26 05 29 – Hangers and Supports for Electrical Systems

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 Canadian Standards Association (CSA International).
- .1 CSA C22.1, Canadian Electrical Code, Part I
- .2 CSA C22.2, Canadian Electrical Code, Part II
  - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
  - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
  - .6 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing (NMPT).

.3 Electrical Safety Authority
- .1 Ontario Electrical Safety Code

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
- .1 Submit cable manufacturing data.

.3 Quality assurance submittals:
- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:
- .1 Deliver, store and handle in accordance with manufacturer's written instructions.
- .2 Ship fuses in original containers.
- .3 Do not ship fuses installed in switchboard.
- .4 Store fuses in original containers

.2 Waste Management and Disposal:
- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 CABLES AND REELS
- .1 Provide cables on reels or coils.
  - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.
- .4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS
- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .7 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS
- .1 One hole steel straps to secure surface conduits NPS 2 (50 mm) and smaller. Two hole steel straps for conduits larger than NPS 2 (50 mm).
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 3 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS
- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for NPS 1 (25 mm) and larger conduits.
- .3 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT
- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.6 FISH CORD
- .1 Polypropylene fish cord secured at both ends.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
.2 Conceal conduits except in mechanical and electrical service rooms or other unfinished areas where indicated.
.3 Surface mount conduits except where indicated.
.4 Use rigid galvanized steel threaded conduit except where specified otherwise.
.5 Use electrical metallic tubing (EMT) where surface mounted conduit is called for above 2.4 m not subject to mechanical injury.
.6 Use rigid pvc conduit underground.
.7 Use flexible metal conduit for the following conditions
    .1 Connection to motors in dry areas
    .2 Connection to recessed lighting fixtures without prewired outlet box
    .3 Connection to surface mounted fluorescent lighting fixtures
    .4 Work in movable metal partitions
.8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations including all mechanical rooms with hydronic systems or system components.
.9 Use explosion proof flexible connection for connection to explosion proof motors.
.10 Install conduit sealing fittings in hazardous areas.
    .1 Fill with compound.
.11 Minimum conduit size for lighting and power circuits: NPS 3/4 (19 mm).
.12 Install EMT conduit from computer room branch circuit panel to junction box in sub-floor immediately below panel.
    .1 Run flexible conduit from junction box to outlet boxes for each computer in sub-floor.
.13 Bend conduit cold:
    .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
.14 Mechanically bend steel conduit over 19 mm diameter.
.15 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
.16 Install fish cord in empty conduits.
.17 Run 2 x NPS 1 (25 mm) spare conduits up to ceiling space and 2 x NPS 1 (25 mm) spare conduits down to ceiling space from each flush panel.
    .1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in flush concrete type box.
.18 Remove and replace blocked conduit sections.
    .1 Do not use liquids to clean out conduits.
.19 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.
.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
.3 Run conduits in flanged portion of structural steel.
.4 Group conduits wherever possible.

.5 Do not pass conduits through structural members except as indicated.
.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS
.1 Run parallel or perpendicular to building lines.
.2 Do not install horizontal runs in masonry walls.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE
.1 Locate to suit reinforcing steel.
.1 Install in centre one third of slab.
.2 Protect conduits from damage where they stub out of concrete.
.3 Install sleeves where conduits pass through slab or wall.
.4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
.1 Use cold mastic between sleeve and conduit.
.5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
.6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
.7 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE
.1 Run conduits NPS 1 (25 mm) and larger below slab and encase in 75 mm concrete envelope.
.1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND
.1 Slope conduits to provide drainage.
.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.8 CLEANING
.1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment

End of 26 05 34

26 28 13.01 – Fuses – Low Voltage

1.0 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 This section includes materials and installation for fuses.

.2 Related Sections

.1 26 05 00 – Common Work Results for Electrical

.2 26 28 23 – Disconnect Switches – Fused and Non-Fused

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 Canadian Standards Association (CSA International).

.1 CSA C22.1, Canadian Electrical Code, Part I

.2 CSA C22.2, Canadian Electrical Code, Part II – General Requirements

.3 Electrical Safety Authority

.1 Ontario Electrical Safety Code

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Provide fuse performance data characteristics for each fuse type and size above 15 A. Performance data to include: average melting time-current characteristics.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Ship fuses in original containers.

.3 Do not ship fuses installed in switchboard.

.4 Store fuses in original containers

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 FUSES – GENERAL

.1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.

.2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

.1 Class L fuses.

.1 Type L1, time delay, capable of carrying 500% of its rated current for 10 s minimum.

.2 Type L2, fast acting.

.2 Class J fuses.

.1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
.2 Type J2, fast acting.

.3 Class R -R fuses.
.1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.
.2 Type R2, time delay, capable of carrying 500% of its rated current for 10 s minimum.
.3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.

.4 Class C fuses.

3.0 EXECUTION

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit.
.2 Ensure correct fuses fitted to physically matched mounting devices.
.1 Install rejection clips for Class R fuses.
.3 Ensure correct fuses fitted to assigned electrical circuit.
.4 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.
.5 Install spare fuses in fuse storage cabinet.

End of 26 28 13.01

26 28 16.02 – Moulded Case Circuit Breakers

1.0 GENERAL

1.1 SUMMARY
- .1 Section includes:
  - .1 Materials for moulded-case circuit breakers, circuit breakers, and ground-fault circuit-interrupters.
- .2 Related Sections
  - .1 Section 26 24 16.01 – Panelboards Breaker Type

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE)
  - .1 ANSI/IEEE C37.13, Low Voltage AC Power Circuit Breakers Used in Enclosures.
- .3 Canadian Standards Association (CSA International).
  - .1 CSA-C22.2 No. 5, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.3 SUBMITTALS
- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
  - .1 Include time-current characteristic curves for breakers with ampacity of 125 A and over or with interrupting capacity as indicated symmetrical (rms) and over at system voltage.

1.4 DELIVERY, STORAGE, AND HANDLING
- .1 Packing, shipping, handling, and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 GENERAL
- .1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Circuit breakers to have minimum 22,000 A symmetrical rms interrupting capacity rating or as indicated.
- .5 Circuit breakers shall be suitable for installation in the panel.

3.0 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with manufacturers recommendations.

End of 26 28 16.02

26 28 23 – Disconnect Switches – Fused and Non-Fused

1.0 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 This section includes materials and installation for fused and non-fused enclosed manual air break switches based on CAN/CSA C22.2 No. 4 and Fuseholder assemblies based on CSA C22.2 No. 39.

.2 Related Sections

.1 26 05 00 – Common Work Results for Electrical

.2 26 28 13.01 – Fuses - Low Voltage

1.2 REFERENCES

.1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.

.2 Canadian Standards Association (CSA International).

.1 CAN/CSA C22.2 No.4, Enclosed Switches.

.2 CSA C22.2 No.39, Fuseholder Assemblies.

1.3 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Do not ship fuses installed in switch.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible and non-fusible disconnect switches in CSA Enclosure to CAN/CSA C22.2 No.4, size as indicated.

.2 Provision for padlocking in off switch position by up to three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, in accordance with Section 26 28 13.01 – Fuses - Low Voltage.

.5 Fuseholders: to CSA C22.2 No.39 relocatable and suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

.8 NEMA 3R enclosures for outdoor installations.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 01 – Common Work Results for Electrical.
.2 Indicate name of load controlled on size 4 nameplate.

3.0 EXECUTION

3.1 INSTALLATION
.1 Install disconnect switches complete with fuses if applicable and as indicated.

End of 26 28 23

26 29 01 – Contactors

1.0 GENERAL

1.1 SUMMARY
- .1 Section includes:
  - .1 This section specifies materials and installation for contactors for system voltages up to 600 V.
- .2 Related Sections
  - .1 26 05 01 – Common Work Results - Electrical.
  - .2 26 29 03 – Control Devices.

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 Canadian Standards Association (CSA International).
  - .1 CSA C22.1, Canadian Electrical Code, Part I
  - .2 CSA C22.2, Canadian Electrical Code, Part II
    - .1 CSA C22.2 No.14, Industrial Control Equipment.
- .3 Electrical Safety Authority
  - .1 Ontario Electrical Safety Code

1.3 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.

1.4 DELIVERY, STORAGE, AND HANDLING
- .1 Packing, shipping, handling, and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
  - .2 Ship fuses in original containers.
  - .3 Do not ship fuses installed in switchboard.
  - .4 Store fuses in original containers
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 CONTACTORS
- .1 Contactors: to CSA C22.2 No.14.
- .2 Permanent magnet latch type controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.
- .3 Fused switch combination contactor as indicated.
- .4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.
- .5 Mount in CSA Enclosure, carrying NEMA rating suitable to the location installed and the application.

.6 Include following options in cover:
.1 Red run indicating lamp.
.2 Hand-Off-Auto selector switch.
.7 Control transformer: in accordance with Section 26 29 03 – Control Devices, in contactor enclosure.

2.2 EQUIPMENT IDENTIFICATION
.1 Provide equipment identification in accordance with Section 26 05 01 – Common Work Results - Electrical.
.2 Size 4 nameplate indicating name of load controlled as indicated.

3.0 EXECUTION

3.1 INSTALLATION
.1 Install contactors and connect auxiliary control devices.

End of 26 29 01

26 29 03 – Control Devices

1.0 GENERAL

1.1 SUMMARY
- .1 Section includes:
  - .1 This section specifies materials and installation for industrial control devices including pushbutton stations, control and relay panels.
- .2 Related Sections
  - .1 26 05 01 – Common Work Results - Electrical.

1.2 REFERENCES
- .1 All codes and standards listed below are meant to refer to the latest edition adopted by the authority having jurisdiction as it relates to the Work.
- .2 Canadian Standards Association (CSA International).
  - .1 CSA C22.1, Canadian Electrical Code, Part I
  - .2 CSA C22.2, Canadian Electrical Code, Part II
    - .1 CSA C22.2 No.14, Industrial Control Equipment.
- .3 Electrical Safety Authority
  - .1 Ontario Electrical Safety Code
- .4 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA ICS 1, Industrial Control and Systems: General Requirements

1.3 SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
  - .1 Include schematic, wiring, interconnection diagrams.

1.4 DELIVERY, STORAGE, AND HANDLING
- .1 Packing, shipping, handling, and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions.
  - .2 Ship fuses in original containers.
  - .3 Do not ship fuses installed in switchboard.
  - .4 Store fuses in original containers
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling and dispose of in a safe and legal manner.

2.0 PRODUCTS

2.1 AC CONTROL RELAYS
- .1 Control Relays: to CSA C22.2 No.14 and NEMA ICS 1.
- .2 Convertible contact type: contacts field convertible from NO to NC, permanent magnet latched double-voltage type with sliding barrier to permit access to contacts only or coil only, coil and contact ratings to suit the installed device.
- .3 Sealed contact type: permanent magnet latched with 2 poles and front mounted contact block to provide 2 additional poles. Coil and contact ratings to suit the installed device.

.4 Universal pole type: electrically held with 2 poles, convertible from NO to NC by changing wiring connections. Coil and contact ratings to suit the installed device.

2.2 RELAY ACCESSORIES

.1 Standard contact cartridges: normally-open - convertible to normally-closed in field.

2.3 SOLID STATE TIMING RELAYS

.1 Construction: AC operated electronic timing relay with solid-state timing circuit to operate output contact. Timing circuit and output contact completely encapsulated to protect against vibration, humidity and atmospheric contaminants.
.2 Operation: on-delay or off-delay.
.3 Potentiometer: self-contained to provide time interval adjustment.
.4 Supply voltage: 120 or 24 V, AC, 60 Hz to suit the application.
.5 Temperature range: minus 20°C to 60°C.
.6 Output contact rating: maximum voltage 300 V AC or DC. Current: to NEMA ICS 1.
.7 Timing ranges: minimum and maximum to suit the application.

2.4 INSTANTANEOUS TRIP CURRENT RELAYS

.1 Enclosure: CSA Type 1
.2 Contacts: NO, NC automatic reset with adjustable tripping point.
.3 Control: 3 wire, with provision for shorting contacts during accelerating period of motor.
.4 Contact rating: to NEMA ICS 1.

2.5 CONTROL CIRCUIT TRANSFORMERS

.1 Single phase, dry type.
.2 Primary: as indicated.
.3 Secondary: to suit application.
.4 VA Rating: to suit application.
.5 Secondary fuse: to suit application.
.6 Close voltage regulation as required by magnet coils and solenoid valves.

3.0 EXECUTION

3.1 INSTALLATION

.1 Install pushbutton stations, control and relay panels, control devices and interconnect to auxiliary systems or control devices as indicated in this or other Specification Sections.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 01 – Common Work Results - Electrical.
.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at time and check out operation of section.
.3 Upon completion of sectional test, undertake group testing.
.4 Check out complete system for operational sequencing.

End of 26 29 03

HVAC SOLUTIONS LEGEND

	BALL VALVE
	BUTTERFLY VALVE
	GATE VALVE
	3-WAY BALL VALVE
	3-WAY GLOBE VALVE
	3-WAY BUTTERFLY
	2-WAY BALL VALVE
	2-WAY GLOBE VALVE
	STRAIGHT AUTOMATIC BALANCING VALVE
	ANGLE AUTOMATIC BALANCING VALVE
	STRAIGHT MANUAL BALANCING VALVE
	ANGLE MANUAL BALANCING VALVE
	SWING CHECK VALVE
	WATER CHECK VALVE
	SILENT CHECK VALVE
	FLOW-TREX
	Y STRAINER
	TEMPERATURE GAUGE
	PRESSURE GAUGE
	FLOW SWITCH
	LOW WATER CUTOFF
	UNION
	REDUCER
	CHEMICAL POT FEEDER
	AIR SEPARATOR - TANK
	AIR SEPARATOR - INLINE
	SLIP - EXPANSION JOINT
	METAL/RUBBER BELOWS
	FLEX HOSE
	FRAME MOUNTED - HORZ. END SUCTION
	FRAME MOUNTED - CLOSE COUPLED
	FRAME MOUNTED - HORZ. SPLIT CASE
	REGULAR - HORZ. IN LINE
	CLOSE-COUPLED - HORZ. IN LINE
	REGULAR - VERT. IN LINE
	CLOSE-COUPLED - VERT. IN LINE
	CIRCULATOR PUMP
	PRESSURE RELIEF VALVE
	PRV T&P
	AUTOMATIC AIR VENT
	PRESS. REDUCING VALVE - PILOT OPER.
	PRESS. REDUCING VALVE - DIRECT
	BACKFLOW PREVENTER - DOUBLE CHK

CONTRACTOR CONNECTIONS

(A)	TIE POINT, CONNECT TO EXISTING
(B)	TIE POINT, SEAL AND PATCH TO MATCH EXISTING
(C)	TIE POINT, CAP EXISTING
(D)	TIE POINT, INSULATE AND WEATHERPROOF

HEATING APPLICATIONS

—HPS—	HIGH PRESSURE STEAM
—MPS—	MEDIUM PRESSURE STEAM
—LPS—	LOW PRESSURE STEAM
—HPC—	HIGH PRESSURE CONDENSATE
—MPC—	MEDIUM PRESSURE CONDENSATE
—LPC—	LOW PRESSURE CONDENSATE
—BBD—	BOILER BLOWDOWN
—PC—	PUMPED CONDENSATE
—VPD—	VACUUM PUMP DISCHARGE
—MU—	MAKEUP WATER
—ATV—	ATMOSPHERIC VENT
—FOD—	FUEL OIL DISCHARGE
—FOG—	FUEL OIL GAGE
—FOS—	FUEL OIL SUCTION
—FOR—	FUEL OIL RETURN
—FOV—	FUEL OIL TANK VENT
—HWS—	HOT WATER SUPPLY
—HWR—	HOT WATER RETURN
—MTWS—	MED-TEMPERATURE HOT WATER SUPPLY
—HTWS—	HIGH-TEMPERATURE HOT WATER SUPPLY
—A—	COMPRESSED AIR
—VAC—	VACUUM (AIR)

