INVITATION TO TENDER ("ITT") N0. PS20120191

CONTRACTOR FOR EXPANSION OF ENERGY TRANSFER STATIONS AND BURIED DISTRICT HEATING PIPING AT THE NEIGHBOURHOOD ENERGY UTILITY

Tenders must be addressed to Purchasing Services City of Vancouver, 453 West 12th Avenue, Vancouver, British Columbia, Canada, V5Y 1V4, (Courier Delivery and Drop off is at the Information Desk, Main Floor Rotunda of the same address) prior to the Closing Time of 3:00:00 p.m. City Hall Clock Time (as defined in Note 2 below), on June 26, 2012 ("Closing Time"). Tenders will be publicly registered at 11:00:00 a.m. Wednesday June 27, 2012 at the City Hall Business Centre Boardroom, 2nd Floor, City Hall (same address as above)

NOTES:

1. Tenders must be in sealed envelopes or packages marked with the Tenderer's name, the ITT title and number. Tenderers should submit one copy of the Tender and the same number of copies of any other documents required by the Tender Documents, including the bid bond described in Part B of this ITT.

2. Closing Time and Vancouver Time will be conclusively deemed to be the time shown on the clock used by the City of Vancouver's Purchasing Services Office for this purpose.

3. The City of Vancouver's Purchasing Services Office is open on business days from 8:30 a.m. to 4:30 p.m. Vancouver Time and closed Saturdays, Sundays, and holidays.

4. DO NOT SUBMIT BY FAX OR E-MAIL.

All queries related to this ITT should be submitted in writing to the attention of:

Jim Lowood, SCMP Contracting Specialist

Fax: 604-873-7057 Email: purchasing@vancouver.ca

(the "**Contact Person**")

INVITATION TO TENDER NO. PS20120191
CONTRACTOR FOR EXPANSION OF ENERGY TRANSFER STATIONS AND BURIED DISTRICT HEATING PIPING AT THE NEIGHBOURHOOD ENERGY UTILITY
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1.0 OVERVIEW OF PROJECT

1.1 The City of Vancouver (the "Owner") invites Tenders for the fabrication, installation and/or supply and commission of piping, valves, equipment (both pre-purchased and auxiliary) and related support at the Neighbourhood Energy Utility facility. The City of Vancouver ("City") is planning on expanding the existing Neighbourhood Energy Utility heating distribution piping past its current service area to service buildings that are currently being constructed or planned to be constructed in the Southeast False Creek area ("SEFC"). The City is committed to the expansion of the services through 2012 with the intent of continuing the expansion through 2014 (for more information on future expansion please see Appendix 6 "Future NEU Customer Connections"). The City is interested in submissions from firms with experience in fabrication, installation and testing of Logstor buried piping networks and hot water Energy Transfer Stations.

1.2 The City will have heat exchangers, energy meters and controls in place for the successful Tenderer ("Contractor") to connect the heating distribution network. Technical information on these heat exchangers can be found in Appendix 4 ("Heat Exchanger Specifications")

1.3 The Contractor's services generally includes, but is not limited to:

a) Obtaining and paying for all permits, licenses, fees required from the regulatory authorities having jurisdiction;

b) Obtaining and paying for all other inspections, fees and approvals;

c) Sequencing the work to allow for permits as required;

d) Submission of shop drawings (drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided to illustrate details of project);

e) Mechanical and Electrical work for the installation of Logstor TM buried piping; including but not limited to:

i) Welding and welding inspection of piping and fittings;

ii) Installation of all joint kits;

iii) Field wiring and testing of alarm wiring;

iv) Flushing all new hot water distribution network;

v) Production of Operation and Maintenance Manuals including weld maps;

vi) Quality Control;

f) Supply and installation of all Energy Transfer Station piping, hangars, valves, instruments, wiring and insulation including but not limited to:

i) Pipe Welding and Weld Inspection;

ii) Supply and installation of and necessary primary piping;

iii) Supply and installation of any necessary secondary piping;

iv) Supply and Installation of thermal insulation for piping;

v) Supply and Installation of electrical control wiring and instruments;

vi) welding, reinstatement, alarm wiring and control cable installation;

vii) Installation of seismic restraints;

viii) Installation of Temperature, Pressure Relief Valves, Flow Meters;

ix) Hydrostatic testing, flushing and commissioning the Energy Transfer Station;

x) Production of Operation and Maintenance Manuals;

xi) Restoration of any areas affected by construction; and

xii) Quality control;

All of the above is to be noted as "the Work".

1.4 The Work Site is located in Southeast False Creek, Vancouver, British Columbia. The Work Site is further described in the Tender Documents.

1.5 A consulting team headed by Kerr Wood Leidel Associates was retained in 2012 to provide professional services for this project (the "Consultant".

1.6 For this project the Contractor will be under the supervision of the appointed City representative who is responsible for the execution of the Project on behalf of the City ("City's Project Manager").

1.7 The Contractor will also be responsible to:

a) provide all necessary electrical and water connections, complete all other construction work, and taking responsibility for removal of any miscellaneous items encountered within all the designated work areas, demolition and removal of all demolished materials, and will arrange and pay for suitable disposal areas;

b) Review shop drawings, product data, samples, and other submittals.

c) Co-operate with the Consultant and City's Project Manager by scheduling operations to minimize conflict and to facilitate continuous use of other buildings. The Contractor is not to impede, restrict or obstruct the public's use of other buildings or adjacent portions of property;

d) Coordinate with the Owner regarding designated areas for mechanical pre-fabrication and material storage;

e) Notify the Consultant and City's Project Manager and utility companies of intended interruption of services and obtaining required permission for these interruptions;

f) Obtain and pay for use of additional storage or Work areas needed for operations;

g) Provide all safety protection as required for the work and as required by local bylaws and WorksafeBC; and

h) Provide and maintaining all legal and necessary temporary barriers and enclosures, guards, railings and warning signs during the execution of the work to fully protect all persons and the City.

1.8 The City will be responsible for the purchase and delivery of the heat exchangers, Logstor piping, and metering and controls within a predefined schedule. The Contractor will be responsible for the unloading of materials and equipment, inspection of the materials and equipment and notification to the Owner of any discrepancies and/or damage to the materials and equipment. If such notification does not occur, the Contractor will be liable for the cost of making good any damage or discrepancies subsequently found.

1.9 The Contractor is to note that where the Work involves breaking into or connecting to existing services, the Contractor is responsible for damage to the existing systems as a result of the Work. The Owner will direct any work that involves breaking into or connecting to existing services to ensure there is a minimum of disturbance to existing systems.

1.10 The Contractor is reminded that City of Vancouver bylaws for hours of work are applicable during this project. Any variance to said bylaws may be brought forward to the Owner for discussion.

1.11 The Contractor is responsible to control any emissions, including noise in accordance with the requirements of the City, Provincial and Federal jurisdictions.

1.12 The Contractor will be responsible for all health and safety requirements and will act as the Prime Contractor (see Supplementary General Conditions) during the term of the project.

1.13 The Work requires piping to be routed through existing spaces that could be congested. Recommended pipe routes are to be determined by the owner. Pipe sizing will be reviewed with the Owner to ensure routing applicability. Pipes shall be routed with consideration for existing overhead clearance precedents, for required pipe supports and to avoid blocking service pathways and access to existing valves and equipment.

1.14 The purpose of this ITT is to select a Tenderer with the capability and experience to efficiently and cost-effectively perform and complete the Work.

2.0 CITY OF VANCOUVER

2.1 The City of Vancouver, with a population of approximately 560,000 lies in a region of more than two (2) million people. Vancouver is the largest city in the province of British Columbia and the third largest metropolitan area in Canada. As the main western terminus of Canada's transcontinental highway and rail routes, as well as home to the Port of Vancouver, Vancouver is the primary city of western Canada and one of the nation's largest industrial centres.

2.2 Vancouver is consistently rated as one of the most livable cities in the world and was host city of the 2010 Olympic and Paralympic Winter Games.

2.3 The Neighbourhood Energy Utility ("NEU") has been in operation since 2010, sending high pressure and high temperature water to neighbouring buildings in the Southeast False Creek ("SEFC") area. The original extension of the heating distribution piping was to the area bounded by Ontario and Main Street, First Avenue to Quebec Street and service connections at Crowe, Cook and Manitoba Street. Subject to future market conditions the City is planning on expanding the service provided by the NEU further to other customers on those streets in the next year and to new customers in the future (See Appendix 6).

3.0 SUSTAINABILTY

3.1 The City's Procurement Policy and related Supplier Code of Conduct found at http://vancouver.ca/fs/bid/epp/index.htm aligns the City's overall approach to procurement with its corporate social, environmental and economic sustainability values and goals. It establishes a commitment to maximize benefits to the environment through product and service selection, to ensure safe and healthy workplaces, where human and civil rights are respected, and to support an environmentally sustainable local economy, whenever possible. In doing so, the Policy ensures incorporation of sustainability and ethical considerations as integral evaluation components in best-value supply selection.

3.2 Contractors are to provide environmentally sensitive products or services wherever possible. Where there is a requirement that the Contractor supplies materials, and where such materials may cause adverse effects, the Tenderer is to indicate the nature of the hazard in its tender submission. The Tenderer is to advise the City of any known alternatives or substitutes for such materials that would mitigate the effects of any adverse conditions on the environment.

4.0 TENDER DOCUMENTS

4.1 The Tender Documents are:

(a) Part A – Introduction and its Appendices;

(i) Appendix 1 – Information Meeting and Site Visit Attendance Form; and

(ii) Appendix 2 – Specifications;

(iii) Appendix 3 – Drawings;

(iv) Appendix 4 – Heat Exchanger Specifications;

(v) Appendix 5 – NEU Construction – Phase 1;

(vi) Appendix 6 – Future NEU Customer Connections;

(b) Part B – Terms and Conditions of ITT Process;

(c) Part C - Form of Tender (including all Schedules),

(d) Part D – Form of Agreement (including all Schedules);

(e) the Specifications (provided separately and to be incorporated as a Schedule to the Contract when finalized);

(f) the Drawings (provided separately and to be incorporated as a Schedule to the Contract when finalized);

(g) any and all amendments and questions and answers issued by the Owner prior to the Closing Time, as well as any and all amendments and questions and answers issued by the Owner after the Closing Time and accepted in writing by the Tenderer, as well as any and all clarifications accepted by the Owner prior to award of the Contract.

4.2 Specifications and Drawings will be available at.

5.0 INFORMATION MEETING

5.1 Tenderers are invited to attend an Information Meeting and Site Visit on Thursday, June 14, 2012 commencing at 10:00 AM.

5.2 Location: False Creek Energy Centre, 1890 Spyglass Place, Vancouver, British Columbia.

5.3 All prospective Tenderers are asked to pre-register for the Information Meeting and Site Visit by submitting an Information Meeting and Site Visit Attendance Form (Appendix 1) by fax to Tamara Jackson, Supply Chain Management or e-mail to purchasing@vancouver.ca by 4:30 PM, Wednesday, June 13, 2012.

6.0 ADMINISTRATIVE REQUIREMENTS

6.1 It is the sole responsibility of the Tenderer to check the Owner's website at http://www.vancouver.ca/bid/bidopp/openbid.htm regularly for addendums, amendments and questions and answers related to this ITT.

7.0 CONDUCT OF ITT – INQUIRES AND CLARIFICATIONS

7.1 The Owner will have conduct of this ITT, and all communications are to be directed only to the Contact Person named on the cover page.

7.2 It is the responsibility of the Tenderer to thoroughly examine the Tender Documents and satisfy itself as to the full requirements of this ITT. All inquiries should be in written form only, faxed to 604-873-7057 or e-mailed to purchasing@vancouver.ca to the attention of the Contact Person. If required, amendments and questions and answers will be posted on the Owner's website as noted above.

CITY OF VANCOUVER
Purchasing Services

Invitation to Tender No. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility

To acknowledge your intent to attend the Information Meeting and Site Visit being held as per Part A, Introduction and to ensure that you receive the required information please submit this form to the person identified below before 4:30 p.m., Wednesday, June 13, 2012.

Tamara Jackson, Supply Chain Management, City of Vancouver

Fax: 604-873-7057

Email: purchasing@vancouver.ca

Your details:

Tenderer's Name:			
	"Tenderer"		
Address:			
Telephone:		Fax:	
Key Contact Person:			
E-mail:		Incorporation Date:	

We will attend the informational meeting for: "Invitation to Tender No. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility".

Authorized Signatory	Name of Tenderer (Please print)
E-mail Address (Please print)	Date

1.0 DEFINITIONS AND INTERPRETATION

1.1 Definitions

Capitalized terms used in the Tender Documents have the meanings set out below. Capitalized terms not otherwise defined have the meanings set out in the Contract, unless the context otherwise requires.

(a) **"Closing Time"** has the meaning set out on the cover page of this ITT;

(b) **"Contract"** (or **"Agreement"**) means a contract substantially in the form of Part D – Form Agreement that the Owner will enter into with the successful Tenderer;

(c) **"Contractor"** means a Tenderer whose Tender the Owner has accepted and to whom the Contract has been awarded;

(d) **"Consultant"** means the architect, engineer or other professional consultant who will act as the Owner's agent for the purpose of managing and administering the Contract, who may be an employee of the Owner or an independent consultant engaged by the Owner on its behalf;

(e) **"Drawings"** means the graphic and pictorial portions of the Tender Documents issued as an appendix to the ITT;

(f) **"Form of Tender"** means the form of tender in Part C – Form of Tender to this ITT on which Tenderers are to complete their Tenders;

(a) **"HST"** means the tax payable and imposed pursuant to Part IX of the Excise Tax Act (Canada) as amended, including any provincial component collected by Canada on behalf of British Columbia, and any successor legislation thereto;

(g) **"Information and Privacy Legislation"** includes the *Freedom of Information and Protection of Privacy Act* (British Columbia) and all other similar legislation in effect from time to time;

(h) **"Losses"** means, in respect of any matter, all:

(i) direct and indirect; and

(ii) consequential,

claims, demands, proceedings, losses, damages, liabilities, deficiencies, costs and expenses (including without limitation, all legal and other professional fees and disbursements, interest, penalties and amounts paid in settlement, whether from a third person or otherwise);

(i) **"Notice of Award"** has the meaning set out in Part C – Form of Tender;

(j) **"Notice to Proceed"** has the meaning set out in Part C – Form of Tender;

(k) **"Specifications"** means the portion of the Tender Documents issued as an appendix to the ITT consisting of the written requirements and standards for products, systems, workmanship, quality, and the services necessary for the performance of the Work;

(l) **"Tender"** means a tender submitted to the Owner in response to this ITT;

(m) **"Tender Contract"** means the contract between the Owner and Tenderers governing the ITT process;

(n) **"Tender Documents"** means the documents identified as such in Part A - Introduction;

(o) **"Tenderer"** means those entities eligible to participate in this ITT process;

(p) **"Tender Price"** means the amount stipulated by the Tenderer in the space provided in the Form of Tender which, for greater certainty, is the Tenderer's proposed Contract price;

(q) **"Work"** means the total construction and related services required by the Tender Documents; and

(r) **"Work Site"** or **"Site"** means the area or areas on or about the Owner's property where the Work is to be carried out.

1.2 **Interpretation**

(a) In these Tender Documents, any reference to the masculine includes the feminine and bodies corporate, and each includes the others where appropriate. Also, any reference to the singular includes the plural where appropriate.

(b) If there is a conflict between or among (i) the Specifications and Drawings and (ii) Part A – Introduction, Part B – Terms and Conditions of ITT Process, Part C - Form of Tender (including the Schedules), Part D - Form of Agreement, the appendices and any amendments and questions and answers issued by the Owner (collectively, the "**Balance of Tender Documents**"), the Balance of Tender Documents shall prevail over the Specifications and Drawings.

(c) In these Tender Documents, when the terms "should" or "are asked to" precede a requirement for the Tenderer, such requirement is not mandatory but it is strongly recommended. When the terms "will", "shall", "is to", "must" or "are to", "are required to" precede a requirement, such requirement is deemed to be mandatory. If a Tenderer is uncertain whether or not a requirement is mandatory, the Tenderer should submit an enquiry to the Contact Person.

2.0 SUBMISSION INSTRUCTIONS

2.1 The Tenderer must complete its Tender on the Form of Tender and submit its Tender in accordance with the instructions provided on the cover page of the ITT.

2.2 Tenders received after the Closing Time may be returned unopened to the Tenderer.

2.3 Faxed or emailed Tenders and/or other documents will not be accepted, and will be returned to the Tenderer.

2.4 Each Tender must be signed by an authorized signatory of the Tenderer, with the signatory's usual signature. Tenders by a company or partnership should specify the full legal name of the legal entity submitting the Tender.

2.5 All blank spaces in the Form of Tender should be filled in and all Schedules completed. All prices and notations should be legibly written in a non-erasable medium. Erasures, interlineations or other corrections should be initialled by the authorized signatory of the Tenderer.

2.6 Subject to any proposed variations requested in a Schedule to the Form of Tender, Tenders are to be all inclusive and without qualification or condition.

2.7 The Owner may, at any time and for any reason, extend the Closing Time by means of written amendment as set out in Part A - Introduction.

2.8 The Owner will not be responsible for any cost incurred by the Tenderer in preparing the Tender.

3.0 BONDS

3.1 Tenders will be irrevocable and remain open for acceptance by the Owner for a period of ninety (90) calendar days after the Closing Time. Each Tender must be accompanied by a bid bond valid for a period of ninety (90) calendar days commencing on the Closing Time, payable to the "City of Vancouver", in the amount of ten percent (10%) of the Tender Price, and not a dollar amount, as a guarantee of the due execution of the Contract and the delivery of the performance bond and labour and material payment bond specified in the Form of Tender. The forms of these bonds are to be those issued by the Canadian Construction Documents Committee as follows:

Bid Bond:	CCDC 220 (latest)
Performance Bond:	CCDC 221 (latest)
Labour and Material Payment Bond:	CCDC 222 (latest)

3.2 Each Tender must be accompanied by a "Consent of Surety", substantially in the form provided as a Schedule to the Form of Tender duly completed by a surety company authorized and licensed to carry on business in British Columbia.

3.3 The bid bond of unsuccessful Tenderers will be returned to them as soon as possible after the Contract is awarded and the bid bond of the Tenderer to whom the award is made will be returned upon execution of the Contract, delivery of a performance bond for 50% of the Tender Price and a labour and material payment bond for 50% of the Tender Price, commencement of the Work, and compliance with any other conditions set out in the Form of Tender. The cost of all bond premiums must be included in the Tender Price.

3.4 All bonds must be issued by a surety company authorized and licensed to carry on business in British Columbia.

4.0 TENDER PRICE

4.1 Subject to any adjustment for changes to the Work, which are approved by the Owner in accordance with the Tender Documents or Contract Documents, the Tender Price shall be the maximum compensation owing to the Contractor for the Work and the Contractor's compensation shall cover and include all profit and all costs of supervision, labour, material, equipment, overhead, financing and all other costs and expenses whatsoever incurred in performing the Work.

4.2 If unit prices and/or lump sums are requested in a Schedule to the Form of Tender such amounts will be used to compute interim progress payments and will be reviewed prior to Contract award so Tenderers are to ensure that the unit prices and/or lump sums accurately reflect the costs for each item. The Tenderer may be required to justify any submitted unit prices and/or lump sums. Failure by the Tenderer to submit a complete breakdown of Tender Price requested in a Schedule to the Form of Tender may result in an incomplete Tender and may be cause for rejection.

4.3 If an itemized breakdown of the Tender Price (or any portion of the Tender Price) is requested in a Schedule to the Form of Tender, the Owner may delete any items in order to meet budget limitation and award a Contract for only the remaining items.

5.0 ACCEPTANCE OF TENDERS

5.1 Notwithstanding anything to the contrary contained in the Tender Documents:

(a) Tenderers are notified that the lowest or any Tender need not necessarily be accepted and the Owner reserves the right to reject any and all Tenders at any time, or cancel the tender process, without further explanation or to accept any Tender considered advantageous to the Owner. Acceptance of any Tender is contingent on funds being approved and a contract award being made by Vancouver City Council or its delegate and the compliance of the Tenderer with the conditions required to be satisfied upon receipt of a Notice of Award. Tenders which contain qualifying conditions or otherwise fail to conform to these Tender Documents may or may not be disqualified or rejected. The Owner may or may not waive any non-compliance, including a material non-compliance, irregularity or anomaly, with the Tender Documents or any conditions, including the timing of delivery of anything required by these Tender Documents and may at its sole discretion elect to retain for consideration Tenders which are non-conforming because they do not contain the content or form required by the Tender Documents or because they have not complied with the process for submission set out in this ITT.

(b) Where the Owner's representative is of the view, in his/her sole discretion, that there is an ambiguity or other discrepancy which cannot be discerned or resolved from examining the contents of the Tender, then whether or not such an ambiguity or discrepancy actually exists on the face of the Tender the Owner may, prior to Contract award, solicit clarification from the Tenderer or accept clarification from the Tenderer on any aspect of the Tender. Such clarification may include the acceptance of any

further documents or information which will then form part of the Tender. The soliciting or accepting of such clarification (whether or not solicited) by the Owner will be without any duty or obligation on the Owner to advise any other Tenderers or to allow them to vary their Tender Prices as a result of the acceptance of clarification from any one or more Tenderers and the Owner will have no liability to any other Tenderer(s) as a result of such acceptance of clarification.

(c) The award of the Contract will be based on the evaluation of the Tenders by the Owner on any basis the Owner deems will best serve its interests, including but not limited to the following criteria, as applicable in the Owner's sole opinion:

(i) the overall cost impact of the Tender on the operations of the Owner, including the addition of all applicable taxes to the prices quoted;

(ii) the ability and experience of the Tenderer, the Tenderer's proposed Suppliers and Subcontractors, and all of their respective senior staff and key personnel assigned to carry out the Work;

(iii) the Tenderer's technical credibility, financial resources, environmental responsibility and WorkSafeBC safety record;

(iv) the Tenderer's understanding of proposed Work;

(v) the Tenderer's scheduling of the Work in relation to the Owner's schedule and the ability to complete the Work within the time frame required by the Owner;

(vi) the Tenderer's ability to meet bonding and insurance requirements;

(vii) the Tenderer's understanding and ability to meet the City's sustainability goals;

(viii) the best value to the Owner based on quality, service, price and any of the criteria set out in this ITT based solely on the Owner's subjective assessment of the Tender;

(ix) the quality of the references, resumes, curriculum vitae, and reputation of the Tenderer, its Suppliers and Subcontractors, and all of their respective senior staff and key personnel, particularly as it relates to the Work.

(d) Where the Owner determines that all Tender Prices are too high, all Tenders may be rejected.

(e) The Owner may, prior to Contract award, negotiate changes to the scope of the Work or any conditions with the Tenderer considered to provide best value or any one or more Tenderers without having any duty or obligation to advise any other Tenderers or to allow them to vary their Tender Prices as a result of changes to the scope of the Work or any conditions and the Owner will have no liability to any other Tenderer as a result of such negotiations or modifications.

(f) The Tenderer acknowledges and agrees that the Owner will not be responsible for Losses incurred by a Tenderer as a result of or arising out of submitting a Tender for

the proposed Contract, or due to the Owner's acceptance or non-acceptance of their Tender or any breach by the Owner of the Tender Contract between the Owner and each of the Tenderers or arising out of any Contract award not made in accordance with the express or implied terms of the Tender Documents.

(g) The Owner may award the Contract on the basis of policies and preferences not stated in the Tender Documents or otherwise than as stated in the Tender Documents.

(h) Prior to contract award, the Tenderer must demonstrate financial stability. Should the Owner so request, the Tenderer may be required to provide annual financial reports or a set of financial statements prepared by an accountant.

(i) Guidelines or policies that may be applicable will not give rise to legal rights on the part of any Tenderer, Contractor, Subcontractor, Supplier, or others as against the Owner and will in no case create any liability on the part of the Owner. For certainty, the Owner's Procurement Policy, as may be amended or replaced from time to time, is now agreed to be an internal guideline document and creates no legal rights or obligations with respect to this ITT.

6.0 AWARD OF CONTRACT

6.1 Award of a Contract will be subject to approval by Vancouver City Council or its delegate and the Tenderer's compliance with the conditions required to be met upon receipt of the Notice of Award.

6.2 The successful Tenderer will become the Contractor and will be required to sign the Contract with the Owner subject to any amendments approved by the Owner in writing.

7.0 EXAMINATION OF TENDER DOCUMENTS

7.1 Each Tenderer should examine the Tender Documents and must also satisfy itself of the extent of the Work. The Tenderer must make its own estimate of the facilities and difficulties attending the performance and the completion of the Work.

7.2 No allowance will be made subsequently on behalf of a Contractor for any error, omission or negligence on the Contractor's part or for non-compliance with the requirements of this clause.

8.0 SITE EXAMINATION/PRE-SUBMISSION DUE DILIGENCE BY TENDERER

8.1 Tenderers should make a careful examination of the Work Site and investigate and satisfy themselves at their own risk and expense as to all matters relating to the nature of the Work to be undertaken, the means of access, the extent of coordination with public use of adjacent areas, the extent of the Work to be performed and any and all matters which are referred to in the Specifications and Drawings and other Tender Documents, or which are necessary for the full and proper completion of the Work and the conditions under which it will be performed. No allowance will be made subsequently for any error, negligence, interpretation, or misinterpretation on the Contractor's part.

8.2 The Owner and the Consultant do not guarantee Work Site and geotechnical information (if any) provided in or with the Tender Documents and the Tenderer must evaluate such information relative to actual conditions.

8.3 Where any Tenderer wishes to evaluate any aspect of actual conditions (beyond the evaluation which it is already afforded by the access and information already provided for in this ITT), the Owner encourages the Tenderers to do so by submitting a written request to do so as far in advance of the Closing Time as is possible. The Owner will then consider whether or not to facilitate the request and if it decides to do so may at its option elect to undertake the evaluation and distribute the results to all Tenderers.

9.0 INTERPRETATION AND CLARIFICATIONS

9.1 If any Tenderer is in doubt as to the true meaning and intent of any part of the Specifications, Drawings, or other Tender Documents, the Tenderer should request an interpretation of same from the Owner at least five (5) Working Days prior to the Closing Time. If such an interpretation is not requested or confirmed by an amendment, the Tender will be presumed to be based upon the interpretation that may be subsequently given in accordance with the Contract Documents after award of the Contract.

9.2 Prior to the Closing Time, all requests for clarification of the Specifications, Drawings, or other Tender Documents will be answered in writing by the Owner and posted on the City of Vancouver Supply Chain Management website. The Owner is not responsible for verbal or any other explanations or interpretations of the Specifications, Drawings or other Tender Documents.

10.0 PRODUCT APPROVAL

10.1 Wherever any material, machinery, equipment and fixtures described in the Contract ("**Product**") is specified or shown by describing proprietary items, model numbers, catalogue numbers, manufacturer or trade names or similar reference, the Tenderer obligates itself to submit its Tender and accept award of the Contract based upon the use of such Products. Use of such reference is intended to establish the measure of quality which the Consultant has determined as a requisite and necessary for the Work. Where two or more Products are shown or specified, the Contractor has the option of which to use.

10.2 For approval of Products other than those specified, Tenderers should submit a request in writing to the Owner at least five (5) Working Days prior to the Closing Time. Requests must clearly define and describe the Product for which approval is requested. Requests should be accompanied by manufacturer's literature, specifications, drawings, cuts, performance data or other information necessary to completely describe the item. Approval by the Owner will only be in the form of an addendum to the Specifications issued by the Owner.

10.3 Approval of manufacturers and/or Products as noted are approved only insofar as they conform to the Specifications.

11.0 INSURANCE

11.1 The Tenderer should ensure that it can maintain insurance described in the Contract.

11.2 The Tenderer should complete and submit the "Certificate of Existing Insurance" attached as a Schedule to the Form of Tender, together with the "Undertaking of Insurance" attached as a Schedule to the Form of Tender.

11.3 Following Contract award, the successful Tenderer will be required to complete a Certificate of Insurance for the Work, a copy of which is attached as a Schedule to the Form of Tender.

12.0 WORKSAFEBC

12.1 The Tenderer should ensure that it can comply with all WorkSafeBC requirements as described in the Contract.

13.0 LABOUR RATES AND EQUIPMENT

13.1 Tenderers should provide if requested in a Schedule to the Form of Tender the force account labour and equipment rates setting out the all-inclusive hourly rates for all applicable types of equipment as well as the all-inclusive hourly rates for all applicable categories of labour which rates will then apply pursuant to the Contract.

14.0 LIST OF SUBCONTRACTORS AND SUPPLIERS

14.1 Tenderers should provide if requested in a Schedule to the Form of Tender a list of Subcontractors and Suppliers, providing name, address of place of business and the portion of the Work to be done by the Subcontractor and/or Supplier or the equipment or materials to be supplied by the Subcontractor and/or Supplier.

14.2 The Owner reserves the right to object to any of the Subcontractors and/or Suppliers listed in a Tender. If the Owner objects to a listed Subcontractor and/or Supplier, then the Owner will permit a Tenderer to propose a substitute Subcontractor and/or Supplier acceptable to the Owner. A Tenderer will not be required to make such a substitution and, if the Owner objects to a listed Subcontractor and/or Supplier, the Tenderer may, rather than propose a substitute Subcontractor and/or Supplier, consider its Tender rejected by the Owner and, by written notice, withdraw its tender. The Owner shall, in that event, return the Tenderer's bid security.

15.0 PERMITS, LICENSES AND FEES

15.1 The successful Tenderer will be required to obtain and pay for any applicable municipal, provincial and federal permits and licences necessary for the proper completion of the Work. The Owner will not be liable in any manner for same and the successful Tenderer agrees to indemnify and save the Owner harmless from and against all claims and Losses in relation to obtaining and paying for any applicable municipal, provincial and federal permits and licences necessary for the proper completion of the Work.

16.0 NON-RESIDENT WITHHOLDING TAX

16.1 Tenderers are advised that, if they are not residents of Canada, federal tax legislation requires that a certain percentage of the Contract Price otherwise payable to the Contractor be withheld by the Owner and remitted to the Receiver-General for Canada. The percentage required to be withheld and remitted varies depending among other things, on the country of residence, the provisions of any applicable tax treaties and the nature of the payment. Non-

resident Tenderers may contact the Vancouver office of the Canada Revenue Agency, Taxation for further details. The Owner will receive a credit under the Contract for and any and all money withheld and remitted.

17.0 NO CLAIM AGAINST THE OWNER

17.1 The Tenderer acknowledges and agrees that the Owner will not be responsible for any costs, expenses, losses, damages (including damages for loss of anticipated profit) or liabilities (the "Damages") incurred by the Tenderer, including, without limiting the generality of the foregoing, any Damages incurred by the Tenderer directly or indirectly caused by any act or omission of the Owner or breach of any agreement or duty by the Owner, express or implied, and by submitting a Tender each Tenderer shall be deemed to have agreed that it has no claim whatsoever.

17.2 The Tenderer now indemnifies and will protect and save the Owner and any of its employees, advisors or representatives (including the Consultant) harmless from and against all Losses, in respect of any claim or threatened claim by any of its Subcontractors, or materials or equipment suppliers alleging or pleading:

(a) a breach of the Tender Contract by the Owner or any of its employees, advisors or representatives (including the Consultant);

(b) an unintentional tort, of the Owner or any of its employees, advisors or representatives (including the Consultant), occurring in the course of conducting this ITT; or

(c) liability on any other basis related to the Tendering process, bidding process or the Tender Contract.

18.0 DISPUTE RESOLUTION

18.1 Any dispute relating in any manner to this ITT, except only disputes arising between the Owner and any Tenderer to whom the Owner has made an award of the Contract, will be resolved by arbitration in accordance with the *Commercial Arbitration Act* (British Columbia) amended as follows:

(a) The arbitrator will be selected by the Owner's Director – Supply Management; and

(b) The release, indemnity and limitation of liability set out above will:

(i) bind the arbitrator, the Tenderer and the Owner; and

(ii) survive any and all awards made by the arbitrator.

19.0 CONFIDENTIALITY AND PRIVACY

19.1 The Tender, once submitted to the Owner, becomes the property of the Owner, which is a public body required under Information and Privacy Legislation to protect or disclose certain types of records according to certain statutory rules. The Tender, upon submission to the Owner, will be received and held in confidence by the Owner, unless and to the extent that it is or must be disclosed pursuant to Information and Privacy Legislation. If unsuccessful, the

Tenderer, at the Owner's request, shall destroy or return all copies and originals (in any format or medium) of the Tender Documents.

20.0 RELEASE OF INFORMATION RESTRICTED

20.1 No information concerning one Tenderer's Tender will be given out to the other Tenderers. Tenderers may attend the opening and registering of Tenders (referred to on the cover page of this ITT) in order to obtain information concerning the names of the other Tenderers who submitted a Tender and the Tender Price shown on each Form of Tender. However, no other information is anticipated to be disclosed by the Owner.

Tender of:			
	Name of Person, Firm, or Company (the "**Tenderer**")		
Business Address:			
Postal or Zip Code:			
Cheques Payable to/Remit to Address:			
Postal or Zip Code:			
Key Contact Person:			
Telephone No.:		**Fax No.:**	
E-mail:			
H.S.T Registration Number			
Dun & Bradstreet Number (if available)		**WorkSafeBC Account Number**	
City of Vancouver Business License Number		**Incorporation Date**	
(If your office is located in Vancouver)			

To be Initialled at Tender Opening:

Director, Supply Management or designate

Witness

Name of Tenderer

Initials of Signing Officer

1.0 TENDER PRICE AND SCHEDULE

Having carefully read and examined the Tender Documents the undersigned hereby offers to complete the Work covered by the Tender Documents and to furnish all plant, tools, equipment, labour, products, material and supervision necessary to execute the Work for the Tender Price of:

1.1 PRICING FOR 2012 EXPANSION

ITT NO. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility
The Tender Price for the 2012 Expansion, which excludes HST, is _____ dollars and _____ cents ($_____)

1.2 PRICING FOR 2013 EXPANSION

ITT NO. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility
The Tender Price for the 2013 Expansion, which excludes HST, is _____ dollars and _____ cents ($_____)

Name of Tenderer _____ Initials of Signing Officer _____

1.3 PRICING FOR 2014 EXPANSION

ITT NO. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility
The Tender Price for the 2014 Expansion, which excludes HST, is _____ dollars and _____ cents ($_____)

1.4 TOTAL TENDER PRICING

ITT NO. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility
The Total Tender Price, which excludes HST, is _____ dollars and _____ cents ($_____)

The undersigned confirms that the above stated Tender Price includes:

(a) all overhead and profit;

(b) all taxes (except HST), including all federal, provincial, and municipal taxes; and

(c) all other fees, charges, costs and expenses whatsoever related to performing the Work.

The undersigned offers to complete the Work according to the following schedule:

(a) Work will begin by July 17, 2012 on piping to all locations, subject to approval by Vancouver City Council or its delegate and the Owner issuing the Notice to Proceed.

(b) Completion of piping to 99 West 2nd Avenue is targeted for August 31, 2012

(c) Substantial performance of the Work is targeted for December 31, 2012.

(d) Total performance of the Work is targeted for January 15, 2013.

Name of Tenderer Initials of Signing Officer

2.0 PAYMENT

If awarded this contract, the undersigned agrees that all payments to be made by the City will be by Electronic Funds Transfer and the undersigned will provide the City with the necessary banking information to facilitate this process.

3.0 NOTICE OF AWARD

The undersigned agrees that this Tender will be irrevocable and open for acceptance by the Owner for a period of ninety (90) calendar days commencing on the Closing Time, even if the Tender of another Tenderer is accepted by the Owner. If within this period the Owner delivers a written notice by which the Owner accepts the Tender (the "**Notice of Award**"), the undersigned will, within ten (10) Workings Days of the receipt of the Notice of Award, deliver to the Owner:

(a) a performance bond and a labour and material payment bond, each in the amount of fifty percent (50%) of the Tender Price, issued by a surety licensed to carry on the business of suretyship in the province of British Columbia, and in a form acceptable to the Owner;

(b) a detailed Construction Schedule;

(c) a detailed Traffic Management Plan addressing vehicular and pedestrian movement, safety and access with specific detailing on methods, signage and materials used to maintain Site operations and access to staff and public users of the Work Site;

(d) a detailed Site Specific Safety and Health Plan addressing as a high-level overview the health and safety issues including, but not limited to hazards, mitigation measures, site orientations, safety meetings, first aid attendant requirements, and training requirements and record keeping;

(e) a WorkSafeBC number and a "clearance letter" confirming that the Tenderer is in WorkSafeBC compliance;

(f) a valid City of Vancouver business licence;

(g) banking details to support payments by Electronic Funds Transfer (EFT); and

(h) a completed and signed Certificate of Insurance (in the form attached as Schedule to this Form of Tender) indicating that all such insurance coverage is in place.

4.0 NOTICE TO PROCEED

The undersigned agrees that upon the Owner's receipt and acceptance of the submissions above and the undersigned's execution and return of the Contract Documents, the Owner will deliver a "Notice to Proceed" by which the undersigned will:

Name of Tenderer Initials of Signing Officer

(a) commence the Work within two (2) Working Days of the receipt of the Notice to Proceed or such longer time as may be otherwise specified in the Notice to Proceed; and

(b) issue, post, and copy the Owner on the Notice of Project as and when required under section 20.2 of the *Occupational Health & Safety Regulation* (BC Regulation 296/97).

5.0 CONDITIONS

(a) The undersigned agrees that if the undersigned receives a Notice of Award and fails or refuses to:

(i) deliver the documents by the times specified in the Notice of Award; or

(ii) commence the Work as required by the Notice to Proceed,

then such failure or refusal will be deemed to be a refusal to enter into the Contract and the Owner may, on written notice to the undersigned, award the Contract to another party. It is further agreed that, as full compensation on account of damages suffered by the Owner because of such failure or refusal, the bid security shall be forfeited to the Owner in the amount equal to the lesser of:

(i) the face value of the bid security; and

(ii) the amount by which the Tender Price is less than the amount for which the Owner contracts with another party to perform the Work.

(b) The lowest or any submitted Tender will not necessarily be accepted. The Owner reserves the right to reject this Tender at any time without further explanation or to accept any Tender considered advantageous to the Owner.

(c) The Schedules attached to this Form of Tender form an integral part of same.

6.0 AMENDMENTS/ADDENDA/QUESTIONS AND ANSWERS

Acknowledgment of receipt of the following amendments, addenda and questions and answers to the Tender Documents is hereby made:

Amendment No.
Addenda No.

Name of Tenderer Initials of Signing Officer

Questions and Answers No.

The undersigned agrees that they thoroughly understand the terms and conditions contained therein.

6.0 OWNER PRE-CONTRACT HAZARD ASSESSMENT

The undersigned acknowledges receipt of the Owner Pre-Contract Hazard Assessment, Schedule 8 of Part 4, Form of Agreement, and associated requirements as specified in Part 4, Form of Agreement, GC 9.4.12.

7.0 CERTIFICATION

The undersigned now certify that this Tender complies in all respects with the Tender Documents.

8.0 LABOUR

The above stated price is based on the Work under the Contract being performed by union/non-union labour. (Delete "union" or "non-union" as applicable).

SIGNED and SEALED this _____ day of _____ by the duly authorized officers of the Tenderer:

Tenderer's Legal Name or Registered Corporate Name and Address:

_____

(Seal)

By: _____

By: _____

Name of Tenderer Initials of Signing Officer

Witness' Name, Signature, and Address where Tenderer is a Proprietorship or Partnership:

Signature

Print Name

Address

Name of Tenderer

Initials of Signing Officer

SCHEDULE "A"

SCHEDULE OF QUANTITIES AND PRICES

The Tender Price, which excludes HST, is apportioned in accordance with the following table. The total of the prices provided for each item should equal the Tender Price stipulated in the space provided in the Form of Tender under Section 1.0, Tender price, Schedule, 1.4 Total Tender Price, which, for greater certainty, is the Tenderer's proposed Contract price. The City is looking at prices for expansion to the customers and will evaluate all prices proposed by the Tenderer. If there is any conflict between the Tender Price entered above and the correct summation of the prices provided below, the correct summation shall take precedence.