AIR CONDITIONING AND REFRIGERATION APPLICATIONS

—RD—	REFRIGERANT DISCHARGE
—RS—	REFRIGERANT SUCTION
—B—	BRINE SUPPLY
—BR—	BRINE RETURN
—CWR—	CONDENSER WATER RETURN
—CWS—	CONDENSER WATER SUPPLY
—CHWR—	CHILLED WATER RETURN
—CHWS—	CHILLED WATER SUPPLY
—FILL—	FILL LINE
—H—	HUMIDIFICATION LINE
—D—	DRAIN
—GLYS—	GLYCOL SUPPLY
—GLYR—	GLYCOL RETURN
—HCS—	HOT/CHILLED WATER SUPPLY
—HCR—	HOT/CHILLED WATER RETURN
—RL—	REFRIGERANT LIQUID
—HPWS—	HEAT PUMP WATER SUPPLY
—HPWR—	HEAT PUMP WATER RETURN

PLUMBING APPLICATIONS

—SAN—	SANITARY DRAIN
—ST—	STORM DRAIN
—CD—	CONDENSATE DRAIN
—V—	VENT
—DCW—	DOMESTIC COLD WATER
—DHWS—	DOMESTIC HOT WATER SUPPLY
—DHWR—	DOMESTIC HOT WATER RETURN
—DHWBS—	DOMESTIC HOT WATER BOILER SUPPLY
—DHWBR—	DOMESTIC HOT WATER BOILER RETURN
—G—	NATURAL GAS LINE

SYMBOL LEGEND

PIPE CONNECTION TYPES

	FLANGED
	THREADED
	BELT AND SPIGOT
	WELDED
	SOLDERED
	SOLVENT CEMENT

PIPE FITTINGS

	CAP
	CROSS
	CROSS, SIDE OUTLET, OUTLET DOWN
	CROSS, SIDE OUTLET, OUTLET UP
	ELBOW, 90°
	ELBOW, ANGLED
	ELBOW, DOUBLE BRANCH
	ELBOW, REDUCING (SHOW SIZES)
	ELBOW, SIDE OUTLET DOWN
	ELBOW, SIDE OUTLET UP
	ELBOW, TURNED DN
	ELBOW, TURNED UP
	PIPE, BREAK
	PIPE, CROSSING
	PIPE, FLOW DIRECTION
	REDUCER, CONCENTRIC
	TEE
	TEE, ANGLED
	TEE, OUTLET DOWN
	TEE, OUTLET UP
	TEE, OUTLET DOWN WITH ELBOW BELOW
	TEE, OUTLET UP WITH ELBOW ABOVE
	TEE, SINGLE SWEEP
	TEE, REDUCING (SHOW SIZES)

PIPE MECHANICAL COMPONENTS

	AIR SCOOP/SEPARATOR
	AIR VENT
	BACKFLOW PREVENTER
	HEAT EXCHANGER, PLATE AND FRAME
	HEAT EXCHANGER, SHELL AND TUBE
	PUMP
(R)	REGULATOR, GAS PRESSURE
	SENSOR, PRESSURE, ELECTRIC
	SENSOR, PRESSURE, PNEUMATIC
	SENSOR, TEMPERATURE, ELECTRIC
	SENSOR, TEMPERATURE, PNEUMATIC
	SENSOR, PRESSURE GAUGE
	THERMOWELL
	SENSOR, THERMOMETER
	STEAM TRAP
	STRAINER
	SUCTION GUIDE
	UTILITY METER

PS	SWITCH, PIPE FLOW
PS	SWITCH, PIPE PRESSURE
LWCO	LOW WATER CUT OFF
	VALVE, 2-WAY, ELECTRIC
	VALVE, 2-WAY, PNEUMATIC
	VALVE, 3-WAY, ELECTRIC
	VALVE, 3-WAY, PNEUMATIC
	VALVE, BALANCING
	VALVE, CHECK
	VALVE, GAS COCK
	VALVE, GLOBE
	VALVE, PRESSURE REDUCING
	VALVE, PRESSURE RELIEF
	VALVE, TRIPLE DUTY
	VALVE, BALL
	VALVE, BUTTERFLY
	VALVE, ISOLATION

AIR HANDLING COMPONENTS

C	COIL, COOLING
C	COIL, DIRECT EXPANSION
C	COIL, HEATING
DT C	COIL, DUAL TEMPERATURE
HxW OR #	DUCT (FIRST FIGURE IS DIMENSION OF SIDE SHOWN)
AD HxW	DUCT, ACCESS DOOR, VERTICAL OR HORIZONTAL
HxW	DUCT, ACOUSTICAL LINING WITH FACING MATERIAL (WITH DUCT DIMENSION)
HxW	DUCT, EXTERIOR THERMAL INSULATION MATERIAL (WITH DUCT DIMENSION)
	DUCT, BREAK
R	DUCT, CHANGE OF ELEVATION, RISE (R) DROP (D)
	DUCT, DIRECTION OF FLOW
HxW	DUCT, SECTION, NEGATIVE PRESSURE (FIRST FIGURE IS TOP)
HxW	DUCT, SECTION, POSITIVE PRESSURE (FIRST FIGURE IS TOP)
HxW H1xW1	DUCT, TRANSITION
600	DAMPER, BACKDRAFT
VD	DAMPER, VOLUME (BALANCING)

	DAMPER, MOTORIZED ELECTRIC
	DAMPER, MOTORIZED PNEUMATIC
	DAMPER, FIRE, VERTICAL
	DAMPER, SMOKE, VERTICAL
	DAMPER, SCHEMATIC
	FAN, PROPELLER
	FAN, CENTRIFUGAL
VFD	VARIABLE FREQUENCY DRIVE
	FAN, VARIABLE INLET VANES
	FAN, VENTILATOR, ROOF EXHAUST
	FAN, VENTILATOR, ROOF INTAKE
	FAN, VENTILATOR, ROOF LOUVERED
	FILTER, BAG
	FILTER, PLEATED
	HUMIDIFIER
CO	SENSOR, CARBON MONOXIDE
CO2	SENSOR, CARBON DIOXIDE
NOx	SENSOR, OXIDES, NITROGEN
SOx	SENSOR, OXIDES, SULFUR
	SENSOR, TEMPERATURE AVG. ELECTRIC
	SENSOR, TEMPERATURE AVG. PNEUMATIC

SPACE COMPONENTS

	BREAK, ARCHITECTURAL
H	SENSOR, HUMIDITY
T	SENSOR, TEMPERATURE
CO	SENSOR, CARBON MONOXIDE
CO2	SENSOR, CARBON DIOXIDE
NOx	SENSOR, NITROGEN OXIDES
SOx	SENSOR, SULFUR OXIDES
	SENSOR, TEMPERATURE, ELECTRIC (OA)
	SENSOR, TEMPERATURE, PNEUMATIC (OA)
Ts	SENSOR, THERMOSTAT, ELECTRIC
Ts	SENSOR, THERMOSTAT, PNEUMATIC
	SENSOR, HUMIDITY, ELECTRIC (OA)
	SENSOR, HUMIDITY, PNEUMATIC (OA)
OS	SWITCH, OCCUPANCY SENSOR
P	SWITCH, PHOTOSENSOR
$	SWITCH ON/OFF

MISCELLANEOUS COMPONENTS

	DRAIN, FLOOR
	VENT
	DETECTOR, FLAME
	DETECTOR, GAS
	DETECTOR, HEAT (THERMAL)
	DETECTOR, SMOKE
	DUCT INTAKE

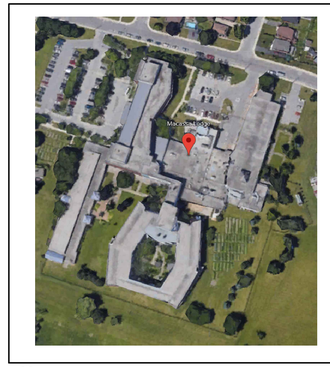
CONTROLS

AI	ANALOG INPUT
AO	ANALOG OUTPUT
DI	DIGITAL INPUT
DO	DIGITAL OUTPUT
V	VIRTURAL POINT
M	MOTOR

ACRONYM LEGEND

AFF	ABOVE FINISHED FLOOR
AHU	AIR HANDLING UNIT
BPV	BOILER PROTECTION VALVE
HKP	HOUSEKEEPING PAD
MUA	MAKE UP AIR
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
REB	RE-BALANCE OUTLET TO REQUIRED CFM
RTU	ROOF TOP UNIT
TMV	THERMOSTATIC MIXING VALVE
TYP	TYPICAL
	REVISION

PROJECT SPECIFIC	
	CONCRETE PAD NEW EXTENSION



1 C-0 MAP PLAN
NTS

2 C-0 MAP PLAN
NTS

DRAWING LIST:

SUMMARY OF MECHANICAL WORK

1. REMOVE FIVE (5) EXISTING HEATING BOILERS, TWO (2) EXISTING WATER HEATER BOILERS AND ONE ABANDONED STEAM BOILER AS INDICATED. REMOVE VENTS, GAS PIPING, WATER PIPING BACK TO MAIN HEADER INCLUDING BOILERS ISOLATION VALVES.
2. CLEAN UP AND REPAIR THE EXISTING CONCRETE HOUSEKEEPING PADS. EXTEND THE CONCRETE HOUSE KEEPING PADS AS REQUIRED FOR NEW BOILERS.
3. PROVIDE FOUR (4) NEW HEATING BOILERS AND TWO (2) NEW WATER HEATER BOILERS. REPLACE WATER HEATERS IN TWO STAGES AS INDICATED TO MAINTAIN UNINTERRUPTED SERVICE WATER TO BUILDING. PROVIDE TEMPORARY VENT AS REQUIRED.
4. ALL NEW BOILERS MUST SUPPORT AT LEAST 45M (150FT) EQUIVALENT VENTING TO ROOF.
5. PROVIDE BOILERS WITH BUILT-IN MASTER / MEMBER CASCADING CONTROLLER. MASTER BOILER CONTROLLER SHALL STAGE AND MODULATE ALL BOILERS TO MAINTAIN THE LOOP SUPPLY TEMPERATURE (OR TANK TEMPERATURE FOR WATER HEATERS).
6. PROVIDE BOILERS WITH LOW WATER CUTOFF, FLOW SWITCH AND DRAIN BLOCKAGE SWITCHES. IF BOILERS DO NOT COME WITH BUILT-IN SWITCHES PROVIDE EXTERNAL CUTOFF SWITCH, FLOW SWITCH AND DRAIN BLOCKAGE SWITCH.
7. PROVIDE BOILERS WITH CIRCULATOR PUMPS. EACH BOILER MUST DIRECTLY TURN ITS CIRCULATOR ON/OFF. PROVIDE EXTERNAL RELAYS AS REQUIRED TO ALLOW BOILERS SENDING 24V SIGNAL TO THE CIRCULATORS' STARTERS.
8. PROVIDE NEW VENTS, STAINLESS STEEL AL29-4C. VENTS INSIDE THE BOILER ROOM MUST BE DOUBLE-WALL AND VENTS INSIDE THE CHASE ARE SINGLE WALL. PROVIDE STAMPED SHOP DRAWINGS FOR REVIEW PREPARED BY QUALIFIED VENT DESIGNER.
9. POWER TO ALL BOILERS SHOULD GO FROM THE PANELS IN ELECTRICAL ROOM THROUGH THE EMERGENCY SWITCHES AT THE MECHANICAL ROOM DOOR AND THEN TO BOILERS.
10. CONNECT NEW BOILERS TO EXISTING SERVICES. PROVIDE NEW ISOLATION VALVES, CIRCULATOR PUMPS, FITTINGS, AS REQUIRED.
11. REPLACE THREE DOMESTIC WATER CIRCULATORS AS INDICATED. PROVIDE NEW STRAINERS AND ISOLATION VALVES. CONNECT TO EXISTING ELECTRICAL FEEDS.
12. INSULATE ALL NEW PIPES COMPLETED WITH PVC JACKET. INSULATION MATERIAL MUST BE RIGID MINERAL FIBRE.
13. INSTALL PIPE IDENTIFICATION AND FLOW DIRECTION ON PIPES.
14. RETAIN OWNER DESIGNATED BAS SERVICE CONTRACTOR (BGIS ITS CANADA) TO INTERLOCK BOILERS AND PUMPS WITH BAS, COMMISSION AND UPDATE GRAPHICS.
15. VERIFY WATER FLOW RATE THROUGH EACH NEW PUMP AND REPORT.
16. PROVIDE START-UP REPORTS FOR BOILERS.
17. PROVIDE COMPLETE OPERATION AND MAINTENANCE MANUAL, WARRANTY LETTER AND CLOSEOUT DOCUMENTS.
18. PROVIDE TRAINING FOR FACILITY STAFF.

ELECTRICAL SUMMARY OF WORK

WORK OF THIS CONTRACT COMPRISES BUT IS NOT LIMITED TO THE FOLLOWING:

1. COMPLETE INSTALLATION TO CONFORM TO OESC.
2. APPLY FOR, OBTAIN AND PAY FOR ESA PERMIT AND INSPECTION.
3. SCHEDULE SHUTDOWNS AT TIME CONVENIENT TO OWNER. COORDINATE SHUTDOWNS WITH OWNER.
4. FOR EQUIPMENT BEING REMOVED - REMOVE WIRING, CONDUIT AND JUNCTION BOXES FOR CIRCUITS THAT ARE ABANDONED. SEAL AND CAP ALL ABANDONED DUCTS AND CONDUIT THAT ARE NOT REMOVED. PATCH AND FINISH SURFACES TO MATCH SURROUNDING FINISHES.
5. REMOVE LOCAL SWITCHES, STARTERS, AND WIRING TO MECHANICAL EQUIPMENT BEING REMOVED. KEEP SWITCHES AND BREAKERS IN PANELS - IDENTIFY THEM AS SPARE.
6. USE WATER TIGHT CONNECTORS FOR TOP ENTRY INTO ENCLOSURES AND BOXES.
7. INCLUDE BOND WIRE IN EMT RUNS - DO NOT RELY ON EMT AS A BONDING CONDUCTOR.
8. SCAN ALL WALL AND FLOOR PENETRATIONS PRIOR TO CORE DRILLING.
9. REUSE EXISTING FEEDS, DISCONNECTS, MOTOR CONTROLLERS FOR NEW MECHANICAL EQUIPMENT.
10. SUPPLY AND INSTALL LOCAL DISCONNECT SWITCH FOR MOTORS PER OESC 28-604 IF NONE EXISTS AND UPSTREAM DISCONNECT CANNOT BE LOCKED IN THE OPEN POSITION.
11. SUPPLY AND INSTALL NEW 20 A BRANCH CIRCUITS FROM PANEL LP-0EH TO NEW HEATING BOILERS. CIRCUITS TO PASS THROUGH EXISTING BOILER DISCONNECT SWITCHES AT ENTRANCE TO BOILER ROOM.
12. REPLACE BOILER DISCONNECT SWITCHES IF EXISTING NOT RATED FOR NEW 20 A CIRCUITS.
13. REUSE EXISTING MOTOR STARTERS. ADJUST OVERLOADS AND FUSES TO MATCH NEW MOTORS.
14. REWORK ELECTRICAL FEEDS TO EXISTING EQUIPMENT THAT IS RELOCATED.
15. BOILER CIRCULATING PUMP TO BE TURNED ON/OFF BY BOILER DIRECTLY. COORDINATE WITH MECHANICAL CONTRACTOR AND CONTROLS CONTRACTOR TO INTERFACE NEW BOILERS WITH EXISTING MOTOR STARTERS. SUPPLY RELAYS AS REQUIRED TO CONTROL MOTOR STARTER FROM BOILER.
16. CONTRACTOR TO COORDINATE CONNECTIONS AND INSPECTIONS WITH ENGINEER, OWNER, ESA, AND CITY INSPECTORS AS REQUIRED.
17. FIRE STOP ALL PENETRATIONS THROUGH ALL WALLS AND FLOORS.
18. SEAL ALL EXTERIOR WALL AND ROOF PENETRATIONS WATERTIGHT.
19. LABEL ALL SWITCHES, RECEPTACLES AND CONTROL DEVICES. INDICATE MAXIMUM FUSE SIZE AND TYPE OR BREAKER TRIP SETTINGS AS APPLICABLE.
20. RESTORE CUT OR DAMAGED SURFACES TO PRE-CONSTRUCTION CONDITIONS.

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

N PROJECT NORTH

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

NO.	ISSUANCE	DATE	BY
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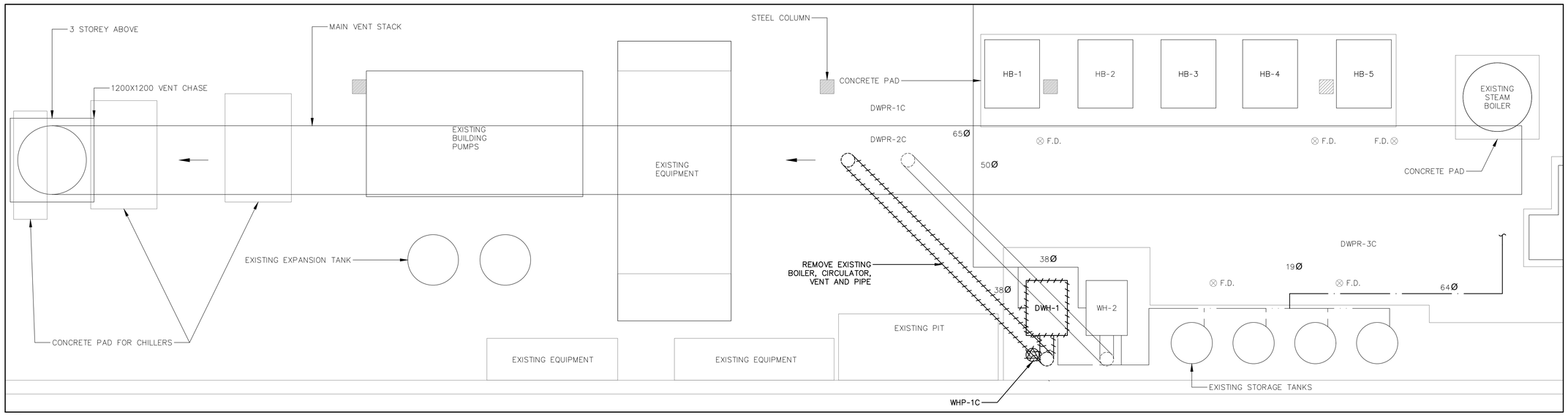
03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company

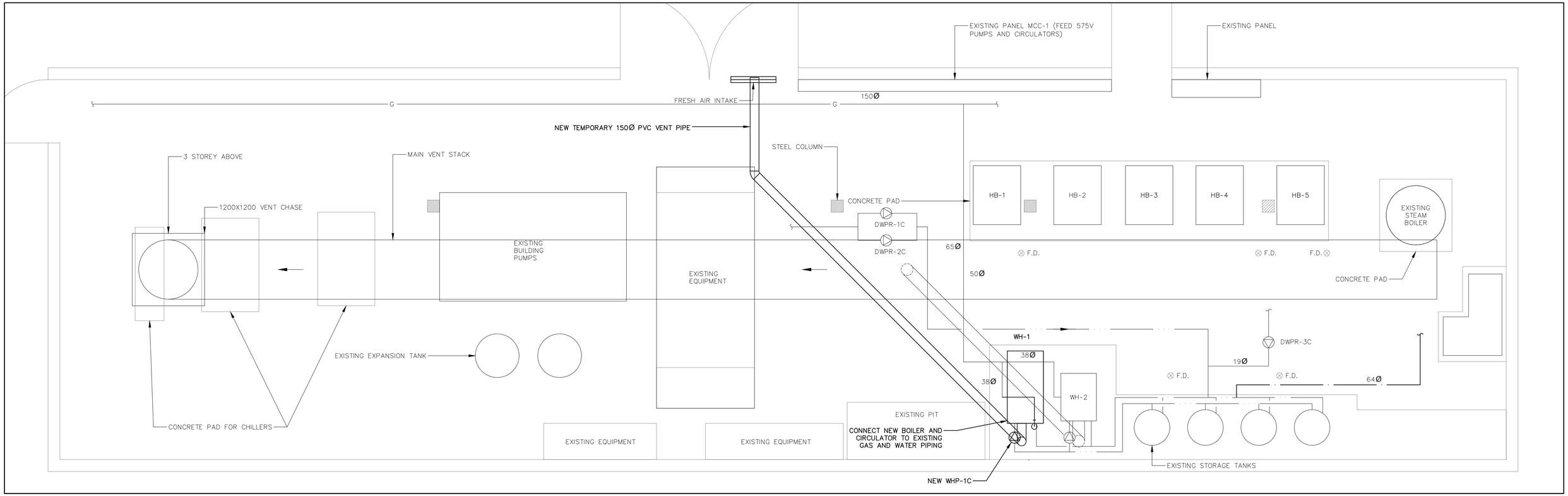
Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: COVER SHEET
DATE: 03/04/2024
SCALE: AS SHOWN
JOB NO.: 24-021
DWG NO.: C-0
ARCH: D

5/14/2024 8:34 AM



1 M-1 PHASE 1 DOMESTIC BOILER DEMOLIITON 1:30



1 M-1 PHASE 1 DOMESTIC BOILER RETROFIT 1:30

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

PROJECT NORTH

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03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: PHASE 1 DOMESTIC BOILER DEMOLITION AND RETROFIT
DATE: 03/04/2024
SCALE: AS SHOWN
JOB NO.: 24-021
DWG NO.: M-1
ARCH: D

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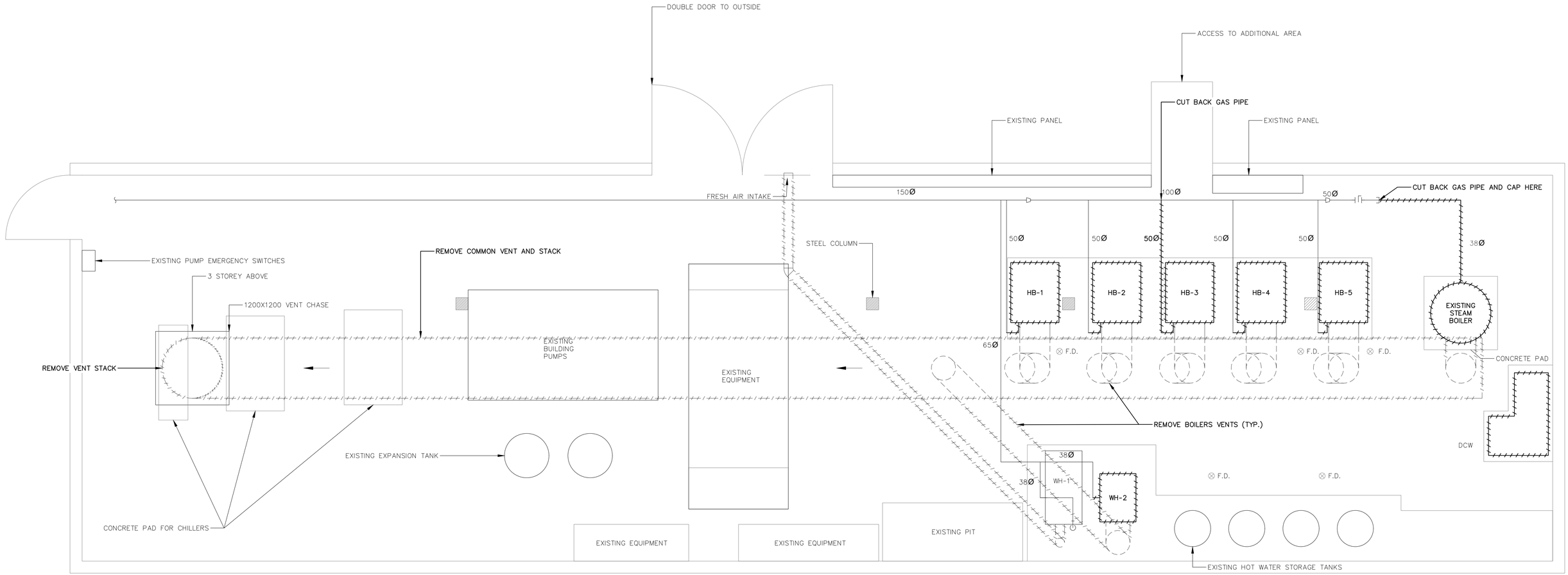

1 / M-2 NATURAL GAS PIPING AND VENTING PLAN
1:30

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

PROJECT NORTH

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

NO.	ISSUANCE	DATE	BY
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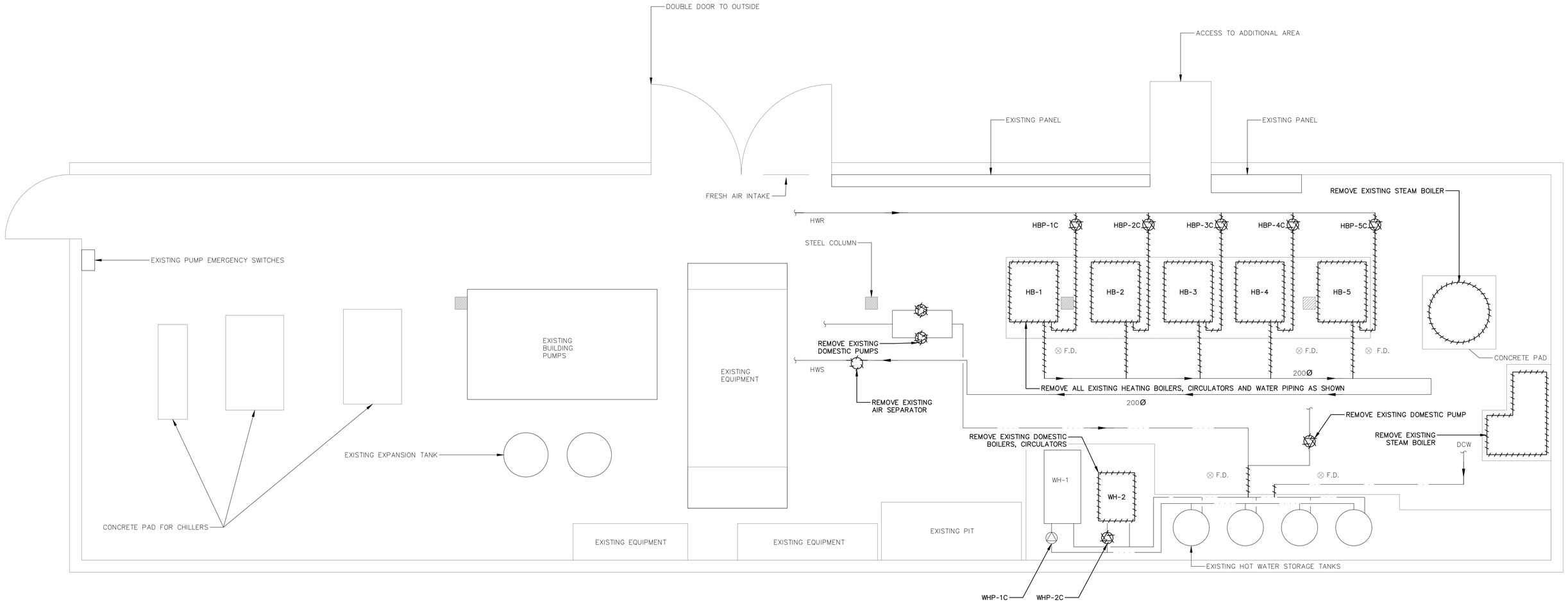
03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: MECHANICAL ROOM GAS & VENT DEMOLITION
DATE: 03/04/2024
SCALE: AS SHOWN
JOB NO.: 24-021
DWG NO.: M-2
ARCH: D

5/14/2024 8:35 AM



1 / M-3 WATER PIPING PLAN
1:30

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

PROJECT NORTH
N

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

NO.	ISSUANCE	DATE	BY
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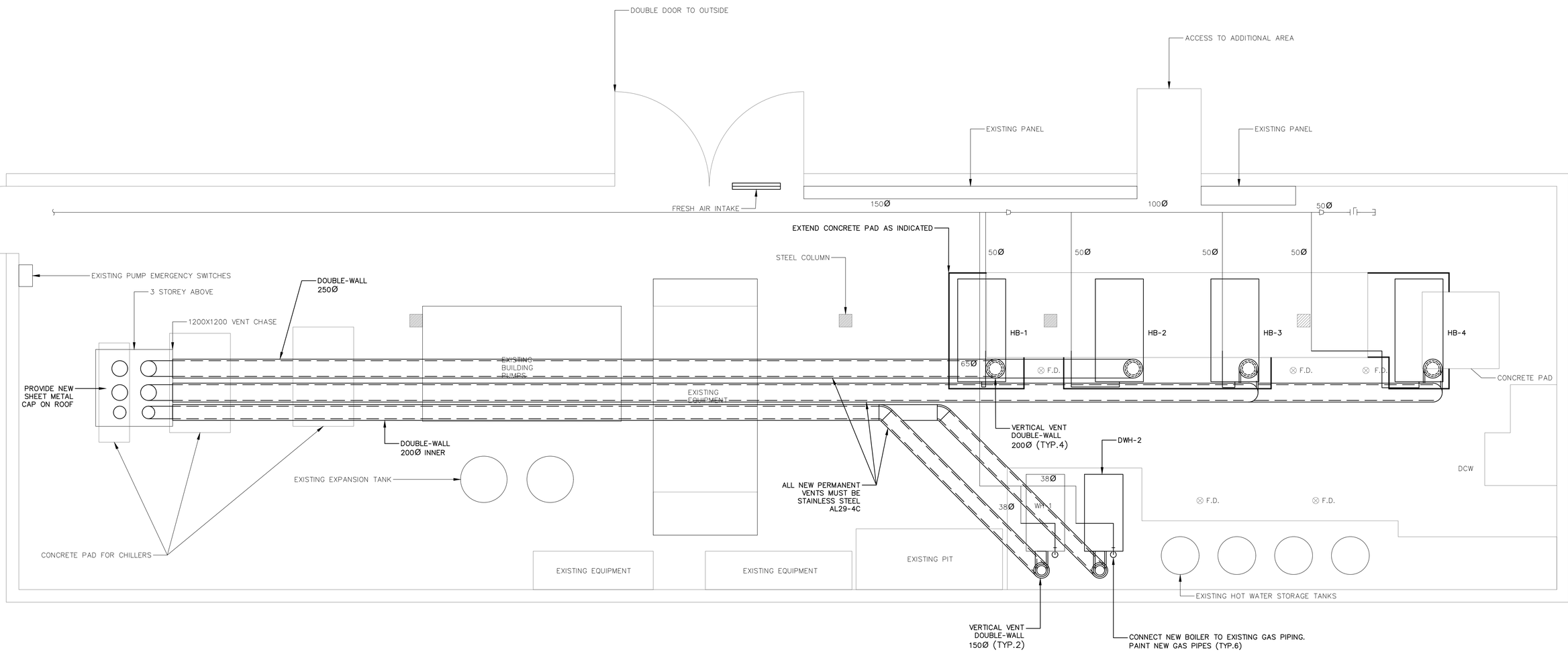
03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: MECHANICAL ROOM HYDRONIC SYSTEM DEMOLITION
DATE: 03/04/2024
SCALE: AS SHOWN
JOB NO.: 24-021
DWG NO.: M-3
ARCH: D