TABLE A1: PRICING SUMMARY FOR 2012 EXPANSION

Item	Description	Price
1.	Mobilization	$
2.	For Connection to - 99 W 2nd Avenue	$
3.	For Connection to - 215 W 2nd Avenue	$
4.	For Connection to - 100 W 1st Avenue	$
5.	Other (including contingency allowances and any other work or costs not reflected in the items above but required to complete the Work covered by the Tender Documents)	$
	Tender Price	**$**

TABLE A2: PRICING SUMMARY FOR 2013 EXPANSION

Item	Description	Price - 3" Pipe Installation	Price - 4" Pipe Installation	Price - 5" Pipe Installation
1.	Mobilization	$	$	$
2.	For Connection to - 1618 Quebec Street	$	$	$
3.	For Connection to - 150 East 1st Avenue	$	$	$
4.	For Connection to - 97 East 2nd Avenue	$	$	$
5.	For Connection to - 2 West 1st Avenue	$	$	$
6.	Other (including contingency allowances and any other work or costs not reflected in the items above but required to complete the Work covered by the Tender Documents)	$	$	$

Name of Tenderer Initials of Signing Officer

	Tender Price	**$**	$	$

TABLE A3: PRICING SUMMARY FOR 2014 EXPANSION

Item	Description	Price - 3" Pipe Installation	Price - 4" Pipe Installation	Price - 5" Pipe Installation
1.	Mobilization	$	$	$
2.	For Connection to - 111 East 1st Avenue	$	$	$
3.	For Connection to - 100 West 2nd Avenue	$	$	$
4.	For Connection to - 15 East 2nd Avenue	$	$	$
5.	For Connection to - 1650 Quebec Street	$	$	$
6.	Other (including contingency allowances and any other work or costs not reflected in the items above but required to complete the Work covered by the Tender Documents)	$	$	$
	Tender Price	**$**	**$**	**$**

List of Unit Prices for Any Additional Work

These unit prices will be used for changing quantities from those indicated in the Tender Documents / Contract Documents upon written instruction from the Owner. The unit prices will be applied in accordance with PART 6 CHANGES IN THE WORK of General Conditions, as modified by the Supplementary General Conditions. The prices should include all labour, materials, overhead and profit, and other incidental expenses to cover finished work in prices quoted.

TABLE A4: SUPPLY PRICING BREAKDOWN BY SIZE AND UNIT

(SUPPLY ONLY)

Item	Description	Size	Unit	Unit Addition	Unit Deletion
1	Type S01 - Linear Pipe (12 m sections)	0.5 inch	Nos		
2	Type S01 - Linear Pipe (12 m sections)	0.75 inch	Nos		

Name of Tenderer Initials of Signing Officer

Item	Description	Size	Unit	Unit Addition	Unit Deletion
3	Type S01 - Linear Pipe (12 m sections)	1 inch	Nos		
4	Type S01 - Linear Pipe (12 m sections)	1.25 inch	Nos		
5	Type S01 - Linear Pipe (12 m sections)	1.5 inch	Nos		
6	Type S01 - Linear Pipe (12 m sections)	2 inch	Nos		
7	Type S01 - Linear Pipe (12 m sections)	2.5 inch	Nos		
8	Type S01 - Linear Pipe (12 m sections)	3 inch	Nos		
9	Type S01 - Linear Pipe (12 m sections)	4 inch	Nos		
10	Type S01 - Linear Pipe (12 m sections)	6 inch	Nos		
11	Type S01 - Linear Pipe (12 m sections)	8 inch	Nos		
12	Type S01 - Socket Elbow	0.5 inch	Nos		
13	Type S01 - Socket Elbow	0.75 inch	Nos		
14	Type S01 - Socket Elbow	1 inch	Nos		
15	Type S01 - Socket Elbow	1.25 inch	Nos		
16	Type S01 - Socket Elbow	1.5 inch	Nos		
17	Type S01 - Socket Elbow	2 inch	Nos		
18	Type S01 - Long Radius Elbow	2.5 inch	Nos		
19	Type S01 - Long Radius Elbow	3 inch	Nos		
20	Type S01 - Long Radius Elbow	4 inch	Nos		

Name of Tenderer Initials of Signing Officer

Item	Description	Size	Unit	Unit Addition	Unit Deletion
21	Type S01 - Long Radius Elbow	6 inch	Nos		
22	Type S01 - Long Radius Elbow	8 inch	Nos		
23	Type S01 - Equal Tee	0.5 inch	Nos		
24	Type S01 - Equal Tee	0.75 inch	Nos		
25	Type S01 - Equal Tee	1 inch	Nos		
26	Type S01 - Equal Tee	1.25 inch	Nos		
27	Type S01 - Equal Tee	1.5 inch	Nos		
28	Type S01 - Equal Tee	2 inch	Nos		
29	Type S01 - Equal Tee	2.5 inch	Nos		
30	Type S01 - Equal Tee	3 inch	Nos		
31	Type S01 - Equal Tee	4 inch	Nos		
32	Type S01 - Equal Tee	6 inch	Nos		
33	Type S01 - Equal Tee	8 inch	Nos		
34	Type S01 - Eccentric Reducer	2 inch	Nos		
35	Type S01 - Eccentric Reducer	2.5 inch	Nos		
36	Type S01 - Eccentric Reducer	3 inch	Nos		
37	Type S01 - Eccentric Reducer	4 inch	Nos		
38	Type S01 - Eccentric Reducer	6 inch	Nos		

Name of Tenderer Initials of Signing Officer

Item	Description	Size	Unit	Unit Addition	Unit Deletion
39	Type S01 - Eccentric Reducer	8 inch	Nos		
40	Type S01 - Weld Neck Flange (ANSI 150)	2.5 inch	Nos		
41	Type S01 - Weld Neck Flange (ANSI 150)	3 inch	Nos		
42	Type S01 - Weld Neck Flange (ANSI 150)	4 inch	Nos		
43	Type S01 - Weld Neck Flange (ANSI 150)	6 inch	Nos		
44	Type S01 - Weld Neck Flange (ANSI 150)	8 inch	Nos		
45	Type BV-01 (Ball Valve)	0.5 inch	Nos		
46	Type BV-01 (Ball Valve)	0.75 inch	Nos		
47	Type BV-01 (Ball Valve)	1 inch	Nos		
48	Type BV-01 (Ball Valve)	1.5 inch	Nos		
49	Type BV-01 (Ball Valve)	2 inch	Nos		
50	Type BV-06 (Ball Valve)	1.25 inch	Nos		
51	Type BV-06 (Ball Valve)	2 inch	Nos		
52	Type BV-06 (Ball Valve)	2.5 inch	Nos		
53	Type BV-06 (Ball Valve)	3 inch	Nos		
54	Type BV-06 (Ball Valve)	4 inch	Nos		
55	Type BV-06 (Ball Valve)	6 inch	Nos		
56	Type BV-06 (Ball Valve)	8 inch	Nos		

Name of Tenderer Initials of Signing Officer

TABLE A5: INSTALLATION AND TESTING PRICING BREAKDOWN BY SIZE AND UNIT

(including labour, materials tools and 20% radiography)

Item	Description	Size	Unit	Unit Addition	Unit Deletion
1	Threaded Joint	0.5 inch	Nos		
2	Threaded Joint	0.75 inch	Nos		
3	Socket Weld	1 inch	Nos		
4	Socket Weld	1.25 inch	Nos		
5	Socket Weld	1.5 inch	Nos		
6	Socket Weld	2 inch	Nos		
7	Butt Weld	2.5 inch	Nos		
8	Butt Weld	3 inch	Nos		
9	Butt Weld	4 inch	Nos		
10	Butt Weld	6 inch	Nos		
11	Butt Weld	8 inch	Nos		
12	Type S04 - Joint insulation	1.25 inch	Nos		
13	Type S04 - Joint insulation	1.5 inch	Nos		
14	Type S04 - Joint insulation	2 inch	Nos		
15	Type S04 - Joint insulation	2.5 inch	Nos		
16	Type S04 - Joint insulation	3 inch	Nos		

Name of Tenderer Initials of Signing Officer

17	Type S04 - Joint insulation	4 inch	Nos		
18	Type S04 - Joint insulation	6 inch	Nos		
19	Type S04 - Joint insulation	8 inch	Nos		

TABLE A6: SUPPY AND INSTALLATION PRICING BREAKDOWN BY SIZE AND UNIT

(including labor, materials, equipment and tools)

Item	Description	Size	Unit	Unit Addition	Unit Deletion
1	Insulation and jacketing (indoor)	1.25 inch	metre		
2	Insulation and jacketing (indoor)	1.5 inch	metre		
3	Insulation and jacketing (indoor)	2 inch	metre		
4	Insulation and jacketing (indoor)	2.5 inch	metre		
5	Insulation and jacketing (indoor)	3 inch	metre		
6	Insulation and jacketing (indoor)	4 inch	metre		
7	Insulation and jacketing (indoor)	6 inch	metre		
8	Insulation and jacketing (indoor)	8 inch	metre		
9	Insulation and jacketing (outdoor)	1.25 inch	metre		
10	Insulation and jacketing (outdoor)	1.5 inch	metre		
11	Insulation and jacketing (outdoor)	2 inch	metre		
12	Insulation and jacketing (outdoor)	2.5 inch	metre		

Item	Description	Size	Unit	Unit Addition	Unit Deletion
13	Insulation and jacketing (outdoor)	3 inch	metre		
14	Insulation and jacketing (outdoor)	4 inch	metre		
15	Insulation and jacketing (outdoor)	6 inch	metre		
16	Insulation and jacketing (outdoor)	8 inch	metre		
17	Type S01 - Weldolet	0.5 inch	Nos		
18	Type S01 - Weldolet	0.75 inch	Nos		
19	Type S01 - Weldolet	1 inch	Nos		
20	Type S01 - Weldolet	2 inch	Nos		
21	Type S01 - Threadolet	0.5 inch	Nos		
22	Type S01 - Threadolet	0.75 inch	Nos		
23	Temperature Indicator (Dial Guage)	4 inch	Nos		
24	Pressure Indicator (Dial Gauge)	4 inch	Nos		
25	Relief Valve	0.75 inch	Nos		
26	Automatic Air Vent		Nos		
27	Control Cable		metre		
28	Power cable		metre		

LIst of Unit Prices for Any Additional Labor

Name of Tenderer Initials of Signing Officer

These unit prices will be used for changing quantities from those indicated in the Tender Documents / Contract Documents upon written instruction from the Owner. The unit prices will be applied in accordance with PART 6 CHANGES IN THE WORK of General Conditions, as modified by the Supplementary General Conditions. The prices should include all labour, materials, overhead and profit, and other incidental expenses to cover finished work in prices quoted.

TABLE A7: PRICING BREAKDOWN OF LABOR BY HOURS

Item	Description	Hourly Rate	Overtime Rate
1.	Project Manager	$	$
2.	Superintendent	$	$
3.	Pipefitter	$	$
4.	Electrician	$	$
5.	Certified Welder	$	$
6.	Skilled Labor	$	$
7.	Semi-Skilled Labor	$	$

Name of Tenderer Initials of Signing Officer

SCHEDULE "B"

PRELIMINARY CONSTRUCTION SCHEDULE

The Work is expected to begin by July 17, 2012 and substantial performance is targeted for December 31, 2012. Please clearly define time requirements for project milestones identified in the table below. If necessary, please add an attachment to this Schedule.

PRELIMINARY CONSTRUCTION SCHEDULE

Work Description	**Period of**				**Period of**				**Period of**				**Period of**				**Period of**			
Work Start Date, July 17,2012																				
General Requirements																				
Mobilization																				
Connection to 99 West 2nd Avenue																				
Connection to 215 West 2nd Avenue																				
Connection to 100 West 1st Avenue																				
Substantial Completion, December 31, 2012																				
Total Completion, January 15, 2013																				

Additional pages may be attached to this page. Each such additional page is to be clearly marked "ITT No. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility, Form of Tender, Schedule B ", and is to be signed by the Tenderer.

Name of Tenderer Initials of Signing Officer

SCHEDULE "C"

SUBCONTRACTORS AND SUPPLIERS

1.0 SUBCONTRACTORS

The Tender intends to use the following Subcontractors for the portions of the Work identified below. All Subcontractors who will perform any portion of the Work should be listed.

Subcontractor	Address	Type of Work

Additional pages may be attached to this page. Each such additional page is to be clearly marked "ITT No. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility, Form of Tender, Schedule C", and is to be signed by the Tenderer.

Name of Tenderer _____ Initials of Signing Officer _____

2.0 SUPPLIERS

The Tenderer intends to use the following Suppliers and manufacturers for the expansion of energy transfer stations and related support at the Neighbourhood Energy Utility

Item	Supplier/Manufacturer	Address

Additional pages may be attached to this page. Each such additional page is to be clearly marked "ITT No. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility, Form of Tender, Schedule C", and is to be signed by the Tenderer.

Name of Tenderer Initials of Signing Officer

SCHEDULE "D"

TENDERER'S EXPERIENCE WITH RELATED WORK

Tenderers should confirm that they have more than the required experience to perform the Work. Each Tenderer should submit a minimum of three (3) completed projects (related in scope and size), including the following information Tenderer and for each and every Supplier and Subcontractor proposed in the Tender:

TABLE 1 OF 3:

Description of Project:	
Location of Project:	
Contract Value:	$ (Cdn. Dollars)
Start and Completion Dates:	
Completed on Schedule?	**Yes No (Circle Correct Response)**
Name of Contract Owner:	
Name of Project Reference:	
Current Telephone Number and E-mail of Project Reference:	
Names of Key Personnel and Subcontractors:	

Name of Tenderer Initials of Signing Officer

TABLE 2 OF 3:

Description of Project:	
Location of Project:	
Contract Value:	$ (Cdn. Dollars)
Start and Completion Dates:	
Completed on Schedule?	**Yes No (Circle Correct Response)**
Name of Contract Owner:	
Name of Project Reference:	
Current Telephone Number and E-mail of Project Reference:	
Names of Key Personnel and Subcontractors:	

Name of Tenderer Initials of Signing Officer

TABLE 3 OF 3:

Description of Project:	
Location of Project:	
Contract Value:	$ (Cdn. Dollars)
Start and Completion Dates:	
Completed on Schedule?	**Yes No (Circle Correct Response)**
Name of Contract Owner:	
Name of Project Reference:	
Current Telephone Number and E-mail of Project Reference:	
Names of Key Personnel and Subcontractors:	

Additional pages may be attached to this page. Each such additional page is to be clearly marked "ITT No. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility, Form of Tender, Schedule D", and is to be signed by the Tenderer.

Name of Tenderer Initials of Signing Officer

SCHEDULE "E"

FORCE ACCOUNT LABOUR & EQUIPMENT RATES

Tenderers should complete the following tables setting out the all-inclusive hourly rates for all applicable types of equipment as well as the all-inclusive hourly rates for all applicable categories of labour which rates will then apply pursuant to the Contract.

TABLE 1 - SCHEDULE OF LABOUR RATES

Job Classification	Regular Rate	Overtime Rate
Project Manager	$	$
Superintendent	$	$
Pipefitter	$	$
Electrician	$	$
Certified Welder	$	$
Skilled Labor	$	$
Semi-Skilled Labor	$	$
(If required by Tender, please insert other Job Classifications)	$	$

TABLE 2 – SCHEDULE OF EQUIPMENT RATES

No.	Equipment Description	Hourly Rate	No. of Hours	Overhead And Profit	Total Price
		$		$	$
		$		$	$
		$		$	$
		$		$	$
		$		$	$

Additional pages may be attached to this page. Each such additional page is to be clearly marked "ITT No. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility, Form of Tender, Schedule E", and is to be signed by the Tenderer.

Name of Tenderer Initials of Signing Officer

SCHEDULE "F"

CONSENT OF SURETY

PROJECT: _____

Should it be required, we the undersigned Surety Company do hereby undertake to become bound as sureties in an approved Contract Performance Bond and Labour and Material Payment Bond each in the amount of fifty percent (50%) of the awarded Tender Price for the fulfillment of the CONTRACT and for the performance of the Work as described herein, which may be awarded to _____ _____ at the Tender Price set forth in the attached Tender, which Performance Bond and Labour and Material Payment Bond we understand are to conform to the applicable CCDC forms and be filed with the Owner within 10 Working Days of receipt of Notice of Award of the Contract, unless otherwise directed by the Owner.

We hereby further declare that the undersigned Surety Company is legally entitled to do business in the Province of British Columbia and that it has a net worth over and above its present liabilities and the amounts herein set forth.

The Common Seal of _____
was hereto affixed in the presence of:

_____

_____ _____
Name of Tenderer Initials of Signing Officer

SCHEDULE "G"

SUSTAINABILITY

The Tenderer will respond to the following sustainability requirements.

1. The Tenderer is to list any products/services that are toxic and/or hazardous to the environment, human use, etc.

Item	Description of Toxin/Hazard	Substantiation for Use	Mitigation strategy to reduce the effect of the Toxin/Hazard

2. The Tender is to identify and advise its standard practice for disposal of obsolete or expired products and/or equipment.

Item	Type of Product/Equipment	Disposal Method

3. The Tenderer is to identify and advise its solutions to address and reduce carbon emissions.

Item	Carbon Emission Risk	Solution Use to Reduce Carbon Emissions

Name of Tenderer Initials of Signing Officer

SCHEDULE "H"

CERTIFICATE OF INSURANCE

(TO BE COMPLETED IF AWARDED THE CONTRACT)

Name of Tenderer Initials of Signing Officer

CITY OF VANCOUVER

CERTIFICATE OF EXISTING INSURANCE
TO BE COMPLETED AND APPENDED TO THE TENDER

Section 2 through 8 – to be completed and executed by the Insurer or its Authorized Representative

1. **THIS CERTIFICATE IS ISSUED TO:** City of Vancouver, 453 W 12th Avenue, Vancouver, BC, V5Y 1V4
and certifies that the insurance policy (policies) as listed herein has/have been issued to the Named Insured and is/are in full force and effect.

2. **NAMED INSURED** ***(must be the same name as the proponent/bidder and is either an individual or a legally incorporated company)***

BUSINESS TRADE NAME or DOING BUSINESS AS

BUSINESS ADDRESS

DESCRIPTION OF OPERATION

3. **PROPERTY INSURANCE (All Risks Coverage including Earthquake and Flood)**

INSURER _____ **Insured Values (Replacement Cost) -**
TYPE OF COVERAGE _____ Building and Tenants' Improvements $ _____
POLICY NUMBER _____ Contents and Equipment $ _____
POLICY PERIOD From _____ to _____ Deductible Per Loss $ _____

4. **COMMERCIAL GENERAL LIABILITY INSURANCE (Occurrence Form)**

Including the following extensions:
√ Personal Injury
√ Property Damage including Loss of Use
√ Products and Completed Operations
√ Cross Liability or Severability of Interest
√ Employees as Additional Insureds
√ Blanket Contractual Liability
√ Non-Owned Auto Liability

INSURER _____
POLICY NUMBER _____
POLICY PERIOD From _____ to _____
Limits of Liability (Bodily Injury and Property Damage Inclusive) -
Per Occurrence $ _____
Aggregate $ _____
All Risk Tenants' Legal Liability $ _____
Deductible Per Occurrence $ _____

5. **AUTOMOBILE LIABILITY INSURANCE** for operation of owned and/or leased vehicles

INSURER _____ **Limits of Liability -**
POLICY NUMBER _____ Combined Single Limit $ _____
POLICY PERIOD From _____ to _____ ***If vehicles are insured by ICBC, complete and provide Form APV-47.***

6. ☐ **UMBRELLA OR** ☐ **EXCESS LIABILITY INSURANCE** **Limits of Liability (Bodily Injury and Property Damage Inclusive) -**

INSURER _____ Per Occurrence $ _____
POLICY NUMBER _____ Aggregate $ _____
POLICY PERIOD From _____ to _____ Self-Insured Retention $ _____

7. **PROFESSIONAL LIABILITY INSURANCE** **Limits of Liability**

INSURER _____ Per Occurrence/Claim $ _____
POLICY NUMBER _____ Aggregate $ _____
POLICY PERIOD From _____ to _____ Deductible Per Occurrence/Claim $ _____

If the policy is in a "CLAIMS MADE" form, please specify the applicable Retroactive Date: _____

8. **OTHER INSURANCE**

TYPE OF INSURANCE _____ **Limits of Liability**
INSURER _____ Per Occurrence $ _____
POLICY NUMBER _____ Aggregate $ _____
POLICY PERIOD From _____ to _____ Deductible Per Loss $ _____

TYPE OF INSURANCE _____ **Limits of Liability**
INSURER _____ Per Occurrence $ _____
POLICY NUMBER _____ Aggregate $ _____
POLICY PERIOD From _____ to _____ Deductible Per Loss $ _____

SIGNED BY THE INSURER OR ITS AUTHORIZED REPRESENTATIVE

_____ Dated _____

PRINT NAME OF INSURER OR ITS AUTHORIZED REPRESENTATIVE, ADDRESS AND PHONE NUMBER

SCHEDULE "J"

UNDERTAKING OF INSURANCE

To: City of Vancouver

Re: ITT No. PS20120191 – Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility

Dear Sirs:

We, the undersigned have completed, signed and attached the "Certificate of Existing Insurance" enclosed with this undertaking and now also do hereby undertake and agree that if _____ (the "**Tenderer**") is awarded the Contract, we will insure the Contractor in accordance with the requirements of the Contract, a copy of which is included in the Tender Documents and will form part of the Contract Documents.

Dated at _____, British Columbia, this _____day of _____20_____.

By: _____

Title: _____

Full Corporate Name of Insurer:

_____

The "Certificate of Existing Insurance" provided with the ITT should be completed and signed and enclosed with this Schedule both of which are to be signed by the Insurance Company or an authorized Broker on behalf of the Insurance Company. A SEPARATE FORM (AND CERTIFICATE OF EXISTING INSURANCE) SHOULD BE SIGNED FOR EACH POLICY IF TENDERER HAS MORE THAN ONE INSURER OR BROKER FOR ITS POLICIES.

Name of Tenderer Initials of Signing Officer

INVITATION TO TENDER ("ITT") NO. PS20120191 – CONTRACTOR FOR EXPANSION OF ENERGY TRANSFER STATIONS AND BURIED DISTRICT HEATING PIPING AT THE NEIGHBOURHOOD ENERGY UTILITY

FORM OF AGREEMENT

between

_____

and

CITY OF VANCOUVER

_____, 20_____

TABLE OF CONTENTS

FORM OF AGREEMENT

THIS AGREEMENT is dated for reference **[insert date]**

BETWEEN:

CITY OF VANCOUVER

453 West 12th Avenue
Vancouver, British Columbia V5Y 1V4

(the "**Owner**")

OF THE FIRST PART

AND:

[INSERT NAME OF CONTRACTOR]
[insert address]

(the "**Contractor**")

OF THE SECOND PART

BACKGROUND

A. By way of an Invitation to Tender for Invitation to Tender No. PS20120191 Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility, the Owner requested tenders from general contractors to perform the Work.

B. In response to the Invitation to Tender, the Contractor submitted a tender dated **[insert date]**.

C. After evaluating the tenders and obtaining approval of award of this Contract by the City of Vancouver, the Owner issued a Notice of Award to the Contractor thereby creating this Contract with the Contractor for the Work based on the Contractor's tender.

THE OWNER AND THE CONTRACTOR NOW AGREE AS FOLLOWS:

ARTICLE A-1 THE WORK

The Contractor shall:

1.1 perform the Work required by the Contract Documents for Invitation to Tender No. PS20120191 Contractor for Expansion of Energy Transfer Stations and Buried District Heating Piping at the Neighbourhood Energy Utility located at 1890 Spyglass Place for which the Contract Documents have been signed by the Owner and Contractor and for which Kerr Wood Leidel is acting as, and is the Consultant;

1.2 do and fulfill everything indicated by the Contract Documents; and

1.3 commence the Work by the 17th day of July, 2012 and, subject to adjustment in the Contract Time as provided for in the Contract Documents, attain Substantial Completion of the Project, as certified by the Consultant, by the 31st day of December, 2012 in accordance with the Project Schedule, included as Schedule to this Agreement.

ARTICLE A-2 AGREEMENTS AND AMENDMENTS

2.1 The Contract supersedes all prior negotiations, representations, or agreements, either written or oral, relating in any manner to the Work, including the tender documents that are not expressly listed in Article A-3 of this Agreement.

2.2 The Contract may be amended only as provided in the Contract Documents.

ARTICLE A-3 CONTRACT DOCUMENTS

3.1 The following are the Contract Documents referred to in Article A-1 of this Agreement, whether or not attached to this Agreement:

(a) this Agreement and the following Schedules:

(b) the Definitions and General Conditions of Stipulated Price Contract (CCDC2 – 2008), not attached but incorporated by reference;

(c) the following Schedules:

(i) Schedule 1 – Supplementary General Conditions;

(ii) Schedule 2 – List of Specifications and Drawings (the listed Specifications and Drawings are incorporated by reference);

(iii) Schedule 3 - Schedule of Quantities and Prices;

(iv) Schedule 4 - Subcontractors and Suppliers;

(v) Schedule 5 – Project Schedule;

(vi) Schedule 6 – Performance and Labour and Material Payments Bonds;

(vii) Schedule 7 – Insurance Certificate;

(viii) Schedule 8 – Owner Pre-Contract Hazard Assessment

(ix) Schedule 9 – Contractor Pre-Contract Hazard Assessment Form

(x) Schedule 10 – Force Account Labour and Construction Equipment Rates;

(d) the Form of Tender submitted by the Contractor, dated (To be Determined), titled Invitation to Tender No. PS20120191 – Contractor for Expansion of Energy Transfer

Stations and Buried District Heating Piping at the Neighbourhood Energy Utility (incorporated by reference);

(e) the Traffic Management Plan provided by the Contractor to the Owner (incorporated by reference); and

(f) the Site Specific Safety and Health Plan provided by the Contractor to the Owner (incorporated by reference).

3.2 Capitalized terms used in the Contract Documents will have the meaning ascribed to such terms in the Contract Documents.

ARTICLE A-4 CONTRACT PRICE

4.1 The Contract Price (which excludes HST but otherwise includes all applicable fees, all municipal taxes, all permits and inspection costs, and all customs and excise import duties and WorkSafeBC assessments relating to the Work) to do, perform and supply all the Work in accordance with, and perform all the obligations specified by the Contract Documents is [insert Contract Price].

4.2 All HST payable by the Owner to the Contractor is [insert applicable amount of HST]. This amount is not included in section 4.1.

4.3 All amounts are in Canadian Funds.

4.4 The Contract Price shall be subject to adjustments as provided for in the Contract Documents.

ARTICLE A-5 PAYMENT

5.1 Subject to GC5.2 - *Applications for Progress Payment*, as modified by the Supplementary General Conditions, the Owner will pay the Contract Price to the Contractor together with applicable HST and will deduct and then make payment of the *Lien Act* holdback amount and certified deficiency holdback amounts together with such HST which may be applicable to those payments, all in accordance with the Contract Documents.

5.2 The payment for any Work under this Contract made to the Contractor by the Owner will not be construed as an acceptance of any Work being in accordance with the Contract Documents.

5.3 Should either party fail to make payments as they become due under the terms of the Contract Documents or in an award by arbitration or court, interest at the Prime Rate plus two percent (2%) per annum on such unpaid amounts will also become due and payable until payment. Such interest will be compounded on a monthly basis. The Prime Rate will be the rate established by the Bank of Canada from time to time as the minimum rate at which the Bank of Canada makes short term advances to Canadian chartered banks.

ARTICLE A-6 RECEIPT OF AND ADDRESSES FOR NOTICES

6.1 Except as otherwise expressly provided in the Contract Documents, communications between the parties or between them and the Consultant will be in writing and sent to the following addresses and will be deemed to be received by the recipient:

.1 on the date of delivery, if delivered by hand to the individual, a member of the firm or to an officer of the corporation for whom they are intended; or

.2 on the day following transmission, if sent by facsimile (and confirmed by documentation of successful fax transmission) or e-mail transmission (except where, in the case of e-mail, the recipient's computer notifies the sender that the recipient is absent, e.g., the "auto-reply" feature has been activated); or

.3 five (5) Working Days after the date of mailing, if sent by post, unless there is a postal service strike or other disruption.

(i) to the Owner at:
City of Vancouver, 453 West 12th Avenue
Vancouver, British Columbia V5Y 1V4

Attention: Kieran McConnell
Project Manager

(ii) to the Contractor at:

[insert name and address]

(iii) to the Consultant at:
Kerr Wood Leidel 4185 Still Creek Drive
Burnaby, British Columbia V5C 6G9

Attention: [to be determined]
[to be determined]

or such other person, position, address as one party may advise the other from time to time or at any time.

ARTICLE A-7 LAW OF CONTRACT

7.1 The laws of British Columbia will apply to and govern the Contract Documents and the Courts of British Columbia will have jurisdiction over all disputes not resolved by mediation or arbitration.

ARTICLE A-8 SUCCESSORS AND ASSIGNS

8.1 The Contract shall enure to the benefit of and be binding upon the Owner and Contractor and their respective successors and permitted assigns.

ARTICLE A-9 TIME OF THE ESSENCE

9.1 All time limits stated in this Contract are of the essence of the Contract.

IN WITNESS WHEREOF the parties hereto have executed this Agreement on the date first herein above written.

CITY OF VANCOUVER
by its authorized signatories:

Signature: _____

Name: _____

Title: _____

Signature: _____

Name: _____

Title: _____

Signature: _____

Name: _____

Title: _____

[INSERT NAME OF CONTRACTOR]
by its authorized signatories:

Signature: _____

Name: _____

Title: _____

Signature: _____

Name: _____

Title: _____

Proof of authority in the form of a certified copy of a resolution naming the person or persons in question as authorized to sign the Agreement for and on behalf of the corporation or partnership, who are parties to this Agreement, shall be attached.

SCHEDULE 1

SUPPLEMENTARY GENERAL CONDITIONS

THE SUPPLEMENTARY GENERAL CONDITIONS FOR CCDC2-2008

CONTRACT DOCUMENTS ARE MODIFICATIONS OF CCDC 2 -2008

1.1.1 These Supplementary General Conditions amend the Agreement, Definitions and General Conditions of Standard Construction Document CCDC 2 – Stipulated Price Contract, 2008 edition **("CCDC 2"**), available for download at http://www.ccdc.org/downloads/index.html. Any reference in the Contract Documents or the Tender Documents to "General Conditions" or "GC" means the General Conditions contained in the CCDC 2 as amended by these Supplementary General Conditions. Whenever there is a conflict between these Supplementary General Conditions and the other Contract Documents or wherever the Contract Documents are silent and these Supplementary General Conditions speak to a particular issue or matter, the provisions of these Supplementary General Conditions shall take precedence.

1.1.2 Unless the context dictates otherwise and to the extent not otherwise defined in the Contract Documents, defined terms in these Supplementary General Conditions adopt the meanings given thereto in the CCDC 2.

1.1.3 To the extent that the *Lien Act* expressly forbids parties from contracting out of all or some of the provisions of the *Lien Act* then, with respect to but only to the extent that, those provisions of the *Lien Act* are deemed to apply to any provisions of these Supplementary Conditions then the provisions set out in the *Lien Act* shall overrule any provision of the Contract Documents that is determined to contradict or contravene the *Lien Act* but only to the extent of such contradiction or contravention.

1 AMENDMENTS TO THE FORM OF AGREEMENT (CCDC 2)

Delete Pages 1 to 6 of CCDC 2 consisting of the "Agreement between Owner and Contractor".

AMENDMENTS TO THE DEFINITIONS

The following definitions from CCDC 2 are amended:

Add the following at the end of paragraph 5:

5. Contract

The Contract supersedes all prior negotiations, representations or agreements, either written or oral, except to the extent included in the Contract Documents or expressly incorporated by reference into the Contract by an actual reference to same in Article A-3 of the Agreement – CONTRACT DOCUMENTS.

Delete paragraph 6 and replace with the following:

6. Contract Documents

The Contract Documents consist of those documents listed in Article A-3 of the Agreement - CONTRACT DOCUMENTS, those documents expressly incorporated by reference into the Contract by an actual reference to same in Article A-3 of the Agreement – CONTRACT DOCUMENTS, amendments agreed upon in writing between the parties together with all other documents, schedules and additions mutually agreed to or settled by the parties from time to time in respect of this Contract.

Add the following at the end of the paragraph 12:

12. Owner

…and expressly excludes the Owner while acting in its capacity as a municipal regulatory authority.

Add the following definition of "Owner Caused Event" as a new paragraph 12.A

12A. Owner-Caused Event

An Owner-Caused Event is a wrongful act or omission of the Owner, the Consultant or anyone employed or engaged by them directly or indirectly, which is contrary to the express provisions of the Contract Documents, but for further certainty any event which is beyond the reasonable control of the Owner, the Consultant or anyone employed or engaged by them directly or indirectly is deemed to be an Excusable Event and not an Owner-Caused Event.

Delete the definition of Substantial Performance of the Work at paragraph 20 and replace with the following:

20. Substantial Performance of the Work

Substantial Performance of the Work shall have the same meaning as "completed" in the *Lien Act* including as interpreted by section 1(3) thereof and shall be determined as provided therein and herein.

Delete the definition of Work at paragraph 25 and replace it with the following:

25. Work

Work means the total construction and related services required by the Contract Documents or properly inferable therefrom.

The following definitions shall be added to and will apply in the Contract Documents:

27. Applicable Laws

Applicable Laws means all applicable federal, provincial and municipal laws, bylaws, codes, rules, regulations, policies and requirements applicable to the Work and the Project.

28. Applicable Permits

Applicable Permits means all necessary approvals, permits, licences and consents required for the performance of the Work.

29. Certificate of Completion

Certificate of Completion means the certificate under section 7 of the *Lien Act* stating that work under a contract or subcontract has been completed (see definition of Substantial Performance of the Work) and includes an order made under section 7(5) of the *Lien Act*.

30. Cost Plus Work

Cost Plus Work means work that is designated as cost plus work in the Schedule of Prices as accepted by the Owner.

31. Environmental Law

Environmental Law means any applicable law relating to the protection of the environment or occupational health and safety including those pertaining to (a) reporting, licensing, permitting, investigating, remediating and cleaning up in connection with any presence or release, or the threat of the same, of Hazardous Substances, and (b) the generation, manufacture, processing, distribution, use, re-use, treatment, storage, disposal, transport, labeling, handling and the like of Hazardous Substances.

32. Excusable Event

An Excusable Event means an event or circumstance (i) that is beyond the reasonable control of the Contractor, and its Subcontractors and Suppliers, and could not reasonably have been foreseen by the Contractor or its Subcontractors and Suppliers, and (ii) the impact of which could not have been avoided or substantially avoided by the exercise by them of commercially reasonable measures, but for greater certainty includes (subject to items (i) and (ii) above and subject also to items (v) through (viii) below) any (iii) acts of God, storm, earthquake, flood, fire, lightning, war (declared or undeclared), hostilities, national emergency, civil disturbance or commotion, insurrection, embargo, blockade, import restriction, epidemic, landslide, explosion, and (iv) government order, or regulation or other act of the public authority (except where the order or act results from a party's own acts or omissions or its failure to comply with Applicable Laws or Applicable Permits), but for greater certainty excludes in any event (v) any Site Labour Disturbance, (vi) temperature, precipitation, wind or other weather condition which, in any four week period, differs from the statistical average for that condition in that period by more than one standard deviation, calculated based on relevant data available from Environment Canada, (vii) a circumstance or cause resulting from the fault or negligence or omission of the Contractor or its Subcontractors or Suppliers, or their failure to perform the Contractor's obligations under this Contract including a failure to properly plan or carry out the Work in accordance with the terms hereof, or (viii) an event or circumstance which by the exercise of reasonable diligence could have been avoided or the effect of which could have been mitigated or which arises from a lack of funds.

33. Final Certificate for Payment

Final Certificate for Payment means the certificate issued on Total Performance of the Work.

34. Hazardous Substance

Hazardous Substance means any contaminant, waste, hazardous substance, hazardous waste, or dangerous goods in such quantities and concentrations as contravene applicable limitations under Environmental Law and that may impair the Environment, injure or damage property or plant or animal life or harm or impair the health of any individual.

35. Holdback Amount

Holdback Amount means the holdback required by the *Lien Act*.

36. Lien or Liens

Lien or Liens means a lien under the *Lien Act*.

37. Lien Act

Lien Act means the *Builders Lien Act* (British Columbia) and any additional successor or replacement legislation which may be passed that is applicable to the Site.

38. Lump Sum Work

Lump Sum Work means Work that is designated as lump sum work in the Schedule of Prices as accepted by the Owner.

39. Occupancy Permit

Occupancy Permit means an occupancy permit that has been issued by the City of Vancouver for the Place of the Work pursuant to the City of Vancouver Building By-law No. 9419.

40. Owner's Site Construction Rules

Owner's Site Construction Rules means all applicable policies, standards, protocols, rules and directions of Owner with regard to the Project and completion of the Work including those identified in the Specifications, Special Conditions or other Contract Documents.

41. Schedule of Prices

Schedule of Prices means the Schedule of Quantities and Prices attached as Schedule 2 to the Agreement.

42. Site

Site means the construction location and boundaries shown on the Drawings.

43. Site Labour Disturbance

Site Labour Disturbance means any strike, lock-out or labour disturbance, including those resulting from any jurisdictional or non-affiliation issues, involving employees, whether or not members of a trade union, of the Contractor, any Subcontractor, any Supplier, or any of their respective subcontractors of any tier, which delays or in any way adversely affects the performance and completion of Work at the Site.

44. Total Performance of the Work

Total Performance of the Work means the entire Work has been satisfactorily performed and is so certified by the Consultant.

45. Trade Union Council

Trade Union Council means a council or association of trade unions of which employees of the Contractor or a Subcontractor are members

46. Unit Price Work

Unit Price Work means Work that is designated as unit price work in the Schedule of Prices as accepted by the Owner.

47. WorkSafeBC Rules

WorkSafe BC Rules means the *Workers Compensation Act* (British Columbia) including without limitation the *WorkSafeBC Occupational Health and Safety Regulation* (British Columbia), and all amendments made to such act and regulations and in force from time to time, and to any statute or regulation that may be passed which supplements or supersedes such regulations

ALTERATION OF GENERAL CONDITIONS AND ADDITIONAL CONDITIONS

GC1.1 CONTRACT DOCUMENTS

GC1.1.7.1 is deleted in its entirety and replaced as follows:

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

- the Agreement between the Owner and the Contractor;
- the Special Conditions (if any);
- these Supplementary General Conditions;
- the Definitions from CCDC 2;
- the General Conditions from CCDC 2;
- Division 1 of the Specifications (if any);
- technical Specifications;

- material and finishing schedule;
- the Drawings; and
- the Form of Tender.

GC1.5 ADVERTISING

GC1.5.1 is added as follows:

The Contractor will obtain the Owner's prior written approval for any public advertising, press release or other general publicity matter, in which the name or trademarks of the Owner or any other person are mentioned or used or in which words are used from which any connection with the Owner name or trademarks may be inferred. The Contractor will not allow or permit any public ceremony in connection with the Work without the permission of the Owner provided in writing. The Contractor will not erect or permit the erection of any sign or advertising without the prior written approval of the Owner.

GC2.2 ROLE OF THE CONSULTANT

GC2.2.5 is deleted in its entirety and replaced with the following:

The Consultant will be the Payment Certifier pursuant to the *Lien Act*. Based on the Consultant's observations and evaluation of the Contractor's application for payment and review of the status of the Work including the Schedule of Work, the Consultant will issue certificates of payment and will issue the Certificate of Completion and the Final Certificate for Payment.

GC2.2.19 is added as follows:

Notwithstanding GC2.2.13, the Contractor shall be responsible for requesting any required instructions or clarifications from the Consultant which are needed for the performance of the Work and shall request such instructions or clarifications in time to avoid any delay of the Work.

GC2.2.20 is added as follows:

Nothing in GC2.2 shall derogate from or affect the terms and provisions of any contractual or other legal relations between the Owner and the Consultant, and such contractual and other legal relations shall in all cases take precedence over GC2.2 in the event of a conflict.

GC2.3 REVIEW AND INSPECTION OF THE WORK

GC2.3.1 is amended by deleting the first sentence of the paragraph and replacing it with the following:

The Owner and the Consultant and their authorized representatives shall have access to the Work at all times.

GC2.3.2 is amended by deleting the first sentence of the paragraph and replacing it with the following:

If work is designated for review, tests, inspections or approvals in the Contract Documents, or by the Consultant's instructions, or by the laws or ordinances of the Place of the Work, the Contractor shall give the Consultant reasonable notification of when the work will be ready for review and inspection.

GC2.3.4 is deleted in its entirety and replaced with the following:

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

GC2.3.8 is added as follows:

The Consultant may:

.1 review and monitor the Contractor’s performance of any aspects of the Work for conformance with the requirements of the Contract, including review and monitor the following:

(a) Contractor’s submittals; and

(b) any and all construction activities;

.2 perform or arrange for the performance of any tests, checks, and inspections of the Work as the Owner may reasonably request whether or not specifically required by the Contract Documents.

Should the Consultant be required to make more than one review of rejected work or should the Consultant perform additional reviews due to failure of the Work to comply with the application status of completion made by the Contractor, the Contractor is required to compensate the Owner for such additional Consultant services including expenses incurred. Adjustment for such compensation should be made as outlined under PART 6 - CHANGES IN THE WORK.

GC2.3.9 is added as follows:

Review, monitoring and/or approval by the Consultant or Owner of the Contractor’s performance of the Contract shall not relieve the Contractor of its sole responsibility and liability for the proper performance of the Contract strictly in accordance with its terms.

GC2.3.10 is added as follows:

Acceptance of the Work by the Owner does not free the Contractor from correcting deficiencies as provided in GC2.4 – DEFECTIVE WORK - which are missed at the time of drawing up the deficiency list or are hidden deficiencies.

GC2.4 DEFECTIVE WORK

GC2.4.1 is amended by adding the following to the end of the paragraph:

In the event that work or materials are found to be condemned then if the Contractor does not remove such condemned materials or work within the time fixed by written notice, the Owner may remove them and may store such materials at the expense of the Contractor. If the Contractor does not pay the expense of such removal within five (5) calendar days thereafter, the Owner may, upon ten (10) days written notice sell such materials with the proceeds thereof, if any, after deducting all the costs and expenses that should have been borne by the Contractor, being returned to the Contractor.

GC2.4.3 is deleted in its entirety and replaced with the following:

If in the opinion of the Consultant it is not expedient to correct defective work or work not performed as provided in the Contract Documents, the Owner may deduct from the amount otherwise due to the Contractor the difference in value between the work as performed and that called for by the Contract Documents or, at the option of the Owner, the cost or value of such work as would have been necessary to correct such non-compliance with the Contract Documents. If the Owner and the Contractor do not agree on the difference in value, they shall refer the matter to the Consultant for a determination.

GC3.1 CONTROL OF THE WORK

GC3.1.3 is added as follows:

The Contractor shall, and shall ensure that each Subcontractor shall, employ competent and skilled workmen and apprentices and shall employ proper equipment in good condition. The Contractor shall have complete control over its employees and Subcontractors and shall enforce discipline and order among its employees and assure discipline and order by its Subcontractors including, in all cases, without limiting the foregoing, compliance with and enforcement of Owner's Site Construction Rules and requirements of WorkSafeBC Rules.

GC3.1.4 is added as follows:

The Contractor shall be familiar with, and its performance of this Contract shall be governed by and comply with, all Applicable Laws and Applicable Permits which exist at present or which may be respectively enacted or obtained after the date hereof by bodies or tribunals having jurisdiction or authority over the Work, and with Owner's Site Construction Rules.

GC3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

GC3.2.2 is amended by deleting the first sentence and replacing it with the following:

When separate contracts are awarded for other parts of the Project, or when work is performed by the Owner's own forces, the Contractor shall:

GC3.2.2.3 is deleted in its entirety.

GC3.2.3.3 is amended by adding the following to the end of the paragraph:

Failure by the Contractor to so report shall invalidate any claims against the Owner by reason of the deficiencies of the other contractors or the Owner's own forces work except those of which the Contractor was not reasonably aware.

GC3.2.7 is added as follows:

The Contractor acknowledges that the Site generally and portions of the Project will continue to be used by the Owner and others as described in the Owner's Site Construction Rules and Special Conditions. The Contractor will work simultaneously and harmoniously with others using the Site and use all efforts not to interfere with or delay others.

GC3.5 CONSTRUCTION SCHEDULE

GC3.5.1.1 is deleted in its entirety and replaced with the following:

… prepare and submit to the Owner and the Consultant within ten (10) Working Days of Issuance of the Notice of Award, a construction schedule that indicates the timing of the major 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;

GC3.5.1.3 is amended by adding the following to the end:

… indicating the results expected from the resulting change in schedule.

GC3.5.2 is added as follows:

The Contractor will regularly monitor the progress of the Work and advise the Owner and the Consultant of any revisions to, or any slippage in, the construction schedule and any extensions of the Contract Time as a result of Change Orders issued hereunder.

GC3.5.3 is added as follows:

The Contractor will submit to the Consultant and the Owner's project manager monthly updates and provide comments on adherence to the construction schedule and details of any remedial actions being undertaken to improve schedule slippages.

GC3.5.4 is added as follows:

If the construction schedule is not adhered to, the Contractor will use all reasonable means to accelerate the Work, without additional compensation, to comply with the construction schedule.

GC3.6 SUPERVISION

GC3.6.3 is added as follows:

Any superintendent or foreman whose work is unsatisfactory to the Consultant, or to whom the Consultant may have any reasonable objection, shall be dismissed from the Work upon written notice of the Consultant. No superintendents or foremen will be substituted or replaced, except at the request or with the written consent of the Owner, or as a result of such employee's voluntary termination of employment or incapacity and any replacement will have comparable or superior qualifications and experience.

GC3.7 SUBCONTRACTORS AND SUPPLIERS

GC3.7.2 is deleted in its entirety and replaced as follows:

The Contractor shall indicate in writing those Subcontractors or Suppliers whose bids have been received by the Contractor which the Contractor would be prepared to accept for the performance of a portion of the Work. Should the Owner not object before signing the Contract, the Contractor shall employ those Subcontractors or Suppliers so identified by the Contractor in writing for the performance of that portion of the Work to which their bid applies. No change of Subcontractors shall be made without cause or written consent of the Consultant and Owner, which consent will not be unreasonably withheld.

GC3.7.7 is added as follows:

In every subcontract the Contractor shall specify that the Consultant shall be the person responsible for payment certification under that subcontract for the purposes of the *Lien Act*. With every request to the Consultant for a determination whether a subcontract has been completed, the Contractor shall furnish a detailed description of the scope of work covered by the subcontract and a complete reconciliation of the subcontract account. In this GC3.7.7, the word "subcontract" shall have the meaning it has when used in the *Lien Act*.

GC3.8 LABOUR AND PRODUCTS

GC3.8 is deleted in its entirety and replaced with the following:

3.8.1 Union Contractors

(a) Open Site

The Site and adjacent work areas associated with the Project are, or are part of, an "open site" and the Work will be performed on a "no strike/no lockout" basis. Accordingly, the Contractor and its Subcontractors, as well as the Owner and other contractors, may employ labour at the Site who are members of a trade union, including a trade union affiliated with a Trade Union Council or who are members of another trade union, or who are not members of a trade union.

(b) Labour Disruptions

The Contractor will use its best commercial efforts to ensure that no Site Labour Disturbance shall occur and the Contractor:

(i) will only retain Subcontractors for the Work whose employees are either:

(1) certified in British Columbia to be represented by a trade union and subject to a collective agreement which does not expire until after the date of Total Performance of the Work; or

(2) not so certified; and

require such Subcontractors to only retain subcontractors and suppliers whose employees are either certified in British Columbia to be represented by a trade

union and subject to a collective agreement which does not expire until after the date of Total Performance of the Work or are not so certified; and

(ii) represents and warrants that, with respect to any employees of the Contractor who may work at or near the Site and who are certified in British Columbia to be represented by a trade union and subject to a collective agreement, such collective agreement to which such employees are subject does not expire until after the date of Total Performance of the Work;

but if any Site Labour Disturbance occurs and does or may adversely impact on the Owner, the Work or the Contract Time, the Contractor will use its best commercial efforts to ensure that the length and extent of such impact is minimized (including without limitation by cooperating with the Owner in any measures they may take to ameliorate such impact) and the Contractor will be liable to the Owner for any such impact.

(c) ***Required for Union Contractors***

Without limiting the generality of Section (b) above, if the Contractor, or any Subcontractor, proposes to employ labour at the Site who are members of a trade union, including a trade union that is affiliated with a Trade Union Council authorized to bind its member trade unions, then the Contractor must first submit to the Consultant:

(i) a waiver of all non-affiliation or reservations rights under applicable collective agreements, including renewals or replacements thereof, effective for the duration of the Contract and executed by the Trade Union Council on behalf of all trades, or executed by the particular trade unions whose members will be so employed; and

(ii) an agreement that there will be no Site Labour Disturbance at or affecting the Site and/or the progress of the Work, effective for the duration of the Contract, and executed by the Trade Union Council on behalf of all trades, or executed by the particular trade unions whose members will be so employed.

(d) ***Fair Wages***

The Contractor shall pay or cause to be paid to every person employed on the Work not less than the wages or remuneration generally accepted as current at that time.

3.8.2 The Contractor shall provide and pay for labour, Products, tools, Construction Equipment, water, heat, light, power, transportation, and other facilities and services necessary for the performance of the Work in accordance with the Contract.

3.8.3 Unless otherwise specified in the Contract Documents, Products provided shall be new. Products which are not specified shall be of a quality consistent with those specified and their use acceptable to the Consultant. All Products supplied by the Contractor must at all times contain 0.00% asbestos. Should any Product be found to contain more than 0.00% asbestos, the Contractor will promptly abate and remove all Products containing asbestos at its sole cost.

3.8.4 The Contractor shall maintain good order and discipline among the Contractor's employees engaged on the Work and shall not employ on the Work anyone not skilled in the tasks assigned. The Owner shall have the right, by written notification to the Contractor, to require the removal from the Project of any employee of the Contractor or a Subcontractor of the Contractor who is incompetent, untrained, acts in an unsafe manner, is disorderly or is otherwise unsatisfactory or who breaches the Owner's Site Construction Rules or the terms of this Contract. Any such employee shall be immediately removed from the Site by the Contractor and shall not be employed again on the Project without the prior written approval of the Owner.

3.8.5 All materials shall be delivered, stored, handled and applied in strict accordance with the manufacturer's instructions, and shall be delivered with type, grade and brand name clearly identifiable and with seals intact.

GC3.9 DOCUMENTS AT THE SITE/DAILY RECORD

GC3.9.1 is deleted in its entirety and replaced with the following:

The Contractor shall keep one copy (as opposed to the originally executed set) of current Contract Documents, Shop Drawings, Change Orders, Change Directives, diary record set out in GC3.9.2 below, submittals, reports, and records of meetings at the Place of the Work, in good order, properly indexed, and available at all regular working hours on Working Days to the Owner and the Consultant.

GC3.9.2 is added as follows:

The Contractor shall, from the date of commencement of the Work, maintain a careful diary record of the progress of the Work. This record shall be open to the Consultant's inspection at all reasonable times and delivered to the Consultant on completion of the Work. The diary shall include:

1. daily weather conditions;

2. commencement, progress and completion of various portions of the work;

3. dates of all meetings and their purpose; and

4. dates of visits or inspections by government authorities, inspectors, utility companies, etc.

GC3.10 SHOP DRAWINGS

GC3.10.2 is amended by adding the following to the end:

… or as the Consultant may reasonably request.

GC3.10.13 is added as follows:

The Contractor represents and warrants that it has reviewed all Contract and Tender Documents and inspected and examined the Site and the Project to the extent it considers necessary and in accordance with prudent practice and satisfied itself as to the nature and

extent of the conditions, including the physical and climatic conditions which may be encountered in the performance of the Work and to the extent possible to establish the state and quality of the existing construction. The Contractor further acknowledges that it will be required to share the Site with the Owner and others, all as described in the Owner's Site Construction Rules and Special Conditions.

GC3.12 CUTTING AND REMEDIAL WORK

GC3.12.3 is amended by adding the following to the end:

… unless the Owner elects to do the work or retain other contractors, after having given the contractor written notice of the work to be performed. Such work shall be performed in accordance with GC3.2.

GC4.1 CASH ALLOWANCES

GC4.1.1 is deleted in its entirety and replaced as follows:

The Contract Price includes the cash allowances, if any, stated in the Contract Documents. Except to the extent specifically described in the Contract Documents, the scope of work or costs included in such cash allowances will:

(a) cover the net out-of-pocket cost of the Contractor for services, products, construction machinery and equipment, freight, unloading, handling, storage, installation and other authorized expenses incurred in performing the work stipulated under the cash allowances, and

(b) will not cover labour or installation, unless (and then only to the extent):

(i) specifically stated in the Specifications or Drawings as being included in the cash allowance, or

(ii) specifically designated as an itemized or separate price, and is therefore included as an itemized or separate price item,

and otherwise will be deemed to be included in the Contract Price.

GC4.1.2 is deleted in its entirety and replaced as follows:

The Contract Price, and not the cash allowances, includes the Contractor's and Subcontractors' overhead and profit in respect to such cash allowances. Unless noted otherwise, none of the work included in the Drawings and Specifications is intended to be paid for by the cash allowances. The cash allowances are for the Owner's use, at the Owner's sole discretion.

GC4.1.3 is amended by adding the following to the end of the paragraph:

The Consultant may require that cash allowance Work proceed only after competitive tenders or proposals are sought and received by the Contractor for all or any part of such Work. The Contractor shall provide full disclosure to the Consultant of all such tenders or proposals. The Contractor shall not accept any such tenders or proposals without the prior consent of the Consultant. The Contractor shall maintain at the Site, or such other location as the Consultant

may approve, accurate and complete records and accounts documenting all costs incurred under cash allowances. These records and accounts shall be available for inspection by the Consultant and the Owner at all reasonable times, and the Consultant and the Owner may take copies thereof.

PART 5 PAYMENT

GC5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

GC5.1 (including the heading) is deleted in its entirety and replaced with the following:

GC5.1 GENERAL FINANCIAL/PAYMENT PROVISIONS

5.1.1 The Owner shall, at the request of the Contractor, before signing the Contract, and promptly from time to time thereafter, furnish to the Contractor reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Contractor now acknowledges that Owner's financial statements as published pursuant to the Financial Information Act (British Columbia) constitute full satisfaction of this requirement and satisfactory evidence of the Owner's ability to fulfill its obligations under this Contract.

5.1.2 The Owner shall give the Contractor Notice in Writing of any material change in the Owner's financial arrangements to fulfill the Owner's obligations under the Contract during the performance of the Contract.

5.1.3 The Owner shall pay to the Contractor for the proper and timely performance and completion of the Work the Contract Price, consisting of:

(i) if all or part of the Work is designated as Unit Price Work in the Schedule of Prices, the product of each Unit Price stated in the Schedule of Prices, multiplied by the measured and actual quantity of each corresponding item of Work necessary for the proper performance and completion of the Work;

(ii) if all or part of the Work is designated as Lump Sum Work in the Schedule of Prices, the aggregate of Lump Sum Prices stated in the Schedule of Prices;

(iii) the aggregate of all Cash Allowances, if any, specified in the Schedule 2 of the Agreement; and

(iv) if all or part of the Work is designated as Cost Plus Work, the cost reasonably and necessarily incurred by the Contractor in performing and completing such Work, such cost to be determined in accordance with GC5.1A.3, plus a percentage or fixed fee, as stated in the Schedule of Prices.

5.1.4 The Contract Price is subject to adjustment only in accordance with the Contract Documents.

5.1.5 The Contract Price is expressed and payable in Canadian dollars.

5.1.6 Subject to the provisions of the Contract Documents and in accordance with the Lien Act in respect of Holdback Amounts, the Owner shall:

.1 make progress payments to the Contractor on account of the Contract Price when due, based:

(i) on the value of the Work completed and Products and materials incorporated into the Work as certified by the Consultant, and

(ii) Products and materials delivered to the Site but not yet incorporated into the Work, as agreed to by the Owner,

together with the Value Added Taxes as are applicable;

.2 upon issuance of a Certificate of Completion in respect of a subcontract to which the Contractor is a party, and where fifty-five (55) calendar days have elapsed since the issuance of the Certificate of Completion without any Liens having been filed which arose under the subcontract, pay the Holdback Amount to the Contractor in respect to the subcontract;

.3 upon issuance of the Certificate of Completion (in respect to Substantial Performance of the Work), and where fifty-five (55) calendar days have elapsed since the issuance of the Certificate of Completion without any Liens or other liens having arisen with respect to this Contract, pay the balance of the Holdback Amount to the Contractor in respect to this Contract;

.4 upon issuance of the Final Certificate for Payment (in respect to Total Performance of the Work), and provided no Liens or other liens have arisen in respect to this Contract, pay the balance of the Contract Price to the Contractor.

5.1.7 If either party fails to pay when due an amount owing to the other under this Contract, that amount will bear interest at the Bank Rate plus two percent (2%), calculated daily from the due date to the date of payment. For this purpose, the "Bank Rate" means the rate of interest established from time to time by the Bank of Canada as the minimum rate at which the Bank of Canada advances short term loans to Canadian chartered banks.

5.1.8 If the Work suffers any loss or damage, as a result of which an amount is paid under any policy of insurance provided by the Owner under the Contract, then such amount shall be paid to the Owner and advanced to the Contractor in monthly progress payments as the Contractor performs and completes repair or restoration Work in respect of such loss or damage.

GC5.1A BASIS OF PAYMENT:

5.1A.1 **Basis of Payment for Unit Price Work**

.1 ***Unit Price Work:*** Payment for Unit Price Work, if any, shall be based on the Unit Prices set out in the Schedule of Prices.

.2 ***Measurement:*** The Contractor shall measure the Work and the Consultant will verify such measurements to determine payment to the Contractor in accordance with the measurement provisions of the Contract Documents.

5.1A.2 **Basis of Payment for Lump Sum Work**

.1 ***Lump Sum Work:*** Payment for Lump Sum Work, if any, shall be based on any Lump Sum Prices set out in the Schedule of Prices.

5.1A.3 **Basis of Payment for Cost Plus Work**

.1 ***Cost Plus Work:*** Payment for Cost Plus Work, if any, shall be based on the cost of such Work, as provided in GC5.1A.3.2, plus a fixed fee or percentage fee calculated as a percentage of the cost of such Work, for the Contractor's overhead and profit. The fixed fee or percentage fee shall be as provided in the Schedule of Prices, except in the case of the valuation of changes in the Lump Sum Work on a cost-plus basis, in which case the applicable percentages shall be limited to the percentages stipulated in GC5.1A.4. In any event, any percentage fee, whether specified in the Schedule of Prices or in this GC5.1A.3.1 shall not be applied to the cost of Construction Equipment for which rates are provided in the "Schedule of Construction Equipment Rates" (if applicable) or labour for which rates are provided in the "Schedule of Labour Rates" (if applicable) set out as Tables 2 and 1 respectively in the Schedule of Force Account Labour and Construction Equipment Rates attached to the Agreement.

.2 ***Cost of the Work:*** The cost of Cost Plus Work and Work done under a Change Directive or Change Order on a cost-plus basis, except as otherwise specified in the Contract Documents, shall be at rates prevailing in the locality of the Site and, subject to GC5.1A.5, shall include the following cost elements as applicable to such Work:

(i) wages and benefits paid for labour in the direct employ of the Contractor under applicable collective bargaining agreements, or under a salary or wage schedule agreed upon by the Consultant and the Contractor;

(ii) salaries, wages, and benefits of the Contractor's personnel, when stationed at the field office, in whatever capacity employed; or personnel at shops or on the road, engaged in expediting the production or transportation of materials or equipment;

(iii) contributions, assessments, or taxes incurred for such items as employment insurance, provincial or territorial health insurance, workers' compensation, and Canada 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 paragraphs (i) and (ii);

(iv) travel and subsistence expenses of the Contractor's personnel described in paragraphs (i) and (ii) to be included only with the prior approval of the Owner;

(v) the cost of all Products, including the cost of transportation thereof;

(vi) the cost of Construction Equipment, Temporary Work, and hand tools not owned by the workers, including transportation, and maintenance thereof, which are consumed in the performance of the Work, at cost less salvage value on such items used but not consumed, which remain the property of the Contractor;

(vii) the cost of 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;

(viii) deposits lost;

(ix) the amounts of all subcontracts;

(x) the cost of quality assurance such as independent inspection and testing services;

(xi) charges levied by authorities having jurisdiction at the Site;

(xii) any adjustment in premiums for all bonds and insurance which the Contractor is required by the Contract Documents to purchase and maintain;

(xiii) any adjustment in Value Added Taxes, other than taxes on income or capital, for which the Contractor is liable;

(xiv) charges for long distance telephone and facsimile communications, courier services, expressage, and petty items incurred in relation to the performance of the Work;

(xv) the cost of removal and disposal of waste products and debris; and

(xvi) cost incurred due to emergencies affecting the safety of persons or property.

.3 ***Approval Required:*** The Contractor shall obtain the Consultant's approval prior to subcontracting or entering into other agreements for Cost Plus Work or Work done under a Change Directive or Change Order on a cost-plus basis.

.4 ***Rejection of Costs:*** The Consultant may refuse to certify payment for all or part of the cost of any item under any cost element, where the item in question

was unsuitable, unnecessary or the cost was otherwise improperly incurred in the performance of the Work.

.5 ***Records:*** The Contractor shall keep full and detailed accounts and records necessary for the documentation of the cost of Cost Plus Work and Work done under a Change Directive or Change Order on a cost-plus basis, and shall provide the Consultant with copies thereof when requested.

.6 ***Access to Records:*** the Owner and the Consultant shall be afforded reasonable access to all of the Contractor's books, records, correspondence, instructions, drawings, receipts, vouchers, and memoranda related to the cost of Cost Plus Work and Work done under a Change Directive or Change Order on a cost-plus basis, and for this purpose the Contractor shall preserve such records for a period of one (1) year after the date of Substantial Performance of the Work.

5.1A.4 **Cost Plus Contract Rates and Mark Ups**

When Cost Plus Work is performed or a change in the Work is valued on a cost-plus basis, then:

(i) the costs of labour will be determined by the labour rates specified in the Schedule of Labour Rates, without mark up, unless otherwise specified therein;

(ii) the costs of Construction Equipment will be determined by the construction equipment rates specified in the Schedule of Construction Equipment Rates, without mark up, unless otherwise specified therein;

(iii) in the case of changes in Lump Sum Work valued on a cost-plus basis, the amount of subcontracts specified will be subject to a mark up of five percent (5%) for overhead and profit, but all other costs specified in GC5.1A.3.2 will be subject to a mark up of ten percent (10%); and

(iv) for further certainty, to the extent that any changes involve changes in the estimated quantities of Unit Price Work such changes will be determined solely by the Unit Prices, without mark-up, unless otherwise specified therein.

5.1A.5 **Cost Plus Maximum under Change Order**

When a change in Lump Sum Work is valued on a cost plus basis, the Owner may require that the aggregate amount incurred under the corresponding Change Directive shall not exceed a maximum amount acceptable to the Owner, acting reasonably, and specified in the Change Directive, as such amount may be revised from time to time by subsequent written authorization of the Owner. The Contractor shall not be entitled to payment in excess of such applicable maximum amounts in respect of any such Change Directives.

5.1A.6 **Daily Records for Cost Plus Work under Change Directives**

When a change in Lump Sum Work is valued on a cost plus basis, the Contractor shall prepare and submit to the Owner on a daily basis a report of costs incurred in performing Work under the corresponding Change Directive. The report must identify all such open Change Directives,

and summarize on a current basis costs incurred, allocated to the cost of labour, Material and Construction Equipment, and otherwise in such reasonable detail as the Owner may direct.

GC5.2 APPLICATIONS FOR PROGRESS PAYMENT

GC5.2 is deleted in its entirety and replaced with the following:

5.2.1 Applications for payment shall be submitted on or before the last day of each calendar month, dated as of the last day of the month, and be in respect to the Work completed prior to the application being signed (the **"payment period"**).

5.2.2 The amount claimed shall be for the value, proportionate to the amount of the Contract, of Work performed and Products delivered to the Place of the Work as of the last day of the payment period.

5.2.3 The Contractor shall submit to the Consultant, as part of the draft Application (see section 5.2.1) at least fifteen (15) calendar days before the first application for payment, a schedule of values for the parts of the Work, aggregating the total amount of the Contract Price, so as to facilitate evaluation of applications for payment. A second schedule, stating the anticipated monthly progress payments, is to be submitted upon request.

5.2.4 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.

5.2.5 When making applications for payment, the Contractor shall submit a statement based upon the schedule of values. Claims for Products delivered to the Site but not yet incorporated into the Work shall be supported by such evidence as the Consultant may reasonably require to establish the ownership, value and delivery of the Products. The Owner has the right to refuse payment for Products delivered to the Site but not incorporated in the Work. The Contractor shall obtain the Owner's permission prior to invoicing for such Products.

5.2.6 Each application for payment shall:

.1 be in such form and detail as the Consultant shall require and submitted consistently in such form and detail unless otherwise advised by the Consultant and clearly show:

(i) the Contractor's full name, address and telephone number;

(ii) the Owner's purchase order number;

(iii) the Owner's project manager;

(iv) the application for payment number and date; and

(v) the Contractor's HST registration number;

.2 be attached to a statement or statutory declaration sworn by an officer of the Contractor which verifies the accuracy and completeness of the information contained therein, and for each application following the first application also include in addition to the foregoing and not in lieu of same, a current CCDC 9A Statutory Declaration of Progress Payment Distribution by Contractor which shall be completed and sworn before a Notary Public or Commissioner for Oaths for the Province of British Columbia;

.3 relate the Work for which payment is claimed to the Construction Schedule and the schedule of values provided and provide such back-up invoices and other materials as may be reasonably necessary for the Consultant to review such application;

.4 verify that there are no Liens or other liens relating to the Contractor, the Work or the Products registered against the Owner, the Project or the Site or the Owner's interest therein or against the Holdback Amount, by signing and submitting the appended "Statement Regarding Outstanding Claims";

.5 attach the documents required under GC9.4 demonstrating compliance by the Contractor and each Subcontractor with WorkSafe BC Rules;

.6 attach the monthly update contemplated by GC3.5.3; and

.7 provide a comprehensive list of items which remain to be completed and any defective items which remain to be corrected and the Contractor's estimate of the costs and time to complete or correct such items.

5.2.7 The Contractor shall deliver a complete application as provided in GC5.2.6 and if such application is not complete, the Consultant may reject all or the applicable portions of same by promptly (and in any event within five (5) calendar days of its receipt) notifying the Contractor of the deficiencies in the application. The Contractor will promptly supply to the Consultant such further certification or information as may be necessary to remedy the deficiencies in the application.

5.2.8 An application for payment shall be deemed to be received by the Consultant only if and when submitted in full conformity with GC5.2.6.

GC5.3 PROGRESS PAYMENT

GC5.3.1.2 is amended by adding the following to the end:

If, after a certificate of payment has been issued to the Owner (and prior to payment by the Owner), the Consultant determines on the basis of new information that the amount certified for payment is incorrectly high or low relative to the Work being certified, then the Consultant shall issue a revised certificate.

GC5.3.1.3 is amended by deleting the words "Article A-5 of the Agreement and replacing with "this GC5".

GC5.3.2 is added as follows:

Subject to the provisions of the Lien Act, the Owner may retain a deficiency holdback from progress draws prior to Substantial Performance of the Work to ensure that sufficient money is withheld to fund the deficiency holdback at Substantial Performance of the Work

GC5.4 SUBSTANTIAL PERFORMANCE OF THE WORK

GC5.4 (including the heading) is deleted in its entirety and replaced with the following:

GC5.4 SUBSTANTIAL PERFORMANCE OF THE WORK/CERTIFICATE OF COMPLETION

5.4.1 When the Contractor considers that Substantial Performance of the Work has been achieved, or if permitted by the Lien Act the Contractor wishes to apply for a Certificate of Completion in respect to a subcontract with a Subcontractor, the Contractor shall, within one Working Day, deliver to the Consultant and to the Owner an application for a Certificate of Completion of same (a "Completion Certificate Application") in conformity with GC5.4.4.

5.4.2 The Consultant will review the Work to verify the validity of the application and shall promptly, and in any event, no later than twenty (20) calendar days after receipt of the Contractor's list and application:

.1 advise the Contractor in writing that the Work or the designated portion of the Work is not "completed" (as that term is used in the Lien Act) and give reasons why, or

.2 issue a Certificate of Completion in respect to the Work or subcontract stating on the certificate the date of issuance in accordance with the Lien Act and issue a copy of that certificate to each of the Owner and the Contractor.

5.4.3 Immediately following the issuance of the Certificate of Completion for the Work, the Contractor, in consultation with the Consultant, shall establish a reasonable date for Total Performance of the Work (which date will be deemed to be the date for same set out in the Construction Schedule if such date is specified).

5.4.4 The Completion Certificate Application referred to in GC5.4.1 shall consist of the following:

.1 a cover letter stating that the submittal is an application for a Certificate of Completion as well as an application for payment, and clearly identifying the Work or subcontract for which the Certificate of Completion is being sought;

.2 all of the certifications and information required on an application for payment as set out in GC5.2.6;

.3 with respect to the Work or subcontract, as applicable, all deliverables, including copies of all manufacturer's warranties, called for in the Contract Documents which are or should be available at the time of the Completion Certificate Application including without limitation and by way of example only all operation manuals, service manuals, warranty certificates, maintenance

contracts, service contracts, software licences, inspection reports, and other applicable manuals, contracts, certificates, guarantees and warranties.

5.4.5 Failure to include an incomplete or defective item on Completion Certificate Application or the Consultant's issuance of a Certificate of Completion or certificate of payment in respect to same does not alter the responsibility of the Contractor to complete the Contract.

5.4.6 Subject to the requirements of the Lien Act relative to the date of issuance by the Consultant of the Certificate of Completion of the Work pursuant to GC5.4.2.2:

.1 the Consultant shall issue to the Owner and copy to the Contractor a certificate of payment for an amount equal to the Contract Price less:

(i) three times the value of any deficiencies shown on the comprehensive list of items to be completed or corrected, as determined by the Consultant,

(ii) the value of incomplete work as determined by the Consultant, and

(iii) the amounts of all previous certificates of payment;

.2 the Owner shall then make payment to the Contractor in accordance with the provisions of GC5.3.1.3 provided always that a Completion Certificate Application shall be deemed received only if and when submitted in accordance with GC5.2.6 as well as GC5.4.4.

GC5.5 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

GC5.5 is deleted in its entirety and replaced with the following:

5.5.1 After the issuance of the Certificate of Completion evidencing Substantial Performance of the Work, the Contractor shall:

.1 submit an application for payment of the Holdback Amount,

.2 submit a current CCDC 9A Statutory Declaration of Progress Distribution by Contractor, as well as a current CCDC 9B Statutory Declaration of Progress Distribution by Subcontractor from each of the Subcontractors, which in every case shall be fully and properly completed and sworn before a Notary Public or Commissioner for Oaths for the Province of British Columbia;

.3 verify that there are no Liens or other liens relating to the Contractor, the Work or the Products registered against the Owner, the Project or the Site or the Owner's interest therein or against the Holdback Amount, by signing and submitting the appended "Statement Regarding Outstanding Claims";

.4 attach the documents required under GC9.4 demonstrating compliance by the Contractor and each Subcontractor with WorkSafe BC Rules; and

.5 attach copies of a current title search of the Site confirming that no Liens have been registered prior to the time the release of the Holdback Amount is due.

5.5.2 After the receipt of and approval of the application documents described in GC5.5.1, the Consultant will issue a certificate for payment of the Holdback Amount (less any previous releases of the Holdback Amount on account of subcontract Certificates of Completion).

5.5.3 The Contractor now acknowledges that the Owner is exempt under the regulations of the Lien Act from the requirement to keep the Holdback Amount in a separate holdback account.

5.5.4 The Holdback Amount is due and payable as set out in GC5.1.6.4. The Owner may retain out of the Holdback Amount any sums required by law to satisfy any Liens or other liens against the Contract, Work, Site, or Owner's interest in the Site or, if permitted by the Lien Act, other third party monetary claims against the Contractor which are enforceable against the Owner. Except to the extent expressly prohibited by the Lien Act, the Owner may retain out of the Holdback Amount any deficiency holdbacks provided for in the Contract Documents.

5.5.5 **[Intentionally Deleted]**

GC5.6 PROGRESSIVE RELEASE OF HOLDBACK

GC5.6.1 is deleted in its entirety and replaced with the following:

Any portion of the Holdback Amount in respect to a Subcontractor or Supplier subcontract is due and payable as set out in GC5.1.6.3. The Owner may retain out of the subcontract portion of the Holdback Amount any sums required by law to satisfy any Liens or other liens against the Contract, Work, Site, or Owner's interest in the Site or, if permitted by the Lien Act, other third party monetary claims against the Contractor which are enforceable against the Owner. Except to the extent expressly prohibited by the Lien Act, the Owner may retain out of the Holdback Amount any deficiency holdbacks provided for in the Contract Documents.

GC5.6.2 is deleted in its entirety.

GC5.6.3 is amended by deleting the words "final certificate for payment" and replacing with "Final Certificate for Payment".

GC5.7 FINAL PAYMENT

GC5.7.1 is deleted in its entirety and replaced as follows:

5.7.1 When the Contractor considers that Total Performance of the Work has been achieved, the Contractor shall submit its final application for payment. The application for payment on attaining Total Performance of the Work shall consist of the following:

.1 all of the certifications and information required on an application for payment as set out in GC5.2.6, all appropriately amended to clearly confirm that the

Work is fully completed, all Products have been delivered, and all Lien periods have expired with no Liens or other liens having been filed;

.2 a current CCDC 9A Statutory Declaration of Progress Distribution by Contractor, as well as a current CCDC 9B Statutory Declaration of Progress Distribution by Subcontractor from each of the Subcontractors, which in every case shall be fully and properly completed and sworn before a Notary Public or Commissioner for Oaths for the Province of British Columbia;

.3 copies of a current title search of the Site confirming that no Liens have been registered as at the date of application for Final Certificate for Payment; and

.4 all deliverables called for in the Contract Documents which were not delivered at the time of Substantial Performance of the Work.

GC5.7.3 is amended by deleting the words "final certificate for payment" and replacing with "Final Certificate for Payment".

GC5.7.4 is deleted in its entirety and replaced as follows:

Subject to paragraph 9.4.1 of GC9.4 – CONSTRUCTION SAFETY & WORKPLACEBC RULES, and the *Lien Act*, the Owner shall, no later than twenty-one (21) calendar days after the issuance of a Final Certificate for Payment, pay the Contractor as provided in GC5.1.6.4

GC6.1 OWNER'S RIGHT TO MAKE CHANGES

GC6.1.3 is added as follows:

Change Orders, contemplated Change Orders, and Change Directives shall be on printed forms supplied by the Owner or Consultant and may include:

.1 job site instructions or site memo forms, for immediate authorization on Site in order not to delay the performance of the Work and for changes of a minor nature with no price variation, shall be issued on site on the signature of the Consultant only;

.2 contemplated Change Orders issued by the Consultant for purposes of the Contractor's response on method of adjustment and extent of adjustment to Contract Price and Time shall be signed by the Consultant only;

.3 Change Orders authorizing the Contractor to proceed with the Work as set out by the Consultant and Contractor in the contemplated Change Order shall be signed by the Owner and Contractor.

GC6.1.4 is added as follows:

The Unit Prices, if any, set out in the Schedule of Prices are firm and fixed, and shall not be subject to adjustment as a result of any difference between the estimated quantities shown in such schedule and the corresponding actual quantities whether or not any Change Orders or Change Directives are issued.

GC6.3 CHANGE DIRECTIVE

GC6.3.3 is deleted in its entirety.

GC6.3.5 is deleted in its entirety.

GC6.3.6 is deleted in its entirety and replaced as follows:

Subject to GC6.3.13, the adjustment in the Contract Price for a change in the Work carried out by way of a Change Directive shall be on the basis of the Contractor's actual and properly documented expenditures and savings attributable to the change. If a change in the Work results in expenditures only, the change in the Work shall be valued as Cost Plus Work in accordance with GC5A. – BASIS OF PAYMENT. If a change in the Work results in savings only, the amount of the credit shall be the actual cost savings to the Contractor, without deduction for overhead or profit. If a change in the Work results in both expenditures and savings, overhead and profit on the Work shall be payable only on the net increase in expenditures, if any, with respect to that change in the Work.

GC6.3.7 is deleted in its entirety.

GC6.3.8 is deleted in its entirety.

GC6.3.9 is deleted in its entirety.

GC6.3.10 is deleted in its entirety.

GC6.4 CONCEALED OR UNKNOWN CONDITIONS

GC6.4.1 is deleted in its entirety and replaced as follows:

If the Contractor discovers conditions at the Place of the Work which are subsurface or otherwise concealed physical conditions at the Site which existed before the commencement of the Work, could not reasonably have been discovered by proper investigation by the Contractor under GC3.10.13, and which differ materially from those disclosed in the Contract Documents, including any geotechnical report, environmental assessment, or other report included or referenced in the Contract Documents or provided or made known to the Contractor before the commencement of the Work; then the Contractor shall give Notice in Writing to the Consultant of such conditions before they are disturbed and in no event later than five (5) Working Days after first observance of the conditions.

GC6.4.1A is added as follows:

The Contractor must give notice under GC6.4.1 within five (5) Working Days after discovery of the conditions or the time when the Contractor by reasonable diligence could have discovered the conditions, failing which the Contractor may not make or enforce any claim against the Owner, whether for a change in the Contract Price or other compensation or for an extension of the Contract Time arising from those conditions.

GC6.4.4 is deleted in its entirety and replaced as follows:

If such concealed or unknown conditions relate to Hazardous Substances, artifacts and fossils, or mould, the parties will be governed by the provisions of GC9.2 – TOXIC AND HAZARDOUS SUBSTANCES, GC9.3 – ARTIFACTS AND FOSSILS and GC9.5 – MOULD.

GC6.5 DELAYS

GC6.5 is deleted in its entirety and replaced as follows:

6.5.1 **Delay Claims Limited**

The Contractor shall be entitled to an extension of the Contract Time and/or an adjustment to the Contract Price or other compensation for delay, howsoever caused, if and to the extent only expressly permitted under this GC6.5 or in respect of a change in the Work, in each case as authorized only by a Change Order and in no event will these provisions apply to delays arising directly or indirectly from the Contractor's Shut-Down-Obligations (as defined in Part F – Special Conditions).

6.5.2 **Excusable Event**

If the Contractor is delayed in the performance or completion of the Work by an Excusable Event, then, subject to the other conditions of this GC6.5, the Contract Time shall be extended for such reasonable time as the Consultant determines, after consultation with the Contractor, as being required to accommodate the anticipated impact on the Contract Schedule of the Excusable Event. Any such time extension shall be confirmed by Change Order under GC6.1. The Contractor shall not be entitled to make or enforce any claim against Owner for any change in the Contract Price or other compensation as a result of an Excusable Event.

6.5.3 **Owner-Caused Event**

If the Contractor is delayed in the performance or completion of the Work by a Owner-Caused Event, then subject to the other conditions of this GC6.5, the Contract Time shall be extended for such reasonable time as the Consultant determines, after consultation with the Contractor, as being required to accommodate the anticipated impact on the Contract Schedule of the Owner-Caused Event, and the Contract Price shall be adjusted to compensate the Contractor for the reasonable direct costs incurred, or anticipated to be incurred, by it as a result of the delay.