5/14/2024 8:35 AM



1 / M-4 NATURAL GAS PIPING AND VENTING PLAN
1:30

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

PROJECT NORTH

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

NO.	ISSUANCE	DATE	BY
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03	ISSUED FOR TENDER	05/13/2024	JG
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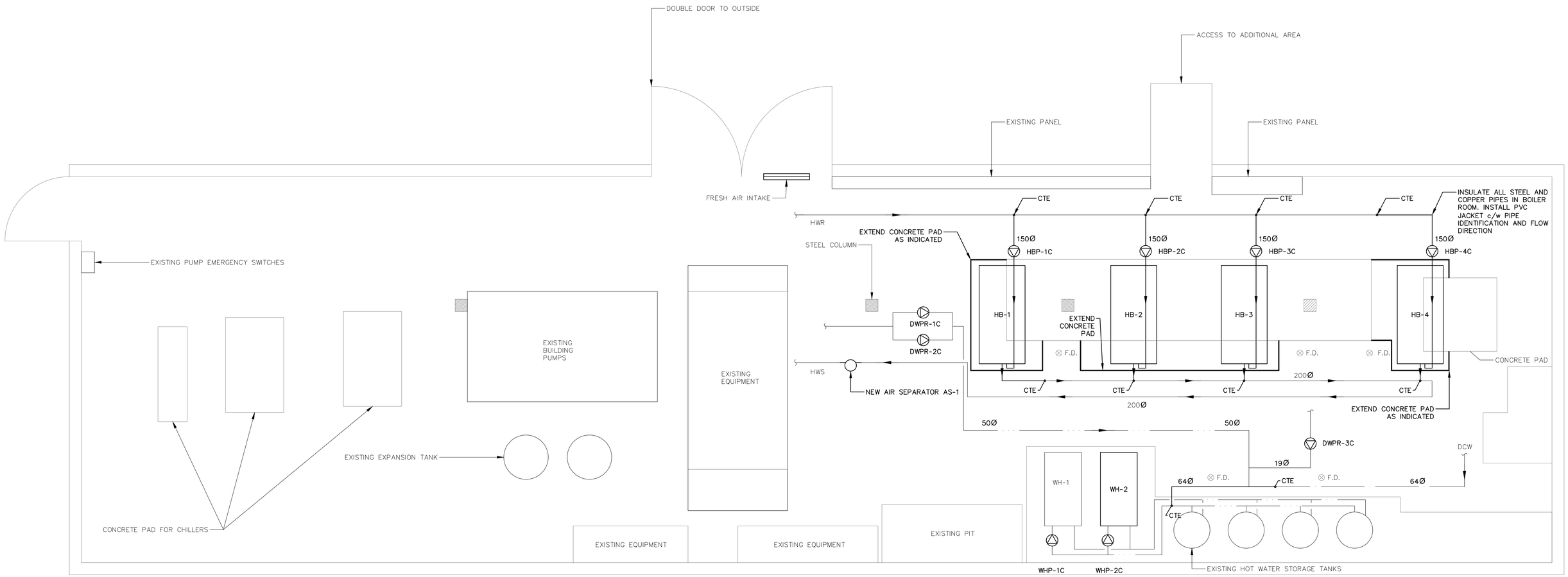
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: MECHANICAL ROOM GAS PIPE AND VENT RETROFIT
DATE: 03/04/2024
JOB NO.: 24-021
DWG NO.: M-4
ARCH: D
SCALE: AS SHOWN

5/14/2024 8:35 AM



CONNECT NEW BOILERS TO EXISTING EQUIPMENT AND PIPING

1 / M-5 WATER PIPING PLAN
1:30

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

PROJECT NORTH
TRUE NORTH

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

NO.	ISSUANCE	DATE	BY
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03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING WCD
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: MECHANICAL ROOM HYDRONIC SYSTEM RETROFIT
DATE: 03/04/2024
JOB NO.: 24-021
DWG NO.: M-5
ARCH: D
SCALE: AS SHOWN

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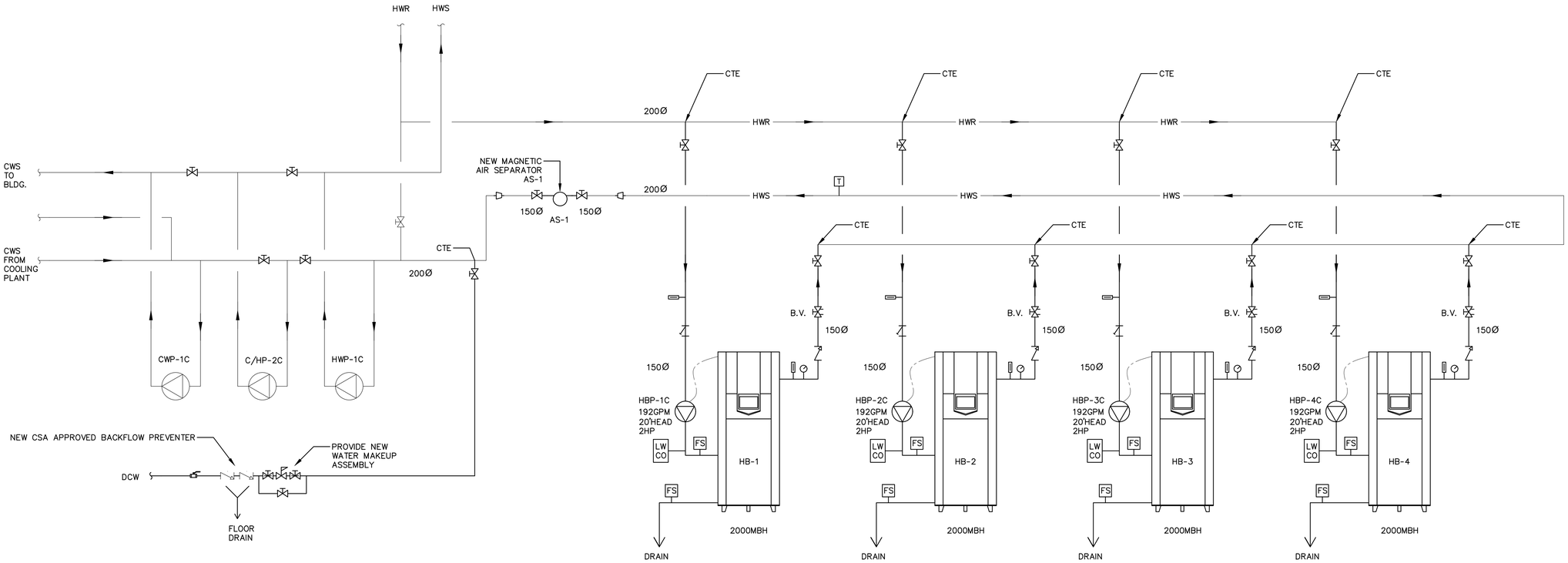

1 / M-6 SPACE HEATING SCHEMATICS
NTS

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

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Do not scale this drawing.

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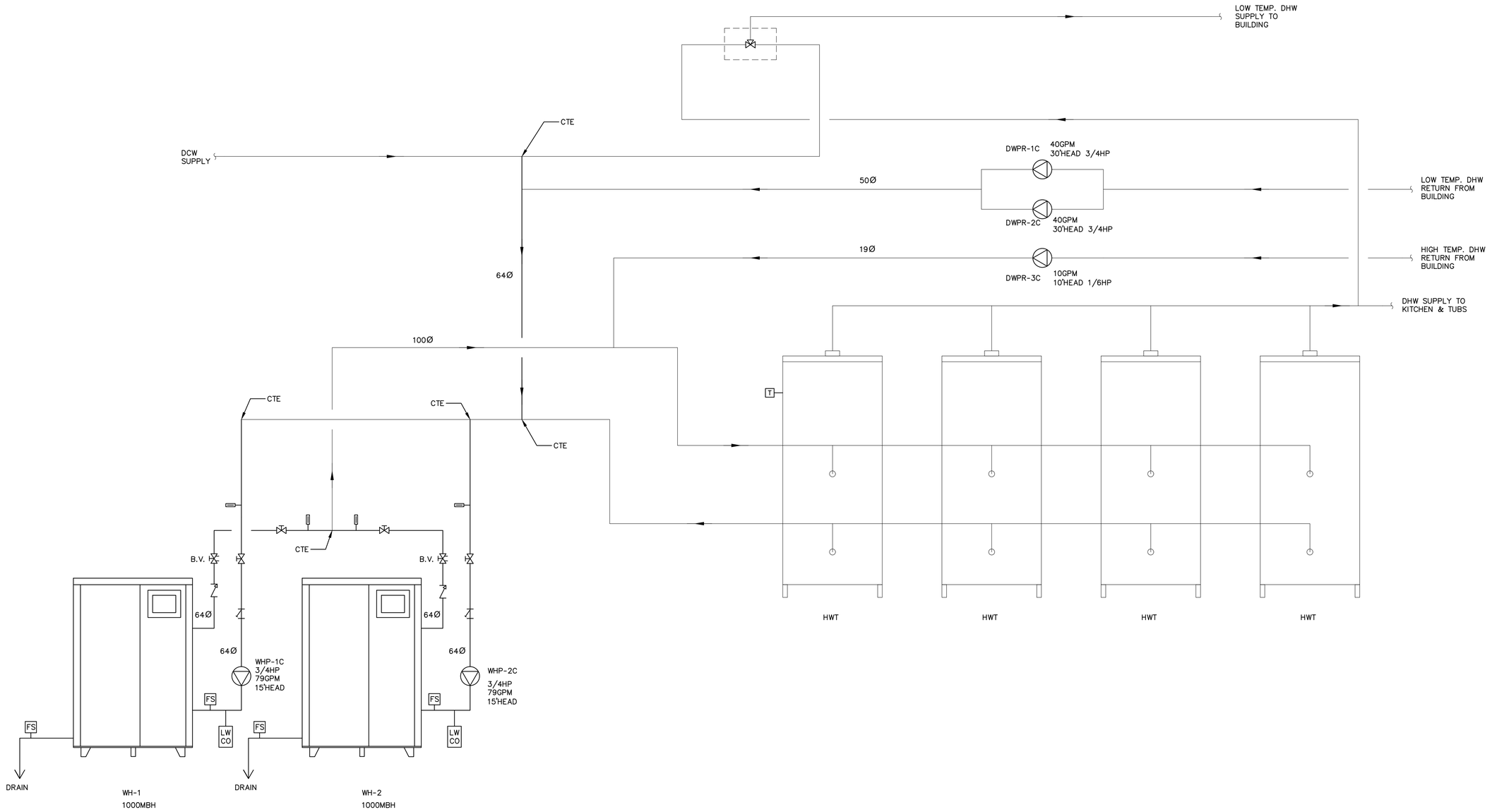
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: SPACE HEATING BOILERS MECHANICAL SCHEMATICS
DATE: 03/04/2024
SCALE: AS SHOWN
JOB NO.: 24-021
DWG NO.: M-6
ARCH: D

5/14/2024 8:35 AM



1 M-7 DOMESTIC WATER HEATING SCHEMATICS
NTS

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

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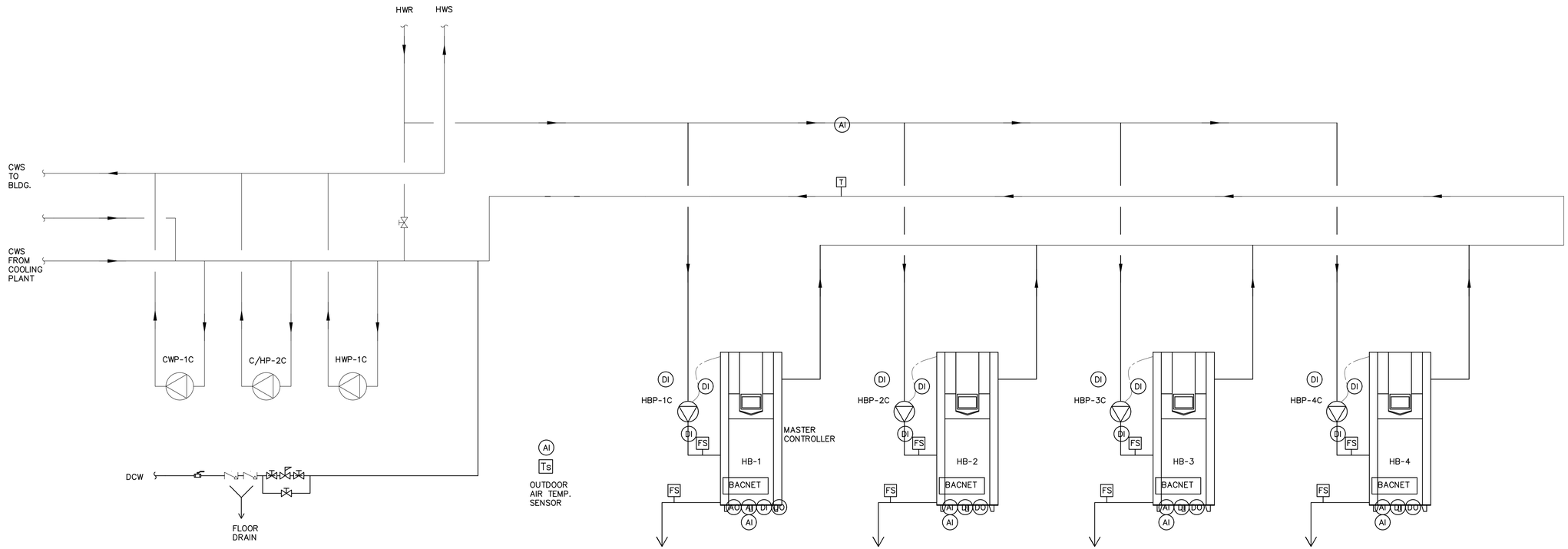
03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: DOMESTIC WATER HEATING MECHANICALSCHEMATICS
DATE: 03/04/2024
SCALE: AS SHOWN
JOB NO.: 24-021
DWG NO.: M-7
ARCH: D

5/14/2024 8:35 AM



1 M-8 SPACE HEATING CONTROL SCHEMATICS
NTS

MASTER BOILER HB-1									
POINTS NAME	AI	AO	DI	DO	SET POINT	MANUAL OVERRIDE	SCHED	TREND	ALARM
OUTDOOR AIR TEMP.	X								
LOOP TEMP.	X							X	
LOOP TEMP. SETPOINT		X			X			X	X
HEATING MODE						X	X		
BOILER ENABLE				X				X	
BOILER FIRING RATE	X								
BOILER LEAVING WATER TEMP.	X							X	X
CIRCULATOR STATUS			X						X
FLOW SWITCH			X						X
BLOCKED DRAIN SWITCH			X						X
BOILER ALARM			X						X
TOTAL	4	1	4	1					

SLAVE BOILERS HB-2,3,4 (TYP.3)									
POINTS NAME	AI	AO	DI	DO	SET POINT	MANUAL OVERRIDE	SCHED	TREND	ALARM
BOILER ENABLE				X				X	
BOILER FIRING RATE	X								
BOILER LEAVING WATER TEMP.	X							X	X
CIRCULATOR STATUS			X						X
FLOW SWITCH			X						X
BLOCKED DRAIN SWITCH			X						X
BOILER ALARM			X						X
TOTAL	2		4	1					

HEATING PLANT SEQUENCE OF OPERATION :