6.5.4 **Claim Conditions**

The right of the Contractor to an extension of the Contract Time, and/or an adjustment of the Contract Price under this GC6.5 is subject to the conditions that:

.1 ***Timely Notice:*** The Contractor gives the Owner prompt written notice of the delay, the nature of the Excusable Event or the Owner-Caused Event, as the case may be, and its intent to submit a claim for time extension and/or adjustment of the Contract Price, and in any event, such notice must be given not later than five (5) Working Days after the occurrence of the Excusable Event or the Owner-Caused Event;

.2 ***Claim Details:*** The Contractor promptly gives the Owner details of its claim, including the time required to accommodate the anticipated impact on the Contract Schedule,

and if applicable, the costs incurred, or anticipated to be incurred, by the Contractor as a result of the delay, and in any event such details must be given not later than fourteen (14) Working Days after the occurrence of the Excusable Event or the Owner-Caused Event;

.3 ***Mitigation Measures:*** The Contractor has taken, and continues to take, all reasonable measures, including those, if any, recommended by the Owner to minimize the impact of the delay on the Contract Schedule, and in the case of a claim for adjustment of the Contract Price, all reasonable measures, including those, if any, recommended by the Owner, to minimize the costs incurred, or anticipated to be incurred, by the Contractor as a result of the delay;

.4 ***Critical Path Impacted:*** No extension of time and/or adjustment of the Contract Price or other financial compensation will be granted, unless the Excusable Event or the Owner-Caused Event, as the case may be, has an adverse impact on the critical path established by the Contract Schedule;

.5 ***Concurrent Delays:*** If there are concurrent delays and impacts, some of which entitle the Contractor to relief under this GC6.5 and some of which do not, the Contractor is not entitled to relief under this GC6.5, the Contractor shall be entitled to an extension of the Contract Time, and if applicable an adjustment of the Contract Price in respect of a Owner-Caused Event, only to the extent that the delays entitling the Contractor to relief under this GC6.5 exceed those that do not so entitle the Contractor to such relief; and

.6 ***No Cumulative Impact Claims:*** Each claim under this GC6.5 based in whole or in part on a particular event must be submitted and will be considered and assessed separately, and the Contractor may not make or enforce any claim under this GC6.5 or otherwise for the cumulative impact on schedule or on cost of two or more such events.

.7 **Acceleration/Suspension of the Work**

(a) ***Notice:*** The Contractor shall give the Owner notice of any delay in the performance of the Work, howsoever caused, and any event or circumstance that could reasonably be expected to cause such delay. The notice shall be given promptly after the delay, event or circumstance is known to the Contractor. The notice shall be accompanied by details of the Contractor's plan to avoid or mitigate the duration and adverse impact of the delay.

(b) ***Acceleration Order:*** If there is a delay, or threatened delay, in the performance of the Work, or if the Owner wishes to accelerate the Work for its convenience, the Consultant, after consultation with the Contractor, may order the Contractor to accelerate the Work, including by way of the provision of additional labour, including overtime work, and Construction Equipment. Each acceleration order must be in writing and signed by the Consultant. The Contractor shall comply promptly with any order given under this GC6.5.4.7(b).

(c) ***Cost Allocation:*** If the delay, or threatened delay, in respect of which an order is made under GC6.5.4.7(b) does not entitle the Contractor to an extension of the Contract Time under GC6.4, including any delay or threatened

delay caused by the Contractor, or any Subcontractor, Supplier or other person for whose acts and omissions the Contractor is responsible under the Contract, then all costs incurred by the Contractor in complying with the order will be for the Contractor's account. If the delay, or threatened delay, would entitle the Contractor to an extension of the Contract Time under GC6.4, then the Consultant, in lieu of granting such extension in whole or in part, shall issue a Change Directive and/or a Change Order under GC6.1, and the Contract Price will be adjusted accordingly.

(d) ***Owner's Right to Suspend the Work:*** The Owner, at any time and from time to time, may suspend the performance of the Work, in whole or in part, for a period not exceeding ninety (90) days as to any one suspension, by notice to the Contractor. The Contractor shall comply promptly with any notice given under this GC6.5.4.7(d), and shall resume full performance of the Work promptly on notice from Owner to do so. Owner shall pay to the Contractor the documented costs reasonably incurred by it as a consequence of the suspension, such cost to include the incremental costs of demobilization and remobilization, Construction Equipment rental or standby charges, Materials storage, bonding and insurance costs, overhead and similar costs payable by the Contractor to Subcontractors, but excluding any allowance for profit or loss of profit, all such costs to be certified by the Consultant and confirmed by Change Order. The Contractor shall use all commercially reasonable efforts to avoid or minimize such costs, including following any reasonable written directions given by Owner for that purpose.

6.5.6 **Protect Work During the Delay**

During any delay or suspension of the Work, the Contractor shall maintain adequate surveillance of the Work and undertake such maintenance and protection of the Work as may be reasonable to maintain public safety and to protect materials, plant and equipment already installed in the Work or delivered to the Place of Work, and shall provide any other protective measures as may be described in the Contract Documents.

GC7.1 OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT

GC7.1.5.2 is amended by deleting the words "final certificate for payment" and replacing with "Final Certificate for Payment".

GC7.1.7 is added as follows:

7.1.7 The Owner may terminate the Contract at any time for the convenience of the Owner by notice given to the Contractor. It the Contract is terminated under this GC7.1.7, then:

(a) the Contractor shall suspend performance of the Work and shall not incur further cost or expense in relation to the Work, except (i) as necessary to protect the Work and the safety of persons, or (ii) as authorized or directed in writing by the Owner;

(b) the Contractor shall remove from the Site its personnel and all Construction Equipment and other material that is owned or leased by the Contractor, except as otherwise required to comply with GC7.1.7(a)(i) and (ii); and

(c) the Owner shall pay the Contractor for all Work performed, including the cost of complying with GC7.1.7(a)(i) and (ii), in accordance with the terms and conditions of payment set out in the Contract, together with the documented and reasonable cost of terminating subcontracts with Subcontractors and Suppliers and demobilizing the Contractor's personnel and Construction Equipment, all as certified by the Consultant, and upon such payment being made, the Contractor shall have no further or other claim against the Owner for, or in connection with, termination of the Contract.

GC7.2 CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE CONTRACT

GC7.2.2 is amended by replacing the number "20" where it appears in the first sentence with the number "30" and by adding the following to the beginning of the first sentence as follows:

Except for the period during which an Owner-initiated suspension under GC6.5.4.7(d) is in effect or subsequently takes effect,

GC7.2.3 is amended by adding the following to the beginning of the first sentence:

If the default cannot be corrected in five (5) Working Days or in such other time as may be subsequently agreed in writing by the parties,

GC7.2.3.1 is deleted in its entirety.

GC7.2.3.4 is deleted in its entirety and replaced with the following:

the Owner violates the requirements of the Contract to a substantial degree and the Consultant, except for GC5.1- GENERAL FINANCIAL/PAYMENT PROVISIONS, confirms by written statement to the Contractor that sufficient cause exists.

GC7.2.4 is amended by revising the second line to read:

corrected within fourteen (14) Working Days

GC 8.2 NEGOTIATION, MEDIATION AND ARBITRATION

GC8.2.1.1 is deleted in its entirety and replaced as follows:

.1 within thirty (30) Working Days after the Contract was awarded, or

GC8.2.1.2 is deleted in its entirety and replaced as follows:

.2 if the parties neglected to make an appointment within the thirty (30) Working Days, within twenty (20) Working Days after either party by Notice in Writing requests that the Project Mediator be appointed.

GC8.2.3 is amended by adding the following to the end:

However, the Owner and the Contractor nonetheless irrevocably and unconditionally attorn to the jurisdiction of the courts of British Columbia, and courts to which appeals therefrom may be taken, in respect of any dispute or claim arising under or relating to the Contract. The Owner and the Contractor acknowledge and agree that such courts have jurisdiction, but not necessarily exclusive jurisdiction in respect of any such dispute or claim. If a dispute arises under or in relation to this Contract, and the dispute cannot be resolved by the Owner's project manager and the Contractor's principal representative on Site within three (3) Working Days after the dispute arises, or the Owner's project manager is not authorized to resolve the dispute, then:

(a) the dispute will be referred to the Owner's Director of Facilities and the Contractor's project manager for resolution, and if they cannot resolve the dispute within three (3) Working Days after referral to them, then

(b) the dispute will be referred to a senior executive of the Owner designated by it and a senior executive of the Contractor designated by it, for resolution, and if they cannot resolve the dispute within three (3) Working Days after referral to them, then

(c) either party may take such further legal proceedings as they consider necessary for the resolution of the dispute either concurrently with or in lieu of the process outlined in GC8.2.4 to GC8.2.9.

GC8.2.4 is amended by revising the second line to read:

…the parties may request the Project Mediator…

GC8.2.6 is amended by revising the second line to read:

…either party may request referral of the dispute…

GC8.2.7 is deleted in its entirety and replaced as follows:

If a Notice in Writing is not given under paragraph 8.2.6 within the required time or the other party does not reply and agree to binding arbitration, the parties may refer the unresolved dispute to the courts or to any other form of dispute resolution, including arbitration, which they have agreed to use

GC8.2.9 is added as follows:

Where references are made in the Contract Documents to "the time of bid closing", it is intended by the parties that this shall mean the effective date of the contract.

GC9.1 PROTECTION OF WORK AND PROPERTY

GC9.1.1 is deleted in its entirety and replaced with the following:

The Contractor shall protect the Work, Products delivered to the Site and the Owner's property and property on or adjacent to the Site from theft and damage which may arise as the result of the Contractor's operations under the Contract, and shall be responsible for such theft and damage, except theft and damage which occurs as the result of:

.1 errors in the Contract Documents;

.2 acts or omissions by the Owner, other contractors, their agents and employees.

GC9.1.4 is amended by revising the first line to read:

Should damage to the Work, Products delivered to the Site, the Place of Work, the Owner's property …

GC9.1.5 is added as follows:

The Contractor is responsible for protection of the Work during shutdown, including shutdowns caused by strikes.

GC9.2 TOXIC AND HAZARDOUS SUBSTANCES

GC9.2.1 is deleted in its entirety and replaced with the following:

For the purposes of the Contract, the Owner shall be deemed to have control and management of the Place of the Work with respect to the condition of the Place of the Work prior to the commencement of the Work in relation to applicable Environmental Law and the presence of any Hazardous Substances.

GC9.2.2 is deleted in its entirety and replaced with the following:

Prior to the Contractor commencing the Work, the Owner shall:

.1 take reasonable steps to determine whether the Place of the Work contains any Hazardous Substances and, if so, whether the condition of the Place of the Work is in compliance with applicable Environmental Law; and

.2 provide the Consultant and the Contractor with a written list of any such Hazardous Substances that the Owner knows to exist on, and their locations within, the Place of the Work.

GC9.2.3 is deleted in its entirety and replaced with the following:

Unless the Contract expressly provides otherwise, the Owner shall be responsible for taking such steps as may be necessary, in accordance with applicable Environmental Law to dispose of, store or otherwise deal with Hazardous Substances so as to cause the Place of the Work to comply with the requirements of applicable Environmental Law before the Contractor commences the Work.

GC9.2.4 is deleted in its entirety and replaced with the following:

Except as previously disclosed in writing by the Owner or as otherwise known by the Contractor, if the Contractor:

.1 encounters Hazardous Substances at the Place of the Work; or

.2 has reasonable grounds to believe that Hazardous Substances are present at the Place of the Work which were not brought to the Place of the Work by the Contractor or

anyone for whom the Contractor is responsible or which were disclosed but have not been dealt with as required under paragraph 9.2.3, the Contractor shall:

.1 take reasonable steps, including stopping the Work, to ensure that no person's exposure to any Hazardous Substance at the Place of the Work exceeds any applicable levels contrary to the requirements of applicable Environmental Law, and

.2 immediately report the circumstances to the Consultant and the Owner by Notice in Writing.

GC9.2.5 is deleted in its entirety and replaced with the following:

If the Owner and the Contractor, acting reasonably, fail to agree on whether the condition of the Place of the Work is in compliance with applicable Environmental Law prior to the commencement of the Work or whether Hazardous Substances were brought onto the Place of the Work by the Contractor or anyone for whom the Contractor is responsible, or whether the Contractor or anyone for whom the Contractor is responsible caused the release of Hazardous Substances on the Place of the Work, the Owner shall retain an independent qualified expert to investigate and report on the subject of the dispute. Subject to paragraph 9.2.6, the Owner shall pay for the cost of the expert's investigation and report. The Owner will provide a copy of the expert's report to the Contractor.

GC9.2.6 is deleted in its entirety and replaced with the following:

If the expert's report under paragraph 9.2.5 determines that the Place of the Work was in compliance with applicable Environmental Law prior to the commencement of the Work or that Hazardous Substances were brought onto the Place of the Work by the Contractor or any for whom the Contractor is responsible, or that the Contractor or anyone for whom the Contractor is responsible caused the release of a Hazardous Substance on the Place of the Work, the Contractor shall pay for the cost of the expert's investigation and report.

GC9.2.7 is deleted in its entirety and replaced with the following:

If the Owner and the Contractor agree, or if the expert's report under paragraph 9.2.5 concludes, that the Contractor or anyone for whom the Contractor is responsible brought a Hazardous Substance onto, or caused the release of a Hazardous Substance on, the Place of the Work, the Contractor shall promptly at the Contractor's expense:

.1 take such steps as are necessary to safely and in compliance with Environmental Law remove, transport and dispose of such Hazardous Substance and to remediate the Place of the Work to such extent as is required to cause the Place of the Work to comply with all applicable Environmental Law;

.2 make good any damage to the Work, the Owner's property and any property affected by any migration of the Hazardous Substance as provided in paragraph 9.1.3 of GC9.1 – PROTECTION OF WORK AND PROPERTY;

.3 reimburse the Owner for all resultant costs and expenses reasonably incurred by the Owner; and

.4 indemnity the Owner as required by GC12.1 – INDEMNIFICATION

GC9.2.8 is deleted in its entirety and replaced with the following:

If the Owner and the Contractor agree, or if the expert's report under paragraph 9.2.5 concludes, that the Contractor or anyone for whom the Contractor is not responsible for bringing a Hazardous Substance onto, or for causing the release of a Hazardous Substance on, the Place of the Work, the Owner shall promptly at the Owner's expense:

.1 take such steps as are necessary to safely and in compliance with Environmental Law remove, transport and dispose of such Hazardous Substance and to remediate the Place of the Work to such extent as is required to cause the Place of the Work to comply with all applicable Environmental Law;

.2 reimburse the Contractor for all resultant costs and expenses reasonably incurred by the Contractor;

.3 extend the Contract time for such reasonable time as the Consultant may recommend in consultation with the Contractor and the expert referred to in paragraph 9.2.5 and reimburse the Contractor for reasonably cost incurred as a result of the delay, and

.4 indemnity the Contractor as required by GC12.1 – INDEMNIFICATION.

GC9.2.9 is amended by deleting the words "Part 8 of the General Conditions – Dispute Resolution" from the second line and replacing with "Part 8 – DISPUTE RESOLUTION".

GC9.2.10 is added as follows:

The Contractor shall, and shall ensure that anyone for whom the Contractor is responsible shall, at all times comply with all applicable Environmental Law and ensure that all Work is conducted in compliance with all applicable Environmental Law.

GC 9.3 ARTIFACTS AND FOSSILS

GC9.3.1 is deleted in its entirety and replaced with the following:

If the Contractor or anyone for whom the Contractor is responsible discovers fossils coins, articles of value or antiquity, structures and other remains or things of scientific, cultural or historical interest at the Place of the Work (in GC9.3 called, "Historical Items"), the Contractor shall immediately give Notice in Writing thereof to the Owner and the Consultant. As shall, as between the Owner and the Contractor, all Historical Items shall be, and shall be deemed to be, the absolute property of the Owner and the Contractor hereby irrevocably waives and disclaims any right, title or interest therein.

GC9.3.2 is deleted in its entirety and replaced with the following:

The Contractor shall take all reasonable precautions, and shall comply with all reasonable directions from the Consultant, to prevent removal or damage to Historical Items as identified in paragraph 9.3.1 or as otherwise known to be present on the Place of the Work.

GC9.3.3 is deleted in its entirety and replaced with the following:

The Consultant will investigate the impact on the Work of the discovery of any Historical Item identified in paragraph 9.3.1. If conditions are found that would cause an increase or decrease in the Contractor's cost or time to perform the Work, the Consultant, with the Owner's approval, will issue appropriate instructions for a change in the Work as provided in GC6.2 – CHANGE ORDER or GC6.3 – CHANGE DIRECTIVE.

GC9.4 CONSTRUCTION SAFETY

The above heading for GC9.4 is amended by adding "&WORKSAFEBC RULES" to the end.

GC9.4.2 is added as follows:

Unless otherwise specified in the Contract Documents or notified to the contrary by the Consultant, the Contractor is the "Prime Contractor" for the purpose of all Applicable Laws relative to occupational health and safety, including the discharge of all duties of the "Prime Contractor" under the Workers Compensation Act (British Columbia), notwithstanding that the Owner, the Consultant or an other contractor may provide from time to time some of the services normally provided by such "Prime Contractor". In this GC9.4 "Prime Contractor" means the contractor so defined under the Workers Compensation Act (British Columbia).

GC9.4.3 is added as follows

If the Contractor is the "Prime Contractor", the Contractor shall:

a. *Compliance with Law*: comply with all Applicable Laws, and all reasonable rules established by the Owner of which the Contractor is given timely notice through the Consultant, relative to occupational health and safety;

b. *Safety Programs*: initiate, maintain and supervise all safety programs and measures in connection with the performance of the Work, which program shall respond fully to the requirements of all Applicable Laws relative to occupational health and safety, all to the satisfaction of the Consultant;

c. *Site Meetings*: conduct regular safety meetings at the Site, no less frequently than weekly, record minutes of such meetings and give copies of such minutes to the Consultant on a weekly basis;

d. *Safety Equipment*: supply and maintain at the Site all safety equipment necessary to protect workers and others from accident or injury; and

e. *First Aid*: supply and maintain at the Site all personnel, equipment and supplies necessary for the provision of appropriate first-aid to any worker or person suffering an accident or injury at or about the Site, and establish an emergency procedure for prompt removal of any such person from the Site to a hospital, clinic or medical office for further treatment.

f. *Notice to Project:* prior to commencement of construction, the Contractor will:

(1) complete and file a "Notice of Project" with the WorkSafeBC in compliance with Section 20.2 of the WorkSafeBC Rules;

(2) post the Notice of Project at the Site, and

(3) provide a copy of the Notice of Project to the Owner and confirm in writing that the Notice of Project has been posted at the Site.

GC9.4.4 is added as follows

If, or for so long as the Contractor is not the "Prime Contractor", the Contractor shall:

a. *Compliance with Law*: comply with all Applicable Laws, and all reasonable rules established by the Owner of which the Contractor is given timely notice through the Consultant, relative to occupational health and safety;

b. *Compliance with Directions*: comply with all reasonable directions issued by the "Prime Contractor" regarding compliance with Applicable Laws, and rules established by the Owner, relative to occupational health and safety; and

c. *Site Safety Meetings*: attend all Site safety meetings convened by the "Prime Contractor".

GC9.4.5 is added as follows

Whether or not the Contractor is the "Prime Contractor", it shall:

a. *Reporting*: report immediately to the "Prime Contractor" (if not the Contractor) and the Consultant all accidents and injuries of any kind or severity occurring on or about the Site and involving employees of the Contractor or any Subcontractor, or any other person of which the Contractor is aware, and arising out of or in connection with the Work;

b. *Written Confirmation*: confirm in writing each report made under subparagraph (a); and

c. *Owner Policy*: respect and adhere to Owner's safety and training polices relative to the Site and the Work.

GC9.4.6 is added as follows

If the Consultant determines that the Contractor is not in compliance with its obligations as "Prime Contractor", if applicable, the Owner may, but is not obliged to, provide some or all of the services required to discharge those obligations. All costs incurred by the Owner in providing such services shall be paid by the Contractor to the Owner, and may be deducted from any amount then or thereafter becoming due to the Contractor under the Contract.

GC9.4.7 is added as follows:

The Contractor shall indemnify and save harmless the Owner from any and all damages, liabilities, cost, fines, penalties, fees and expenses whatsoever including, without limitation, legal fees, charges and disbursements as between a solicitor and his own client, related to or arising out of the assignment to the Contractor, and the Contractor's assumption, of the

responsibilities, obligations and liabilities of the Prime Contractor under the WorkSafeBC Rules with respect to the place of the Work.

GC9.4.8 is added as follows:

The Contractor agrees that it shall at its own expense procure and carry or cause to be procured and carried and paid for, full WorkSafeBC coverage for itself and all workers, employees, servants and others engaged in or upon any work or service which is the subject of this Contract.

GC9.4.9 is added as follows:

The Contractor agrees that the Owner has the unfettered right to set off the amount of the unpaid premiums and assessments for such WorkSafeBC coverage against any monies owing by the Owner to the Contractor. The Owner shall have the right to withhold payment under this Contract until the WorkSafeBC premiums, assessments or penalties in respect of work done or service performed in fulfilling this Contract had been paid in full.

GC9.4.10 is added as follows:

Within ten (10) Business Days of the Owner delivering the Notice of Award to the Contractor, the Contractor will provide the Owner with the Contractor's and all Subcontractor's WorkSafeBC registration numbers.

GC9.4.11 is added as follows:

Within ten (10) Working Days of the Owner delivering the Notice of Award to the Contractor, and concurrently with making any application for payment under this Contract, the Contractor will provide the Owner with written confirmation that the Contractor and all Subcontractors are registered in good standing with WorkSafeBC and that all assessments have been paid to date of the Notice of Award or date of application for payment, as applicable.

GC9.4.12 is added as follows:

The Contractor may or may not have received, as part of the Contract Documents, a "Pre-Contract Hazard Assessment" prepared by or for the Owner pursuant to the Owner's statutory obligations under the WorkSafeBC Rules (Section 119 of the Act) as an "owner of a workplace". Despite the Owner's statutory obligations, the Contractor now acknowledges and agrees that the Contractor may not rely on the "Pre-Contract Hazard Assessment" and now agrees to assume by the terms of this Contract full responsibility for carrying out the Owner's obligations under Section 119 of the *Workers' Compensation Act*, including without limitation and by way of example only, conducting all due diligence inquiries of all applicable Owner staff and departments in order to ascertain what, if any, information is known or has been recorded by Owner staff about the Site that is necessary to identify and eliminate or control hazards to the health or safety of persons at the Site. The Owner now agrees to make all reasonable efforts to assist the Contractor in obtaining timely access to Owner staff and Owner records for this purpose. Within ten (10) Working Days of the Owner delivering the Notice of Award to the Contractor, the Contractor will complete such due diligence inquiries and must complete and deliver written confirmation, in the form of Schedule 9, Contractor's Pre-Contract Hazard

Assessment, to the Consultant prior to the Owner being obligated to issue the Notice to Proceed.

GC9.4.13 is added as follows:

The Contractor will indemnify the Owner and hold harmless the Owner from all manner of claims, demands, costs, losses, penalties and proceedings arising out of or in any way related to:

.1 unpaid WorkSafeBC assessments of the Contractor or any other employer for whom the Contractor is responsible under this Contract;

.2 the acts or omissions of any person engaged directly or indirectly by the Contractor in the performance of this Contract, or for whom the Contractor is liable pursuant to the Contractor's obligations as the Prime Contractor, and which acts or omissions are or are alleged by WorkSafeBC to constitute a breach of the WorkSafeBC Rules or other failure to observe safety rules, regulations and practices of WorkSafeBC, including any and all fines and penalties levied by WorkSafeBC; or

.3 any breach of the Contractor's obligations under Clause GC9.1.

GC9.4.14 is added as follows:

The Contractor agrees to retain a full-time construction safety officer for projects governed by Section 1.8 and Sub-section 1.10.5 of the Vancouver Building By-law. The construction safety officer shall bear written proof of qualification satisfactory to the City of Vancouver's Director of Permits and Licenses.

GC9.5 MOULD

GC9.5.1 is deleted in its entirety and replaced with the following:

If the Contractor or the Owner observers or reasonably suspects the presence of mould of the nature and quantity at the Place of the Work such that special handling and precautions are required under Environmental Law or that otherwise may reasonably present a hazard to the health and safety of persons, the remediation of which has not been separately arranged by the Owner or is not expressly part of the Work,

.1 the observing party shall promptly report the circumstances to the other party by Notice in Writing;

.2 the Contractor shall promptly take all reasonable steps, including stopping all or such portions of the Work as may be necessary to ensure that no person suffers injury, sickness or death and that no property is damaged as a result of exposure to or the presence of the mould; and

.3 if the Owner and the Contractor do not agree on whether any mould discovered is of the nature and quantity such that special handling and precautions are required under Environmental Law or whether such mould may otherwise reasonably present a hazard to the health and safety of persons or with respect to what steps are appropriate to be

taken to deal with the mould, or as to the cause of the presence of the mould, the Owner shall retain an independent qualified expert to investigate and report on the subject of the dispute. Subject to paragraph 9.5.2, the Owner shall pay for the cost of the expert's investigation and report. The Owner will provide a copy of the expert's report to the Contractor.

GC9.5.2 is deleted in its entirety and replaced with the following:

If the expert's report under paragraph 9.5.1.3 determines that the mould does not require special handling and precautions in compliance with Environmental Law or does not otherwise reasonably present a hazard to the health and safety of persons, the Contractor will pay for the cost of the expert's investigation and report. If the expert's report under paragraph 9.5.1.3 determines that the mould was caused as the result of the acts or omissions of the Contractor or anyone for whom the Contractor is responsible, the Contractor shall promptly, at the Contractor's expense:

.1 take such steps as are necessary to safely and in compliance with Environmental Law remove, transport and dispose of such mould and to remediate the Place of the Work to such extent as is required to cause the Place of the Work to comply with all applicable Environmental Law;

.2 make good any damage to the Work, the Owner's property and any property affected by the mould as provided in paragraph 9.1.3 of GC9.1 – PROTECTION OF WORK AND PROPERTY;

.3 reimburse the Owner for all resultant costs and expenses reasonably incurred by the Owner; and

.4 indemnify the Owner as required by GC12.1 – INDEMNIFICATION.

GC9.5.3 is deleted in its entirety and replaced with the following:

If the Owner and the Contractor agree, or if the expert's report under paragraph 9.5.1.3 concludes, that the presence of mould on the Place of the Work requires special handling or precautions under Environmental Law or otherwise presents a hazard to the health or safety of persons, and that the Contractor or anyone for whom the Contractor is responsible is not responsible for the presence of such mould, the Owner shall promptly at the Owner's expense:

.1 take such steps as are necessary to safely and in compliance with Environmental Law remove, transport and dispose of such mould and to remediate the Place of the Work to such extent as is required to cause the Place of the Work to comply with all applicable Environmental Law;

.2 reimburse the Contractor for the cost of taking the steps under paragraph 9.5.1.2 and making good any damage to the Work as provided in paragraph 9.1.4 of GC9.1 - PROTECTION OF WORK AND PROPERTY; and

.3 extend the Contract Time for such reasonable time as the Consultant may recommend in consultation with the Contractor and the expert referred to in paragraph 9.5.1.3 and reimburse the Contractor for reasonable costs incurred as a result of the delay, and

GC10.1 TAXES AND DUTIES

GC10.1.1 is deleted in its entirety and replaced as follows:

The Contractor shall allow for the payment by the Contractor of all federal, provincial and municipal taxes, rates, levies, assessments and duties, both refundable and non-refundable, and all deposits, (temporary crossings, excavations, etc.). The Contractor agrees that the Owner shall not be liable for any of the said items and agrees to indemnify and save harmless at all times the Owner from and against all claims which may be made with respect thereto. The Owner will pay the Contractor the amount of the Value Added Taxes as indicated in ARTICLE A-4 CONTRACT PRICE of the AGREEMENT but its cost shall be excluded from the Contract Price.

GC10.1.2 is amended by revising the first line to read:

…in such included taxes, duties and rebates…

GC10.1.3 is added as follows:

Where an exemption or recovery of government sales taxes, customs duties or excise taxes is applicable to the Contract, the Contractor shall submit for the Owner's review the exemption or recovery application and the supporting invoices of the actual quantities of materials incorporated in the Work prior to applying for the rebate. The Owner will then issue a certificate verifying the application. The Contractor acknowledges its submission of its Tender Form and agreement to the Contract Price on the basis that the Contractor will be entitled to all such rebates.

GC10.2 LAWS, NOTICES, PERMITS AND FEES

GC10.2.2 is deleted in its entirety and replaced as follows:

The Contractor shall, except as set out below in this GC10.2.2 and unless otherwise specified in the Contract Documents, obtain and all permits, licences, and certificates and pay all fees required for the performance of the Work, and obtain all necessary access and storage rights for areas outside of the Site (including without limitation and by way of example only, parking for its workers, swing arc of any construction crane required for the Work, or storage of materials) but this shall not include the development permit and building permit which have been obtained by the Consultant, paid for by the Owner, and issued to the Owner, nor shall it include the obligation to obtain easements or other access rights over the actual Site.

GC10.2.3 deleted in its entirety and replaced as follows:

The Contractor shall be responsible for the procurement of permits, licences, inspections, and certificates, which are necessary for the performance of the Work and customarily obtained by contractors in the jurisdiction of the Place of the Work after the issuance of the building permit The Contract Price includes the cost of all permits (except building and development permits but including occupancy permits), licences, inspections and certificates and their procurement. The Contractor will arrange for all inspections and testing required by such permits. The Contractor shall provide to the Consultant copies of all permits and inspection reports from the various authorities as soon as they are received.

GC10.2.5 is amended by revising the first sentence to read:

The Contractor shall be responsible to provide reasonable verification that the Contract Documents …

GC10.4 WORKERS' COMPENSATION

GC10.4 is deleted in its entirety.

PART 11 INSURANCE AND CONTRACT SECURITY

GC11.1 INSURANCE (including the heading) is deleted in its entirety and replaced as follows:

GC11.1 GENERAL INSURANCE REQUIREMENTS

11.1.1 The Contractor and Subcontractors shall be required to file with the Owner within ten (10) Working Days of issuance of the Notice of Award, a Certificate of Insurance, and where required by the Owner's Director of Risk Management, certified copies of all insurance policies and endorsements evidencing the placement and endorsement of insurance in accordance with this GC11.

11.1.2 The Contractor and Subcontractor shall be required to file evidence of renewal of the insurance policies required under this GC11 with the owner at least fifteen (15) calendar days prior to their expiry.

11.1.3 In addition to the specific requirements below, all policies of insurance shall:

.1 be endorsed so as to provide for thirty (30) calendar days' prior notice to the Owner of cancellation, lapse or material change;

.2 if property insurance (as opposed to liability) insurance, contain a waiver of subrogation in favour of the Owner Insurance Group (as defined below) and all employees and agents of the Owner Insurance Group;

.3 specifically name the City of Vancouver and the Consultant as additional insureds (collectively referred to in this GC11 as the "Owner Insurance Group");

.4 be issued by a company or companies authorized to issue insurance policies in British Columbia; and

.5 be issued on a policy form acceptable to the Owner's Director of Risk Management.

11.1.4 Unless otherwise specified, insurance shall be continuously maintained from no later than the ten (10) Working Days after issuance of the Notice of Award through to the date on which both the Certificate of Completion has been issued for the Work and an Occupancy Permit, if required, has been issued for the Place of the Work.

GC11.2 SPECIFIC INSURANCE COVERAGE is added as follows:

11.2.1 Without restricting the generality of GC12.1 – INDEMNIFICATION, and despite the limits of liability set out in GC12.1 – INDEMNIFICATION, the Contractor shall provide at the Contractor's expense the following types of insurance:

(a) **Wrap Up Liability Insurance** protecting the Owner Insurance Group, the Contractor, and their respective subcontractors, agents and employees against damages arising from personal injury (including death) and claims for property damage which may arise out of the operations of the Contractor, its Subcontractors, or their respective agents or employees in connection with the Work.

The policy shall be placed prior to commencement of the Work and shall specifically cover liability arising out of the performance of this Contract and shall cover all liability assumed by the Contractor under any contract or agreement, including the indemnity provisions of this Contract. The policy shall be maintained continuously throughout the entire term of the contract through to the date on which both the Certificate of Completion has been issued for the Work and an Occupancy Permit, if required, has been issued for the Place of the Work, and thereafter, in the case of completed operations coverage for a further period of twenty-four (24) months and shall contain the following extensions of coverage:

.1 Broadform Property Damage and completed Operations;

.2 Personal Injury;

.3 Blanket Contractual Liability;

.4 Cross Liability and Severability of Interests Clause;

.5 Contingent Employer's Liability; and

.6 Non-owned Auto Liability,

And where such further risk exists, following extensions of coverage shall be included:

.1 Shoring, blasting, excavating, underpinning, demolition, removal, pile-driving and grading, as applicable;

.2 Hoist liability;

.3 Operation of attached machinery; and

.4 Contractor's pollution liability including coverage for asbestos, mould or other hazardous substances.

This insurance shall be for an amount of not less than five million dollars ($5,000,000) inclusive per occurrence, and shall include a standard form of

severability of interests and cross-liability clause. The deductible per occurrence shall not exceed ten thousand dollars ($10,000) and the Contractor shall be liable for all deductible amounts.

(b) **Property and Boiler Insurance**

(1) ***All-Risks Course of Construction Property Insurance*** in the joint names of the Contractor and the Owner Insurance Group, covering the Work and all property of every description to be used in the performance of the Work. This insurance shall be primary, and be of an amount of not less than the sum of the Contract Price. The deductible per occurrence shall not exceed ten thousand dollars ($10,000).

(2) ***Boiler Insurance*** insuring the interests of the Contractor and the Owner Insurance Group for not less than the replacement value of boilers and pressure vessels forming part of the Work.

(3) ***Occupancy by Owner:*** Where the Owner wishes to use or occupy part or all of the Work prior to Total Performance of the Work, it shall give written notice to the Contractor pursuant to GC13 - Occupancy and if requested the Contractor shall promptly notify the Owner in writing of the additional premium cost, if any, to maintain property and boiler insurance, which shall be at the Owner's expense.

If, because of such use or occupancy, the Contractor is not requested to or is requested to but is unable to provide coverage, the Owner upon written notice from the Contractor and prior to such use or occupancy shall provide, maintain and pay for property and boiler insurance insuring the full value of the Work, as in subparagraphs (1) and (2), including coverage for such use or occupancy and shall provide the Contractor with proof of such insurance. The Contractor shall refund to the Owner the unearned premiums applicable to the Contractor's polices upon termination of coverage.

(4) ***Owner to be Loss Payee***: The policy shall provide that, in the event of loss or damage, payment shall be made to the Owner. Loss or damage shall not affect the rights and obligations of either party under the Contract except that the Contractor shall be entitled to such reasonable extension of the Contract Time relative to the extent of the loss or damage as the Consultant may decide in consultation with the Contractor.

(5) ***Payment for Loss or Damage***. The Contractor shall be entitled to receive from the Owner, in addition to the amount due under the Contract, the amount at which the Owner's interest in restoration of the Work has been appraised, such amount to be paid as the restoration of the Work proceeds and in accordance with the requirements of GC5.3 - APPLICATIONS FOR PAYMENT and GC5.4 – PROGRESS PAYMENTS. In addition the Contractor shall be entitled to receive from the

payments made by the insurer the amount of the Contractor's interest in the restoration of the Work.

(6) ***Deductibles:*** The Contractor shall be responsible for payment of all deductible amounts.

(7) ***Loss Caused by Other Contractor:*** In the event of loss or damage to the Work arising from the work or act of the Owner or an other Contractor, then the Owner, shall pay the Contractor the cost of restoring the Work as the restoration of the Work proceeds and in accordance with the requirements of GC5.3 - APPLICATIONS FOR PAYMENT and GC5.4 – PROGRESS PAYMENTS.

(c) **All Risk Contractor's Equipment Insurance** covering all equipment owned or rented by the Contractor and its agents or employees against all risks of loss or damage with coverage sufficient to allow for immediate replacement.

(d) **Automobile Liability Insurance** to be carried at all times on all licensed vehicles owned by or leased to the Contractor, protecting against damages arising from bodily injury (including death), and from claims for property damage arising from the operations of the Contractor, its agents or employees. This insurance shall be for a minimum amount of five million dollars ($5,000,000) inclusive per accident.

Where, in the Owner's opinion, marine risk exists, the Contractor is also required to carry the following coverage:

(e) **Hull & Machinery Insurance** in the amount not less than the full value of the vessel, barge or equipment with a deductible of no more than ten thousand dollars ($10,000) protecting the Contractor and its Subcontractors from all claims for loss or damage to any vessel, barge or equipment arising out of ownership or operation of the Contractor or its Subcontractors.

(f) **Protection & Indemnity Insurance** including Owner's legal liability insurance to cover all claims for bodily injury including death, property damage or loss arising out of the activities conducted by the Contractor, Subcontractor, or their respective employees or agents in an amount no less than five million dollars ($5,000,000) per occurrence and a deductible of not more than ten thousand dollars ($10,000).

GC11.3 FAILURE TO INSURE is added as follows:

11.3.1 If the Contractor fails to provide evidence of the required insurance under this GC11 as and when required by the Contract Documents, then the Owner shall have the right to do so and then give evidence of same to the Contractor and Consultant and the cost of doing so will then be payable by the Contractor to the Owner or at the Owner's option may be deducted from the Contract Price by Change Directive.

GC11.2 CONTRACT SECURITY

GC11.2 (including the heading) is deleted in its entirety and renumbered as follows:

GC11.4 CONTRACT SECURITY

11.4.1 The Contractor shall pay for and deliver to the Owner, within ten (10) working Days of issuance of the Notice of Award, a performance bond and a labour and material payment bond, which shall each be for fifty percent (50%) of the Contract Price and shall include, but shall not be limited to:

.1 payment of any Consultant's and legal expenses incurred by the Owner in determining the extent of the Work executed and Work still to be executed, and any additional Work required as a result of the interruption of the Work,

.2 payment of additional expenses caused to the Owner for watchmen's services, light, heat, power, etc. incurred to the Owner during the period between the default of the original Contract and the commencement of the new Contract,

.3 extended guarantee periods, corrections after final payment, and warranty obligations, and

.4 coverage of the faithful performance of all terms and conditions of the Contract Documents including all additions and revisions thereto permitted under the Contract.

11.4.2 Such bonds shall be issued by a duly licensed surety company authorized to transact the business of a surety in British Columbia and the bonds shall be maintained in good standing until the issuance of the Final Certificate for Payment and the expiry of the warranty. Subject to the requirements of this GC11.4, the bonds shall be in accordance with the latest edition of the CCDC approved bond forms.

11.4.3 The Contractor will give the Owner Notice in Writing of any material change in the surety within five (5) calendar days of the occurrence.

GC12.1 INDEMNIFICATION

GC12.1.1 is deleted in its entirety and replaced as follows:

The Contractor now indemnifies and shall defend, indemnify and hold harmless the Owner, the Consultant, the project manager and their respective directors, officers, employees, agents, consultants or advisors (collectively, the "Indemnitees") from and against all claims, demands, losses, costs, damages, actions, suits or proceedings ("Liability"), whether founded in equity or at law including contract, tort or statute and howsoever caused, arising from or in any way connected with any wrongful or negligent act, error or omission of, or defective goods supplied by, the Contractor, Subcontractors, Suppliers or their respective employees or agents when attending the Site or in the performance of the Work, whether or not any one or more of the Indemnitees are contributorily negligent. Expressly excluded from this indemnity is any Liability caused solely and directly by the wrongful act or negligence of an Indemnitee.

GC12.1.2 is deleted in its entirety and replaced as follows:

The obligation of the Contractor to indemnity hereunder shall be limited to the greater of the Contract Price or five million dollars ($5,000,000) but in no event shall the sum be greater than twenty million dollars ($20,000,000). However, despite any other term of this Contract, in no event will this limitation apply in any way to reduce or limit the indemnity or recovery by either party under any insurance policy or bond required by the Contract Documents and in no event will this limit apply to the Contractor's or Owner's obligations to indemnify under GC9.2 – TOXIC AND HAZARDOUS SUBSTANCES, GC9.4 CONSTRUCTION SAFETY & WORKSAFE BC RULES, GC9.5 –MOULD and GC10.3 – PATENT FEES.

GC12.1.3 is deleted in its entirety and replaced as follows:

The obligation of the Contractor to indemnify hereunder shall be inclusive of interest and all legal costs.

GC12.1.4 is deleted in its entirety and replaced as follows:

The Owner and the Contractor shall indemnify and hold harmless the other from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings arising out of their obligations described in GC9.2 – TOXIC AND HAZARDOUS SUBSTANCES, GC9.4 CONSTRUCTION SAFETY & WORKSAFE BC RULES, GC9.5 –MOULD and GC10.3 – PATENT FEES

GC12.1.5 is deleted in its entirety.

GC12.1.6 is deleted in its entirety and replaced as follows:

In respect to any claim for indemnity or to be held harmless by the Owner or the Contractor:

.1 Notice in Writing of such claim shall be given within a reasonable time after the facts upon which such claim is based became known;

.2 should any party be required as a result of its obligation to indemnify another to pay or satisfy a final order, judgment or award made against the party entitled by this contract to be indemnified, then the indemnifying party upon assuming all liability for any costs that might result shall have the right to appeal in the name of the party against whom such final order or judgment has been made until such rights of appeal have been exhausted.

GC12.1.7 is added as follows:

GC12.1 - INDEMNIFICATION shall govern over the provisions of paragraph 1.3.1 of GC1.3 -RIGHTS AND REMEDIES.

GC12.2 WAIVER OF CLAIMS

GC12.2.1 is deleted in its entirety and replaced as follows:

Waiver of Claims by Owner: As of the date of the Final Certificate for Payment, the Owner expressly waives and releases the Contractor from all claims against the Contractor including

without limitation those that might arise from the negligence or breach of Contract by the Contractor except one or more of the following:

.1 those made in writing prior to the date of the Final Certificate for Payment and still unsettled;

.2 those arising from the provisions of GC12.1 - INDEMNIFICATION or GC12.3 - WARRANTY;

.3 those arising from the provisions of GC9.3 - TOXIC AND HAZARDOUS SUBSTANCES AND MATERIALS, GC9.4 CONSTRUCTION SAFETY & WORKSAFE BC RULES, GC9.5 –MOULD and GC10.3 – PATENT FEES and those arising from the Contractor bringing or introducing any toxic or hazardous substances and materials to the Place of the Work after the Contractor commences the Work; and

.4 those arising from the Contractor's actions, errors, omissions or negligence which result in delays or substantial defects or deficiencies in the Work. "Substantial defects or deficiencies" means those defects or deficiencies in the Work which affect the Work to such an extent or in such a manner that all or any part of the Work is unfit for the purpose intended by the Contract Documents.

GC12.2.2 is deleted in its entirety and replaced as follows:

Waiver of Claims by Contractor: As of the date of the final certificate for payment, the Contractor expressly waives and releases the Owner from all claims against the Owner including without limitation those that might arise from the negligence or breach of Contract by the Owner except:

.1 those made in writing prior to the Contractor's application for Final Payment and still unsettled; and

.2 those arising from the provisions of GC9.3 - TOXIC AND HAZARDOUS SUBSTANCES AND MATERIALS or GC10.3 - PATENT FEES.

GC12.2.3 is deleted in its entirety and replaced as follows:

GC12.2 - WAIVER OF CLAIMS shall govern over the provisions of paragraph 1.3.1 of GC1.3 - RIGHTS AND REMEDIES.

GC 12.2.4 is deleted in its entirety and replaced as follows:

The Owner waives and releases the Contractor from all claims referred to in paragraph 12.2.1.4 except claims for which Notice in Writing of claim has been received by the Contractor from the Owner within a period of six (6) years from the date of Substantial Performance of the Work.

GC12.2.5 is deleted in its entirety.

GC12.2.6 is deleted in its entirety.

GC12.2.7 is deleted in its entirety.

GC12.2.8 is deleted in its entirety.

GC12.2.9 is deleted in its entirety.

GC12.2.10 is deleted in its entirety.

GC12.3 WARRANTY

GC12.3.1 is deleted in its entirety and replaced as follows:

The Contractor shall perform the Work in a good and workmanlike manner.

GC12.3.2 is deleted in its entirety and replaced as follows:

The Contractor now warrants that the Work (and all Products) will be free from all defects arising from faulty construction, manufacturing, installation, materials, equipment or workmanship in any part of the Work (or Products) for a period of one (1) year commencing on the issuance of the Certificate of Completion for the Work and for any Work and Products warranted by a Subcontractor or Supplier for a period of longer than one (1) year after the issuance of the Certificate of Completion, the Contractor now warrants that it has fully and effectively assigned such warranty to the Owner and that the Owner may enforce same to the same extent and in the same manner as if the warranty had been issued directly to the Owner by that Subcontractor or Supplier.

GC12.3.3 is deleted in its entirety and replaced as follows:

For the purposes of this GC12.3, the phrase, "defects arising from faulty construction, manufacturing, installation, materials, equipment or workmanship in any part of the Work (or Products)"

(a) expressly excludes any and all defects arising from or contributed to by the acts or omissions of the Consultant in the design and specification of the Work as set out in the Drawings, Specifications, or other written instructions or directives issued by the Consultant under this Contract, but only to the extent of the Consultant's defective design or specification, and

(b) expressly includes all defects or deficiencies that arise even if the Work is carried out in a good and workmanlike manner.

GC12.3.4 is deleted in its entirety and replaced as follows:

During the warranty period, the Contractor will promptly repair and correct all defects at no cost to the Owner. If the Contractor fails to repair or correct any defect during the warranty period within ten (10) calendar days of written notice of its existence, the Owner may but is not obligated to make the repairs or corrections itself and the actual out-of-pocket costs of such repairs or corrections made by the Owner will be payable by the Contractor to the Owner within seven (7) calendar days of receiving an invoice from the Owner for same. In the event of an emergency where, in the opinion of the Owner, delay could cause serious loss or damage, or inconvenience to the public, the repairs or corrections may be made without prior notice being sent to the Contractor.

GC12.3.5 is deleted in its entirety and replaced as follows:

Where, pursuant to GC13.1 - Occupancy, the Owner commences the use of the Work and Products for their intended purposes prior to the issuance of the Certificate of Completion for the Work, the warranty period will be deemed to commence from the issuance date despite such prior use.

GC12.3.6 is deleted in its entirety and replaced as follows:

Issuance of the Certificate of Total Performance of the Work will not extinguish any of the Contractor's obligations under this Contract and the Contractor will remain liable to perform and complete all Work and carry out all obligations required under this Contract

GC13.1 OCCUPANCY

GC13.1.1 is added as follows:

The Owner reserves the right to take possession of and use any completed or partially completed portion of the Work, regardless of the time of completion of the Work, providing it does not interfere with the Contractor's Work determined by the Consultant.

GC13.1.2 is added as follows:

Such taking possession or use of such Work or part thereof as described in GC13.1.1 shall not be construed as final acceptance of the Work or any part thereof, or an acknowledgement of fulfillment of the Contract.

END OF SUPPLEMENTARY GENERAL CONDITIONS

SCHEDULE 2
LIST OF SPECIFICATIONS AND DRAWINGS

The following is the list of Specifications and Drawings referred to in Article A-3:

(To be Attached at Time of Contract Signing)

SCHEDULE 3
SCHEDULE OF QUANTITIES AND PRICES

The Contract Price referred to in Article A-4 of the Agreement includes the following:

TABLE A1: PRICING SUMMARY FOR 2012 EXPANSION

Item	Description	Price
1.	Mobilization	$
2.	For Connection to - 99 W 2nd Avenue	$
3.	For Connection to - 215 W 2nd Avenue	$
4.	For Connection to - 100 W 1st Avenue	$
5.	Other (including contingency allowances and any other work or costs not reflected in the items above but required to complete the Work covered by the Tender Documents)	$
	Tender Price	**$**

TABLE A2: PRICING SUMMARY FOR 2013 EXPANSION

Item	Description	Price – 3" Pipe Installation	Price – 4" Pipe Installation	Price – 5" Pipe Installation
1.	Mobilization	$	$	$
2.	For Connection to - 1618 Quebec Street	$	$	$
3.	For Connection to - 150 East 1st Avenue	$	$	$
4.	For Connection to - 97 East 2nd Avenue	$	$	$
5.	For Connection to - 2 West 1st Avenue	$	$	$
6.	Other (including contingency allowances and any other work or costs not reflected in the items above but required to complete the Work covered by the Tender Documents)	$	$	$
	Tender Price	**$**	$	$

TABLE A3: PRICING SUMMARY FOR 2014 EXPANSION

Item	Description	Price – 3" Pipe Installation	Price – 4" Pipe Installation	Price – 5" Pipe Installation
1.	Mobilization	$	$	$
2.	For Connection to - 111 East 1st Avenue	$	$	$
3.	For Connection to - 100 West 2nd Avenue	$	$	$
4.	For Connection to - 15 East 2nd Avenue	$	$	$
5.	For Connection to - 1650 Quebec Street	$	$	$
6.	Other (including contingency allowances and any other work or costs not reflected in the items above but required to complete the Work covered by the Tender Documents)	$	$	$
	Tender Price	**$**	**$**	**$**

TABLE A4: SUPPLY PRICING BREAKDOWN BY SIZE AND UNIT

(SUPPLY ONLY)

Item	Description	Size	Unit	Unit Addition	Unit Deletion
1	Type S01 - Linear Pipe (12 m sections)	0.5 inch	Nos		
2	Type S01 - Linear Pipe (12 m sections)	0.75 inch	Nos		
3	Type S01 - Linear Pipe (12 m sections)	1 inch	Nos		
4	Type S01 - Linear Pipe (12 m sections)	1.25 inch	Nos		
5	Type S01 - Linear Pipe (12 m sections)	1.5 inch	Nos		
6	Type S01 - Linear Pipe (12 m sections)	2 inch	Nos		
7	Type S01 - Linear Pipe (12 m sections)	2.5 inch	Nos		

Item	Description	Size	Unit	Unit Addition	Unit Deletion
8	Type S01 - Linear Pipe (12 m sections)	3 inch	Nos		
9	Type S01 - Linear Pipe (12 m sections)	4 inch	Nos		
10	Type S01 - Linear Pipe (12 m sections)	6 inch	Nos		
11	Type S01 - Linear Pipe (12 m sections)	8 inch	Nos		
12	Type S01 - Socket Elbow	0.5 inch	Nos		
13	Type S01 - Socket Elbow	0.75 inch	Nos		
14	Type S01 - Socket Elbow	1 inch	Nos		
15	Type S01 - Socket Elbow	1.25 inch	Nos		
16	Type S01 - Socket Elbow	1.5 inch	Nos		
17	Type S01 - Socket Elbow	2 inch	Nos		
18	Type S01 - Long Radius Elbow	2.5 inch	Nos		
19	Type S01 - Long Radius Elbow	3 inch	Nos		
20	Type S01 - Long Radius Elbow	4 inch	Nos		
21	Type S01 - Long Radius Elbow	6 inch	Nos		
22	Type S01 - Long Radius Elbow	8 inch	Nos		
23	Type S01 - Equal Tee	0.5 inch	Nos		
24	Type S01 - Equal Tee	0.75 inch	Nos		
25	Type S01 - Equal Tee	1 inch	Nos		
26	Type S01 - Equal Tee	1.25 inch	Nos		

Item	Description	Size	Unit	Unit Addition	Unit Deletion
27	Type S01 - Equal Tee	1.5 inch	Nos		
28	Type S01 - Equal Tee	2 inch	Nos		
29	Type S01 - Equal Tee	2.5 inch	Nos		
30	Type S01 - Equal Tee	3 inch	Nos		
31	Type S01 - Equal Tee	4 inch	Nos		
32	Type S01 - Equal Tee	6 inch	Nos		
33	Type S01 - Equal Tee	8 inch	Nos		
34	Type S01 - Eccentric Reducer	2 inch	Nos		
35	Type S01 - Eccentric Reducer	2.5 inch	Nos		
36	Type S01 - Eccentric Reducer	3 inch	Nos		
37	Type S01 - Eccentric Reducer	4 inch	Nos		
38	Type S01 - Eccentric Reducer	6 inch	Nos		
39	Type S01 - Eccentric Reducer	8 inch	Nos		
40	Type S01 - Weld Neck Flange (ANSI 150)	2.5 inch	Nos		
41	Type S01 - Weld Neck Flange (ANSI 150)	3 inch	Nos		
42	Type S01 - Weld Neck Flange (ANSI 150)	4 inch	Nos		
43	Type S01 - Weld Neck Flange (ANSI 150)	6 inch	Nos		
44	Type S01 - Weld Neck Flange (ANSI 150)	8 inch	Nos		
45	Type BV-01 (Ball Valve)	0.5 inch	Nos		

Item	Description	Size	Unit	Unit Addition	Unit Deletion
46	Type BV-01 (Ball Valve)	0.75 inch	Nos		
47	Type BV-01 (Ball Valve)	1 inch	Nos		
48	Type BV-01 (Ball Valve)	1.5 inch	Nos		
49	Type BV-01 (Ball Valve)	2 inch	Nos		
50	Type BV-06 (Ball Valve)	1.25 inch	Nos		
51	Type BV-06 (Ball Valve)	2 inch	Nos		
52	Type BV-06 (Ball Valve)	2.5 inch	Nos		
53	Type BV-06 (Ball Valve)	3 inch	Nos		
54	Type BV-06 (Ball Valve)	4 inch	Nos		
55	Type BV-06 (Ball Valve)	6 inch	Nos		
56	Type BV-06 (Ball Valve)	8 inch	Nos		

TABLE A5: INSTALLATION AND TESTING PRICING BREAKDOWN BY SIZE AND UNIT

(including labour, materials tools and 20% radiography)

Item	Description	Size	Unit	Unit Addition	Unit Deletion
1	Threaded Joint	0.5 inch	Nos		
2	Threaded Joint	0.75 inch	Nos		
3	Socket Weld	1 inch	Nos		

4	Socket Weld	1.25 inch	Nos		
5	Socket Weld	1.5 inch	Nos		
6	Socket Weld	2 inch	Nos		
7	Butt Weld	2.5 inch	Nos		
8	Butt Weld	3 inch	Nos		
9	Butt Weld	4 inch	Nos		
10	Butt Weld	6 inch	Nos		
11	Butt Weld	8 inch	Nos		
12	Type S04 - Joint insulation	1.25 inch	Nos		
13	Type S04 - Joint insulation	1.5 inch	Nos		
14	Type S04 - Joint insulation	2 inch	Nos		
15	Type S04 - Joint insulation	2.5 inch	Nos		
16	Type S04 - Joint insulation	3 inch	Nos		
17	Type S04 - Joint insulation	4 inch	Nos		
18	Type S04 - Joint insulation	6 inch	Nos		
19	Type S04 - Joint insulation	8 inch	Nos		

TABLE A6: SUPPY AND INSTALLATION PRICING BREAKDOWN BY SIZE AND UNIT

(including labor, materials, equipment and tools)

Item	Description	Size	Unit	Unit Addition	Unit Deletion

Item	Description	Size	Unit	Unit Addition	Unit Deletion
1	Insulation and jacketing (indoor)	1.25 inch	metre		
2	Insulation and jacketing (indoor)	1.5 inch	metre		
3	Insulation and jacketing (indoor)	2 inch	metre		
4	Insulation and jacketing (indoor)	2.5 inch	metre		
5	Insulation and jacketing (indoor)	3 inch	metre		
6	Insulation and jacketing (indoor)	4 inch	metre		
7	Insulation and jacketing (indoor)	6 inch	metre		
8	Insulation and jacketing (indoor)	8 inch	metre		
9	Insulation and jacketing (outdoor)	1.25 inch	metre		
10	Insulation and jacketing (outdoor)	1.5 inch	metre		
11	Insulation and jacketing (outdoor)	2 inch	metre		
12	Insulation and jacketing (outdoor)	2.5 inch	metre		
13	Insulation and jacketing (outdoor)	3 inch	metre		
14	Insulation and jacketing (outdoor)	4 inch	metre		
15	Insulation and jacketing (outdoor)	6 inch	metre		
16	Insulation and jacketing (outdoor)	8 inch	metre		
17	Type S01 - Weldolet	0.5 inch	Nos		
18	Type S01 - Weldolet	0.75 inch	Nos		
19	Type S01 - Weldolet	1 inch	Nos		

Item	Description	Size	Unit	Unit Addition	Unit Deletion
20	Type S01 - Weldolet	2 inch	Nos		
21	Type S01 - Threadolet	0.5 inch	Nos		
22	Type S01 - Threadolet	0.75 inch	Nos		
23	Temperature Indicator (Dial Guage)	4 inch	Nos		
24	Pressure Indicator (Dial Gauge)	4 inch	Nos		
25	Relief Valve	0.75 inch	Nos		
26	Automatic Air Vent		Nos		
27	Control Cable		metre		
28	Power cable		metre		

TABLE A7: PRICING BREAKDOWN OF LABOR BY HOURS

Item	Description	Hourly Rate	Overtime Rate
1.	Project Manager	$	$
2.	Superintendent	$	$
3.	Pipefitter	$	$
4.	Electrician	$	$
5.	Certified Welder	$	$
6.	Skilled Labor	$	$
7.	Semi-Skilled Labor	$	$

SCHEDULE 4
LIST OF SUBCONTRACTORS AND SUPPLIERS

The following are the Subcontractors that the Contractor will use for the Work:

Division/Section Of Work	Subcontractor	Address

The following are the Suppliers and Manufacturers that the Contractor will use for the Work:

Item	Supplier/Manufacturer	Address

SCHEDULE 5
PROJECT SCHEDULE

(To be Attached at Time of Contract Signing)

SCHEDULE 6
PERFORMANCE AND LABOUR AND MATERIAL PAYMENT BONDS

(To be Attached at Time of Contract Signing)

SCHEDULE 7
INSURANCE CERTIFICATE

(To be Attached at Time of Contract Signing)

SCHEDULE 8
OWNER PRE-CONTRACT HAZARD ASSESSMENT FORM

OWNERS LIST OF KNOWN WORKPLACE HAZARDS

(ATTACHED)

SCHEDULE 8
OWNER PRE-CONTRACT HAZARD ASSESSMENT FORM

OWNERS LIST OF KNOWN WORKPLACE HAZARDS

Contract Title CONTRACTOR FOR EXPANSION OF ENERGY TRANSFER STATIONS AND BURIED DISTRICT HEATING PIPING AT THE NEIGHBOURHOOD ENERGY UTILITY

Project Manager (City employee) Kieran McConnell

Contract Name and No. (if known) ITT No. PS20120191

PURPOSE

This document shall be completed by the Owner's designated project manager, who shall list all the known worksite hazards and all the **existing** work process hazards that will be associated with the upcoming contract. The completed document shall then be provided to all potential contractors, as part of the tender package, so the project can be bid appropriately based on the known worksite hazards.

DEFINITIONS

"Project Manager" means the City employee designated to be the liaison with the contractor for the purpose of managing, overseeing, coordinating or in any other way administering the contract.

INSTRUCTIONS FOR COMPLETION

The document must be completed in full. Choices for each entry are:

Yes (Y) the known worksite hazard or existing work process hazard does exist

No (N) the known worksite hazard or existing work process hazard does not exist*, or, a third party (environmental consultant) will address the issue (usually for a hazardous materials assessment)

* based on reasonable estimation from all input by persons with expertise or relevant knowledge and understanding

Not Applicable (NA) the worksite hazard or existing work process is not applicable for this contract type

INFORMATION FROM HAZARDOUS MATERIALS ASSESSMENTS PROVIDED BY A THIRD PARTY

A hazardous materials assessment may be completed prior to the Project Manager completing the Owners List of Known Workplace Hazards. Any such assessment should be referenced by the Project Manager in this document and provided with the tender package. Hazardous materials may include asbestos, lead, crystalline silica, ammonia, PCB's, CFC's, moulds, mercury, ozone depleting substances (ODS), radioactive substances.

ASSISTANCE IN COMPLETING THIS DOCUMENT

If you have questions while completing this document, or are unsure if the listed hazards apply, please seek assistance from Health and Safety (604.871.6078 or healthandsafety@vancouver.ca).

Hazard or Issue	Project Manager
	Yes (Y), No (N) or Not Applicable (NA)
1. **Asbestos-containing Materials**. Disturbance or penetrations of flooring, walls, ceiling tiles, pipe lagging, ac pipe, transite siding, particularly in older facilities; e.g., furniture/fixture installation, carpeting/flooring services and boiler repair/tune-up services	
(a) Asbestos containing materials (ACM) will be encountered	N
(b) A hazardous materials assessment for asbestos is provided in the tender package	N
(c) A hazardous materials assessment for asbestos is the responsibility of the contractor	N
2. **Lead-containing Materials**. Disturbance of lead-based paint, particularly in older facilities. Also present in certain electrical circuitry and metal alloys; e.g., overhead bridge crane maintenance/repair, high-voltage cable splicing services, boiler repair/tune-up services, fixture installation services, and chiller maintenance/repair services	
(a) Inorganic lead-containing materials may be encountered	N
(b) A hazardous materials assessment for lead is provided in the tender package	N
(c) A hazardous materials assessment for lead is the responsibility of the contractor	N
3. **Other hazardous materials.** May include ammonia, pcb's, cfc's, moulds, mercury, ozone depleting substances (ods), radioactive substances, sewage, unknown contaminated materials, other (list other here) _____ _____ _____	

Hazard or Issue	Project Manager
	Yes (Y), No (N) or Not Applicable (NA)
(a) A hazardous materials assessment for ammonia is provided in the tender package	N
(b) a hazardous materials assessment for (list the specific hazardous material) will be provided in the tender package;	N
(c) a hazardous materials assessment for (list the specific hazardous materials) will be the contractors responsibility	N
4. **Confined Spaces**. Working in vaults, chambers, pits, tanks, etc.; e.g., construction, inspection and testing services, water/fuel storage tank clean-out services, and utility corrosion inspection services:	Y - Manholes
(a) a hazard assessment (for entry and inspection only) from the City of Vancouver is provided in the tender package;	N
(b) the City of Vancouver shall provide procedures to isolate adjacent piping, or to lock out equipment (complicated systems only);	Y
(c) the contractor shall be responsible for isolation and lockout procedures.	N
5. **Lock Out.** Industrial equipment maintenance, power machinery repair services, pump maintenance/repair services, mechanical refrigeration systems, elevator repair, overhead bridge crane maintenance/repair services, cathodic protection services, hydraulic test systems repair/service, and air compressor rebuilding services:	
(a) lockout will be required to isolate or prevent the unexpected release of energy (electrical, mechanical, hydraulic, chemical, thermal, kinetic, gravitational, pneumatic);	Y
(b) work will be performed on or near energized equipment, lines, or circuits	Y
If yes to (a) or (b) describe: The work involves connecting to existing pressurized hot water piping (65C at 40 PSI). Neighbourhood Energy Utility lockout procedures will apply, however these procedures require the Contractor to provide their own locks in addition to NEU locks.	
6. **Fall Protection.** Tree pruning, window and ledge cleaning, window replacement, overhead bridge crane maintenance/repair services, roll-up door replacement, tent installation, awning/canopy installation, overhead air exchange installation, construction inspection and testing services	
(a) Workers will be exposed to a potential fall in excess of 3 m (10 feet), or to a fall of less than 3 m which would likely result in a serious injury (ex. impalement on rebar)	N
(b) Scaffolding or ladders will be required to be secured to a building or structure	N

Hazard or Issue	Project Manager
	Yes (Y), No (N) or Not Applicable (NA)
7. **Overhead and Underground Utilities.** Tree pruning services, tree removal, utility relocation or replacement, underground utility identification (digging with powered equipment), concrete sawing services, pole painting	
(a) There will be electrical hazards associated with overhead power lines such as limits of approach and contact	N
(b) Necessary assurances (in writing) have (or will be) obtained by the City, through the utility company, for any work where minimum limits of approach cannot be maintained (provide documentation and review at pre job meeting with the successful contractor candidate)	NA
(c) Necessary assurances must be obtained (in writing) by the successful contractor, through the utility company, for any work where minimum limits of approach will not be able to be maintained	NA
(d) Underground or hidden utilities are located on the job site and any excavation or drilling work in proximity to an underground utility service must be undertaken in conformity with the requirements of the owner of that utility service	Y
If yes to (c), and the specific physical locations where minimum limits of approach will not be able to be maintained are known, how will this information be provided to the contractor? _____ _____ _____	
8. **Construction, Excavation, Shoring and Demolition**	
(a) As Prime Contractor, the City of Vancouver project manager will submit the Notice of Project	Y
(b) Workers will be required to enter an excavation over 1.2m (4 ft) in depth	Y
9. **Chemicals, Solvents, Fumes, Vapors, And/Or Dusts** (existing work processes or known worksite hazard only) – ice rinks, swimming pools, cleaning solvents, adhesives, paints, coatings, binders; e.g., storage tank clean-out services, countertop installation (epoxies), and flooring	
(a) The worksite has chemicals solvents, fumes, vapours or dusts that may affect the contractor	Y
(b) Material Safety Data Sheets for chemicals currently in use at the worksite will be available, on request, to the contractor	Y

Hazard or Issue	**Project Manager**
	Yes (Y), No (N) or Not Applicable (NA)
If yes to (a), list the work processes and/or chemicals in use: The ETS construction is on sites where the City does not control the environment. In these locations, the Contractor is required to follow the safety policy of the site.	
10. **Noise** (existing work processes only)	
Employees will be exposed to noise levels above 85dbA	N

OTHER HAZARDS (NOT IDENTIFIED ABOVE)
(a)
(b)
(c)

KNOWN WORKPLACE HAZARDS LIST COMPLETED BY	
Project Manager Name (print): Kieran McConnell	
	Date: 2012-05-25
	Phone: 604-871-6981

SCHEDULE 9
CONTRACTOR PRE-CONTRACT HAZARD ASSESSMENT FORM

CONTRACTORS PRE-WORK HAZARD IDENTIFICATION

Contract Title _____

Project Manager (City Employee) _____

Contractor Representative _____

Contract Name and No. _____

PURPOSE

This document shall be completed by the contractor awarded the contract, who shall identify all the **known and potential work process hazards** associated with the contract. The contractor, who is responsible for all identified actions, shall provide a completed Pre-Work Hazard Identification document to the Project Manager (City employee) for review and consultation before the contract work begins.

REFERENCE MATERIAL

In order to complete this document, the contractor should reference a completed copy of the List of **Known Workplace Hazards**, initially provided with the tender package. The contractor is also responsible to reference any **Hazardous Materials Assessments**, provided by the City with the tender package, and possibly referenced in the List of Known Workplace Hazards document.

INSTRUCTIONS FOR COMPLETION

The document must be completed in full. Choices for each entry are:

Yes (Y)	this work process or worksite hazard will exist for this contract and are the responsibility of the contractor
No (N)	even though the work process or worksite hazard will exist, it will not be the responsibility of the contractor
Not Applicable (NA)	the work process or worksite hazard is not applicable for this contract

Each grouping of safety hazards or issues in this document (bold text, capitalized) may list some examples of work tasks where this hazard may be encountered. These examples are not conclusive; there may be other examples of work tasks that create this hazard or issue.

DOCUMENTATION AND TRAINING REQUIREMENTS

During the contract term, the contractor may be requested by the City of Vancouver, and shall provide documented evidence for items identified with a **(D)** in this document.

The summary table at the end of the document provides all potentially required documentation, and if applicable, the WCB OHS Regulation reference.

For any identified hazard marked with a **(T)**, the contractor is responsible to train their employees.

HAZARDOUS MATERIALS

The contractor is responsible for providing additional information on hazardous materials which may be encountered as part of the work process, yet not identified in the List of Known Workplace Hazards.

Hazard or Issue			Project Manager		
			Yes (Y), No (N) or Not Applicable (NA)		
1.	**Asbestos-containing Materials**. Disturbance or penetrations of flooring, walls, ceiling tiles, pipe lagging, ac pipe, transite siding, particularly in older facilities; e.g., furniture/fixture installation, carpeting/flooring services, and boiler repair/tune-up services				
	(a)	We have reviewed the hazardous materials assessment for asbestos provided by the City of Vancouver (or third party) in the tender package	Y	N	NA
	(b)	We will provide a written hazardous materials assessment for asbestos	Y	N	NA
	(c)	We have a written Asbestos Program **(D)**	Y	N	NA
	(d)	As Prime Contractor, we will submit a Notice of Project Asbestos(NOP-A) to WorksafeBC at least 24 hours in advance of the project startup	Y	N	NA
2.	**Lead-containing Materials**. Disturbance of lead-based paint, particularly in older facilities. Also present in certain electrical circuitry and metal alloys; .e.g., overhead bridge crane maintenance/repair, high-voltage cable splicing services, boiler repair/tune-up services, fixture installation services, and chiller maintenance/repair services				
	(a)	We have reviewed the hazardous materials assessment for lead provided by the City of Vancouver (or third party) in the tender package	Y	N	NA
	(b)	We will provide a written hazardous materials assessment for lead	Y	N	NA
	(c)	We have a written exposure control program for Lead **(D)**	Y	N	NA

Hazard or Issue			Project Manager		
			Yes (Y), No (N) or Not Applicable (NA)		
3.	**Other Hazardous Materials**. May include pcb's, cfc's, molds, mercury, ozone depleting substances (ods), radioactive substances, sewage and unidentified contaminated hazardous materials, other: (list other here) _____ _____ _____				
	(a)	We have reviewed the hazardous materials assessment for (insert hazardous material type here) provided by the City of Vancouver, or a third party, in the tender package	Y	N	NA
	(b)	We have reviewed the hazardous materials assessment for (insert hazardous material type here) provided by the City of Vancouver, or a third party, in the tender package	Y	N	NA
	(c)	We will provide a hazardous materials assessment for (insert hazardous material type here)	Y	N	NA
	(d)	We will provide a hazardous materials assessment for (insert hazardous material type here)	Y	N	NA
4.	**Confined Spaces**. Working in vaults, chambers, pits, tanks, etc.; e.g., construction, inspection and testing services, water/fuel storage tank clean-out services, and utility corrosion inspection services.				
	(a)	We have reviewed the confined space hazard assessment provided by the City of Vancouver in the tender package	Y	N	NA
	(b)	We have a written confined space entry program **(D)**	Y	N	NA
	(c)	Our employees have received confined space training **(T)**	Y	N	NA
	(d)	We shall complete a confined space hazard assessment specific to the work to be performed **(D)**	Y	N	NA
	(e)	We shall develop site specific written safe operating procedures (including evacuation and rescue components) prior to starting work **(D)**	Y	N	NA
	(f)	We shall identify and record isolation points **(D)**	Y	N	NA
	(g)	We will develop alternate procedures (as per WCB OHS Regulation # 9.22) to be used to isolate adjacent piping containing harmful substances **(D)**	Y	N	NA
	(h)	We will provide for the services of rescue persons	Y	N	NA

Hazard or Issue	Project Manager
	Yes (Y), No (N) or Not Applicable (NA)
If yes to (g), provide brief description: _____ _____ _____	
5. **Lock Out**. Industrial equipment maintenance, power machinery repair services, pump maintenance/repair services, mechanical refrigeration systems, elevator repair, overhead bridge crane maintenance/repair services, cathodic protection services, hydraulic test systems repair/service, and air compressor rebuilding services	
(a) We will be required to lock out in order to isolate or prevent the unexpected release of energy (electrical, mechanical, hydraulic, chemical, thermal, kinetic, gravitational, pneumatic)	Y N NA
(b) We will perform work on, or near, energized equipment, lines or circuits	Y N NA
Note: If yes to (a) or (b) above, no work may be performed until reviewed by City of Vancouver project manager or project manager designate. If yes to (a) or (b) describe: _____ _____ _____	
6A. **Fall Protection**. Tree pruning, window and ledge cleaning, window replacement, overhead bridge crane maintenance/repair services, roll-up door replacement, tent installation, awning/canopy installation, overhead air exchange installation, construction inspection and testing services.	
(a) Our employees will be exposed to a potential fall in excess of 3 m (10 feet), or to a fall of less than 3 m which would likely result in a serious injury (ex. impalement on rebar)	Y N NA
(b) We will produce a written Fall Protection Plan for work that will occur more than 25 feet above grade, or, if written procedures (control zone) are to be used as the means of fall protection **(D)**	Y N NA
(c) Our employees who will be required to use fall protection have received training **(T)**	Y N NA

Hazard or Issue			Project Manager		
			Yes (Y), No (N) or Not Applicable (NA)		
If yes to (a), describe: _____ _____ _____					
6B. **Scaffolding and Ladders**. Window replacement or cleaning, tree pruning, roll-up door replacement, tent installation, and awning/canopy installation					
	(a)	Our employees will use scaffolding or ladders for access to the work	Y	N	NA
	(b)	The scaffolding or ladders will be exposed to wet and/or slippery conditions	Y	N	NA
	(c)	We will ensure scaffolding or ladders are secured before accessing the worksite	Y	N	NA
	(d)	Scaffolding will be erected and dismantled only by qualified workers	Y	N	NA
7. **Overhead Power Lines and Underground Utilities**. Tree pruning services, tree removal, utility relocation or replacement, underground utility identification services, concrete sawing services, pole painting					
	(a)	There are electrical hazards associated with overhead power lines such as limits of approach and contact	Y	N	NA
	(b)	We will obtain necessary assurances, in writing, through the utility company, for any work where minimum limits of approach cannot be maintained	Y	N	NA
	(c)	Underground or hidden utilities may be on the job site and we shall contact the Project Manager and BC OneCall at least four business days prior to the start of any excavation work	Y	N	NA
	(d)	In the event of an inadvertent utility strike, we will have a written procedure for immediate notification of both the utility company and WorkSafeBC **(D)**	Y	N	NA
8. **Construction, Excavation, shoring and Demolition**					
	(a)	As Prime Contractor, we will submit a Notice of Project (NOP) to WorksafeBC at least 24 hours in advance of the project startup date	Y	N	NA
	(b)	Workers may be required to enter an excavation over 1.2m (4 ft) in depth	Y	N	NA
	(c)	We will develop site specific written safe operating procedures, including evacuation and rescue components, prior to starting any excavation work **(D)**	Y	N	NA

Hazard or Issue		Project Manager		
		Yes (Y), No (N) or Not Applicable (NA)		
(d)	Shoring will be installed in accordance with Part 20 of the WorkSafeBC OH&S Regulation	Y	N	NA
(e)	We will provide safe means of entry and exit for excavations	Y	N	NA
(f)	We will provide for the services of rescue persons and equipment (excavation rescue)	Y	N	NA
(g)	We will develop a demolition/salvage plan **(D)**	Y	N	NA
(h)	We will evaluate the demolition materials for reuse or recycling	Y	N	NA
(i)	We will protect passers-by from potential hazards	Y	N	NA
9.	**Chemicals, Solvents, Fumes, Vapours and Dusts**. Cleaning solvents, adhesives, paints, coatings, binders; e.g., storage tank clean-out services, countertop installation (epoxies), and flooring			
(a)	We will complete a hazard assessment for chemicals we will use in our work, and if chemicals already exist at the workplace, our assessment will identify possible results of any reactions between our chemicals and those of the Citys operations	Y	N	NA
10.	**Noise and Vibration**. Includes installations and heavy equipment operation. Noise examples for 85 – 90 dbA (at noise source) include forklift, smoke alarm, table saw. Whole body vibration examples include truck or equipment operator and jackhammer operation			
(a)	Our employees will be exposed to noise levels above 85dbA	Y	N	NA
(b)	We have a written hearing conservation program **(D)**	Y	N	NA
(c)	Our employees will be exposed to excessive levels of whole body vibration (WBV)	Y	N	NA
11.	**Occupational Health and Safety Program**			
(a)	We have a written Safety Program **(D)**	Y	N	NA
(b)	We will make regular inspections of all workplaces	Y	N	NA
(c)	We will immediately investigate any reported unsafe conditions and correct as required	Y	N	NA
(d)	We will investigate all incidents and provide written incident reports to the Project Manager	Y	N	NA
(e)	We will develop a written plan **(D)** identifying how risk to the public and workers will be minimized (may include the use of barriers and safe entry/exit points from the worksite)	Y	N	NA

Hazard or Issue		Project Manager		
		Yes (Y), No (N) or Not Applicable (NA)		
12. **First Aid**				
(a)	First aid equipment, supplies, facilities and services will be readily accessible during working hours	Y	N	NA
(b)	We will complete a first aid assessment **(D)**	Y	N	NA
(c)	We will post site drawings and signs indicating the location of, and how to summon, first aid	Y	N	NA
(d)	We will develop an effective means of communication between the first aid attendant and the work areas	Y	N	NA
13. **Fire Protection**. Solvents, fuels, soldering, torch cutting, or heating devices; e.g., gasoline and diesel fuel delivery services, flooring services, fire suppression service, and water pipe repair services				
(a)	We will weld, solder, or cut with a torch	Y	N	NA
(b)	We will use or store flammable/combustible liquids	Y	N	NA
(c)	We will use temporary heating devices	Y	N	NA
(d)	We will provide water and/or fire extinguishers on the job site	Y	N	NA
14. **Personal Protective Equipment (PPE)**				
(a)	We will ensure our workers have appropriate personal protective clothing and equipment (e.g., safety footwear, hi-vis vests, hardhats, eye protection, face protection, hearing protection, chemical gloves/clothing)	Y	N	NA
(b)	We have a written PPE program **(D)**	Y	N	NA
15. Respiratory Protection				
(a)	The work will involve materials or processes requiring respiratory protection	Y	N	NA
(b)	We have a written respiratory protection program **(D)**	Y	N	NA
16. Tools Machinery and Equipment				
(a)	We will use powder-actuated tools.	Y	N	NA
(b)	Our employees who operate equipment have been trained and are qualified in use of that equipment. **(T)**	Y	N	NA

Hazard or Issue		Project Manager		
		Yes (Y), No (N) or Not Applicable (NA)		
If yes to (a), describe: _____ _____ _____				
17. **Cranes, Forklifts, and Manlifts.** Heavy or oversized goods delivery, tree pruning, overhead bridge crane maintenance/repair, and roll-up door replacement				
(a)	We will use a crane, forklift, manlift or other lifting equipment	Y	N	NA
(b)	Our lifting and rigging equipment is certified where applicable, and inspected on a regular basis	Y	N	NA
(c)	Our operators shall have a valid operators certificate (mobile crane or tower crane) or have received training (boom lift, scissor lift or forklift) **(T)**	Y	N	NA
(d)	Only lifting attachments approved for use by the forklift manufacturer will be used	Y	N	NA
18. **Rigging**				
(a)	We will lift or sling loads overhead	Y	N	NA
(b)	We will inspect ropes, hooks and slings before use on each shift	Y	N	NA
19. **Motor Vehicles and Heavy Equipment.** Goods delivery, personnel transportation services, trailer relocation services, oil/water pumpout and recycling services, asphalt grinding and asphalt sealing services, weed/brush abatement and mowing services, landscape hydroseed services, tree stump grinding, and concrete sawing and removal				
(a)	We will use motor vehicles or heavy equipment at the work location	Y	N	NA
(b)	All operators have a valid provincial driver's license	Y	N	NA
(c)	We will inspect vehicles, including safety features (e.g., ROPS)	Y	N	NA
20. **Traffic Control**				
(a)	There will be uncontrolled movement of vehicular traffic at the worksite	Y	N	NA
(b)	We will develop a written traffic control plan **(D)**	Y	N	NA
(c)	We will put in place any required traffic control devices	Y	N	NA
(e)	The traffic control devices conform to the Ministry of Transportation and Infrastructure (MoTI) “Traffic Control Manual for Work on Roadways”	Y	N	NA

Hazard or Issue	Project Manager
	Yes (Y), No (N) or Not Applicable (NA)
We will provide Traffic Control Persons (TCP's) as required by law	Y N NA
21. Crystalline Silica Dust	
(a) Our work will involve jackhammering, rotohammering, drilling, grinding or other disturbance of concrete or stone, creating potential exposure to silica dust	Y N NA
22. **Additional Concerns**	
We foresee additional health and safety concerns associated with the work	Y N NA
If yes, describe: (a) _____ (b) _____ (c) _____ (d) _____ (e) _____ (f) _____	
Describe the control measures each of the concerns listed above: (a) _____ (b) _____ (c) _____ (d) _____ (e) _____ (f) _____	

PRE CONTRACT HAZARD ASSESSMENT COMPLETED BY	
Contractor's Representative Name (print):	
Contractor's Representative Signature:	Date:
Title:	Phone:

CONTRACTOR'S DESIGNATE RESPONSIBLE FOR ONSITE SAFETY	
Name (print):	
Title:	Phone:

		Yes (Y), No (N) or Not Applicable (NA)		
Summary of Documentation (D) to be Provided by the Contractor upon request by the City of Vancouver (documentation required as per Workers Compensation Board Occupational Health and Safety (WCB OHS) Regulation, the Workers' Compensation Act (WCA) or the City of Vancouver)				
(a)	Safety Program (WCB OHS Regulation Parts 3.1-3.3)	Y	N	NA
(b)	Asbestos Exposure Control Plan (WCB OHS Regulation Part 6.3)	Y	N	NA
(c)	Lead (Pb) Exposure Control Plan (WCB OHS Regulation Part 6.60)	Y	N	NA
(d)	Respiratory Protection Program (WCB OHS Regulation Part 8.5)	Y	N	NA
(e)	Confined Space Entry Program (WCB OHS Regulation Parts 9.5 and 9.6)	Y	N	NA
(f)	Plan for minimizing risk to public and to workers (City of Vancouver)	Y	N	NA
(g)	Personal Protective Equipment (PPE) Program (WCB OHS Regulation Part 8.5)	Y	N	NA
(h)	Hearing Conservation Program (WCB OHS Regulation Part 7.5)	Y	N	NA
(i)	Confined Space Hazard Assessment (WCB OHS Regulation Part 9.9)	Y	N	NA
(j)	Work Procedure, including evacuation and rescue, for confined space (WCB OHS Regulation Part 9.10 and 9.11)	Y	N	NA
(k)	Identification of Isolation Points (confined space) (WCB OHS Regulation Part 9.19)	Y	N	NA
(l)	Alternate procedures to isolate adjacent piping (confined space) (WCB OHS Regulation Part 9.22)	Y	N	NA
(m)	Fall Protection Plan (WCB OHS Regulation Part 11.3)	Y	N	NA
(n)	Traffic Control Plan (Ministry of Transportation and Infrastructure (MOTI) manual, as referenced in WCB OHS Regulation Part 18.3)	Y	N	NA
(o)	In the event of a utility strike, a written procedure for notification of Utility Provider (WCB OHS Regulation Part 4.18) and WorksafeBC (Workers' Compensation Act Part 3, Division 10, Sec. 172 (1)(c))	Y	N	NA
(p)	Work Procedure (including evacuation and rescue) for excavations (City of Vancouver)	Y	N	NA
(q)	Demolition/Salvage Plan (City of Vancouver in reference to WCB OHS Regulation Part 20.112)	Y	N	NA
(r)	First Aid Assessment (WCB OHS Regulation Part 3.16 (2))	Y	N	NA

		Yes (Y), No (N) or Not Applicable (NA)		
Summary of Training Requirements (T) of Contractor Employees (for any persons completing this type of work throughout the duration of the contract)				
(a)	Confined Space Entry (WCB OHS Regulation Part 9.8)	Y	N	NA
(b)	Fall Protection (WCB OHS Regulation Part 11.2 (6))	Y	N	NA
(c)	Equipment Operation (WCB OHS Regulation Part 4.3(1)(b)(i)(ii))	Y	N	NA
(d)	Mobile Equipment (ex. boom lift, scissor lift, forklift) (WCB OHS Regulation Part 16.4)			

SCHEDULE 10

FORCE ACCOUNT LABOUR AND CONSTRUCTION EQUIPMENT RATES

TABLE 1 - SCHEDULE OF LABOUR RATES

Job Classification	Regular Rate	Overtime Rate
Foreman	$	$
Plumber	$	$
Insulator	$	$
Electrician	$	$
Welder	$	$
(If required by Tender, please insert other Job Classifications)	$	$

TABLE 2 – SCHEDULE OF CONSTRUCTION EQUIPMENT RATES

No.	Equipment Description	Hourly Rate	No. of Hours	Overhead And Profit	Total Price
		$		$	$
		$		$	$
		$		$	$
		$		$	$
		$		$	$

APPENDIX 2 - SPECIFICATIONS

(Attached)

NEU District Heating Expansion
Southeast False Creek
Energy Transfer Stations

Division 15 & 16 Specifications

ITT no. PS20120191

KWL Project no. 0042.067-600

Issue for Tender
Jun 04, 2012

KERR WOOD LEIDAL
consulting engineers

Division 15 Mechanical

Division 16 Electrical

Table of Contents

PART 1 GENERAL

1.1 General Requirements

.1 All work shall be performed by qualified tradesmen working for a reputable Contracting company experienced in this type of work and shall be strictly in accordance with the best commercial practice.