- ENABLE BOILERS IN HEATING MODE
- RESET HOT WATER SUPPLY TEMP. TO BUILDING PER OUTDOOR AIR TEMP.
- MASTER BOILER STAGE AND MODULATES ALL BOILERS AS REQUIRED TO MAINTAIN THE SET SUPPLY WATER TEMPERATURE

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

NO.	ISSUANCE	DATE	BY
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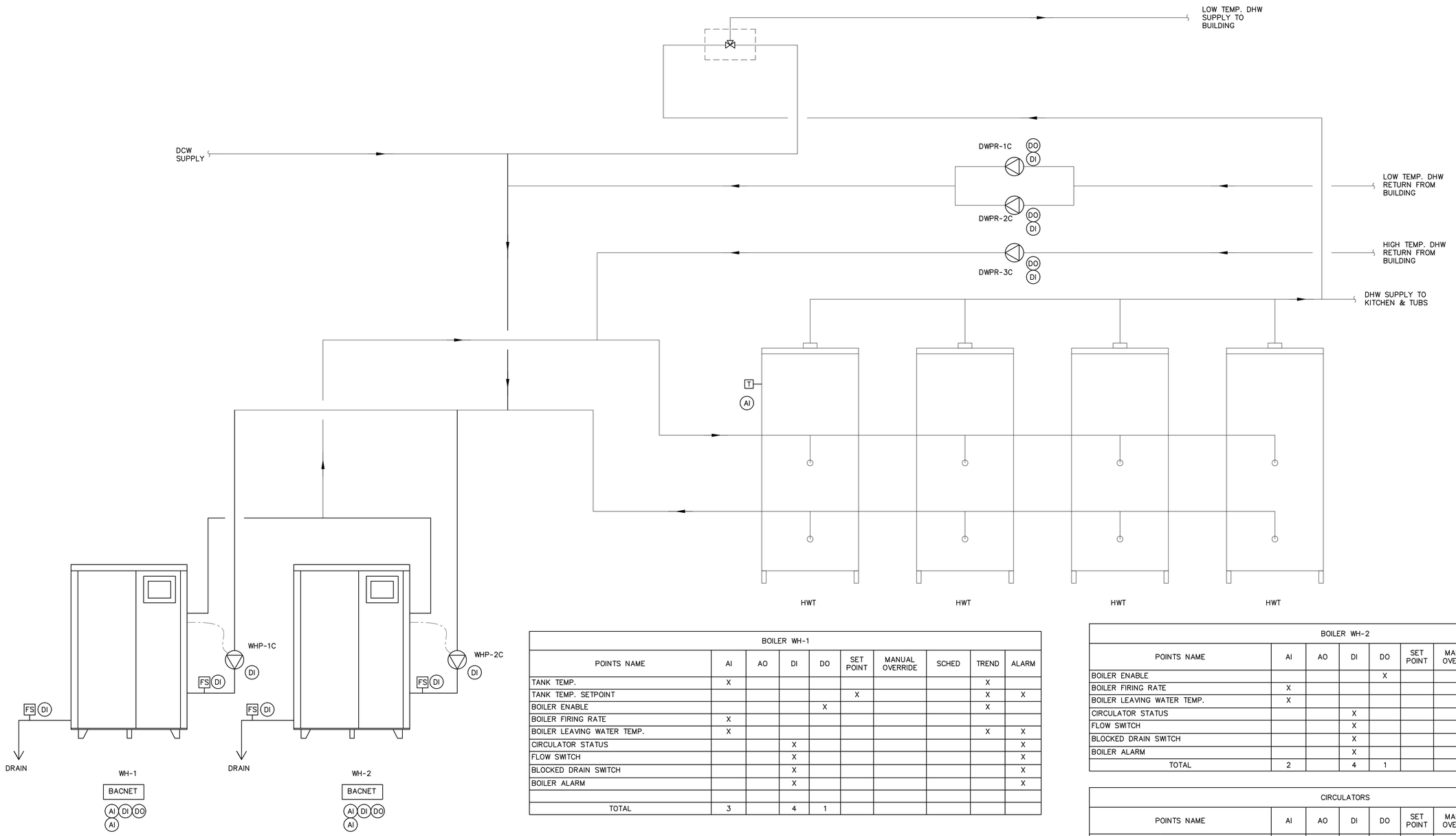
03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: SPACE HEATING BOILERS CONTROL SCHEMATICS
DATE: 03/04/2024
SCALE: AS SHOWN
JOB NO.: 24-021
DWG NO.: M-8
ARCH: D

5/14/2024 8:35 AM



1 M-9 DOMESTIC WATER HEATING CONTROL SCHEMATICS
NTS

BOILER WH-1									
POINTS NAME	AI	AO	DI	DO	SET POINT	MANUAL OVERRIDE	SCHED	TREND	ALARM
TANK TEMP.	X							X	
TANK TEMP. SETPOINT					X			X	X
BOILER ENABLE				X				X	
BOILER FIRING RATE	X								
BOILER LEAVING WATER TEMP.	X							X	X
CIRCULATOR STATUS			X						X
FLOW SWITCH			X						X
BLOCKED DRAIN SWITCH			X						X
BOILER ALARM			X						X
TOTAL	3		4	1					

BOILER WH-2									
POINTS NAME	AI	AO	DI	DO	SET POINT	MANUAL OVERRIDE	SCHED	TREND	ALARM
BOILER ENABLE				X				X	
BOILER FIRING RATE	X								
BOILER LEAVING WATER TEMP.	X							X	X
CIRCULATOR STATUS			X						X
FLOW SWITCH			X						X
BLOCKED DRAIN SWITCH			X						X
BOILER ALARM			X						X
TOTAL	2		4	1					

CIRCULATORS									
POINTS NAME	AI	AO	DI	DO	SET POINT	MANUAL OVERRIDE	SCHED	TREND	ALARM
DWPR-1C START / STOP				X		X	X		
DWPR-1C STATUS			X					X	X
DWPR-2C START / STOP				X		X	X		
DWPR-2C STATUS			X					X	X
DWPR-3C START / STOP				X		X	X		
DWPR-3C STATUS			X					X	X
TOTAL			4	4					

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:
REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

NO.	ISSUANCE	DATE	BY
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----	----	----	----
----	----	----	----
03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company
Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: DOMESTIC WATER HEATING CONTROL SCHEMATICS
DATE: 03/04/2024
JOB NO.: 24-021
DWG NO.: M-9
ARCH: D
SCALE: AS SHOWN

5/14/2024 8:35 AM

HEATING BOILER SCHEDULE

ID	LOCATION	TYPE	FUEL TYPE	ELECTRICAL: INPUT LOAD (BTU/H) (W)	ELECTRICAL: OUTPUT LOAD (BTU/H) (W)	FLUID: FLOW RATE (GPM) (L/S)	FLUID: ENTERING/ LEAVING TEMP. (°F) (°C)	FLUID: WORKING FLUID	ELECTRICAL: HEAD LOSS (FT) (KPA)	ELECTRICAL: MCA (A)	ELECTRICAL: FLA (A)	ELECTRICAL: HEATER VOLTAGE VOLT/PH/HZ	ELECTRICAL: CONTROL CIRCUIT VOLTAGE	PHYSICAL: OPERATING WEIGHT (LB) (KG)	PHYSICAL: STACK DIAMETER (IN) (MM)	PHYSICAL: LENGTH/ WIDTH/ HEIGHT (IN) (MM)	NOTES
HB-1	BASEMENT	CONDENSING BOILER	NAT GAS	1999000	1923000	192	140/160	WATER	14.5	16.3	13	120/1/60	24 VAC	2662	8	64.25/30/78	1-8
	MECH. ROOM			585707	563439	12.1152	60/71		43.3					1210.0	203.2	1632/762/1981	
HB-2	BASEMENT	CONDENSING BOILER	NAT GAS	1999000	1923000	192	140/160	WATER	14.5	16.3	13	120/1/60	24 VAC	2662	8	64.25/30/78	1-8
	MECH. ROOM			585707	563439	12.1152	60/71		43.3					1210.0	203.2	1632/762/1981	
HB-3	BASEMENT	CONDENSING BOILER	NAT GAS	1999000	1923000	192	140/160	WATER	14.5	16.3	13	120/1/60	24 VAC	2662	8	64.25/30/78	1-8
	MECH. ROOM			585707	563439	12.1152	60/71		43.3					1210.0	203.2	1632/762/1981	
HB-4	BASEMENT	CONDENSING BOILER	NAT GAS	1999000	1923000	192	140/160	WATER	14.5	16.3	13	120/1/60	24 VAC	2662	8	64.25/30/78	1-8
	MECH. ROOM			585707	563439	12.1152	60/71		43.3					1210.0	203.2	1632/762/1981	

1. PROVIDE WITH 50 PSIG ASME PRESSURE RELIEF VALVE.
2. RUN RIGID OPEN DRAIN LINE FOR CONDENSATE AND PRV.
3. CONNECT EXISTING OUTDOOR AIR TEMPERATURE SENSOR TO BOILER CONTROLLER.
4. PROVIDE WITH MASTER / MEMBER ON-BOARD CONTROLLER.
5. PROVIDE WITH BACNET MSTP CARD
6. BOILER CIRCULATOR PUMP ON/OFF VIA BOILER CONTROLLER.
7. PROVIDE WITH LOW WATER CUTOFF, FLOW SWITCH AND DRAIN BLOCKAGE SWITCH
8. BOILERS MUST SUPPORT 45m (150FT) OF EQUAL LENGTH OF DIRECT VENTING

DOMESTIC WATER HEATER SCHEDULE

ID	LOCATION	TYPE	FUEL TYPE	ELECTRICAL: INPUT LOAD (BTU/H) (W)	ELECTRICAL: OUTPUT LOAD (BTU/H) (W)	FLUID: FLOW RATE (GPM) (L/S)	FLUID: ENTERING/ LEAVING TEMP. (°F) (°C)	FLUID: WORKING FLUID	ELECTRICAL: HEAD LOSS (FT) (KPA)	ELECTRICAL: TOTAL AMP (A)	ELECTRICAL: HEATER VOLTAGE VOLT/PH/HZ	ELECTRICAL: CONTROL CIRCUIT VOLTAGE	PHYSICAL: WEIGHT (LB) (KG)	PHYSICAL: STACK DIAMETER (IN) (MM)	PHYSICAL: LENGTH/ WIDTH/ HEIGHT (IN) (MM)	NOTES
WH-1	BASEMENT	CONDENSING BOILER	NAT GAS	999000	979020	79	115/140	WATER	15	11.7	120/1/60	24 VAC	494	6	48/24/45	1-8
	MECH. ROOM			292707	286852.9	4.9849	15.6/48.9		44.8				224.5	152.4	1220/610/1143	
WH-2	BASEMENT	CONDENSING BOILER	NAT GAS	999000	979020	79	115/140	WATER	15	11.7	120/1/60	24 VAC	494	6	48/24/45	1-8
	MECH. ROOM			292707	286852.9	4.9849	15.6/48.9		44.8				224.5	152.4	1220/610/1143	

1. PROVIDE WITH 150 PSIG ASME PRESSURE RELIEF VALVE.
2. RUN RIGID OPEN DRAIN LINE FOR CONDENSATE AND PRV.
3. CONNECT EXISTING TANK TEMPERATURE SENSOR TO BOILER CONTROLLER
4. PROVIDE WITH MASTER / MEMBER ON-BOARD CONTROLLER.
5. PROVIDE WITH BACNET MSTP CARD
6. BOILER CIRCULATOR PUMP ON/OFF VIA BOILER CONTROLLER.
7. PROVIDE WITH LOW WATER CUTOFF, FLOW SWITCH AND DRAIN BLOCKAGE SWITCH
8. BOILERS MUST SUPPORT 45m (150FT) OF EQUAL LENGTH OF DIRECT VENTING

DOMESTIC CIRCULATION PUMP SCHEDULE

ID	MANUFACTUER MODEL	LOCATION	TYPE	FLUID: FLOW RATE (GPM) (L/S)	FLUID: WORKING FLUID	FLUID: HEAD LOSS (FT) (KPA)	PUMP: CONSTRUCTION	ELECTRICAL: MOTOR SIZE (HP) (KW)	ELECTRICAL: MOTOR SPEED (RPM)	ELECTRICAL: VOLT/PH/HZ	PHYSICAL: OPERATING WEIGHT (LB) (KG)	PHYSICAL: DIA./ HEIGHT (IN) (MM)	NOTES
DWRP-1C	ARMSTRONG	BASEMENT	INLINE	40	POTABLE	30	BRONZE	0.75	1750	575/3/60	98	13.5/22	1-4
	SERIES H-H64	MECH. ROOM	CIRCULATOR	2.52	WATER	89.7		0.5595			44.5	343/560	
DWRP-2C	ARMSTRONG	BASEMENT	INLINE	40	POTABLE	30	BRONZE	0.75	1750	575/3/60	98	13.5/22	1-4
	SERIES H-H64	MECH. ROOM	CIRCULATOR	2.52	WATER	89.7		0.5595			44.5	343/560	
DWRP-3C	ARMSTRONG	BASEMENT	INLINE	10	POTABLE	10	BRONZE	0.167	1750	115/1/60	35	8.5/15.7	1-4
	SERIES H-H32	MECH. ROOM	CIRCULATOR	0.63	WATER	29.9		0.124582			15.9	216/399	

1. GRUNDFOS, ITT BELL & GOSSETT, TACO OR APPROVED EQUIVALENT ARE ACCEPTABLE
2. CONTRACTOR TO CONFIRM VOLTAGE PRIOR TO ORDERING
3. PROVIDE WITH STRAINER
4. PROVIDE PUMPS WITH PREMIUM EFFICIENCY MOTORS

BOILER CIRCULATION PUMP SCHEDULE

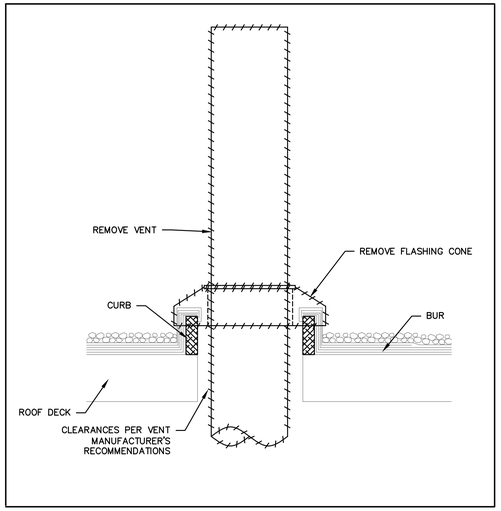
ID	MANUFACTUER MODEL	LOCATION	TYPE	FLUID: FLOW RATE (GPM) (L/S)	FLUID: WORKING FLUID	FLUID: HEAD LOSS (FT) (KPA)	PUMP: CONSTRUCTION	ELECTRICAL: MOTOR SIZE (HP) (KW)	ELECTRICAL: MOTOR SPEED (RPM)	ELECTRICAL: VOLT/PH/HZ	PHYSICAL: OPERATING WEIGHT (LB) (KG)	PHYSICAL: DIA./ HEIGHT (IN) (MM)	NOTES
HBP-1C	ARMSTRONG	BASEMENT	CLOSED-COUPLED	192	WATER	20	CAST	2	1760	575/3/60	209	18/17.25	1-5
	4380-3X3X6-4P	MECH. ROOM	VERTICAL INLINE	12.12		59.8	IRON	1.492			95.0	457/438	
HBP-2C	ARMSTRONG	BASEMENT	CLOSED-COUPLED	192	WATER	20	CAST	2	1760	575/3/60	209	18/17.25	1-5
	4380-3X3X6-4P	MECH. ROOM	VERTICAL INLINE	12.12		59.8	IRON	1.492			95.0	457/438	
HBP-3C	ARMSTRONG	BASEMENT	CLOSED-COUPLED	192	WATER	20	CAST	2	1760	575/3/60	209	18/17.25	1-5
	4380-3X3X6-4P	MECH. ROOM	VERTICAL INLINE	12.12		59.8	IRON	1.492			95.0	457/438	
HBP-4C	ARMSTRONG	BASEMENT	CLOSED-COUPLED	192	WATER	20	CAST	2	1760	575/3/60	209	18/17.25	1-5
	4380-3X3X6-4P	MECH. ROOM	VERTICAL INLINE	12.12		59.8	IRON	1.492			95.0	457/438	
WHP-1C	ARMSTRONG	BASEMENT	INLINE	79	POTABLE	15	BRONZE	0.75	1750	575/3/60	44		1-5
	S57	MECH. ROOM	CIRCULATOR	4.98	WATER	44.8		0.5595			20.0		
WHP-2C	ARMSTRONG	BASEMENT	INLINE	79	POTABLE	15	BRONZE	0.75	1750	575/3/60	44		1-5
	S57	MECH. ROOM	CIRCULATOR	4.98	WATER	44.8		0.5595			20.0		

1. GRUNDFOS, ITT BELL & GOSSETT, TACO OR APPROVED EQUIVALENT ARE ACCEPTABLE
2. CONTRACTOR TO CONFIRM VOLTAGE PRIOR TO ORDERING.
3. PROVIDE WITH STRAINER
4. PUMP ON/OFF VIA BOILER
5. PROVIDE PUMPS WITH PREMIUM EFFICIENCY MOTORS

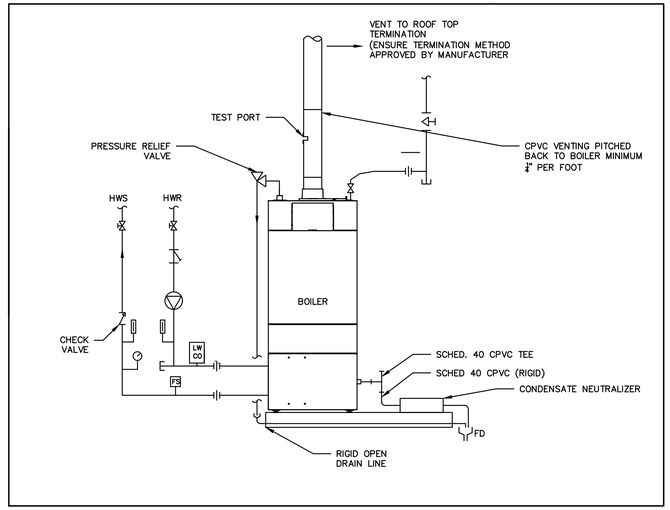
AIR SEPARATOR SCHEDULE

ID	MANUFACTURER AND MODEL NUMBER	LOCATION	TYPE	FLUID: FLOW RATE (GPM) (L/S)	FLUID: WORKING FLUID	FLUID: HEAD LOSS (FT) (KPA)	PHYSICAL: OPERATING WEIGHT (LB) (KG)	PHYSICAL: DIA./ HEIGHT (IN) (MM)	NOTES
AS-1	BOILERMAG XT	BASEMENT	MAGNETIC	600	WATER	0.69	133	12.75/16.5	1, 2
	BMXT-6	MECH ROOM	AIR DIRT SEPARATOR	37.86		2.06241	60.5	325/420	

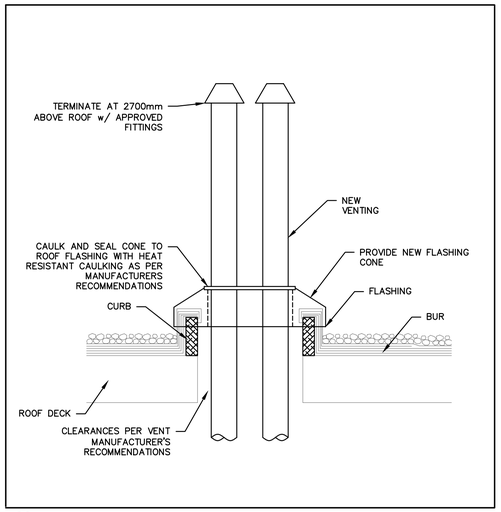
1. AIR SEPARATORS MANUFACTURED BY BELL & GOSSETT, MAGNACLEAN OR APPROVED EQUIVALENT ARE ACCEPTABLE
2. PROVIDE WITH AIR VENT



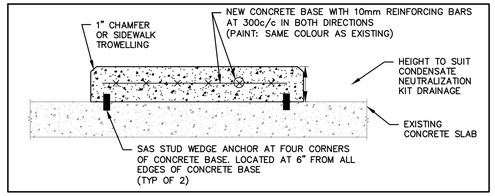
1 M10 VENT STACK DEMOLITION DETAIL
NTS



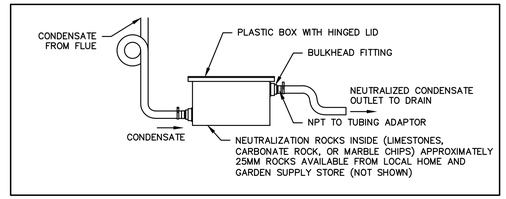
3 M10 CONDENSING HOT WATER BOILER CONNECTION DETAIL
NTS



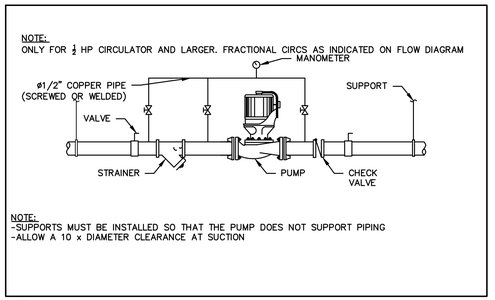
2 M10 VENTING ROOF TERMINATION DETAIL
NTS



4 M10 CONCRETE HOUSEKEEPING PAD DETAIL
NTS



5 M10 CONDENSATE NEUTRALIZATION KIT DETAIL
NTS



6 M10 LOOP CIRCULATOR PUMP DETAIL
NTS

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
A.RAHMANI
100141492
05/13/2024
PROVINCE OF ONTARIO

ORIENTATION:

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Do not scale this drawing.

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EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

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ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: SCHEDULES AND INSTALLATION DETAILS
DATE: 03/04/2024
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JOB NO.: 24-021
DWG NO.: M10
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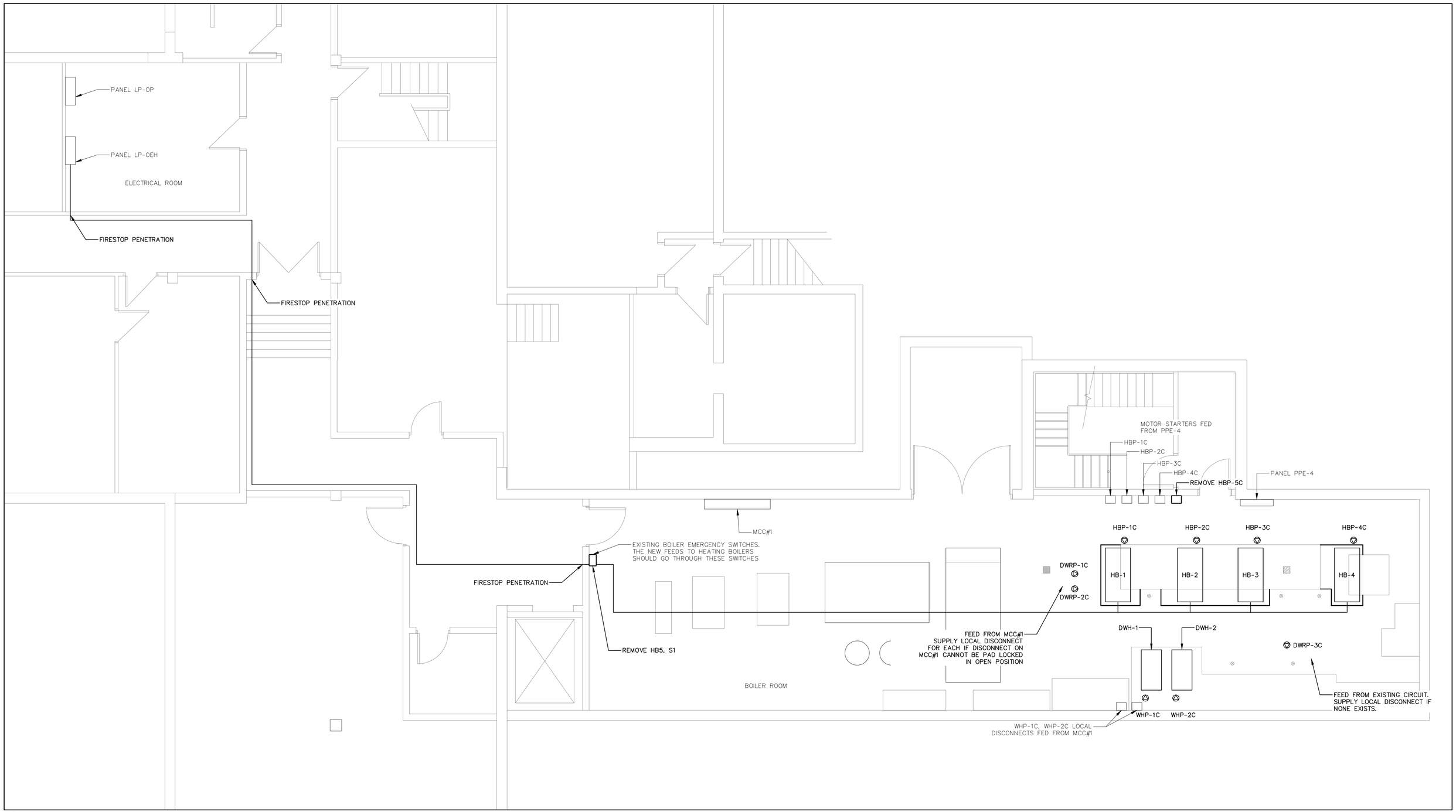

1 / E-1 BASEMENT PLAN
1:50

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
05/13/24
C.J BRAMBLE
PROVINCE OF ONTARIO

ORIENTATION:

PROJECT NORTH
TRUE NORTH

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

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EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: BASEMENT PLAN
DATE: 03/04/2024
SCALE: AS SHOWN
JOB NO.: 24-021
DWG NO.: E-1
ARCH: D

5/14/2024 8:35 AM

ELECTRICAL SCHEDULE

EQUIPMENT		CHARACTERISTICS									WIRING		STARTERS									ISOLATING DEVICE						REMOTE CONTROL					
EQUIPMENT ID	EQUIPMENT TYPE	VOLTAGE/PHASE/HERTZ	PANEL ID-CCT OR SPLITTER ID	LOAD	FLA	MCA	MOCP	FUSE	CIRCUIT BREAKER	DISCONNECT	WIRE SIZE (AWG/KCMIL)	EMT CONDUIT SIZE (MM)	MANUAL	MAGNETIC	COMBINATION	CONTACTOR	ECM	MANUAL THERMOSTAT	VFD	HAND-OFF-AUTO(HOA) SWITCH	STOP-START PUSH BUTTON	PILOT LIGHT	LOCAL DISCONNECT	LOCAL FUSED DISCONNECT	LOCAL WP DISCONNECT	SWITCHABLE AT BREAKER	RECEPTACLE (5-20R)	RECEPTACLE (5-15R)	EMERGENCY STOP PUSH BUTTON	BUILDING AUTOMATION CONNECTION	PRESSURE SWITCH	FIRE ALARM INTEGRATION	MOTOR CONTROL RELAY	CONTROL VOLTAGE (V)	NOTES
HB-1	CONDENSING BOILER	120/1/60	LP-0EH	-	13	16.3	-	-	20	30	12	-	-	-	-	-	-	-	-	-	-	E	-	-	-	-	-	-	C	-	-	-	-	1,4,6,9,10
HB-2	CONDENSING BOILER	120/1/60	LP-0EH	-	13	16.3	-	-	20	30	12	-	-	-	-	-	-	-	-	-	-	E	-	-	-	-	-	-	C	-	-	-	-	1,4,6,9,10
HB-3	CONDENSING BOILER	120/1/60	LP-0EH	-	13	16.3	-	-	20	30	12	-	-	-	-	-	-	-	-	-	-	E	-	-	-	-	-	-	C	-	-	-	-	1,4,6,9,10
HB-4	CONDENSING BOILER	120/1/60	LP-0EH	-	13	16.3	-	-	20	30	12	-	-	-	-	-	-	-	-	-	-	E	-	-	-	-	-	-	C	-	-	-	-	1,4,6,9,10
HBP-1C	CIRCULATING PUMP	575/3/60	PPE-4	2 HP	2.7	3.4	-	-	15	-	12	-	-	-	E	-	-	-	-	E	-	E	-	-	-	-	-	-	C	-	-	-	-	1,3,7,10
HBP-2C	CIRCULATING PUMP	575/3/60	PPE-4	2 HP	2.7	3.4	-	-	15	-	12	-	-	-	E	-	-	-	-	E	-	E	-	-	-	-	-	-	C	-	-	-	-	1,3,7,10
HBP-3C	CIRCULATING PUMP	575/3/60	PPE-4	2 HP	2.7	3.4	-	-	15	-	12	-	-	-	E	-	-	-	-	E	-	E	-	-	-	-	-	-	C	-	-	-	-	1,3,7,10
HBP-4C	CIRCULATING PUMP	575/3/60	PPE-4	2 HP	2.7	3.4	-	-	15	-	12	-	-	-	E	-	-	-	-	E	-	E	-	-	-	-	-	-	C	-	-	-	-	1,3,7,10
DWH-1	CONDENSING BOILER	120/1/60	LP-0P	-	6.6	8.3	-	-	15	30	12	-	-	-	-	-	-	-	-	-	-	-	E	-	-	-	-	-	C	-	-	-	-	1,4,7,10
DWH-2	CONDENSING BOILER	120/1/60	LP-0P	-	6.6	8.3	-	-	15	30	12	-	-	-	-	-	-	-	-	-	-	-	E	-	-	-	-	-	C	-	-	-	-	1,4,7,10
WHP-1C	CIRCULATING PUMP	575/3/60	MCC#1	0.75 HP	1.3	1.7	-	15	-	-	12	-	-	-	E	-	-	-	-	E	-	E	-	-	-	-	-	-	C	-	-	-	-	1,3,7,10
WHP-2C	CIRCULATING PUMP	575/3/60	MCC#1	0.75 HP	1.3	1.7	-	15	-	-	12	-	-	-	E	-	-	-	-	E	-	E	-	-	-	-	-	-	C	-	-	-	-	1,3,7,10
DWRP-1C	PUMP	575/3/60	MCC#1	0.75 HP	1.3	1.7	-	15	-	-	12	-	-	-	E	-	-	-	-	E	-	E	E	-	-	-	-	-	C	-	-	-	-	1,5,7,8,10
DWRP-2C	PUMP	575/3/60	MCC#1	0.75 HP	1.3	1.7	-	15	-	-	12	-	-	-	E	-	-	-	-	E	-	E	E	-	-	-	-	-	C	-	-	-	-	1,5,7,8,10
DWRP-3C	PUMP	120/1/60	NOT IDENTIFIED	0.167 HP	4.4	5.5	-	-	15	-	12	-	-	-	E	-	-	-	-	-	-	-	E	-	-	-	-	-	C	-	-	-	-	1,5,7,8,10

E - ELECTRICAL CONTRACTOR
M - MECHANICAL CONTRACTOR
C - CONTROLS CONTRACTOR

NOTES
1. ALL CONDUCTOR INSULATION TO BE SUITABLE FOR NON-COMBUSTIBLE CONSTRUCTION.
2. USE SUNLIGHT RESISTANT RIGID PVC OUTDOORS. PROVIDE EXPANSION JOINTS AS REQUIRED.
3. REUSE EXISTING MOTOR STARTERS AND DISCONNECT SWITCHES. PROVIDE AUXILIARY RELAYS AS REQUIRED FOR ON/OFF CONTROL VIA BOILER. ADJUST OR REPLACE OVERLOAD TO MATCH NEW MOTOR. REPLACE FUSES TO MATCH NEW MOTOR.
4. DISCONNECT SWITCH IN SAME LOCATION AS EXISTING.
5. REUSE EXISTING MOTOR STARTER AND DISCONNECT SWITCH. ADJUST OR REPLACE OVERLOAD TO MATCH NEW MOTOR. REPLACE FUSES TO MATCH NEW MOTOR.
6. WIRE SIZE SHOWN IS MINIMUM. INCREASE SIZE AS REQUIRED FOR MAXIMUM 4.0% VOLTAGE DROP - SEE CABLE SCHEDULE.
7. WIRE SIZE SHOWN IS MINIMUM. USE EXISTING IF WIRE SIZE IS LARGER THAN OR EQUAL TO MINIMUM.
8. USE EXISTING DISCONNECT SWITCH. IF NO EXISTING SWITCH PROVIDE LOCAL DISCONNECT PER OESC 28-604 UNLESS UPSTREAM DISCONNECT IS LOCKABLE IN OPEN POSITION.
9. REPLACE EXISTING DISCONNECT SWITCH IF NOT RATED FOR 20 A CIRCUIT.
10. REFER TO MECHANICAL DRAWINGS FOR BAS INTERFACE.