.2 Coordinate work with the Contractor's working schedule and cooperate to achieve the earliest possible completion of the work.

.3 Supply all relevant materials, tools and labour to complete all work outlined below.

.4 Refer to Section 15050 for seismic requirements.

1.2 Codes and Permits

.1 The following bodies have jurisdiction over this project.

.1 British Columbia Safety Authority (BCSA).

.2 BC Plumbing Code

.2 All piping installation on the primary side shall be in accordance to ASME B31.1 and CSA 51

.3 All piping installation on the secondary side shall be in accordance to ASME B31.9

1.3 Work Included

.1 Receive, handle, store and track all Owner supplied materials as directed by the Owner. Storage ground will be provided by the Owner.

.2 Installation of all Owner supplied materials as per manufacturer recommendations.

.1 Refer to Front End for a list of Owner supplied materials

.2 Tie to existing, Welding, joint insulation, x-ray and hydrotest of all pre-insulated piping and pipe accessories

.3 Installation of all expansion foam pads

.4 Installation and wiring of leak detection junction boxes

.5 Flushing, cleaning and passivation of all installed piping

.3 Supply and install all piping, equipment, controls and accessories as listed in the project schematics, drawings and specifications.

.4 Installation of all control and power wiring for the Owner supplied materials under this scope per BC building code. Wiring termination shall be as per supplier recommendations.

1.4 Work Excluded

.1 Road Works

.2 Excavation and backfilling

.3 Supply and installation of concrete manholes

.4 Installation of equipment housekeeping pads

.5 Coring and water proofing for building penetrations

1.5 Delivery

.1 Coordinate equipment delivery with other trades. Note that some items may involve long delivery and therefore should be ordered immediately after Contract award and expedited efficiently.

.2 The Contractor is responsible for the following work under this contract:
- .1 Coordinating delivery of Owner-supplied equipment with vendors.
- .2 Inspection and acceptance of equipment following delivery.
- .3 Ensure equipment conforms to the project specifications.
- .4 Report any visible damage or non-conformance to the contract administrator immediately.
- .5 Offloading of Owner-supplied equipment.
- .6 Transport equipment to Owner's designated storage area.
- .7 Track all received materials and equipment and inform the contract administrator of any missing items.

1.6 Drawings and specifications

.1 Contract drawings for mechanical work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment, piping and ductwork. Care shall be taken to ensure that the installation is in accordance with detailed drawings, where given, and that the installation meets architectural requirements.

.2 It is intended that these specifications and drawings shall cover the complete mechanical installation ready for uninterrupted operation. Consequently, minor details not necessarily shown or specified, but necessary for the proper functioning of the installation, including equipment serviceability shall be included in the Contractor's estimate.

1.7 Shop drawings

.1 Submit one (1) hard copy and one (1) soft copy of shop drawings for approval for all fabricated steel piping, gauges, valves, pipe accessories and equipment to be provided under this contract. Also provide shop drawings for tie in to existing installations.

.2 Shop drawings shall show:
- .1 outside dimensions
- .2 total net assembled weight
- .3 materials of construction
- .4 welded joints
- .5 coatings and finishes
- .6 electrical data (where applicable).

.3 And shall include the seal of a Professional Consultant registered in British Columbia (where applicable).

.4 Review of shop drawings is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that approvals of the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for quantities and dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all subtrades.

.5 The Consultant reserves the right to require the Contractor to make any changes in the Contractor's drawings and/or his specifications which may be necessary, in the opinion of the Consultant, to make the finished product conform to the requirements and intent of these specifications.

.6 Any fabrication completed prior to shop drawing approval shall be at the Contractor's risk.

1.8 Instruction and Service Manuals

.1 Provide one (1) hard copy and one (1) soft copy of instruction and service manuals c/w spare parts lists for all of the equipment supplied by the contractor.

.2 Coordinate and bind with manuals provided by electrical subcontractor.

.3 Manuals are to be bound in a 3 ring hard cover binder with the name of the project and facility clearly labelled.

.4 Manuals shall contain at least the following:
- .1 Title page
- .2 Table of contents
- .3 Drawings and manufacturers' specifications for each specific item of equipment supplied including model nos. and serial nos.
- .4 Maintenance and operating instructions where applicable
- .5 Electrical connection drawings and control schematic for applicable equipment.
- .6 Provide space for literature for Owner Supplied Equipment. (Requirements to be supplied by the Consultant).

1.9 Equal and Alternate Equipment

.1 Equipment, other than that specified, of equal quality, will be allowed. Acceptable equipment shall be that which has been reviewed and approved by the Consultant five working days prior to the closing of tenders.

.2 Should the Contractor propose to substitute equipment having different dimensions or requiring connections or piping layout at variance with the drawing, it shall be the Contractor's responsibility to submit a detailed drawing showing how proposed substitute equipment is to be installed and connected in the available space. Any proposed variations from contract drawings shall be specifically indicated.

.3 Where two or more items of equipment or materials of similar design are to be installed, they shall be the products of one manufacturer.

.4 Equipment, other than that specified, which has been approved by the Consultant as "equal" 5 days prior to the closing of tenders may be substituted at the Contractor's discretion provided aforementioned conditions are met.

.5 Equipment, other than that specified, which may be approved by the Consultant as an "alternate" following the closing of tenders, may be substituted by the Contractor at the discretion of the Consultant provided suitable adjustment of contract price is negotiated.

.6 Equipment, other than that specified, which has been installed but not approved by the Consultant, may be rejected. In this case the equipment shall be removed, and approved equipment installed, at the Contractor's expense.

.7 The Contractor shall be responsible for all expenses incurred in the work of other trades made necessary because of substitution.

1.10 Related Work

.1	General Requirements	Front End
.2	All Mechanical Sections	Division 15
.3	Electrical	Division 16

PART 2 PRODUCTS

2.1 Materials Supplied by the Owner

.1 The Contractor shall be responsible for installation of the following equipment supplied by the Owner.
- .1 Pre-insulated Piping & Accessories
- .2 Welded Ball Valves
- .3 Heat exchangers
- .4 Energy meters and controls

PART 3 EXECUTION

3.1 Protection of Materials and Equipment

.1 In addition to the responsibilities outlined in the General Conditions, for care of property and materials, the Contractor shall ensure that the mechanical components shall be given the following attention:

.1 After delivery, before and after installation, protect equipment and materials against theft, injury or damage from all causes.

.2 All materials and equipment stored on site shall be stored as per manufacturer recommendations.

.3 Protect equipment outlets, pipe and duct openings with temporary plugs, caps and canvas.

.4 All motors and/or motor operated equipment and other delicate equipment such as gauges and control panels, etc., shall be stored indoors in a heated space and completely covered with dustproof-sheets until such time as these items are put into operation or tested.

3.2 Quality of Workmanship and Materials

.1 All materials contemplated by these specifications and the plans accompanying them, unless otherwise stated, must be new and at all times open to the inspection, acceptance or rejection of the Owner but any omission or failure on the part of the Owner to disapprove or reject any work or material shall not be construed to be an acceptance of any defective work or material.

.2 All equipment shall be installed in accordance with Manufacturer's printed installation directions. Erect equipment in neat and workmanlike manner, align, level and adjust for satisfactory operation. Install so that connecting of piping and accessories can be made readily so that all parts are easily accessible for inspection, maintenance and repair.

3.3 Co-operation with Other Trades

.1 Care shall be taken in laying out the mechanical work to accommodate the space requirements for other installations. Particular attention must be given to length of hangers and locations of piping in order to ensure that these components of the building fit into the space allotted, and also to ensure that required head room is provided below piping.

3.4 Screws, Bolts, Fasteners

.1 Screws, bolts and nuts shall be uniform in size, head pattern, material and finish for similar service, and shall be of a type best suited to that service.

3.5 Coatings

.1 Shop coatings (to be applied before delivery) are specified in Division 15 with each item of material or equipment.

3.6 Cleaning and Touch Up Painting

.1 Thoroughly clean all fixtures and equipment of grease, dirt, or other foreign material at the completion of the project.

.2 Chrome-plated and stainless steel fittings, gauge glasses and indicator light lenses shall be polished upon completion of the work.

.3 Any finished surfaces which have become scratched, marred or damaged in any way shall be repaired and refinished, or replaced at the discretion of the Consultant.

.4 All dirt or rubbish on walls, floors, ceilings or fixtures accumulated from the work of the Contractor or hired subcontractors shall be removed promptly from the premises.

.5 Touch up all other painted surfaces which may become damaged in the course of construction.

3.7 Electrical Power Connections and Wiring

.1 All power and control wiring shall be completed by the Contractor.

.2 All starting and disconnect switches unless otherwise stated in this division will be provided under Division 16. Any additional control relays or switches required and their wiring to ensure operation of systems as specified shall be provided under Division 16.

3.8 Start Up of Mechanical Systems

.1 The Contractor shall be responsible for the start up and testing of all mechanical systems supplied or installed under this contract. This shall include but is not limited to:

.1 Heat Exchangers

.2 ETS Controls

.3 The startup schedule shall be as outlined in the Front End

3.9 Identification

.1 Coordinate colour coding of piping and equipment with Consultant.

.2 Colour code mechanical equipment, piping and exposed ductwork.

.3 Legend and direction of flow arrows shall consist of adhesive backed labels, yellow colour, with minimum 20 mm3/4in. high black lettering equal to Brady System B-500, vinyl cloth labels for non-insulated surfaces; and Brady B 946 for insulated surfaces.

.4 Identify piping with labels, colour bands, and flow arrows. Provide identification at 15 m50 ft. maximum intervals, before and after pipes pass through walls, at all sides of tees, behind access doors and in equipment rooms as required.

.5 Apply colour bands at both ends of the label with primary colour bands used to secure both ends of individual labels. Refer to colour schedule at end of this section.

.6 Provide 20 mm3/4 in. diameter brass, with metal photo black numbers, or white lamacoid with black engraved numbers, secured to valve stem with key chain.

.7 Provide neat, typewritten directories, giving valve number, services and location. Frame one copy under glass for wall mounting as directed, second copy to be forwarded to Owner. Include copies in O & M Manuals.

.8 Tag automatic controls, instruments and relays and match/key to control shop drawing identification numbers. Tag all equipment and control panels.

.9 Identify electric starting switches, thermostats controlling motors, remote push button stations, and controls equipment supplied under this division with lamacoid plates having 6 mm1/4 in. minimum letter size. Identification to state equipment controlled.

3.10 Colour Coding Schedule

.1 Cordinate with Consultant for color code requirements

.2 Mechanical Control Systems

.1 Conduit pull boxes, terminal boxes and junction boxes - GREY Covers - GREY with black `C'.

.2 Main and secondary control panels, factory finish acceptable - control Contractor to install company label to identify.

END OF SECTION

1. GENERAL

1.1 Scope

.1 Provide seismic restraints on all piping, ducts and equipment. Restraints shall be in accordance with the latest edition of the Seismic Restraint Manual for Mechanical Systems produced by SMACNA and the latest edition of the ASHRAE Applications Handbook Chapter 49 Seismic Restraint Design as well as current local building codes.

.2 Where rotating equipment is factory installed in a cabinet or enclosure and the vibration isolation mounts are also factory installed they shall have factory installed seismic restraints and provisions for anchoring complete unit to structure. The manufacturer shall supply certificates (signed by a Professional Engineer registered within the jurisdiction) verifying the design of the seismic restraints in accordance with the provisions of this section.

.3 Submit shop drawings of all seismic restraint details, prepared and sealed by a Professional Engineer registered in British Columbia.

.4 Provide signed and sealed letters of assurance, as required by the authority having jurisdiction, taking responsibility for the seismic restraints.

.5 Provide these letters of assurance sealed by a registered professional engineer for the seismic restraints, "Assurance of Professional design and commitment for field review" as well as "Assurance of Professional field review and compliance".

2. PRODUCTS

.1 Provide slack cable restraint systems, or other acceptable systems. (pipe snubbers, struts, etc.)

.2 Other approved systems are conventional pipe guides, rigid restraint where the piping is non-isolated or passes through a block or concrete wall, or a cable strap and space piece attached to the structure, used where the piping is adjacent to a wall and conventional slack cable/rigid restraints cannot be used.

2.2 Approved Manufactures

.1 Pipe Reistraints

.1 Trelleborg.

3. EXECUTION

.1 Provide slack cable restraints on the fans, and connect to the fan in such a way that the axial projection of the wires pass through the centre of gravity of the fan, where possible.

.2 Orient restraint wires on fans and equipment at approximately 90° to each other (in plan), and tie back to the ceiling slab at an angle not exceeding 45° to the slab.

.3 Select the restraints for the specified seismic requirements. (These requirements are generally 0.8 g for normal fans and piping and 1.4 g for piping and equipment containing toxic materials).

.4 Select the anchor in the concrete slab for a load equal to one quarter of the weight of the fan at a 45° pull (0.35 x the specified seismic requirements).

.5 Install vibrating equipment on seismically rated isolators whenever possible.

.6 Where seismically rated isolators can not be used on vibrating equipment, use non-seismic isolators and provide slack cable restraints.

.7 For non-vibrating equipment, secure the equipment to the structure by:

.1 Bolting directly to the structure.

.2 Use rigid seismic restraints.

.3 Use taught cable restraints - not slack.

.4 Rigid restraints are preferable to cable restraints as cables have no compression load capabilities.

.8 Installation of bolts and fasteners:

.1 Torque bolts to 75% of proof load.

.2 For threaded connections use either self locking nuts, double nuts or a chemical thread lock (Loctite Series 242).

.9 Install cables using appropriate grommet, shackles, and other hardware to ensure alignment of the restraints and to avoid bending the cables at connection points. Cables can be directly wrapped around the pipe as opposed to using collars.

.10 On piping systems, provide transverse slack cable restraints at a maximum spacing of *12.5 m* ***(40 ft.)*** and longitudinal restraints at *25* m ***(80 ft.)*** maximum spacing, or as limited by anchor/slack cable performance.

.11 Vary adjacent spacing of restraints on a piping by 10% to 30% to avoid coincident resonances.

.12 Transverse bracing for one pipe section may also act as longitudinal bracing for the pipe connected perpendicular to it, provided the bracing is installed within *600 mm* ***(24 in.)*** of the elbow or tee, and if the connected pipe is the same or smaller in size. Do not use branch lines to restrain main lines.

.13 Provide flexibility in piping joints or sleeves where pipes pass through building seismic or expansion joints.

.14 At vertical pipe risers, wherever possible, support the weight of the riser at a point or points above the centre of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed *10 m* ***(32 ft.)*** on centre with guide clearance not exceeding 3 mm. Vary adjacent spacing of restraints on a piping run by 10% to 30% to avoid coincident resonances.

.15 Restraints shall be installed at least *25 mm* ***(1 in.)*** clear of all other equipment and services.

.16 Adjust restraint cables such that they are not visibly slack, or that the flexibility is approximately *35* mm ***(1.5 in.)*** under thumb pressure for a *1,500 mm* ***(5 ft.)*** cable length

(equivalent ratio for other cable lengths). Adjust the clearance at cable/spacer piece restraints to not exceed 6 *mm* ***(1/4 in)***.

.17 Bolt all non-isolated equipment (eg. floor mounted tanks, heat exchangers, etc.) to the structure.

.18 300 mm Rule: As indicated in SMACNA, seismic restraint for piping and ductwork is not required if suspended less than 300 mm from supporting structure. This rule does not apply to equipment. Where beams occur, the pipe/duct must be supported from the beams for the rule to apply.

3.2 DUCTWORK

.1 Provide traverse bracing 9 m on centre maximum. (Except rectangular ducts 1550 mm) and larger in either direction may be braced at 9.8 m on centre.)

.2 Provide longitudinal bracing at 18 m o.c. maximum. Transverse bracing for one duct section may also act as longitudinal bracing for a duct section connected perpendicular to it, if the bracing is installed within four feet of the intersection of both ducts and bracing is sized for the larger duct. Duct joints shall conform to SMACNA Duct Construction Standard. All joints in duct sections shall provide a positive fastening together of the section.

.3 A group of ducts may be combined in a larger size frame using the overall dimensions with maximum weight for selection of the members from the schedule on sheet 17 of the SMACNA Guidelines.

.4 Walls (including gypsum-board non-bearing partitions) which have ducts running through them may replace a typical transverse brace. Provide solid blockings around duct penetration at stud wall construction.

.5 Install ducts and pipes not braced with 1 150 mm minimum clearance to vertical ceiling hanger wires.

.6 All sheet metal for bracing to be Fy = 33 ksi.

.7 Minimum sheet metal for bracing to be 16 ga.

.8 It is the responsibility of the contractor to ascertain that an appropriate size device be selected for each individual piece of equipment.

3.3 PIPING

.1 Provide restraint details on piping and equipment as follows.

.2 Vertical Piping

.1 Attachment - Secure vertical piping at sufficiently close intervals to keep the pipe in alignment and carry the weight of the pipe and contents. Stacks shall be supported at their bases and, if over 2 stores in height, at each floor by approved metal floor clamps.

.2 Screwed pipe - Screwed pipe (I.P.S.) shall be supported at not less than every other storey height.

.3 Copper tubing - Copper tubing shall be supported at each storey for piping 40 mm and larger diameter, and at not more than 1.8 m intervals for piping 40 mm and smaller in diameter.

.4 Support pipes of other materials in accordance with the capability of the pipe to resist seismic loads.

.3 Horizontal Piping

.1 Supports - Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging.

.2 Screwed pipe - Screwed pipe (I.P.S.) or flanged pipe shall be supported at approximately 3 m intervals.

.3 Copper tubing - Copper tubing shall be supported at approximately 1.8 m intervals for tubing 40 mm and smaller in diameter and 3 m intervals for tubing

50 mm and larger id diameter.

.4 Support pipes of other materials in accordance with the capability of the pipe to resist seismic loads.

.4 Provide transverse bracings at 12.2 m o.c. maximum unless otherwise noted.

.5 Provide longitudinal bracings at 24.4 m o.c. maximum unless otherwise noted. When thermal expansion or contraction is involved, provide longitudinal bracings at anchor points. The longitudinal braces and the connections must be capable of resisting the force induced by expansion and contraction.

.6 Transverse bracing for one pipe section may also act as longitudinal bracing for the pipe section connected perpendicular to it, if the bracing is installed within 600 mm of the elbow or tee of similar size.

.7 For threaded piping the flexibility may be provided by the installation of swing joints. In welded or solder joint piping the flexibility shall be provided by expansion loops or manufactured flexible connectors. For piping with manufactured ball joints select length of piping offset using "Seismic Drift" in place of "Expansion Per Joint Manufacturers" selection table. Seismic Drift = 0.015 ft. per foot of height 12 mm/m of height.

.8 Do not use branch lines to brace main lines.

.9 Trapeze hangers may be used. Provide flexibility in joints where pipes pass through building seismic or expansion joints, or where rigidly supported pipes connected to equipment with vibration isolators.

.10 A rigid piping system shall not be braced to dissimilar parts of a building or two dissimilar building systems that may respond in a different mode during an earthquake. Examples: wall and a roof; solid concrete wall and a metal deck with lightweight concrete fill.

.11 Provide large enough pipe sleeves through walls or floors to allow for anticipated differential movements.

.12 At vertical pipe risers, wherever possible, support the weight of the riser at a point of points above the centre of gravity of the riser. Provide lateral guides at the top and bottom of the riser, and at intermediate points not to exceed 9.2 m o.c.

.13 Cast iron pipe of all types, glass pipe and any other pipe joined with a shield and clamp assembly where the top of the pipe is 300 mm or more from supporting structure shall be braced on each side of a change in direction of 90° or more. Riser joints shall be braced or stabilized between floors.

.14 For gas piping, the bracing details, schedules and notes may be used except that transverse bracing shall be at 6.1 m o.c. maximum and longitudinal bracing at 12.2 m o.c. maximum. 25, 30, 40 & 50 mm diameter pipes shall be braced the same as 65 mm diameter pipe in the schedule. (No bracing is required for pipes 18 mm diameter and smaller.)

.15 The seismic bracing and support of fire sprinkler piping is not part of this specification.

.16 It is the responsibility of the contractor to ascertain that an appropriate size restraint device be selected for each individual piece of equipment. Submit details on shop drawings.

3.4 NON-ISOLATED FLOOR MOUNTED EQUIPMENT

.1 Bolt all non-isolated equipment, e.g. floor mounted tanks, heat exchangers, boilers, etc. to the structure. Design anchors and bolts for seismic force applied horizontally through the centre of gravity. For equipment which may be subject to resonances, use a nominal 2g seismic force.

3.5 ISOLATED PIPING AND EQUIPMENT

.1 Install cables using appropriate grommets, shackles and other hardware to ensure alignment of the restraints and to avoid bending the cables at connecting points.

.2 Vary adjacent spacing of restraints on a piping run by 10% to 30% to avoid coincident resonances.

.3 Install restraints at least 50 mm clear of all other equipment and services.

.4 Adjust restraint cables such that they are not visibly slack, or such that the flexibility is approximately 40 mm under thumb pressure for a 1.5 m cable length (equivalent ratio for other cable lengths). Adjust the clearance at cable strap/spacer piece restraints to not exceed 6 mm.

.5 Provide transverse and axial restraints as close as practical to a vertical bend.

.6 At steel trusses, connect to top chords and follow truss manufacturer's instructions.

.7 Connect slack cable restraints to ceiling hung equipment in such a way that the axial projection of the wires passes through the centre of gravity of the equipment.

.8 Orient restraint wires on ceiling hung equipment at approximately 90° to each other (in plan), and tie back to the ceiling slab at an angle not exceeding 45° to the slab.

.9 Select the anchors in the concrete slab for a load equal to twice the weight of the equipment.

END OF SECTION

Table of Contents

PART 1 GENERAL

1.1 Work Included

.1 This Section covers process mechanical piping, fittings, valves, supports and appurtenances, as shown on the drawings and described in the related Sections.

.2 Provide all labour, materials and incidentals required to construct complete and operable mechanical piping systems, regardless of whether such are specifically called for in the Drawings or Specifications.

.3 Read this Section in conjunction with the Drawings and Contract Documents, particularly the piping specifications. Where there is a conflict, the Consultant shall be notified to resolve it. The Consultant has the right to apply the more stringent requirement in such cases.

1.2 Related Work

.1 Section 15009 Basic Mechanical Methods

.2 Section 15098 Piping – Primary Hot Water Side

.3 Section 15108 Valves – Primary Hot Water Side

.4 Section 15280 Insulation for Field-insulated Piping

.5 Section 15260 Hangers

1.3 Quality Assurance

.1 Work shall be carried out only by qualified tradesmen.

.2 Submit qualifications.

.3 Welders shall meet British Columbia Safety Authority (BCSA) requirements.

.4 Conform to all standard specifications referenced herein.

1.4 Reference Standards

.1 ANSI/ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

.2 ANSI/ASME B31.1 Power Piping

.3 ANSI B32.1 Metal Products

.4 CSA CAN3-S16.1-M Steel Structures for Buildings (Limit State Design)

.5 CSA W59-M Welded Steel Construction (Metal Arc Welding)

.6 CSA W47.1 Certification of Companies for Fusion Welding of Steel Structures

1.5 Submittals

.1 Provide shop drawings for all fabricated steel and stainless steel piping, supports and appurtenances.

.2 Submit manufacturers' literature and catalogue information for all valves and equipment.

.3 Submit list of recommended spare parts with current prices for valves and equipment.

.4 Submit welder qualifications (WPQ) and welding procedures (WPS) as specified by ASME B31.1 Section 127.5.

.5 Bid Requirements:

(a) Bid Form (Refer to Front End)

(b) Compliance Statements for project specifications

(c) Product Data

.6 Post Award Requirement

(a) Update all relevant Bid Submittals

(b) Product Data
(i) Pipe manufacturer's name
(ii) Technical Data sheets
(iii) Quality certifications

(c) Shop Drawings

(d) Delivery Schedule

(e) Mill certificates

(f) Supplier Installation Guidelines

(g) Isometrics for above ground installation (Refer to 3.3 of this Section)

(h) Quality Control: Field Quality Control submittals as specified in Part 3 of this Section.

(i) Samples**:** Welders must demonstrate and be certified. Witnessed welding will be required. Refer to quality control section.

1.6 Delivery, Storage and Handling

.1 Protect all piping and valves from weather, and from all damage.

1.7 Piping Specification Sheets

.1 The Piping Specification Sheets (Section 15099) detail the technical requirements for each type of piping system, commodity, and service.

.2 The Piping Specification Sheets do not include requirements such as piping supports and other items required.

PART 2 PRODUCTS

2.1 General

.1 All products shall conform to the Piping Specification Sheets.

.2 All products shall be new, undamaged, and free from rust and defects.

.3 All products of a similar nature shall be the product of a single manufacturer.

2.2 Flanges

.1 Material:

(a) Forged steel to ASTM A105 and ASTM A181

(b) Provide raised-face flange, except when matching an equipment or instrument connection.

.2 Dimensions:

(a) NPS 24 and less: to ASME B16.5.

(b) NPS 30 and above: to ASME B16.47, series A.

(c) Other dimension and/or drilling pattern standard may be required to mate equipment flanges.

(d) Contractor shall verify with manufacturer's data the flange type and size of all free-issued items (equipment, valve, instrument, etc.) provided by the owner.

.3 Bolts and Nuts

(a) to ASTM A193 B-7 and A194-2H.

.4 Gaskets (Hot Water)

(a) Material: Non-asbestos synthetic, or Aramid fibers bonded with nitrile (NBR) rubber.

(b) Thickness: 1.6 mm (1/16")

(c) Rating: Refer to Section 15099

(d) Conforms to ASME B16.21

(e) Gaskets to be one piece full diameter flange with precision located holes to match the flange bolt pattern

(f) Install to supplier recommendations

2.3 Strainers

.1 "Y" Type

.2 Rating: Refer to Section 15099

.3 Screen shall be 5/32 inch with a 30 mesh

.4 Effective screen area shall be minimum 2.5 times the pipe size

2.4 Pipe Sleeves

.1 All pipes, drains and vents passing through concrete walls shall be cast in place with seepage collars as detailed on the drawings. Where seepage collars are not shown a threaded fitting shall be used as a seepage collar. For existing walls, only coring is permitted.

.2 Where pipes pass through floors sleeves shall be used as specified herein.

2.5 Flange Isolation Gaskets

.1 Where indicated on the drawings, install in the place of rubber flange gaskets, isolation gaskets to the following requirements:

(a) gaskets to be full diameter flange insulating gaskets with precision located holes to match the flange bolt pattern, phenolic with nitrile seal elements.
(b) insulating sleeves to be 0.79 mm thick wall, polyethylene.
(c) insulating bolt washers to be 3.97 mm thick, polyethylene.

.2 Provide PSI Type >E= Linebacker gaskets c/w sleeves and washers to the above requirements, available from Bedford Pipe & Consultanted Products Ltd. Burnaby, B.C. (604) 291-6271, or approved equal.

.3 Install to manufacturer's recommendations, including bolt tightening sequence.

2.6 Pressure Gauges

.1 Liquid filled 110 mm dial gauge with black lettering (dual scale kPa and PSI)

.2 Range: 0 – 1724 kPa

.3 Connection ½" NPT – lower mount stainless steel 304

.4 Accuracy: 1.0 %

.5 Stainless steel tube, and case with glass or acrylic window with front calibration

2.7 Temperature Gauges

.1 125 mm dial gauge with adjustable angle, stainless steel case and glass or acrylic window

.2 Bimetallic hermetically sealed with stainless steel stem extending to 40-60% of pipe diameter

.3 ½" NPT thermowell with a 50 mm extension for pipe insulation

.4 Range: 0 - 125°C

.5 Accuracy: 1%

PART 3 EXECUTION

3.1 General Piping System Installation Requirements

.1 Carefully place and support all pipe at proper lines and grades; where possible slope to permit complete drainage.

.2 Blow or flush all piping clean after assembly and before connecting to equipment.

.3 Handle pipes with care at all times and use equipment designed for the purpose. Replace any pipe damaged in handling or installing.

.4 Install and join pipe in accordance with manufacturer's written instructions and good practice.

.5 Repair factory coatings at field cuts or where otherwise damaged.

3.2 Underground Piping

.1 Excavation, Trenching and Backfilling:

(a) By others.

.2 Material handling:

(a) Contractor to follow supplier recommendations for material handling and installation.

3.3 Installation

.1 General:

(a) Installation shall conform to the provisions of latest release of ASME B31.1 and CSA B51.

(b) Installation shall conform to the British Columbia Safety Authority (BCSA).

(c) Follow supplier recommendations for installation of type S04 piping including but not limited to:
i. Pipe storing and laying
ii. Joint Insulation
iii. Leak Detection wire installation

(d) Provide standard weight iron pipe size brass nipples and adapters where copper lines connect to fixtures.

(e) Pipe to pipe branch connections shall not be used.

(f) Ream all cut tube and pipe ends to the full inside diameter at the tube or pipe to remove burrs.

(g) Remove any burrs on the outside of cut tube and pipe ends.

(h) Provide air vents and drains on pipelines wherever indicated on drawings AND manual vent / drain at any high / low point, even if air vent or drain is not shown on drawings.

(i) Spring supports shall be locked during testing. Follow supplier recommendations for locking methods.

.2 Isometrics:

(a) Provide detailed isometric schematics of the piping system.
i. Provide one isometric schematic for each line.
ii. Provide Weld Maps for all welds

(b) The isometric schematic shall contain the following data as a minimum:
i. All shop weld joints and field weld joints;
ii. Online valves type and location;
iii. Pipe supports type and location;
iv. Pipe anchor points location;
v. Straight piping sections length and elevation, and branch angles;
vi. Isometric spool numbering.

(c) The Weld Maps shall contain the following data as a minimum
i. Welder ID no. for shop welded joints;
ii. Weld joints subjected to non-destructive test (NDT);
iii. Welding procedure specification number;

.3 Permissible Threaded Pipe and Bolt Assemblies:

(a) All threaded pipe shall be free of metal shavings. Excess cutting oil removed from pipe.

(b) Only use a Teflon paste type pipe lubricant for threaded assembly. Teflon tape is prohibited.

(c) Teflon tape and alternate paste or liquid lubricants are unacceptable.

(d) When utilizing machine-threaded assemblies for piping connection (i.e. flanges), an anti-seize lubricant shall be applied to machine threads.

(e) All machine-threaded assemblies shall be a minimum of Grade 5 material domestic manufacture.

.4 Permissible Welded Assemblies:

(a) Weld rings:
i. Prepare pipe as recommended by manufacturer.

(b) Butt welds:
i. Prepare pipe ends in accordance with ASME B31.1.

(c) Weldolets:
i. Required at branch connections where the branch diameter is smaller than the header diameter.
ii. Reducing tee may be provided, subject to the Consultant acceptance.
iii. Remove slag from inside pipe following installation on 6 inch and larger shop fabrications.

(d) Sockets:
i. Small diameter sockets for instruments, vent, drain, etc. to be rated for 3000 PSI.

(e) Caps:
i. Use butt-welded caps installed in accordance with ASME B31.1.

(f) Elbows:

i. Use butt-welded fittings.
ii. Elbows to be long radius only, except where indicated on drawings or as stated in Section 15099

(g) Reducers:
i. Concentric transitions shall be used on vertical piping system, unless otherwise indicated on drawings.
ii. Eccentric transitions shall be used on horizontal piping systems, unless otherwise indicated on drawings.
- Install flat-on-top unless otherwise indicated on drawings.

(h) Tees: Required at branch connections where the branch diameter is same or one size less than the header diameter.

.5 Welder Qualifications

(a) Qualify welding process and operator for piping according to ASME "Boiler and Pressure Vessel Code", section IX: "Welding and Brazing Qualifications".

(b) On-line welder qualification will be applied by radiograph first three, different production welds of each welder.

(c) Comply with provisions of ASME B31 series "Code of Pressure Piping".

.6 Pipe Welding:

(a) All welding of piping shall be performed in accordance with the latest edition of the Code for Pressure Piping ASME B31.1 and CSA B51.

(b) All welders performing under these specifications shall have been fully qualified in accordance with the test requirements of Section IX of the ASME Boiler Code.

(c) Each welder's certificate of qualification shall be supplied to the Consultant before any welding is performed.

(d) Provide welding procedure specification and procedure qualification record for each type of weld joint to be used.

(e) Each welder shall identify work by stamping each weld with its identification number, indicating qualifications. The contractor's name (in abbreviation for or initial), shall prefix the welder's number, thus identifying the entire work.

(f) Tack welds during fabrication shall be made by certified welders

(g) Each welder must have identification badge on then while working. Badge shall be presented to the Consultant representative on request.

.7 Process Piping:

(a) Install systems in accordance with ASME B31.1 and CSA B51

(b) Perform welding in accordance with ASME Standards

(c) Pitch at 1 mm/m for drainage and air elimination

3.4 Quality Control

.1 Delivery on site of all piping and fittings:

(a) Prior to delivery, the Mill Test Report (MTR) shall be submitted to the Consultant for review and acceptance of material.

(b) Upon delivery to the site of all pipes, the Contractor shall verify that the materials received matches the MTR submitted by the Contractor's supplier and that it complies with the specifications.

(c) If there is a discrepancy between the documentation and the identification markings on the material or the materials specified, the delivery shall be rejected without any costs to the Owner.

(d) The Contractor shall protect pipe and fittings from oxidation due to the elements or water.

.2 Pre-fabrication of piping spools:

(a) The Contractor shall maintain a proper control and traceability documentation to verify compliance with the applicable codes and standards and with the Specifications.

(b) The Consultant shall be provided free access to the Contractor's fabrication shop at any time during the fabrication of the piping spools.

(c) The Consultant will review the produced piping spools and control documents at Contractor's Workshop prior to delivery on site.

(d) When the piping spools are fabricated on site instead of at the Contractor's shop, the same requirements apply.

.3 Welders Qualifications:

(a) Welder certificates signed by the Contractor and a third party Inspector certifying that all welder and operator qualifications comply with the latest edition of the Code for Pressure Piping, ANSI/ASME B31.1 and all addenda.

(b) All welders performing under these specifications shall have been fully qualified in accordance with the test requirements of Section IX of the ASME Boiler Code.

(c) The Owner's representative may disqualify any welder based on observed competence and ability to complete quality work.

(d) Contractors shall utilize the following ASME forms. All copies shall be submitted to the Consultant for review and final acceptance:
i. Welding Procedures Specification (WPS) - Form QW-482
ii. Procedure Qualifications Record (PQR) - Form QW-483
iii. Welding Operator Qualifications (WPQ) - Form QW-484

(e) Provide welding procedures and welding procedure qualification for each type of weld joint to be used.

(f) Each welder shall identify his work by stamping each weld with identification, indicating: joint number, welder ID number. The contractor's name (in abbreviation form or initial), shall prefix the welder's number, thus identifying entire work.

(g) Each welder must have identification badge on then while working. Badge shall be presented on request.