CABLE SCHEDULE

#	CABLE									FROM		TO		NOTES
	# OF CONDUCTORS	L & N SIZE	GND SIZE	MATERIAL	MIN EMT SIZE	MIN PVC SIZE	CABLE TEMP RATING	LENGTH ESTIMATE (m)	INSULATION RATING	EQUIPMENT NUMBER	LOCATION	EQUIPMENT NUMBER	LOCATION	
1	1 @ 1 + N	8 AWG	+ 10 AWG	Cu	1 @ 21 mm	1 @ 21 mm	90°C	63	600V	LP-0EH	ELECTRICAL ROOM	HB-1	BOILER ROOM	1,2,3,5
2	1 @ 1 + N	8 AWG	+ 10 AWG	Cu	1 @ 21 mm	1 @ 21 mm	90°C	65	600V	LP-0EH	ELECTRICAL ROOM	HB-2	BOILER ROOM	1,2,3,5
3	1 @ 1 + N	8 AWG	+ 10 AWG	Cu	1 @ 21 mm	1 @ 21 mm	90°C	67	600V	LP-0EH	ELECTRICAL ROOM	HB-3	BOILER ROOM	1,2,3,5
4	1 @ 1 + N	6 AWG	+ 10 AWG	Cu	1 @ 27 mm	1 @ 27 mm	90°C	70	600V	LP-0EH	ELECTRICAL ROOM	HB-4	BOILER ROOM	1,2,3,5

NOTES
1. SIZING DONE ASSUMING COPPER WIRE. IF ALUMINIUM USED FOLLOW ALL APPLICABLE CODES AND GUIDELINES INCLUDING THE OESC AND OBC.
2. IF CABLE WILL BE LONGER THAN ESTIMATED CABLE LENGTH, VOLTAGE DROP CALCULATION WILL NEED TO BE PERFORMED TO SEE IF CABLE SIZE NEEDS TO BE INCREASED.
3. CONDUCTOR INSULATION TO BE SUITABLE FOR NON-COMBUSTIBLE CONSTRUCTION.
4. CONTROL CABLES NOT INCLUDED.
5. MAY BE REDUCED TO #12 AWG FOR CONNECTION TO EQUIPMENT. TOTAL VOLTAGE DROP AT BOILER FLA NOT TO EXCEED 4.0% FROM PANEL TO BOILER.

PANEL LP-0P - AS FOUND

DESCRIPTION	BKR	CCT NO.		BKR	DESCRIPTION
LIGHTING CENTRAL STORAGE	20	1	2	20	LIGHTING NORTH WEST CORRIDOR
LIGHTING	20	3	4	20	LIGHTING BASEMENT EAST MAINTENANCE
WS-1	15	5	6	15	**WH-1 (DWH-1)**
DAC-1	15	7	8	15	**WH-2 (DWH-2)**
CF-1 (CHEMICAL FEED)	15	9	10	15	NOT MARKED
SPARE	15	11	12	15	RECEPTACLE
SPARE	15	13	14	15	RECEPTACLE
SPARE	15	15	16	20	NOT MARKED
WELDING BENCH OUTLET	15	17	18		
SPARE	15	19	20	15	NOT MARKED
SPARE	15	21	22	15	NOT MARKED
SPARE	15	23	24	15	NOT MARKED
SPARE	??	25	26	20	SPARE
		27	28		
		29	30		
SPARE	??	31	32	20	SPARE
		33	34		
		35	36		
SPARE	30	37	38	-	-
		39	40	-	-
		41	42	-	-

MAINS RATING: 225 A
MAIN BREAKER: NONE
VOLTAGE RATING: 120/208-3Φ-4W
SHORT CIRCUIT RATING: NOT MARKED
CUTLER HAMMER PL-1

NOTES:
1. FED FROM 200 A SWITCH ON 400 A SPLITTER

PANEL LP-0P - RETROFIT

DESCRIPTION	BKR	CCT NO.		BKR	DESCRIPTION
LIGHTING CENTRAL STORAGE	20	1	2	20	LIGHTING NORTH WEST CORRIDOR
LIGHTING	20	3	4	20	LIGHTING BASEMENT EAST MAINTENANCE
WS-1	15	5	6	15	**DWH-1**
DAC-1	15	7	8	15	**DWH-2**
CF-1 (CHEMICAL FEED)	15	9	10	15	NOT MARKED
SPARE	15	11	12	15	RECEPTACLE
SPARE	15	13	14	15	RECEPTACLE
SPARE	15	15	16	20	NOT MARKED
WELDING BENCH OUTLET	15	17	18		
SPARE	15	19	20	15	NOT MARKED
SPARE	15	21	22	15	NOT MARKED
SPARE	15	23	24	15	NOT MARKED
SPARE	??	25	26	20	SPARE
		27	28		
		29	30		
SPARE	??	31	32	20	SPARE
		33	34		
		35	36		
SPARE	30	37	38	-	-
		39	40	-	-
		41	42	-	-

MAINS RATING: 225 A
MAIN BREAKER: NONE
VOLTAGE RATING: 120/208-3Φ-4W
SHORT CIRCUIT RATING: NOT MARKED
CUTLER HAMMER PL-1

NOTES:
1. FED FROM 200 A SWITCH ON 400 A SPLITTER

PANEL LP-0EH - AS FOUND

DESCRIPTION	BKR	CCT NO.		BKR	DESCRIPTION
EXITS	15	1	2	15	LIGHTING
ELEVATOR/PIT	15	3	4	15	LIGHTING
KITCHEN ELEVATOR TUNNEL LIGHTING	15	5	6	15	LIGHTING
EMS C-BASEMENT	15	7	8	20	C-WING ELEV/CONTROL
HB-1	15	9	10	15	ADT BOX IN SHOP FIRE MONITORING
HB-2	**15**	11	12	15	1/3 CONDENSATION PUMP
HB-3	**15**	13	14	15	SSP-1 1/3
HB-4	**15**	15	16	15	SSP-2 1/3
HB-5	**15**	17	18	15	STSP-1 1/3
1/3 HP ELSP-1	15	19	20	15	STSP-2 1/3
UH 1/20	15	21	22	15	C-WING JOCKEY 1/3
S-1 CHEM SYSTEM/STEAM BOILER	15	23	24	15	SPARE
CLIMACHECK CHILLER PANELS	15	25	26	15	SPARE
SPARE	20	27	28	20	SPARE
SPARE	20	29	30	15	F.A. PANEL
SPARE	20	31	32	20	SPARE
SPARE	20	33	34	20	FC-8
SPARE	20	35	36	20	-
-	-	37	38	-	-
-	-	39	40	-	-
-	-	41	42	-	-

MAINS RATING: 100 A
MAIN BREAKER: NONE
VOLTAGE RATING: 120/208-3Φ-4W
SHORT CIRCUIT RATING: NOT MARKED
CUTLER HAMMER PL-1

NOTES:
1. FED FROM PPE-2

PANEL LP-0EH - RETROFIT

DESCRIPTION	BKR	CCT NO.		BKR	DESCRIPTION
EXITS	15	1	2	15	LIGHTING
ELEVATOR/PIT	15	3	4	15	LIGHTING
KITCHEN ELEVATOR TUNNEL LIGHTING	15	5	6	15	LIGHTING
EMS C-BASEMENT	15	7	8	20	C-WING ELEV/CONTROL
SPARE	15	9	10	15	ADT BOX IN SHOP FIRE MONITORING
HB-2	**20**	11	12	15	1/3 CONDENSATION PUMP
HB-3	**20**	13	14	15	SSP-1 1/3
HB-4	**20**	15	16	15	SSP-2 1/3
HB-1	**20**	17	18	15	STSP-1 1/3
1/3 HP ELSP-1	15	19	20	15	STSP-2 1/3
UH 1/20	15	21	22	15	C-WING JOCKEY 1/3
SPARE	15	23	24	15	SPARE
CLIMACHECK CHILLER PANELS	15	25	26	15	SPARE
SPARE	20	27	28	20	SPARE
SPARE	20	29	30	15	F.A. PANEL
SPARE	20	31	32	20	SPARE
SPARE	20	33	34	20	FC-8
SPARE	20	35	36	20	-
-	-	37	38	-	-
-	-	39	40	-	-
-	-	41	42	-	-

MAINS RATING: 100 A
MAIN BREAKER: NONE
VOLTAGE RATING: 120/208-3Φ-4W
SHORT CIRCUIT RATING: NOT MARKED
CUTLER HAMMER PL-1

NOTES:
1. FED FROM PPE-2

PANEL PPE-4 - AS FOUND

DESCRIPTION	BKR	CCT NO.		BKR	DESCRIPTION
HBP-1C	15	1	2	20	VP-2C
		3	4		
		5	6		
HBP-2C	15	7	8	15	VP-1A
		9	10		
		11	12		
HBP-3C	15	13	14	15	SPARE
		15	16		
		17	18		
HBP-4C	15	19	20	40	SPARE
		21	22		
		23	24		
HBP-5C	15	25	26	30	SPARE
		27	28		
		29	30		
-	-	31	32	-	-
-	-	33	34	-	-
-	-	35	36	-	-
-	-	37	38	-	-
-	-	39	40	-	-
-	-	41	42	-	-

MAINS RATING: UNKNOWN
MAIN BREAKER: NONE
VOLTAGE RATING: 600-3Φ-3W
SHORT CIRCUIT RATING: UNKNOWN

NOTES:
1. FED FROM FROM PPE-1

PANEL PPE-4 - RETROFIT

DESCRIPTION	BKR	CCT NO.		BKR	DESCRIPTION
HBP-1C	15	1	2	20	VP-2C
		3	4		
		5	6		
HBP-2C	15	7	8	15	VP-1A
		9	10		
		11	12		
HBP-3C	15	13	14	15	SPARE
		15	16		
		17	18		
HBP-4C	15	19	20	40	SPARE
		21	22		
		23	24		
SPARE	15	25	26	30	SPARE
		27	28		
		29	30		
-	-	31	32	-	-
-	-	33	34	-	-
-	-	35	36	-	-
-	-	37	38	-	-
-	-	39	40	-	-
-	-	41	42	-	-

MAINS RATING: UNKNOWN
MAIN BREAKER: NONE
VOLTAGE RATING: 600-3Φ-3W
SHORT CIRCUIT RATING: UNKNOWN

NOTES:
1. FED FROM FROM PPE-1

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
05/13/24
C.J. BRAMBLE
PROVINCE OF ONTARIO

ORIENTATION:

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

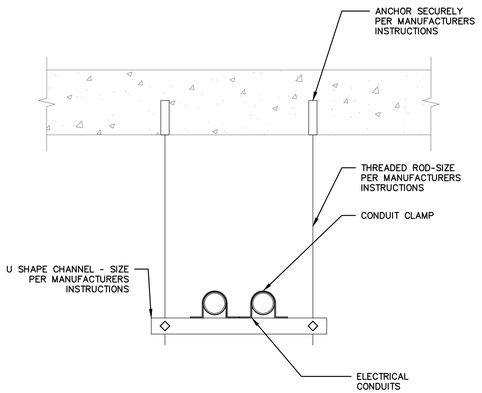
NO.	ISSUANCE	DATE	BY
----	----	----	----
----	----	----	----
----	----	----	----
03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
DWG TITLE: ELECTRICLA SCHEDULES
CHK: AR
DATE: 03/04/2024
JOB NO. 24-021
DWG NO. E-2
ARCH D
SCALE: AS SHOWN

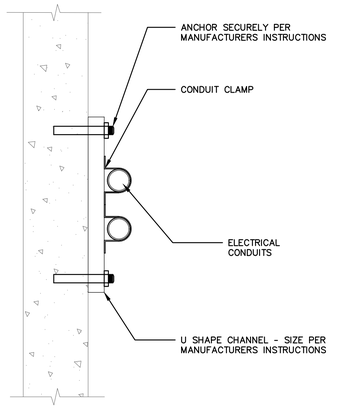
5/14/2024 8:35 AM



NOTE:
SPACING AND LOCATION OF SUPPORTS PER OESC LATEST EDITION

MAXIMUM SPAN BETWEEN CONDUIT SUPPORTS									
TRADE SIZE		RIGID METAL		EMT		RIGID PVC		LIQUID TIGHT	
mm	in	mm	in	mm	in	mm	in	mm	in
16	1/2	1500	59	1500	59	750	29	1500	59
21	3/4	1500	59	1500	59	750	29	1500	59
27	1	2000	78	2000	78	750	29	1500	59
35	1-1/4	2000	78	2000	78	1200	47	1500	59
41	1-1/2	3000	118	3000	118	1200	47	1500	59
53	2	3000	118	3000	118	1500	59	1500	59
63	2-1/2	3000	118	3000	118	1800	70	1500	59
78	3	3000	118	3000	118	1800	70	1500	59
91	3-1/2	3000	118	3000	118	2100	82	1500	59
103	4	3000	118	3000	118	2100	82	1500	59
129	5	3000	118	3000	118	2100	82	1500	59
155	6	3000	118	3000	118	2500	98	1500	59
200	8	3000	118	3000	118	2500	98	1500	59
WHEN TWO OR MORE SIZES AND/OR TYPES USE THE SAME SUPPORTS MAX. SPAN SHALL BE THE SMALLEST MAX. SPAN									

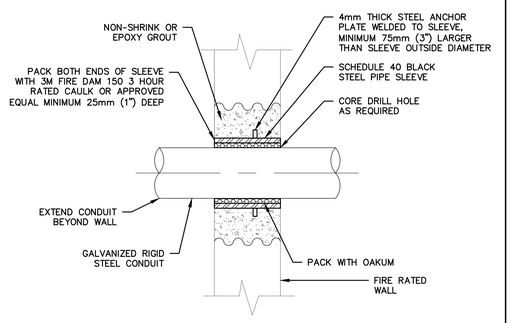
1 E-3 CONDUIT SUPPORT FROM CEILING DETAIL
NTS



NOTE:
SPACING AND LOCATION OF SUPPORTS PER OESC LATEST EDITION

MAXIMUM SPAN BETWEEN CONDUIT SUPPORTS									
TRADE SIZE		RIGID METAL		EMT		RIGID PVC		LIQUID TIGHT	
mm	in	mm	in	mm	in	mm	in	mm	in
16	1/2	1500	59	1500	59	750	29	1500	59
21	3/4	1500	59	1500	59	750	29	1500	59
27	1	2000	78	2000	78	750	29	1500	59
35	1-1/4	2000	78	2000	78	1200	47	1500	59
41	1-1/2	3000	118	3000	118	1200	47	1500	59
53	2	3000	118	3000	118	1500	59	1500	59
63	2-1/2	3000	118	3000	118	1800	70	1500	59
78	3	3000	118	3000	118	1800	70	1500	59
91	3-1/2	3000	118	3000	118	2100	82	1500	59
103	4	3000	118	3000	118	2100	82	1500	59
129	5	3000	118	3000	118	2100	82	1500	59
155	6	3000	118	3000	118	2500	98	1500	59
200	8	3000	118	3000	118	2500	98	1500	59
WHEN TWO OR MORE SIZES AND/OR TYPES USE THE SAME SUPPORTS MAX. SPAN SHALL BE THE SMALLEST MAX. SPAN									

2 E-3 CONDUIT SUPPORT FROM WALL DETAIL
NTS



3 E-3 ELECTRICAL CONDUIT THRU WALL DETAIL
NTS

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

NOTES:

SEAL:

REGISTERED PROFESSIONAL ENGINEER
05/13/24
C.J BRAMBLE
PROVINCE OF ONTARIO

ORIENTATION:

The contractor shall check and verify all dimensions and report any errors or omissions to the consultant before commencing or proceeding with work.