(h) Inspection and testing
i. All welds shall be inspected 100% by visual examination.
ii. Each weld shall be filed as necessary before inspection.
iii. Clean each weld with a power brush to remove slag, platter, etc.
iv. Provide all material, tools, and labor to execute non-destructive tests (NDT)
v. Contractor shall hire an approved 3rd party for all non-destructive testing in accordance to ASME B31.1. All non-destructive testing shall be included in the Contractor's price

(i) Weld radiographic examination:
i. 20% of all welded joints for above ground shall undergo radiographic examination. Contractor shall coordinate with the Consultant for all welds to be tested.
ii. Any rejected weld shall be repaired and tested at the Contractor's expense. The Consultant shall select an extra weld for inspection for every rejected weld for the same welder at no extra cost to the Owner.
iii. Excessive rejected welds for the same welder may disqualify a welder from any further work on site, at the discretion of the Consultant.
iv. Where radiographic examination is not possible, ultrasonic examination may be utilized, with the Consultant's permission.
v. 100% of all welded joints for underground piping shall undergo radiographic examination

(j) Ultrasonic examination:
i. To verify the minimum pipe thickness after grinding,
ii. Initial testing of automatic welds,
iii. Where radiographic examination does not clearly show compliance of the weld,
iv. Where radiographic examination is prohibited for safety concerns.

(k) Magnetic particle examination:
i. Fillet welds,
ii. Any re-beveling,
iii. On completion of weld repairs,
iv. On removal of arc strikes.

3.5 Pressure tests

.1 General

(a) The use of additives, liquids, compounds and similar substances in pipe systems to provide a leak free system is prohibited.

(b) Valves shall not be used for dead ending a pressure test pipe section. Blind flanges / end caps can be utilized.

(c) Pressure Test limits shall be as per Section 15099.

.2 Pressure test requirements:

(a) All piping shall be hydro-tested as indicated by the Consultant.

(b) Initial and final pressure tests shall be witnessed by the Owner Representative.

(c) Notify the Consultant one week prior to scheduled test date.

(d) Submit piping pressure test method statement prior to proceeding to any pressure test.

(e) Submit test report for all pressure tests.

(f) All Primary piping is registered with British Columbia Safety Authority (BCSA). It is the responsibility of the Contractor to coordinate with BCSA for all relevant tests inspections

(g) Process piping pressure test:
i. 2,400 kPa (348 PSI).

(h) Costs for pressure testing shall be borne by Contractor

(i) Contractor to hire approved third party for pressure testing.

(j) All pressure testing for underground piping shall include a timer chart assembly.

3.6 Piping Through Concrete, Masonry and Walls

.1 Where pipe passes through walls, exercise extreme care to insure that joints are watertight.

.2 Free pipe of all dirt and grease to secure a tight bond with concrete.

3.7 Tolerances for Pipe Installation

.1 Install inside piping precisely to dimensions shown on drawings.

.2 Cast sections of major piping into place only after piping has been assembled in place. Spool pieces may be substituted for long delivery items.

3.8 Unions

.1 Unless pipe is flanged, provide unions in all piping connections to all items of equipment to permit the removal of each and every device without dismantling the pipe.

3.9 Air Vents

.1 Install manual air vents at all high points

.2 Install automatic air vents only if indicated in the P&ID's. Coordinate locations with Consultant

.3 All air vents shall be piped and capped to 1000 mm above floor level.

3.10 Heat Exchangers Installation Requirements

.1 All heat exchangers shall be installed by the Contractor. Refer to Front End for a list.

.2 Contractor shall receive, inspect, handle and store all equipment supplied by the Vendor at the storage facility provided by the Owner.

.3 All heat exchanges shall be anchored to a house keeping pad supplied by the applicable package Contractor to meet local seismic code.

.4 All plate heat exchangers shall be field insulated where applicable.

.5 Contractor shall provide provisions for by-passing the heat exchangers during flushing.

.6 Pipe supports to be installed close to heat exchangers nozzles to eliminate any loads to be transferred to those nozzles.

3.11 Flushing, Cleaning and Passivation

.1 Supply all temporary equipment and bypasses required for pipe flushing.

.2 Supply manpower to remove all temporary bypasses after the completion of the flushing and to complete connections to equipment.

.3 Provide all the manpower, tools, chemicals and equipment required for the flushing, cleaning, and passivation as instructed by the Consultant.

.4 Flushing, cleaning, and passivation procedures for all piping networks are summarized in Section 15736

END OF SECTION

Type S01		**Carbon Steel Process Piping**
Service		Primary Hot Water (above ground)
Operating Pressure rating		1,600 kPa (232 PSI)
Temperature rating		120 Deg C
Test Condition		2,400 kPa (348 PSI) for 120 minutes
Item	**Sizes**	**Specification**
Basic Material & Reference Standard	2 inch and less	• Plain Ends • ASTM A106, grade A seamless, or • ASTM A53, grades B seamless
	2½ inch to 12 inch	• Beveled ends • ASTM A106, grade A seamless, or • ASTM A53, grade B seamless or electric resistance welded
	14 inch and above	• Beveled ends • ASTM A106, grade A seamless, or • ASTM A53, grade B seamless or electric resistance welded, or • API 5L double submerged arc welded
Thickness	2 inch and less	ASME B36.10, schedule 80
	2½ inch to 12 inch	ASME B36.10, schedule 40
	14 inch to 24 inch	ASME B36.10, standard weight (0.375”)
Fittings / Joints	¾ inch and below	threaded socket fittings, material to ASTM A105 and dimensions to ASME B16.11
	1 inch to 2 inch	welded socket fittings, material to ASTM A105 and dimensions to ASME B16.11
	Above 2½ inch	butt-welded, black steel with bevelled ends for welding, to ASME B16.9, same wall thickness as pipe (Elbows shall be long radius)
Welding Outlets	14 inch to 24 inch	Weldolets, sockolets and thredolets to ANSI B16.9, ANSI B16.11 and ANSI B31.1
Insulation	All	As per Section 15205

Notes

1. All indoor piping with removable insulation shall be painted with an alkyd primer with a minimum dry film thickness of 2.5 mils suitable for 120°C
2. All exterior piping (including piping within manholes) shall be painted with an alkyd primer (minimum dry film thickness of 3 mils) suitable for 120°C and a compatible epoxy coating (minimum dry film thickness of 3 mils)

Type S04		**Pre-Insulated Carbon Steel Process Piping**
Service		Primary Hot Water (Underground)
Operating Pressure rating		1,600 kPa (232 PSI)
Temperature rating		120 Deg C
Test Condition		2,400 kPa (348 PSI) for 120 minutes
Item	**Sizes**	**Specification**
Basic Material & Reference Standard	1 inch and above	• Beveled Ends • ASTM A106, grade A seamless, or • ASTM A53, grades B seamless
Thickness	2 inch and less	ASME B36.10, schedule 80
	2½ inch to 12 inch	ASME B36.10, schedule 40
	14 inch to 24 inch	ASME B36.10, standard weight (0.375")
Fittings / Joints	¾ inch and below	threaded socket fittings, material to ASTM A105 and dimensions to ASME B16.11
	1 inch to 2 inch	welded socket fittings, material to ASTM A105 and dimensions to ASME B16.11
	Above 2½ inch	butt-welded, black steel with bevelled ends for welding, to ASME B16.9, same wall thickness as pipe (Elbows shall be long radius)
Insulation	• Shall be a bonded system and conforms to BS EN 253 • 38 mm (1½ inch) void free polyurethane foam • Unaged thermal conductivity shall not exceed 0.029 W/(m.K) when tested in accordance to Section 5.4.4 of BS EN 253 • Unaged minimum compressive strength: 0.3 MPa when tested in accordance to Section 5.3.3 of BS EN 253 • Unaged minimum shear strength: 0.08 MPa when tested in accordance to Section 5.4.1.5 of BS EN 253 • Insulation shall be factory applied, except at joints where field welding is required.	
Jacket	Black HDPE conforming to BS EN 253	
Test Procedure	Testing Procedures to confirm to BS EN 253	
Leak Detection	The Bonded system shall include a leak detection system built-in within the jacket	
Notes		
1. Full conformance to BS EN 253 takes precedence over pipe thicknesses outlined in this section		

END OF SECTION

1. GENERAL

1.1 Quality Assurance

.1 Welding materials, fabrication standards and labour qualifications must conform to ANSI/ASME B31.9, ANSI B16.25, ASME Section IX, and the Provincial Board of Labour Regulations latest current editions.

.2 Use welders fully qualified and licensed by Provincial Authorities.

.3 Gas Piping: National Standard of Canada CAN1-B149.1 (latest edition), installation Code for Natural Gas Burning Appliances and Equipment.

.4 Propane Piping: National Standard of Canada CAN1-B149.2 (latest edition), Installation Code for Propane Burning Appliances and Equipment.

.5 Oil Piping: CSA Standard B139, Installation Code for Oil Burning Equipment (latest edition).

.6 Automatic Sprinkler System Piping: current edition of NFPA No.13, Standard for the Installation of Sprinkler Systems.

.7 Standpipe and Hose System Piping: current edition NFPA No.14, Standard for the Installation of Standpipe and Hose Systems.

.8 Domestic Water, Drainage and Vent Piping: current Provincial and Municipal Codes.

.9 Medical compressed Air, Gas and Vacuum System Piping: current edition of CSA Z305.1, Non Flammable Medical Gas Piping Systems. Refer to 15490, Medical Gas Systems.

.10 Refrigerant Piping: current edition of CSA B52.

.11 All below grade steel piping shall be yellow jacketed with taped and sealed joints.

.12 Non specified pipe joining and pipe fitting methods such as T-drill and press fit are not permitted in any piping system covered under Division 15.

2. PRODUCTS

2.1 Approved Manufactures

.1 Grooved Mechanical Pipe Joints: Victaulic, Mech Line (only where permitted).

2.2 Pipe

	Service	Material
.1	Sanitary drainage, and vent, inside building, above ground	`DWV' copper, ASTM B306 Cast iron, CSA B70 PVC-DWV, ULC Approved to CAN4-S102.2 for non-combustible buildings

	Service	Material
.2	Sanitary drainage, and vent, inside building, below ground	Cast iron, CSA B70 PVC-DWV, CAN/CSA B181.2
.3	Sanitary drainage and vent, outside building	Cast iron, CSA B70 PVC, SDR-35 for sizes to *300 mm**12 in.***, ASTM-D3034, complete with tracer wire. Concrete pipe for sizes over *300 mm**12 in.***
.4	Storm drainage, inside building, above ground	Cast iron, CSA B70 DWV Copper, ASTM B306
.5	Storm drainage, inside building, below ground	Cast iron, CSA B70 PVC-DWV, CAN3B182.1
.6	Storm drainage, outside building	Cast iron, CSA B70 PVC, SDR-35 for sizes to *300 mm**12 in.***, ASTM-D3034, complete with tracer wire. Concrete pipe for sizes over *300 mm**12 in.***
.7	Domestic water, above ground (inside building)	Type `L' hard copper for cold water and Type 'K' hard copper for hot water and recirc. water for sizes up to *100 mm**4 in.***, ASTM B88M Ductile Iron centrifugally cast for cold water main sizes *100 mm**4 in.*** and larger, ANSI/AWWA C151/A21.51. No steel piping allowed for domestic hot water.
.8	Domestic Water (buried inside building)	Type `K' soft copper, ASTM B88M
.9	Domestic water service	Type `K' soft copper, ASTM B88M below ground PVC, Class 150, conforming to CSA B137.3 and AWWA C900, complete with tracer wire
.10	Hot water and glycol heating to *120°C* ***250°F***	Steel, Sch.40, ASTM A53, Grade B heating to *120°C**250°F***
.11	Natural gas, propane Grade B	Steel, Sch.40, ASTM A53

	Service	Material
.12	Equipment drains and overflows	Sch.40, galvanized steel, ASTM A120 Type `L' hard copper ASTM B88M
.13	Fire protection	As per NFPA 13 and NFPA 14, Schedule 10. Acceptable copper piping grade: Type 'L' or Type 'K'
.14	Oil (above ground)	Steel, Sch.40, ASTM A120
.15	Oil (below ground)	Refer to Section 15600
.16	Compressed air	Type `L' hard copper, ASTM B88M Steel Sch.40, galvanized, ASTM A120 (for pipes over *65 mm**2½ in.*** dia.)
.17	Refrigerant	ACR copper, ASTM B280
.18	Chilled water Condenser water	Steel, Sch.40, ASTM A53, Grade B
.19	Steam (to *103 kPa**15 psi***), Vents	Steel, Sch.40, ASTM A53, Grade B
.20	Condensate, pumped condensate	Steel, Sch.80, ASTM A120
.21	Diesel engine exhaust Grade B	Steel, Sch.40, ASTM A53 UL Listed Insulated Position Pressure Piping System
.22	Ground water piping inside building	T316 stainless steel Schedule 10S
.23	Ground water piping outside building	HDPE DR26

2.3 Fittings and Joints

	Service	Material	Joint
.1	Sanitary drainage and vent inside building, above ground	Cast iron	Gasket clamp
		Wrought or Cast copper	50-50 Solder
.2	Sanitary drainage and vent, inside building, below ground	Cast iron (hubless fitting)	Gasket & clamp

	Service	Material	Joint
		PVC-DWV	Solvent weld
.3	Sanitary drainage and vent, outside building	Cast iron	Hub & spigot
		PVC- Gravity Sewer	Hub & spigot with gasket
		Concrete	Hub & spigot
.4	Storm drainage, inside building, above ground	Cast iron	Gasket & clamp
		Wrought or cast copper	50-50 solder
.5	Storm drainage, inside building, below ground	Cast iron	Gasket & clamp
		PVC-DWV	Solvent weld
.6	Storm drainage, outside building	Cast iron	Hub & spigot
		PVC-Gravity sewer	Hub & spigot with gasket
		Concrete	Hub & spigot
.7	Domestic water, above ground	Wrought copper, bronze	Lead free solder, brazed for pipes over 50 mm
		Cast bronze	Screwed
		Ductile Iron pipe	Grooved mechanical
.8	Domestic water, buried	PVC	Hub & spigot, with "O" ring
		Copper pipe	No joints permitted underground
.9	Hot water and glycol heating *120°C**250°F***	Banded malleable iron, *1033 kPa**150 psi***, up to *50 mm**2 in.***	Screwed,
		Steel, same schedule as pipe, for sizes *50 mm**2 in.*** and larger	Welded
		Wrought copper,	95-5 solder, brazed bronze, for pipes over *50 mm**2 in.***

	Service	Material	Joint
		Cast brass	Screwed
		Cast bronze	Flare tube
.10	Natural gas, propane	Banded malleable iron, *1033 kPa**150 psi***, for sizes *40 mm**1½ in.*** and under	Screwed
		Steel, same schedule as pipe, for sizes *50 mm**2 in.*** and larger: and for high pressure(over *860 kPa**125 psi***)- all sizes; and for piping installed outdoors - all sizes	Welded
.11	Equipment drains and overflows	Galvanized banded malleable iron	Screwed
		Wrought copper, bronze	50-50 solder
		Cast brass	Screwed
.12	Fire protection	Malleable iron or cast iron	Screwed or flanged
		Banded malleable iron or steel	Grooved mechanical Victaulic Brand or Grinnel Gruv-Lok only
		Steel, same schedule as pipe	Welded
		Note: Grooved mechanical fittings permitted only in areas where piping is exposed.	
.13	Oil (above ground)	Malleable iron, banded, *1033 kPa**150 psi***	Screwed
		Forged steel	Screwed
		Forged steel, socket weld	Welded
		Steel, same schedule as pipe	Welded
		Cast bronze	Flared tube
.14	Oil (below ground)	Refer to Section 15600	
.15	Compressed air	Wrought copper or cast	95-5 solder

	Service	Material	Joint
		brass	
.16	Refrigerant	Wrought copper	Brazed, phos copper alloy
.17	Chilled water and condenser water	Banded malleable iron, *1033 kPa**150 psi***, sizes up to *50 mm**2 in.***	Screwed
		Steel same schedule as pipe for sizes *150 mm**2 in.*** and larger	Welded
		Cast steel mechanical	Grooved Victaulic Brand or Grinnel Gruv-Lok only
		Wrought copper, bronze	95-5 solder, brazed for pipes over *50 mm**2 in.***
		Cast brass	Screwed
		Cast bronze	Flared tube
		Note: Grooved mechanical fitting are permitted only in areas where piping is exposed.	
.18	Steam to *103 kPa**15 psi***, Vents, Condensate	Banded malleable iron, *1033 kPa**150 psi***, sizes up to *50 mm**2 in.***	Screwed
		Steel, same schedule as pipe, sizes *50 mm**2 in.*** and larger	Welded
.19	Diesel engine exhaust	Steel, same schedule as pipe, all sizes	Welded
.20	Well Water	HDPE DR26	Fusion welded

.21 Use factory fabricated butt welded fittings for welded steel pipes.

.22 Use long radius elbows for steel and cast iron water piping, including grooved mechanical fittings.

2.4 Unions, Flanges and Couplings

.1 *Size 50 mm**2 in.*** and under: *1033 kPa**150 psi*** malleable iron, bronze to iron ground joint unions for threaded ferrous piping, air tested for gas service, all bronze for copper piping.

.2 Sizes *65 mm**2½ in.*** and over: *1033 kPa**150 psi*** forged steel welding neck flanges for ferrous piping, *1033 kPa**150 psi*** bronze slip-on flanges for copper piping. Gaskets shall be *1.5 mm**1/16 in.*** thick performed synthetic rubber bonded asbestos. Gaskets for gas service shall be synthetic rubber.

.3 Flange bolting: For systems up to *120°C**250°F***, use carbon steel stud bolts, semi-flushed and heavy hex nuts, ASTM A307-GrB. For systems up to *215°C**420°F***, use alloy steel bolts ASTM A193-GrB7, and semi-finished heavy hex nuts ASTM A194-Gr2H.

.4 Where permitted by the Consultant, use grooved mechanical couplings to engage and lock grooved or shouldered pipe ends and to allow for some angular deflection, contraction and expansion. Couplings consist of malleable iron housing-clamps, C-shaped composition sealing gasket EPDM Grade `E' and steel bolts. Use galvanized couplings for galvanized pipe. Victaulic brand or Grinnel Gruv-Lok only

2.5 Grooved Mechanical Piping

.1 Grooved Mechanical is acceptable on chilled water, condenser water, potable water, compressed air lines, fire protection, equipment drains and overflows.

.2 Couplings: Contractor shall use "Zero Flex" Rigid Couplings in all applications except where flexible style couplings are approved by the Engineer for use at equipment connections: i.e.: Pumps, chillers, cooling towers. An installation diagram will need to be approved by Engineer prior to installation.

.3 For copper connections 2" to 4", Contractor shall use Victaulic Style 606 Couplings complete with EPDM Flush Seal Gasket. Coupling has angle bolt pad to provide a rigid joint.

.4 For Ductile Iron Potable Water Piping System, Contractor shall use Style 31 Coupling and Style 307 Transition Coupling.

.5 When transitioning between grooved ductile iron and grooved copper in a potable water system, Contractor shall use the Groove X Groove Style 47 Dielectric Water Way.

.6 Butterfly Valves: Where Victaulic piping system is used, Contractor shall incorporate Victaulic Style 300 Butterfly, complete with EPDM Grade "E" encapsulated disc, rated to 300 PSI dead en service. In compressed air lines, Contractor shall incorporate Style 300 complete with Nitrile Grade "T" encapsulated disc.

.7 Domestic Water Valves: For Victaulic Ductile Iron domestic water piping, Contractor shall incorporate Style 300 BFV complete with EPDM Grade "E" gasket. On incoming water, Contractor shall use Style 705 W monitored BFV, 717 PPS coated check valve joined together with a Zero Flex Style 07 coupling complete with flush seal EPDM Grade "E" gasket. Where grooved strainer is used on potable water service strainer shall be Style 732 PPS coated Wye Strainer.

.8 Victaulic copper connection for potable water, Contractor shall incorporate Style 608 Butterfly valve rated in 300 PSI dead end service.

.9 Valves and specialities for use in chilled, condenser, glycol and heat pump systems:

Check Valves	Victaulic Style 716 & Style 779 complete with Venturi Ports

Circuit Balancing Valves	Tour and Anderson
Suction Diffusers	Victaulic Style 731
Triple Duty Valves	Combination Victaulic 300 BFV/716 Check Valve
Strainers	Victaulic Style 730 (Tee) and Style 732 (Wye)

.10 For Victaulic grooved joints, pipe ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket seating. The gasket style and elastamer material (grade) shall be verified as suitable for the intended service as specified.

.11 Contractor shall verify the pipe and grooves meet Victaulic's current specifications. Acceptable products - Victaulic brand or Grinnel Gruv-Lok.

3. EXECUTION

3.1 Preparation

.1 Ream pipes and tubes. Clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.

.2 Protect all steel pipes when stored on site from external conditions and ensure protective coating remains intact. If in the opinion of the Consultant, deterioration of the protective coating has instigated corrosion, all rust must be removed down to bare metal and prime coated with red oxide paint.

3.2 Connection

.1 Screw joint steel piping up to and including *40 mm**1½ in***. Weld piping *65 mm**2½ in.*** and larger, including branch connections. Screw or weld *50 mm**2 in.*** piping for liquid systems, weld *50 mm**2 in.*** piping for air and gas systems.

.2 Make screwed joints with full cut standard taper pipe threads with approved non-toxic joint compound applied to male threads only.

.3 Make joints for plain end pipe with gasket and clamp type mechanical fastener.

.4 Clamp cast iron water pipe at fittings with *20 mm**¾ in.*** rods and properly anchor and support.

.5 Use grooved mechanical couplings and mechanical fasteners, only where permitted by the Consultant.

.6 Use galvanized couplings with galvanized pipe.

.7 Make connections to equipment, specialty components, and branch mains with unions or flanges.

.8 Provide dielectric type connections wherever joining dissimilar metals in open systems. Brass adapters and valves are acceptable.

.9 Use insulating plastic spacers for copper pipe installation in metal studs.

3.3 Route and Grades

.1 Route piping in orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping wherever practical at common elevations. Install concealed pipes close to the building structure to keep furring to a minimum.

.2 Slope water piping 0.2% and provide hose bibb drains at low points.

.3 Equip low points with *20 mm**¾ in.* drain valves and hose nipples.

.4 Provide air collection chambers with manual air vent at all high points of system. Collection chambers to be *25 mm**1 in.* dia. or line size whichever is greater and *150 mm**6 in.* high minimum. Square tees may only be used to assist with complete venting and draining.

.5 Slope steam piping 0.5% in direction of flow and condensate return piping 0.75%. Provide drip trap assembly at all low points and in front of control valves. Run condensate lines from traps to nearest condensate receiver. Where condensate lines form a trap, provide vent loop over the trapped section.

.6 Make reductions in water and steam pipes with eccentric reducing fittings installed to provide drainage and venting. Top flat for water, bottom flat for steam.

.7 Grade horizontal drainage and vent piping 2% minimum, unless noted otherwise.

.8 Pipe the discharge from all relief valves, safety valves, vents, drains, equipment blowdowns, water columns and overflows to the nearest building drain. Pipe to glycol recovery tanks for a glycol based system.

3.4 Installation

.1 Install piping to allow for expansion and contraction without unduly stressing pipe or equipment connected.

.2 Provide clearance for proper installation of insulation and for access to valves, air vents, drains and unions.

.3 Install piping material specified as inside the building to *2500 mm**8 ft.* outside of building.

.4 Yellow jacket buried steel lines, joints and fittings, prime coat and paint lines exposed to outdoors.

3.5 Welded Pipe Branch Connections

.1 Make branch connections according to the following schedule.

Legend:

T: Forges tee or reducing tee

S: Socolet

W: Weldolet

	*15**½ in.***	T												
	*20**¾ in.***	T	T											
	*25**1 in.***	T	T	T										
	*30**1¼ in.***	T	T	T	T									
	*40**1½ in.***	T	T	T	T	T								
	*50**2 in.***	S	S	S	T	T	T							
HEADER	*65**2½ in.***	S	S	S	S	T	T	T						
	*75**3 in.***	S	S	S	S	S	T	T	T					
	*100**4 in.***	S	S	S	S	S	T	T	T	T				
	*150**6 in.***	S	S	S	S	S	W	T	T	T	T			
	*200**8 in.***	S	S	S	S	S	W	W	W	T	T	T		
	*250**10 in.***	S	S	S	S	S	W	W	W	W	T	T	T	
	*300**12 in.***	S	S	S	S	S	W	W	W	W	W	T	T	T
		15	*20*	*25*	*30*	*40*	*50*	*65*	*75*	*100*	*150*	*200*	*250*	*300*
		½"	***¾"***	***1"***	***1¼"***	***1½"***	***2"***	***2½"***	***3"***	***4"***	***6"***	***8"***	***10"***	***12"***

BRANCH

END OF SECTION

Table of Contents

PART 1 GENERAL

1.1 Work Included

.1 This Section includes all labour, materials and incidentals for complete and operable valves, operators and appurtenances as shown on the drawings and specified herein.

.2 Read this Section in conjunction with the Drawings and Contract Documents, particularly the piping specifications. Where there is a conflict, conform to the most stringent requirements.

1.2 Related Work

.1 Section 15098 Piping - Primary Hot Water Side

.2 Section 15099 Piping Specification Sheets

1.3 Quality Assurance and Reference Standards

.1 Work shall be carried out only by qualified tradesmen.

.2 Conform to all standard specifications referenced herein.

1.4 Submittals

.1 Submit manufacturer's literature and catalogue information for all valves and actuators prior to ordering any materials.

.2 Submit list of recommended spare parts with current prices for valves and equipment.

1.5 Delivery, Storage and Handling

.1 Protect all valves from weather, and from all damage.

1.6 Valve Specification Sheets

.1 The Valve Specification Sheets (Section 15109) detail the technical requirements for each type of valve specified, including the valve materials, performance requirements and reference specifications.

.2 The Valve Specification Sheets do not necessarily include requirements such as actuator supports and other items required.

.3 All valves of a particular code shall be from the same manufacturer.

PART 2 PRODUCTS

2.1 General

.1 All products shall conform to the Valve Specification Sheets.

.2 Named Acceptable Products are given in the Valve Specification Sheets to define basic materials and performance criteria required for each valve type.

.3 All products shall be new, undamaged, and free from rust and defects.

.4 All products of a similar nature shall be the product of a single manufacturer.

2.2 Definitions

.1 Abbreviations used in Detailed Valve Specification Sheets:

AV - Angle Valve
BC - Balancing Cock Valve
BD - Butterfly Damper
BF - Butterfly Valve
BV - Ball Valve
CB - Circuit Balancing Valve
CV - Check Valve
DV - Diaphragm Valve
GA - Gauge/Root Valve
GL - Globe Valve
GV - Gate Valve
KV - Knife Gate Valve
MV - Mud Valve
NV - Needle Valve
PD - Pump Discharge (Triple Duty) Valve
PN - Pinch Valve
PR - Pressure Reducing/Relief Valve
PV - Plug Valve
TW - Two Way/Three Way Multiport Valve

PART 3 EXECUTION

3.1 Installation Requirements

.1 All valves shall be installed as per supplier recommendations.

.2 All valves shall be installed in a cracked open position.

3.2 Chain operators:

.1 Provide chain operators for valves located 2200 mm or higher above finished floor level.

.2 Extend chain to an elevation of 1500 mm above finished floor level.

3.3 Vents and Drains

.1 All vents and drains shall be 1 inch type BV-01 unless stated otherwise.

.2 All drains shall be furnished with an elbow and a cap with a chain.

.3 All vents shall be furnished with a plug.

.4 Provide drains at all low points and for all strainers

.5 Provide vents at all high points

END OF SECTION

Ball Valve	**BV-01**
General	
Description	Two-piece steel ball valve
Basic Material & Reference Standard	Carbon steel
Ends	Welded or Threaded
Pressure rating	1600 kPa (232 psi)
Temperature rating	120 deg C
Size Range	½ inch to 1½ inch
Service	Primary side vents and drains
Materials	
Body	Carbon steel, 2-piece
Ball	Stainless steel, full port
Seat	Teflon
Shaft	Stainless steel (note 1)
Operator	
Handle	Epoxy coated steel
Notes	
1. Blowout-proof shaft required.	
Standard of Acceptance	
Apollo Valves Series 72-140	

Ball Valve	**BV-06**
General	
Description	Welded Ball Valves
Basic Material & Reference Standard	Carbon Steel
Ends	Beveled weld end
Pressure rating	1600 kPa (232 psi)
Temperature rating	120 deg C
Size Range	1” to 6”
Service	Primary Hot Water
Materials	
Body	Sch 40 Carbon Steel
Ball	304 Stainless Steel, reduced port
Seats	O-Ring Teflon (PTFE)
Shaft	304 Stainless Steel
Operator	
Lever actuator	▪ Epoxy coated steel construction. ▪ Provision for padlocking.
Notes	
All valves shall have a registered CRN number	
Standard of Acceptance	
Broen (Ballomax) and Armour Valve (Bohmer)	

Pressure Relief Valve	**PR-01**
General	
Description	Direct-operated, spring loaded pressure relief valve
Basic Material & Reference Standard	Bronze B584 Alloy 84400
Ends	¾" NPT inlet
Pressure rating	1600 kPa (232 psi)
Temperature rating	120 deg C
Size Range	¾"
Service	Primary Hot Water
Setting	250 psi
Materials	
Body	Bronze
Disc/Retainer	Stainless Steel
Seat/Seal	Buna-N
Approved Models	
Kunkle model 918	

END OF SECTION

1. GENERAL

1.1 Scope

.1 Gate valves.

.2 Globe or angle valves.

.3 Ball valves.

.4 Check valves.

.5 Plug cocks.

.6 Eccentric plug valves.

.7 Butterfly valves.

.8 Drain valves.

.9 Hose bibbs.

.10 Strainers.

1.2 Manufacturer

.1 Provide valves of the same type by the same manufacturer throughout.

.2 Provide valves with manufacturer's name and pressure rating clearly marked on outside of body.

1.3 Shop Drawings

.1 Submit copies of valves "ordering schedule" for review before ordering valves.

.2 Submit detailed shop drawings clearly indicating make, model, size, pressure rating, materials of construction and intended service.

2. PRODUCTS

2.1 Approved Manufactures

.1 Valves – Butterfly: Jenkins, Keystone, DeZurik, Centreline, Monotight, Dresser, Lunkenheimer, Crane, Bray, Toyo, Grinell.

.2 Valves – Circuit Balancing: Armstrong, B & G, Wheatly, Tour & Anderson.

.3 Valves – Drain, Radiator: Jenkins, Dahl, Crane, Toyo, Kitz.

.4 Valves – Eccentric Plug: DeZurik, Homestead.

.5 Valves – Gate, Globe, Swing, Check, Ball: Jenkins, Toyo, Crane, Kitz, Milwaukee.

.6 Valves – Plumbing Flush: Crane, Sloan, Teck.

.7 Valves – Pressure Balanced Mixing: Symmons.

.8 Valves – Pressure Reducing: Armstrong, Bell & Gossett, Taco.

.9 Valves – Relief: Armstrong, Bell & Gossett, Taco, Wheatley.

.10 Valves – Shower: Symmons, Powers.

.11 Valves – Silent Check: Val-matic, APCO, StreamFlo.

.12 Valves – Suction Diffusers Combination Check and Balance: Armstrong, B&G, Taco.

.13 Valves – Thermostatic Mixing: Symmons, Poweres.

.14 Valves – Water Pressure Reducing: Watts, Clayton, Singer, Zurn, Wilkins, BCA, Cash Acme, Braukman.

.15 Plug Cocks: DeZurik, Newman-Milliken.

2.2 Domestic Cold Water System

.1 Ball Valves up to *50 mm* ***2 in.***: Brass body, chrome plated brass ball, threaded or solder ends, TFE seat and packing. *4134 kPa* ***600 psi*** non-shock WOG rating. Threaded, Red-White Fig. 5044A. Solder joint, Red-White Fig. 5049A.

.2 Globe Valves up to *50 mm* ***2 in.***: Bronze body, screw over bonnet, threaded ends rating *1035 kPa* ***150 psi*** steam, solder ends rating *2070 kPa* ***300 psi*** water. Threaded, Red-White Fig. 221. Solder ends, Red-white Fig. 222.

Globe Valves *65 mm* ***2½ in.*** and over: Cast iron body, flanged ends, O.S. and Y, renewable bronze seat ring, renewable composition disc. Rating *860 kPa* ***125 psi*** steam. *1380 kPa* ***200 psi***. Red-White Fig. 400.

.3 Butterfly Valves: Cast iron wafer full-lug body, 300 Series stainless steel shaft, bronze disc, replaceable EPDM seat, lever lock handle operator with multiple position lock plate for valve sizes to *100 mm* ***4 in.***, heavy duty gear handwheel operator with position indicator for valve sizes *150 mm* ***6 in.*** and over. Minimum rating *1200 kPa* ***175 psi***, *121°C* ***250°F***. Keystone F1000, F1020.

.4 Gate Valves up to *50 mm* ***2 in.***: Bronze body, inside screw, travelling stem, solid wedge, screw-in bonnet, threaded ends rating *860 kPa* ***125 psi*** steam, solder ends rating *1380 kPa* ***200 psi*** water. Threaded, Red-White Fig. 293. Solder ends, Red-White Fig. 299.

Gate Valves *65 mm* ***2½ in.*** and over: Cast iron body, bronze trim, O.S. and Y, rising stem, solid wedge, flanged ends, rating *860 kPa* ***125 psi*** steam. Red-White Fig. 421.

.5 Swing Check Valves up to *50 mm* ***2 in.***: Bronze body, screw-in cap, replaceable disc, *860 kPa* ***125 psi*** steam rating. Threaded, Red-White Fig. 236. Solder ends, Red-White Fig. 237.

Swing Check Valves 65 mm 2½ in. and over: Cast iron body, regrind-renew swing check, bolted cover, flanged ends, bronze disc and seat ring, rating *860 kPa* ***125 psi*** steam. Red-White Fig. 435.

.6 Silent Check Valves for Pump Discharge:

Up to *50 mm* ***2 in.***: Bronze body, SS stem, 316 SS spring, teflon disc and seat ring, 430 SS seat screw, threaded ends. *1380 kPa* ***200 psi*** water. Val Matic VM-S1400.

65 mm ***2½ in.*** and over: Wafer style, cast iron body, 316 SS seat, plug, spring and bushing. ANSI Class 125. Val Matic, Series 1400.

2.3 Domestic Hot Water System

.1 Valves to be used in the hot water section of the system shall be exactly as specified in the cold water section with one exception, that all composition disc valves shall be fitted with discs suitable for hot water.

2.4 Domestic Water System Hose Bibbs

.1 Bronze body globe valve, renewable composition disc, threaded inlet, "garden hose" thread outlet, rating *2070 kPa* ***300 psi*** water.

Bronze or red brass, replaceable hexagonal disc, hose thread spout.

.2 Non-freeze bronze wall hydrant, projecting *20 mm* ***3/4 in.*** hose connection type, galvanized casing, removable key, *polished bronze *polished nickel bronze *chrome plated face, inlet connection to suit installation. Roto-Tech-Smith RS-5600 Series.

Non-freeze nickel-bronze recessed wall hydrant, concealed *20 mm****3/4 in.*** hose connection, galvanized casing, removable key, *polished bronze *polished nickel bronze *chrome plated face, inlet connection to suit installation. Roto-Tech-Smith RS-5500 Series.

2.5 Hot Water Heating, Glycol and Chilled Water and Condenser Water Systems

.1 Ball Valves up to *50 mm* ***2 in.***: Brass body, chrome plated brass ball, threaded or solder ends, TFE seat and packing. *4134 kPa* ***600 psi*** non-shock WOG rating. Threaded, Red-White Fig. 5044A. Solder joint, Red-White Fig. 5049A.

.2 Globe Valves up to *50 mm* ***2 in.***: Bronze body, screw over bonnet, threaded ends rating *1035 kPa* ***150 psi*** steam, solder ends rating *2070 kPa* ***300 psi*** water. Threaded, Red-White Fig. 221. Solder ends, Red-white Fig. 222.

Globe Valves *65 mm* ***2½ in.*** and over: Cast iron body, flanged ends, O.S. and Y, renewable bronze seat ring, renewable composition disc. Rating *860 kPa* ***125 psi*** steam. *1380 kPa* ***200 psi*** water. Red-White Fig. 400.

.3 Butterfly Valves: Cast iron wafer full-lug body, 300 Series stainless steel shaft, bronze disc, replaceable EPDM seat, lever lock handle operator with multiple position lock plate for valve sizes to *100 mm* ***4 in.***, heavy duty gear handwheel operator with position indicator for valve sizes *150 mm* ***6 in.*** and over. Minimum rating *1200 kPa* ***175 psi***, *121°C* ***250°F***. Keystone F1000, F1020.

.4 Gate Valves up to *50 mm* ***2 in.***: Bronze body, inside screw, travelling stem, solid wedge, screw-in bonnet, threaded ends rating *860 kPa* ***125 psi*** steam, solder ends rating *1380 kPa* ***200 psi*** water. Threaded, Red-White Fig. 293. Solder ends, Red-White Fig. 299.

Gate Valves *65 mm* ***2½ in.*** and over: Cast iron body, bronze trim, O.S. and Y, rising stem, solid wedge, flanged ends, rating *860 kPa* ***125 psi*** steam. Red-White Fig. 421.

.5 Swing Check Valves up to *50 mm* ***2 in.***: Bronze body, screw-in cap, replaceable disc, *860 kPa* ***125 psi*** steam rating. Threaded, Red-White Fig. 236. Solder ends, Red-White Fig. 237.

Swing Check Valves *65 mm* ***2½ in.*** and over: Cast iron body, regrind-renew swing check, bolted cover, flanged ends, bronze disc and seat ring, rating *860 kPa* ***125 psi*** steam. Red-White Fig. 435.

.6 Silent Check Valves for Pump Discharge:

Up to *50 mm* ***2 in.***: Bronze body, SS stem, 316 SS spring, teflon disc and seat ring, 430 SS seat screw, threaded ends. *1380 kPa* ***200 psi*** water. Val Matic VM-S1400.

65 mm ***2½ in.*** and over: Wafer style, cast iron body, 316 SS seat, plug, spring and bushing. ANSI Class 125. Val Matic, Series 1400.

.7 Eccentric Plug Valves: Cast iron body with resilient faced cast iron plug, bolted bonnet, stainless steel bearings, nickel seat. Multiple packing ring, stem seal and resilient plug facing materials suitable for hot water/glycol service to *121°C* ***250°F***. Valve ends threaded up to *50 mm* ***2 in.***, flanged *65 mm* ***2½ in.*** and over. Lever operator with adjustable open position memory stop up to *100 mm* ***4 in.*** valves, heavy duty gear reducer handwheel operator with adjustable open position memory stop for valves *150 mm* ***6 in.*** and over. Rating *1210 kPa* ***175 psi*** water at *121°C* ***250°F***. DeZurik Series 100.

.8 Terminal Heat Transfer Unit Valves up to *30 mm* ***1 ¼ in.***: Heavy pattern brass body radiator valve, wheel handle, rising stem, inside screw, renewable composition swivel disc, straight or angle globe, threaded or union ends, positive back seating. Dahl Series 11040.

Terminal Heat Transfer Unit Valves *40 mm* ***1½ in.*** and over: Bronze gate valves, threaded ends up to *50 mm* ***2 in.***, cast iron gate valves, flanged ends, valve sizes *65 mm* ***2½ in.*** and over. Red-White Fig. 421.

.9 Terminal Heat Transfer Unit Balancing Valves up to *30 mm* ***1 ¼ in.***: Removable cap key, screw set memory bonnet for balancing, brass body, rising stem, inside screw, renewable composition swivel disc, straight or angle globe, threaded or union ends, positive back seating. Dahl Series 13000-M.

Terminal Heat Transfer Unit Balancing Valves *40 mm* ***1½ in.*** and over: Eccentric plug valve, as described above.

.10 Drain Valves up to *50 mm* ***2 in.***: Brass 2 piece body ball valve, blowout proof stem, teflon seats, forged brass chrome palted ball, hose end connection with cap and chain by male IP, *4200 kPa* ***600 psi*** water, oil, gas rating, Red-White Fig. 5046.