Do not scale this drawing.

NO.	ISSUANCE	DATE	BY
----	----	----	----
----	----	----	----
----	----	----	----
03	ISSUED FOR TENDER	05/13/2024	JG
02	ISSUED FOR 95% REVIEW	04/16/2024	AR
01	ISSUED FOR 90% REVIEW	04/02/2024	JG

EFFICIENCY ENGINEERING .com
A Kontrol Technologies Company

Hamilton

JOB NAME: MACASSA LODGE BOILER RETROFIT
ADDRESS: 701 Upper Sherman Ave, Hamilton, ON L8V 3M7
DWN: JG
CHK: AR
DWG TITLE: DETAILS
DATE: 03/04/2024
JOB NO.: 24-021
DWG NO.: E-3
ARCH: D
SCALE: AS SHOWN

5/14/2024 8:35 AM

C13-20-24 - Tender for General Contractor required for Macassa Lodge Space and Domestic Hot Water (DHW) Heating Boilers Upgrade

Opening Date: September 6, 2024 12:00 PM

Closing Date: October 1, 2024 3:00 PM

Bid Number: C13-20-24

***** *IMPORTANT* *****

Bidders are advised to review and confirm their bids&tenders™ vendor account is set up in the bidder's correct LEGAL name.

This name must exactly match the name on all documentation required of the Successful Bidder, eg; insurance certificate, WSIB certificate.

Schedule of Prices

* Denotes a "**MANDATORY"** field

Do not enter $0.00 dollars unless you are providing the line item at zero dollars to the City of Hamilton (unless otherwise specified).

If the line item and/or table is "**NON-MANDATORY**" and you are not bidding on it, leave the table and/or line item blank. Do not enter a $0.00 dollar value.

Cost of Work

Line Item No.	Description	Lump Sum Price *
1	Cost of Work	
	Subtotal:	

Summary Table

Bid Form	Amount
Cost of Work	
Total Contract Price:	

Specifications

Bidder's Business Structure

The City of Hamilton reserves the right to verify the business name and structure of the bidder, whether or not this section is completed, to ensure that the bidder is an existing legal entity. If the bidder is not an existing legal entity, the Bid will be rejected.

Business Structure of Bidder *	If 'Corporation' Selected, Specify Where Incorporated:	If 'Other' Selected, Specify Business Structure:	Registered Business Name of Bidder (if applicable):
Select A Value			

Documents

It is your responsibility to ensure the uploaded file(s) is/are not defective or corrupted and are able to be opened and viewed by the City. If the attached file(s) cannot be opened or viewed, your Bid shall be rejected.

BONDING UPLOAD SECTION

Each Bid submission must be accompanied by a **digital** bid bond.

The City will only accept submissions that include the bid bond in an electronically verifiable and enforceable (e-Bond) format.

A scanned PDF copy of the bond is not acceptable.

Instruction: After uploading the bid bond, ensure the uploaded bid bond is electronically verifiable and enforceable prior to submission of this Bid.

For additional infomation on Bid Security refer to the Request for Tenders document.

- Bid Bond * (mandatory)

Form of Tender

The bidder hereby acknowledges and agrees:

1. Submission of Bid

I/We the undersigned bidder, having examined the locality and site of the Work as well as all the Request for Tenders documents, hereby tenders and offers to furnish all material, labour, service, equipment, scaffolding and all incidentals, and to render all services and pay all applicable customs duties and taxes (other than any Value Added Taxes) and all other charges as specified and/or as necessary for performance and completion of the above referred to Work, all in full accordance with the Request for Tenders documents provided to the bidder by the City (receipt of which is hereby acknowledged) for the Base Bid Price (which is included in the "Contract Price" in the CCDC 2 – 2020 Stipulated Price Contract).

2. Base Bid Price

I/We confirm all prices provided in this Bid:

- are in Canadian funds
- include Provisional Items, if applicable
- include contingency allowances, if applicable
- include cash allowances, if applicable
- do not include Value Added Taxes

Any Value Added Taxes payable are for the account of the City and are in addition to the Base Bid Price stated in the Schedule of Prices.

I/We understand that if this Request for Tenders contains a contingency allowance, Provisional Item(s) or cash allowances, I/we are not entitled to payment thereof except for the extra or additional work carried out by me/us, as directed by the City and in accordance with the Contract and only to the extent of such extra or additional work and payment approved by the City.

3. Addenda

I/We have made any necessary inquiries with respect to Addenda issued by the City and have ensured that we have received, examined and provided for all Addenda to the Request for Tenders in this Bid.

4. Commencement and Completion

If awarded the Request for Tenders, I/we agree and undertake that:

- I/We will provide all necessary documents required as set forth prior to the commencement of the Work.
- I/We will commence the Work following receipt of a notice to proceed and otherwise in accordance with the Contract. I/We agree to have the Works "substantially performed" as described in the Construction Act (Ontario) and in accordance with the requirements set out in the Contract.
- in the event that I/we fail to perform the Contract as provided, I/we understand and agree that I/we shall be liable to liquidated damages and other remedies as specified in the contract documents.

5. Contract

I/We understand and agree that a binding contract shall come into being upon acceptance of this Bid by the City and the award of the Request for Tenders to me/us. The subsequent execution of the Contract for the Work is a formality and not a condition precedent to the existence of a binding contract.

6. Occupational Health and Safety

I/We understand and agree that the Work must be conducted in a safe manner. Accordingly, I/we confirm that I/we and all subcontractors used on the Work for the City of Hamilton will comply with all applicable laws, regulations and by-laws of Canada, the Province of Ontario and the City of Hamilton, including but not limited to the Occupational Health and Safety Act, and all applicable regulations thereunder. Further, without limiting any of the foregoing, I/we confirm that I/we have both a written occupational health and safety policy and program to implement that policy, and that all of our employees,

subcontractors and any other persons performing the Work shall be appropriately trained, licensed and certified, as required to perform the Work.

7. Fair Wage Policy and Schedule

I/We agree to comply in all respects with the City of Hamilton's Fair Wage Policy and to be fully responsible for ensuring that all of my/our subcontractors also comply in all respects with said Fair Wage Policy.

8. Execution

If this Bid is accepted by the City and the Request for Tenders is awarded to me/us, I/we agree to provide and pay for the proof of insurance, WSIB clearance certificate, performance of contract security and a labour and material payment bond as required by the contract documents, my/our health & safety manual and any other document identified in the award letter as being required by the City prior to it being able to issue a purchase order, and to execute the Contract, in quadruplicate, all within 10 Business Days after the City has issued its award letter or within such longer time period as the City may specify.

9. Bid Security

I/We have submitted the Bid Security as specified in the Request for Tenders. The Bid Security shall be irrevocable for **90 CALENDAR DAYS** after the closing date and time of the Request for Tenders.

In the event of default or failure on my/our part to execute the Contract as required above and to provide the specified security required under the Request for Tenders and the Contract, I/we agree that the City may at its discretion do one or more of the following: declare the Bid Security forfeited, annul the award or terminate the Contract, accept the next lowest compliant Bid, advertise for new tenders, or carry out the Work in any manner deemed in the best interests of the City. In such a case, if required by the City, I/we shall pay the City the difference between the Base Bid Price and any greater sum that the City may be obligated to pay by reason of that default or failure, including the cost of any advertisement for new tenders.

10. Time Open for Acceptance

I/We agree and confirm that this Bid is irrevocable and is to continue open to acceptance by the City for a period of **90 CALENDAR DAYS** after the closing date and time of the Request for Tenders. The City may at any time within the above **90 CALENDAR DAY** period accept this Bid whether or not any other Bid has previously been accepted, upon notice of acceptance and award in writing to me/us, personally delivered or mailed to me/us by ordinary prepaid mail, to the address provided in the Bid submission, or delivered by fax to the fax number set forth in the Bid submission. Any notice mailed or faxed shall be deemed to have been received on the date mailed or faxed. Any notice personally delivered shall be deemed to have been received on the date the notice is personally delivered.

11. No Collusion / Conflict of Interest

I/We hereby declare that no person, firm or corporation other than me/us has any interest in this Bid or in the proposed Contract for which this Bid is made. I/We further declare that this Bid is made without any connection, comparison of figures or arrangements with, or knowledge of, any other person making a Bid for the same work and is in all respects fair and without collusion or fraud.

I/We confirm that we comply with Article 12 - Conflict of Interest, Lobbying and Collusion of the Instructions to Bidders and Article 4 – Joint Ventures of the Supplementary Instructions to Bidders.

I/We understand that, without limiting or restricting any other right or privilege of the City, the City may terminate the Contract where the bidder is in contravention with the City's Procurement Policy with respect to conflict of interest or vendor eligibility.

12. Interpretation

I/We confirm that we have received no oral information, instruction or advice from any officer, employee, agent or consultant of the City which changes the content of the Request for Tenders and all Addenda thereto.

I/We acknowledge and agree that we have not assumed that any information concerning our operations, business or personnel or any other information required to be provided by us when submitting our Bid is known to the City, regardless of whether such information may be actually previously known to the City or not. Further, we acknowledge and agree that all information to be provided by us is to be complete and full and in such detail as required.

13. Procurement Policy

In submitting a Bid in response to the Request for Tenders, I/we agree and acknowledge that I/we have read and will be bound by the terms and conditions of the City's Procurement Policy. I/We understand that the City's Procurement Policy can be viewed on the City's website at: https://www.hamilton.ca/build-invest-grow/buying-selling-city/bids-and-tenders/procurement-policy-by-law

14. Ontarians with Disabilities Act, 2001 and Accessibility for Ontarians with Disabilities Act, 2005

I/We confirm that I/we and all Subcontractors used on the Work for the City of Hamilton will comply with all applicable accessibility laws, regulations and by-laws of Canada, the Province of Ontario and the City of Hamilton, including but not limited to the Ontarians with Disabilities Act, 2001 (ODA), the Accessibility for Ontarians with Disabilities Act, 2005 (AODA), Ontario Regulation 429/07 (Accessibility Standards for Customer Service) and Ontario Regulation 191/11 (Integrated Accessibility Standards), throughout the term of the Contract. Without limiting the generality of the foregoing, I/we shall provide to the City, prior to commencing Work, a Statement of Acknowledgement that I/we have read and understand the City's AODA Integrated Accessibility Standards and Customer Service Standard Handbook (the "Handbook"), that I/we have provided the training required by the Handbook, and that I/we will comply with the requirements of the Handbook and applicable accessibility laws, regulations and by-laws. See City of Hamilton's AODA Integrated Accessibility Standards and Customer Service Standard Handbook at: https://www.hamilton.ca/people-programs/equity-diversity-inclusion/accessibility-services/accessibility-guidelines-policies#policies-procedures

15. Compliance with City of Hamilton By-laws

I/We declare that I/we are in compliance with all municipal by-laws as they pertain to the City of Hamilton in respect of the operation of my/our business and in respect of the Work described in the Request for Tenders. I/We understand and agree that if this statement is untrue or incorrect, the City of Hamilton shall be entitled at its sole discretion to reject this Bid, or if such untruth or incorrectness comes to light after this Bid is accepted, to terminate or refuse to enter into, as applicable, any Contract and to pursue any other legal recourse the City deems appropriate, and that such untruth or incorrectness shall be a default under the Contract.

16. Lump Sum Breakdown

I/We understand and agree that after the opening of the Bids, if I/we are one of the two apparent low bidders, if requested by the City we are required to submit to the Tender Coordinator, within two Business Days of the closing date of the Request for Tenders, the document entitled Lump Sum Breakdown of Base Bid Price. The breakdown shall be given on the breakdown pages provided in the Request for Tenders. I/We acknowledge and agree that the City may refuse to accept any breakdown which contains prices considered to be unbalanced and may request me/us to adjust the breakdown to correct such unbalancing, and I/we agree to do so upon such request of the City.

17. Provisional Items

I/We understand and agree that, after the award of the Request for Tenders, the City reserves the right to delete from the Base Bid Price one or more of the items identified in the Schedule of Prices as Provisional Items, without penalty or compensation to the Successful Bidder, for credit at the price shown in the table. All prices are inclusive of all duties and taxes applicable, except for Value Added Taxes.

I/We understand that I/we are required to complete the table in the Schedule of Prices for each Provisional Item listed. I/We understand that failure to do so will result in the rejection of this Bid by the City.

I/We agree that the Unit Prices provided for each Provisional Item include all costs required for complete execution of the item of work, including the bidder's office staff, site supervisory staff, project management costs, clerical and other costs for documentation, materials, labour, equipment, delivery, handling, statutory charges, overhead and profit, other related charges, inclusive of all other duties and taxes applicable, and similar charges on account of such item of work. Unit Prices entered shall exclude all Value Added Taxes.

I/We agree that if the quantity actually required for each item of work is more or less than estimated, the extended price for such item of work will be increased or decreased respectively using the same Unit Price or Lump Sum Price specified in the Schedule of Prices.

I/We agree that these Provisional Items are in addition to the requirements outlined in the Specifications. I/We understand that

if I/we are awarded the Request for Tenders, I/we are not entitled to payment for any Provisional Item except for the extra or additional work carried out by me/us, as directed by the City and in accordance with the Contract and where payment was previously approved by the City.

18. Alternatives

I/We understand and agree that alternatives to specified equipment suppliers and/or equipment in the Request for Tenders will not be considered by the City prior to the award of the Request for Tenders.

19. Electronic Funds Transfer
I/We acknowledge and agree to provide the City with the information required for the City to make payment by EFT.

☐ I/WE agree to be bound by the terms and conditions and have authority to bind the Bidder and submit this Bid on behalf of the Bidder.

Conflict of Interest
Except with the prior express written consent of the City, **prior to submitting this Bid**, vendors are required to notify the City in writing, of any potential conflict of interest that may arise prior to the award of any contract and fully disclose any details thereof. Failure on the part of a vendor to declare a conflict of interest to the City and to obtain the City's prior express written consent to waive the conflict of interest shall result in the vendor being ineligible to Bid and shall form a basis for rejection of a Bid submitted to the City.

Do you have a potential conflict of interest? ○ **Yes** ○ **No**

Acknowledgement of Addenda
The Bidder acknowledges and agrees that any Addenda below form part of the bid document.

Please check the box in the column "**I have reviewed this addendum"** below to acknowledge each of the Addenda.

File Name	I have reviewed the below addendum and attachments (if applicable)	Pages
There have not been any addenda issued for this bid.		