Terminal unit brass T-body drain valve, wheel handle, ground body-bonnet joint, renewable disc, brass chain, forged brass gasketed cap. Working pressure *1725 kPa* ***250 psi*** at *121°C* ***250°F***. Dahl 21.616.

.11 Circuit Balancing Valves: Suitable for throttling. All metal parts non-ferrous, die cast non-porous copper alloy. Flow measuring accuracy ±2%. Positive shut-off, drain connection with cap. Memory balancing feature. Fittings for connection of portable differential pressure meter. Bell & Gosset circuit setter.

2.6 Natural Gas Systems

.1 Plug Cocks: Class 125 non-lubricated parallel-plug valve, cast iron body and plug, short pattern, regular port, full bore, threaded or flanged ends, CGA approved.

.2 Ball valves up to *50 mm* ***2 in.***: Class 125 non-lubricated ball valves suitable for outdoor use, brass body, CGA approved Section 3.16 threaded ends, Kitz Fig. #68 (AKTAF).

.3 Ball valves *65 mm* ***2½ in.*** and larger: Flanged, carbon steel body, stainless steel trim, lever operated, teflon seats and seals. Kitz Fig. 150SCTB-N.

.4 Seismic Gas Shut Off Valve:

.1 Up to 50 mm

.1 Koso series 310 high pressure screwed body.

.2 65 mm and larger

.1 Koso series 314 high pressure flanged body.

.2 138 kPa maximum gas pressure.

.3 Visual open-close indicator with manual reset.

2.7 Oil System

.1 Gate Valves up to *50 mm* ***2 in.***: Bronze body, inside screw, travelling stem, solid wedge, screw-in bonnet, threaded ends rating *860 kPa* ***125 psi*** steam. Red-White Fig. 293.

.2 Check Valves up to *50 mm* ***2 in.***: Bronze body and disc, regrinding swing check, screw-in cap, threaded ends, rating *860 kPa* ***125 psi*** steam. Red-White Fig. 236.

2.8 Steam and Condensate Systems to *103 kPa* *15 psi*

.1 Gate Valves up to *50 mm* ***2 in.***: Bronze body, inside screw, travelling steam, solid wedge, screw-in bonnet, threaded ends rating *860 kPa* ***125 psi*** steam. Red-White Fig. 293.

Gate Valves *65 mm* ***2½ in.*** and over: Cast iron body, flanged ends, O.S. and Y, rising stem, bronze trim, solid wedge, rating *860 kPa* ***125 psi*** steam. Red-White Fig. 421.

.2 Globe Valves up to *50 mm* ***2 in.***: Bronze body, screw over bonnet, threaded ends, rating *1035 kPa* ***150 psi*** steam. Red-White Fig. 221.

Globe Valves *65 mm* ***2½ in.*** and over: Cast iron body, flanged ends, O.S and Y, renewable bronze seat ring, renewable composition disc. Rating *860 kPa* ***125 psi*** steam. Red-White Fig. 400.

.3 Swing Check Valves up to *50 mm* ***2 in.***: Bronze body and disc, regrinding swing check, screw-in cap, threaded ends, rating *860 kPa****125 psi*** steam. Red-White Fig. 236.

Swing Check Valves *65 mm****2½ in.*** and over: Cast iron body regrind-renew swing check, bolted cover, flanged ends, bronze disc and seat ring, rating *860 kPa****125 psi*** steam. Red-White Fig. 435.

.4 Silent Check Valves for Pump Discharge:

Up to *50 mm****2 in.***: Bronze body, SS stem, 316 SS spring, teflon disc and seat ring, 430 SS seat screw, threaded ends. *1380 kPa* ***200 psi*** water. Val Matic VM-S1400.

*65 mm****2½ in.*** and over: Wafer style, cast iron body, 316 SS seat, plug, spring and bushing. ANSI Class 125. Val Matic Series 1400.

2.9 Fire Protection System

.1 Gate Valves up to *50 mm* ***2 in.***: Bronze body, threaded ends, O.S. and Y, rising stem, screw-in bonnet, solid wedge, rating *1380 kPa* ***200 psi*** water, Underwriters listed.

Gate Valves over *50 mm* ***2 in.***: Cast iron body, flanged ends, O.S. and Y, rising stem, bronze trim, solid wedge, wheel handle, rating *1380 kPa* ***200 psi***. Underwriters listed.

Gate Valves Underground: Cast iron body, mechanical joint or flanged ends, inside screw, non-rising stem, bronze trim, solid wedge, square operating nut, rating *1380 kPa* ***200 psi*** water, Underwriters listed. Indicator post operator, Underwriters listed.

.2 Butterfly Valves: FM and ULC approved, cast iron lug-wafer body, bronze disc, BUNA-N liner. *1380 kPa* ***200 psi*** at *68°C* ***155°F***.

.3 Swing Check Valves up to *50 mm* ***2 in.***: Bronze body threaded ends, screw-in cap, renewable composition disc rating *2070 kPa* ***300 psi*** W.O.G.

Swing Check Valves *65 mm* ***2½ in.*** and over: Cast iron body, flanged ends, bolted cover, regrind-renew bronze disc and seat ring, rating *1205 kPa* ***175 psi*** water. Underwriters listed. Jenkins Figure 477. Check valves serving siamese connections provided with rubber faced disc.

2.10 Valve Operators

.1 Provide suitable hand wheels for gate, globe or angle, radiation and drain valves and inside hose bibbs.

.2 Provide one plug cock wrench for every ten plug cocks sized *50 mm* ***2 in.*** and smaller, minimum of one. Provide each plug cock sized *65 mm* ***2½ in.*** and larger with a wrench, with set screw.

.3 Provide valves larger than *100 mm* ***4 in.*** located more than *2.1 m* ***7 ft.*** from floor in equipment rooms with chain operated sheaves. Extend chains to *1.5 m* ***5 ft.*** above floor and hook to clips to arrange to clear walking aisles.

2.11 Strainers

.1 Size *50 mm* ***2 in.*** and under: Screwed brass or iron body, Y pattern with *0.75 mm* ***24 ga.*** stainless steel perforated screen.

.2 Size *65 mm to 100 mm* ***2½ in. to 4 in.***: Flanged iron body, Y pattern with *1 mm* ***20 ga.*** stainless steel perforated screen.

.3 Size *125 mm* ***5 in.*** and larger: Flanged iron body, Y pattern with *3 mm* ***11 ga.*** stainless steel perforated screen.

.4 Screen free area shall be minimum three times area of inlet pipe.

2.12 Triple Duty Valve

.1 For base mounted or vertical inline pump discharge application, performs the functions of a nonslam check valve, throttling valve, shut-off valve and calibrated balancing valve. Equip with brass readout valves (with integral check valves) to read differential pressure across valve.

Cast iron, bronze seat, replaceable bronze disc with EPDM insert.

Up to *50 mm* ***2 in.***: NPT connections, *1200 kPa* ***175 psi*** working pressure, brass stem, chatter preventing SS spring.

Over *50 mm* ***2 in.***: Flanged connections, *860 kPa* ***125 psi*** rated, stainless steel stem and chatter preventing spring.

2.13 Suction Diffuser

.1 For base mounted or floor mounted vertical inline pumps where scheduled.

Cast iron construction; NPT connections up to *50 mm* ***2 in.***: flanged connections.

Over *65 mm* ***2½ in.***: cast iron straightening fitting, stainless steel combination diffuser - strainer - orifice cylinder with *4.8 mm* ***3/16 in.*** perforations, and permanent magnet. Provide complete with a 16 mesh bronze strainer.

3. EXECUTION

3.1 Installation and Application

.1 Install valves with stem upright or horizontal, not inverted.

.2 Provide threaded lug type butterfly valves for equipment isolation service. Provide wafer or threaded lug type valves for zone shut-off service.

.3 Where permitted by codes, butterfly valves may be used in fire protection systems.

.4 Use eccentric plug valves in water systems for throttling/balancing service.

.5 Use memory radiator balancing valves in water and glycol systems terminal heat transfer unit balancing service. For radiant panels provide "circuit setter" valves on return line for each central zone; and a ball valve for shut off service.

.6 Provide drain valves at main shut-off valves, low points of piping and apparatus and terminal units.

.7 Size drain lines and drain valves equal to size of apparatus drain connection.

.8 For pipe sizes *20 mm* ***3/4 in.*** and over, minimum drain size to be *20 mm* ***3/4 in.***

.9 Provide hose thread connection with cap and chain for *20 mm* ***3/4 in.*** drain valves located in ceiling and public areas.

.10 Provide male NPT nipples with threaded pipe cap for drain sizes over *20 mm* ***3/4 in.*** where not piped directly to floor drains.

.11 Provide valved drain and hose connections off the bottom of all strainers.

.12 Install gate or ball valves for shut off and isolating service, to isolate equipment, part of system, and vertical risers. Ball valves shall be used up to and including 50 mm.

.13 Install globe valves for throttling in steam system in sizes 150 mm and larger.

.14 Install globe or angle valves for throttling service and control device or meter bypass.

.15 *Provide spring loaded check valves on discharge of condensate pumps, condenser water and water booster pumps

.16 Use plug cocks for gas service.

.17 Use plug cocks in water system for throttling service. Use non-lubricated plug cocks only when shut-off or isolating valves are also provided.

.18 *Use butterfly valves in (heating water systems), (in chilled and condenser water systems), (in heating, chilled and condenser water systems) interchangeably in place of gate valves on all piping 65 mm and larger.

.19 *Use butterfly valves in fire protection systems where approved. Use OS&Y gate valves on inlet side of fire and jockey pumps and for window deluge systems.

.20 Provide gate or ball valve in hot and cold water lines serving a male or female washroom group of fixtures at each hose bibb and at all equipment requiring isolation.

.21 Use bronze body ball valves for domestic water service.

.22 Provide valves upstream of all meters, gauges, automatic air vents, etc. for isolation purposes.

.23 Run line size pipe to floor drains from all drain cocks, drain valves, etc.

.24 Provide main piping system drain valves as a low point and pipe to drain. Drain valves shall be 2 pipe sizes smaller than largest mains and minimum 25 mm.

.25 Provide 50 mm globe by-pass valves around steam isolation valves 150 mm and larger.

.26 Provide isolation valves in all systems such that floor by floor for horizontal systems, all risers in a vertical system and zone areas on a large horizontal system can be isolated.

.27 Spring loaded water check valves shall be located 8 pipe diameters downstream of pumps or elbows.

3.2 Valve Connections

.1 Provide valves suitable to connect to adjoining piping as specified for pipe joints. Use pipe size valves.

.2 Thread pipe sizes 50 mm and smaller.

.3 Flange pipe sizes 65 mm and larger.

.4 Solder or screw to solder adapters for copper tubing.

.5 Use grooved body valves with mechanical grooved jointed piping.

.6 Provide butterfly valves with tapped lug body when used for isolating service.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Hangers and supports for mechanical piping.

1.2 RELATED SECTIONS

.2 Division 15 Section: 15098 – Primary Hot Water Piping.

.3 Division 15 Section: 15099 – Piping Specification Sheets

1.3 REFERENCES

.4 American Society of Mechanical Consultants (ASME):
- .1 B31.1 - Power Piping (SI Edition).
- .2 B31.3 - Chemical Plant and Petroleum Refinery Piping.
- .3 B31.9 - Building Services Piping.

.5 ASTM International (ASTM):
- .1 A36 - Standard Specification for Carbon Structural Steel.
- .2 A47 - Standard Specification for Ferritic Malleable Iron Castings.
- .3 A48 - Standard Specification for Gray Iron Castings.
- .4 A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .5 A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .6 A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .7 A387 - Standard Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum.
- .8 A515 - Standard Specification for Pressure Vessel Plates, Carbon Steel, for Intermediate-and Higher-Temperature Service.
- .9 A536 - Standard Specification for Ductile Iron Castings.
- .10 A575 - Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
- .11 A668 - Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
- .12 A1011 - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .13 B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.

.6 Manufacturers Standardization Society of The Valve and Fittings Industry (MSS) Standard Practices:
- .1 SP-58 Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 SP-69 Pipe Hangers and Supports - Selection and Application.
.3 SP-77 Guidelines for Pipe Support Contractual Relationships.
.4 SP-89 Pipe Hangers and Supports - Fabrication and Installation Practices.
.5 SP-90 Guidelines on Terminology for Pipe Hangers and Supports.
.6 SP-127 Bracing for Piping Systems Seismic-Wind-Dynamic Design, Selection, Application.

1.4 SUBMITTALS

.7 Product Data: Manufacturer's data sheets on each product to be used, including:
.1 Preparation instructions and recommendations.
.2 Load capacity and sizing schedules specific to Project.
.3 Installation methods.

.8 Certifications:
.1 Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Certificates shall be furnished only as required by specific codes, upon request.

.9 Shop Drawings:
.1 Bases, hangers and supports.
.2 Connections to equipment and structure.
.3 Structural assemblies.

.10 Closeout Submittals:
.1 Warranty: Warranty documents.
.2 Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.

1.5 QUALITY ASSURANCE

.11 Manufacturer Qualifications:
.1 Manufacturing facilities shall be registered to ISO 9001.2000 and assessed to ISO 9000.2000 standard. A copy of the current certificate shall be available upon request.

.12 Installer Qualifications:
.1 Utilize an installer experienced in performing work of this section who is experienced in installation of work similar to that required for this project and per the minimum requirements of MSS SP-89.

.13 Conduct pre-installation meeting to verify project requirements, coordinate with other trades, and establish condition and completeness of substrate. Review manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.14 Store products in manufacturer's unopened packaging until ready for installation.

.15 Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 PROJECT CONDITIONS

.16 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

.17 Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights, Owner may have under Contract Documents.

PART 2 PRODUCTS

2.1 GENERAL

.1 All pipe hangers shall be in accordance to MSS-SP 58, ASME B31.1 and CSA B51

2.2 MANUFACTURERS

.1 Standard of Acceptance: Anvil Intl., Inc. Adjustable Clevis for insulated lines, Fig 300;

.2 Substitutions: Permitted, subject to Consultant approval.

2.3 MANUFACTURED UNITS - APPLICATION REQUIREMENTS

.1 Fabricate hangers, supports and sway braces to comply with building codes.

.2 Do not use installed hangers for rigging or erection purposes.

.3 Application Requirements: Use components for intended service conditions only. Comply with service requirements below unless noted otherwise on drawings and schedules.

.1 Steel hangers in contact with dissimilar metal shall be isolated to avoid dielectric effect.

.2 Exterior utility and mechanical yard areas shall use piping that is hot dip galvanized.

.3 Interior piping to be black iron.

.4 Hydronics and plumbing piping hangers shall be manufactured from carbon steel, cast malleable iron or cast iron.

.5 Steam piping hangers shall be manufactured from Chrome Molybdenum steel.

.6 Submerged piping hangers shall be manufactured from 316 stainless steel.

PART 3 EXECUTION

3.1 CONTRACTOR GENERAL REQUIREMENTS:

.1 Incorporate in construction pipe hangers and supports to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Comply with maximum load ratings with consideration for allowable stresses prescribed by ASME B31.1 or MSS SP-58.

.3 Provide supports, guides and anchors that do not transmit unacceptable heat and vibration to building structure.

.4 The selection of pipe hangers and supports shall be based upon the overall design concept of the piping systems and any special requirements, which may be called for in the specifications. The support systems shall provide for, and control, the free or intended movement of the piping including its movement in relation to that of connected equipment.

.5 Provide for vertical adjustments after installation of supported material and during commissioning, where feasible, to ensure pipe is at design elevation and slope.

.6 Contractor shall appoint a BC registered Professional Engineer to review the seismic loading of all support systems as shown on the contractor’s shop drawings and provide stamped approval indicating the proposed support systems meet the requirements of all applicable codes. Any additional restraints shall be approved by the Engineer.

.7 The Contractor shall provide all pipe hangers, supports, guides, anchors, brackets and related appurtenances required for the installation of the piping and equipment, regardless of whether these are shown on the drawings.

.8 Pipe shall not be hung from or supported by other pipe.

.9 Perforated band, iron wire, or chain hangers will not be approved.

.10 All pipe hangers shall be oversized to be installed over the insulation. Contractor to utilize inserts / saddles accordingly

3.2 SELECTION OF HANGERS AND SUPPORTS FOR PIPE MOVEMENT:

.1 Select hangers and supports to perform under all conditions of operation,

allowing free expansion and contraction, and to prevent excessive stresses being introduced into piping system and connected equipment. Anchors shall be provided wherever necessary to protect equipment and control direction of pipe movement. Pipe guides shall be provided at each side of each expansion joint.

.2 Angularity of rod hanger resulting from horizontal movement of the piping system from cold to hot positions shall not to exceed 4 degrees from vertical.

.3 Where horizontal pipe movement is greater than 1/2 inch (12.7 mm), offset pipe hanger and support so that rod hanger is vertical in hot position.

.4 Where significant vertical movement of the pipe occurs at the hanger location, a resilient support must be used. Selection of resilient supports shall be based on permissible load variation and effects on adjacent equipment. Support selection for typical load variations are shown in Table 2 of MSS-SP-69. Load and movement calculations shall be made for the proper selection of spring hangers. Vertical movement and load transfer from riser expansion to horizontal runs shall be given consideration when applying spring hangers. Spring Cushion Hangers may be used where vertical movement does not exceed 1/4 inch (6 mm), and where formal load and movement calculations are not required. Variable spring Hangers shall be used for all other resilient support requirements. Constant Support Hangers shall be used on piping systems where the deviation in supporting force must be limited to 6 percent and which cannot be accommodated by a Variable Spring Hanger. (Extracted from ANSI/MSS-SP69, 2003, Page 7, Section 7.4 and 7.4.1 to 7.4.3, inclusive, with permission of the publisher, the Manufacturers Standardization Society.)

3.3 HANGER SPACING:

.1 Refer to table below:

Size Inch (mm)	Hanger Rod Diameter Inch (mm)	Maximum Support Centres		
		PVC Pipe (mm)	Copper Pipe (mm)	Steel Pipe (mm)
1/2 to 2 (12 to 50)	3/8 (10)	1500	2500	2500
2.5 to 3 (65 to 80)	1/2 (13)	2000	-	2500
4 (100)	5/8 (16)	2200	-	2500
5 to 6 (125 to 150)	3/4 (19)	2600	-	3750
8 (200)	7/8 (22)	3000	-	3750
10 (250)	7/8 (22)	3500	-	3750
12 (300)	7/8 (22)	3800	-	3750

.2 For calculated loads, rod diameters may be sized in accordance with MSS SP-58, Table 3 provided Table 1 and Section 73 of MSS SP-58 are satisfied.

.3 Rods may be reduced one size for double rod hangers. Minimum rod diameter shall be 3/8 inch (9.5 mm) (M10).

.4 Columns noted refer to Table 3.

.5 When practical, locate hangers immediately adjacent to any change of direction of pipe. Total length of pipe between supports less than three-fourths the full hanger span.

.6 In case of concentrated loads (such as valves, strainers and flow meters) the supports shall be placed as close as possible

3.4 ANCHORS GUIDES AND RESTRAINTS:

.1 Anchors, guides and restraints shall be located by the Consultant responsible for piping design. Should the need or the desirability of relocating, eliminating or adding anchors, guides or restraints arise; such changes shall be brought to the attention of the Consultant for consideration and approval.

.2 Anchors, guides and restraints shall be designed for imposed loadings as determined by the Consultant. For guided systems, in the absence of specified lateral loads, the guide shall be designed for 30 percent of the dead weight load based on the spans listed in Table 3, with a design load of 50 lb (0.22 kN) as a minimum.

.3 For pressure piping with joints not having a restraining design, other positive restraining means such as clamps, rods and/or thrust blocking shall be used to maintain the integrity of the joints.

.4 The necessity for, and the location of, shock suppressors and seismic control devices shall be as determined by the Contractor's Engineer responsible for seismic analysis.

.5 The location, type and number of corrective devices which may be necessary to control any unforeseen vibrations, as determined after the piping is in service, are not a part of this standard.

.6 Refer to MSS SP-127 for the design, selection, and application of the bracing piping systems subject to seismic - wind - dynamic loading.

.7 (Extracted from ANSI/MSS-SP69, 2003, Page 11, Section 13 and 13.1 to 10.6, inclusive, with permission of the publisher, the Manufacturers Standardization Society.)

3.5 EXAMINATION

.1 Do not begin installation until substrates have been properly prepared.

.2 If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.6 PREPARATION

.1 Clean surfaces thoroughly prior to installation.

.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.7 HANGER INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Clamps on Riser Piping:
- .1 Support independent of connected horizontal pipe work using riser clamps and riser clamp lugs welded to riser.
- .2 Bolt tightening torques shall be to industry standards.
- .3 Steel Pipes: Clamp is fitted preferably below coupling or welded pipe lug.

.3 Use approved constant support type hangers where:
- .1 For critical high temperature where vertical movement of pipe work is 1/2 inch (12.7 mm) or more.
- .2 Transfer of load to adjacent hangers or connected equipment is not permitted.

.4 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 percent of total load.

.5 Adjust hangers to equalize load.

.6 Support from Structural Members: Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

.7 Field welding of supports should be done by qualified welders using qualified welding procedures.

.8 Proper care and ventilation should be given when welding galvanized components.

.9 All hangers shall employ a lock nut arrangement.

3.8 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipe work from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is greater than 1/2 inch (12.7 mm), offset pipe hanger and support so that rod hanger is vertical in hot position.

3.9 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 Tighten all set screws and lock nuts.
- .2 Hammer jaw firmly against underside of beam for Figure 127 only.

3.10 PROTECTION

.1 Protect installed products until completion of project.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

3.11 Coatings and Painting

.1 Pre-engineered factory coated supports does not apply to this section

.2 All surfaces shall be clean and clear of any rust or any impurity before coating application

.3 All interior pipe supports shall be painted with an alkyd primer (minimum dry film thickness of 2 mils) suitable for 120°C and a compatible epoxy coating (minimum 2 coats with a combined dry film thickness of 3 mils)

.4 All exterior pipe supports shall be painted with an alkyd primer (minimum dry film thickness of 4 mils) suitable for 120°C and a compatible epoxy coating (minimum 2 coats with a combined dry film thickness of 4 mils)

END OF SECTION

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PART 1 GENERAL

1.1 Work Included

.1 This section includes all labour, materials and incidentals for supply and field-installation of piping insulation systems as shown on the Drawings and herein described.

1.2 Related Work

.1	Section 15098	Primary Hot Water Piping
.2	Section 15108	Primary Hot Water Valves
.3	Section 15260	Hangers & Supports

1.3 Quality Assurance and Reference Standards

.1 Work shall be carried out only by qualified tradesmen.

.2 Conform to all standard specifications referenced herein.

1.4 Submittals

.1 Submit manufacturers' literature and catalogue information for all materials and equipment.

1.5 Delivery, Storage and Handling

.1 Protect all materials and equipment from weather and from all damage.

1.6 Co-operation and Sequencing of Work

.1 Co-operate with all trades in scheduling work.

.2 Do not install insulation until piping has been completed, tested and accepted by the Owner.

PART 2 PRODUCTS

2.1 General

.1 Maximum Fire spread rating of 25 (CAN/ULC-S102-M)

.2 Maximum smoke spread rating of 50 (CAN/ULC-S102-M)

2.2 Insulation

.1 Formed mineral fibre

.2 Factory applied vapour barrier not required

.3 Material in accordance to ASTM C 547

.4 51 mm minimum thickness

.5 Thermal conductivity shall not exceed 0.034 W/m°C when tested at 24°C in accordance to ASTM C 335

.6 Valves and flanges: Insulate valve bodies and flanges with fitted oversized pipe covering, or mitred blocks to thickness of adjacent pipe covering. Unions, drain piping and valves shall be left uncovered.

2.3 Fastening

.1 All insulation seams shall be fastened with aluminum fast setting self adhesive tape

.2 Tape width shall be 2 inches (50 mm) minimum.

2.4 PVC Jacketing

.1 All pipe insulation on interior piping shall be covered with pre-formed PVC jacketing

.2 Thickness shall be 0.3 mm minimum.

.3 Colour: white

2.5 Aluminum Jacketing

.1 All pipe insulation on outside piping shall be covered with embossed aluminum cladding

.2 Aluminum thickness shall be 0.6 mm minimum

.3 Provide 50 mm laps on all seams. Only aluminum rivets or sheet metal screws are allowed for fastening.

.4 Mitered segments shall be provided for pipe elbows and fittings with sufficient overlap over seams.

2.6 Insulation Blanket

.1 Supply and install insulation blankets for all flanged piping components including owner supplied equipment (heat exchangers, control valves and flow meters). All the following components shall be insulated using this product

.1 Plate frame heat exchangers

.2 Strainers

.3 Expansion joints / compensators / threaded unions

.4 Flanged valves

.2 Insulation blankets shall be suitable for temperatures up to 120°C

.3 Insulation blankets shall facilitate easy removal and re-installation of the same blanket

.4 Thermal conductivity shall not exceed 0.035 W/m°C when tested at 24°C in accordance to ASTM C 335

.5 Minimum insulation thinness is 50 mm.

PART 3 EXECUTION

3.1 General

.1 Follow supplier recommendations

.2 Co-ordinate insulation with other trades.

.3 Do not install insulation until:

.1 Piping has been installed, tested and approved;

.2 Pipe surface is clean and dry

3.2 Installation of Pipe Insulation

.1 Install insulation in accordance with ANSI/NFPA 90A and ANSI/NFPA 90B and BC Insulation Contractors Association Manual, and according to manufacturer's instructions.

.2 Where necessary, for valves and custom fittings, shape insulation to suit and provide complete coverage.

.3 Field cut insulation for fittings and appurtenances.

.4 Install jacketing over all insulation. Cut and shape to suit insulation as required. Fasten jacketing with stainless steel straps at a maximum spacing of 300 mm. Ensure joint is at bottom of pipe and arranged to prevent ingress of water. Seal joint.

.5 Steel pipe cover protective saddle ((Type 39) and protective shield (Type 40) shall be installed at all pipe support locations in accordance to MSS-SP58 Section 9

END OF SECTION

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PART 1 GENERAL

1.1 Background

.1 This section refers to those portions of the work that are unique to the requirements for flushing, cleaning and passivating installed process piping.

.2 Hydrostatic testing shall be completed prior to commencing pipe conditioning.

.3 All pipes shall be flushed, cleaned and passivated prior to the commencement of any commissioning.

.4 Flushing refers to circulation of water with the objective to remove solids that in process water suspension have the potential to cause damage to instrumentation and/or equipment or deposit and foul equipment.

.5 Cleaning refers to the circulation of chemical cleaners to remove grease and petroleum products, and iron oxides from the interior of piping systems.

.6 Passivation refers to pipe treatment by circulation of a chemical to cause the deposit of a non-reactive scale and corrosion inhibitor film on the internal surface of the pipe

.7 All water quality testing associated with the pipe conditioning will be at the Contractor's expense.

.8 Contractor to pursue any permit requirements for drainage / disposal generated during the pipe conditioning process.

1.2 Related Work

.1 Piping Specification Sheets Section 15099

1.3 References

.1 This section must be referenced to and interpreted simultaneously with all other sections pertinent to the works described herein.

1.4 Submittals

.1 Provide data sheets, including safety and first aid data, for all chemicals.

.2 Provide information on chemicals to demonstrate the non-toxicity of the blow down water and environmental acceptability.

.3 Submit detailed procedure and concentration calculations for the determination of chemical feed rate.

.4 Submit hydraulic calculations for every step for all branches.

.5 Provide detailed drawings of any branches that will be manually cleaned if cleaning and/or flushing is not possible due to configuration.

.6 Provide detailed drawings of temporary pipe routing that is required to complete pipe conditioning to the requirements specified herein.

.7 Provide temporary pump and strainer data sheets.

1.5 Scheduling of Work

.1 Schedule work to minimize interruptions to existing services.

PART 2 PRODUCTS

2.1 Chemicals

.1 All chemicals required for pipe conditioning shall be supplied by the Contractor.

.2 Chemicals shall be selected to achieve suitable cleaning and passivation of the piping system. The system will include both copper and stainless steel components, in addition to carbon steel pipe.

.3 All chemicals shall be non-foaming and acceptable to the environment.

2.2 Equipment

.1 The Contractor shall be responsible for the supply, installation and removal of all temporary piping, hoses and appurtenances to complete the requirements of pipe conditioning specified herein.

.2 The Contractor shall be provide all equipment required to complete pipe conditioning as specified, including but not limited to pumps, strainers, compressor, hose and manual cleaning tools.

PART 3 EXECUTION

3.1 General

.1 Contractor shall arrange for the assistance and supervision of the Chemical Supplier during pipe conditioning. A supplier representative shall be present on site during flushing, cleaning, and passivation.

.2 The Chemical Supplier shall review the method proposed for pipe conditioning and provide comments prior to approval by the Engineer.

.3 Prior to proceeding to the next step of conditioning the Chemical Supplier must confirm satisfactory results of water analysis.

.4 Upon pipe conditioning completion, the Chemical Supplier is to submit a report confirming the condition of the piping network and the proper execution of the chemical cleaning and passivation.

3.2 Manual Cleaning

.1 Manual cleaning shall be completed for any piping section that cannot be flushed and/or cleaned as a result of configuration. Steel particulates and other solid contaminants shall be removed

.2 Manual cleaning shall be accomplished by scrubbing the internal surface of the piping.

.3 Final cleaning shall be completed with compressed air.

.4 All piping that has been manually cleaned shall be visually inspected and cannot be further processed (e.g. welding).

.5 Any piping section that can not undergo the chemical cleaning step as per Section 3.4 shall be filled with diluted chemical as per supplier recommendation for 24 hours.

3.3 Flushing

.1 Contractor to ensure all heat exchangers, equipment and instrumentation are bypassed or replaced by a spool piece.

.2 It is the responsibility of the Contractor to supply temporary means to determine flow/speed at the pump.

.3 Contractor shall supply a temporary strainer with a 3 mm screen and 30 mesh.

.4 Install all temporary piping, hoses and appurtenances to complete the requirements of flushing.

.5 Fill the system with potable quality water and circulate the water to ensure a minimum of three (3) complete cycles of water at any location in the system. System shall be flushed at the water velocity of 2.0 m/s.

.6 Flushing shall be done in a sequence in accordance with the hydraulic calculations submitted to allow circulation of water in all pipes of the system.

.7 Drain the system and refill with clean potable water. Continue procedure until water is visually clear.

.8 Retain a sample of the water for testing.

3.4 Cleaning

.1 Contractor to ensure all heat exchangers, equipment and instrumentation are bypassed or replaced by a spool piece.

.2 It is the responsibility of the Contractor to supply temporary means to determine flow/speed at the pump.

.3 Contractor shall supply a temporary strainer with a 4 mm screen and 30 mesh.

.4 Add the cleaning agent in the water at the specified concentration level and as per recommendation of Chemical Supplier.

.5 The cleaning mixture shall be circulated for a minimum of 48 hours or as required by Chemical Supplier for all pipe sections. Flow velocity of the cleaning mixture shall be between 1 to 1.5 m/s.

.6 Purge the system with clean potable water.

.7 Repeat steps 4 to 6 as many times as required by Chemical Supplier.

.8 Retain a sample of the water for testing.

3.5 Passivation

.1 Add chemical treatment in the water at the specified concentration level and as per recommendation of Chemical Supplier.

.2 The chemical treatment shall be circulated for 24 hours or as required by Chemical Supplier. Flow velocity of the chemical treatment shall be between 0.5 to 1.0 m/s.

.3 It is the responsibility of the Contractor to achieve an iron content of 1.0 ppm at this point. If it can not be achieved by bleeding and increasing the chemical concentration, the Contractor must repeat the pipe condition procedure.

.4 Retain a sample of the final water for testing.

.5 Once the passivation is completed, the concentration of chemicals within the piping system shall be brought to the normal plant operation. The pipes shall be maintained full of water, and a circulation of at least one complete cycle of water at any location in the system shall be done 2-3 times a week.

END OF SECTION

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PART 1 GENERAL

1.1 General

.1 General requirements, instructions to bidders, this specification and any addenda hereto form part of the contract documents and shall be read in conjunction with them. Work to include the furnishing of all labor and materials, unless specified otherwise, to complete and put into operating condition all electrical systems as indicated on the drawings and specified herein.

.2 It is the intent of the work to provide complete, neatly finished, and operational systems and any labor, material, permits, licenses, approvals and inspections required for completion of the work, whether specifically mentioned in the drawings or specifications or not, are to be included in the tendered price.

.3 Responsibility as to which trade provides required articles or materials rests solely with the general contract trade. Extras will not be considered based on grounds of difference of interpretation of specifications as to which trade involved shall provide certain specialties or materials.

.4 The drawings and specifications for the complete works, including all of those related to other trades are to be examined before submitting tenders. All electrical and communications requirements indicated are to be included in the scope of the work.

.5 Clean up and remove all unused wiring and conduits.

.6 Remove and reinstall existing devices to facilitate construction as required.

.7 Confirm outlet locations and mounting height with project coordinator on site prior to installation.

.8 Fire proof all fire rated penetrations after installation as per section 39.

.9 Coordinate with and get approval from landlord for all drilling, coring and cutting of building structure. Coordinate locations on site prior to carrying out the work. Allow for all costs for x-raying/scanning. Contractor must obtain written approval from the landlord structural engineer prior to commencement of the work.

.10 Provide all necessary temporary power and lighting.

.11 Clean up an remove all unused wiring and conduits.

.12 Remove and reinstall all devices to facilitate construction as required.

.13 Where tenant spaces are occupied by the client, all noisy work such as (but not restricted to) wiring and cabling pulling, installation of conduit shall be done after hours. Wiring connections to systems furniture to be done on weekend, including cabling terminations

1.2 Drawings and Specifications

.1 Drawings and specifications are complementary to each other and what is called for by one is to be binding as if called for by both.

.2 Should any discrepancy appear between drawings and specifications that leaves the electrical trade in doubt as to true intent and meaning, obtain ruling from the engineer before submitting tender, or allow for the most expensive alternative.

1.3 Examination of Other Drawings

.1 The electrical contractor is to examine carefully structural, architectural and mechanical drawings, and the work of other trades and satisfy himself that the work under this contract can be satisfactorily carried out without changes to the building as shown on the plans. Should any difficulty arise showing conflict with, or requiring additional work beyond the work of these drawings, bring this matter to the attention of the engineer before submitting tender.

1.4 Uniformity of Equipment

.1 Unless otherwise specified, uniformity of manufacture is to be maintained for any particular item throughout.

1.5 Standards of Material And Workmanship

.1 All materials are to be new and of the quality specified, and shall be approved by CSA or equivalent agency recognized in British Columbia.

.2 All work shall be executed in a neat and workmanlike manner by qualified tradesmen. The electrical contractor shall keep a competent foreman and necessary assistants on the site during the progress of the work.

.3 All material and installation shall match building standard unless it is noted otherwise on the drawings.

1.6 Record Plans & Maintenance Manuals

.1 The engineer will furnish to the electrical trade one set of drawings to be used for record purposes. The electrical trade is to accurately record on these prints all revisions to the original plans that are made on site during construction.

.2 The electrical trade is to produce at his own expense a set of AutoCAD 2004 (or later) drawings, including all changes to the original tender drawings covered by addenda, change orders, field changes, and job conditions, and turn these over to the engineer in electronic and hard copy form. Completed record drawings are to be clearly marked "record drawings".

.3 This contractor shall allow for a cost of $500 per drawing for record drawing production and this amount shall included in the tender bid for transferring all redline as-built markups to cad format. AES shall be carried by the contractor to produce the record cad drawings.

.4 This contractor shall provide 3 three-ring binders for maintenance manuals. Manuals shall contain all warranties, shop drawings, inspection letters, panel schedules, etc.

1.7 Shop Drawings

.1 The electrical contractor is to submit to the engineer, for review, shop drawings of major electrical equipment. Such equipment shall include, but not be limited to switchgear, panelboards, series-rated breaker combinations, fixtures and fittings not provided by the owner.

.2 All drawings are to be submitted in triplicate and two copies will be returned to the electrical trade. Submit additional copies for approval as may be required.

.3 The engineer's review of shop drawings is to be for general design only and will not relieve the electrical trade or suppliers from responsibility for errors, proper fitting, construction of work, and furnishing of materials. Review will not be construed as approving departures from contract document requirements if such departures are not specifically noted. The electrical trade is responsible for verifying all dimensions.

1.8 Guarantee Warranty

.1 The electrical trade shall furnish a written guarantee warranty, signed by authorized personnel, stating:

.1 That all work executed under this contract will be free from defects of material and workmanship for a period of 1 year from date of final acceptance.

.2 The above parties further agree to, at their own expense, repair and replace all such defective work, and other work damaged thereby, which fails or becomes defective during the term of the guarantee warranty provided that such failure is not due to improper usage.

.3 The period of the guarantee specified will in no way supplant any other guarantee of a longer period but be binding on work not otherwise covered.

1.9 Setting Out of the Work

.1 The electrical trade is responsible for correcting all work completed contrary to the intent of drawings and specifications and shall bear all costs involved in making the corrections. Where intent of drawings and specifications is not clear, obtain clarification from the engineer before proceeding with work.

.2 The electrical trade is to give work his personal supervision, lay out his own work, do all necessary leveling and measuring or employ a competent engineer to do so. Figures, full size and detail drawings to take precedence over scale measurements.

.3 The electrical trade shall be responsible for any damage caused to the owner or any other trade by improper location or carrying out of his work.

.4 The electrical trade, in the setting out of his work, is to make reference to architectural, structural, and mechanical drawings. He shall consult with all relevant trades in setting out locations for conduit runs, lighting fixtures, panel assemblies, and all other electrical equipment, so that conflicts are avoided and symmetrical spacing is maintained.

.5 The electrical trade shall confirm outlet locations and mounting heights with the project coordinator on site prior to installation.

.6 Switch mounting heights are to be coordinated with architectural details and shall be adjusted, if required, to coordinate with paneling, dados, masonry course lines, or other relevant building features.

.7 Where outlet boxes occur in exterior walls, the electrical trade is to ensure that there is insulation behind the outlet boxes to prevent condensation through the boxes.

.8 Allow for work after hours as required and coordinate with owner/tenants if applicable.

.9 Contractor to coordinate any interruptions to adjoining tenants in order to avoid any inconveniences to said tenant. If necessary contractor to do any required connections on off hours.

1.10 Examination of the Site

.1 Prior to submitting tender, the electrical trade shall carefully examine the site and ascertain all conditions which may affect his trade. No additional money will be allowed for work resulting from conditions that should have been noticed and accounted for during a thorough examination of the site.

1.11 Cutting and Patching

.1 The general trade will be responsible for all cutting and patching required for electrical installation. Structural members must not be cut without consent of the engineer.

.2 Where work done by the electrical trade damages the work of other trades, the electrical trade shall repair and make good such damage to the satisfaction of each trade concerned and the engineer.

.3 All penetrations shall be sealed with approved fire stop material.

1.12 Cleanup

.1 The electrical trade and his sub-trades are to keep the site free during construction of debris, boxes, packing, and other materials associated with the work of this trade. All waste material is to be disposed of in a safe and environmentally responsible manner.

.2 Upon completion of work, the electrical installation shall be left in a clean and finished condition to the satisfaction of the engineer.

1.13 Access Doors

.1 The electrical trade is to supply and install access doors as required for proper servicing of all electrical work. Access doors shall be complete with necessary frames and hinged doors held closed with captive studs. Access panel to be of not less than 14 gauge steel, prime coat finished and painted on the job to match the wall or ceiling finish.

.2 The number of access doors shall be kept to a minimum.

.3 The electrical trade shall provide access panels in the drywall ceilings for all electrical junction boxes and equipment in accordance with applicable codes.

1.14 Codes, Permits and Inspection

.1 The entire installation, inclusive of material and labor, is to comply with all the requirements of all building codes and authorities having jurisdiction, the Canadian electrical code, Vancouver city by-law and regulations of the local inspection department.

.2 The electrical trade is to obtain all permits required for each stage of work, and after completion of the entire installation furnish to the engineer a certificate of final inspection and approval from the electrical inspection department of the local authority.

1.15 Mechanical Equipment

.1 Unless specified otherwise, the electrical contractor is to supply and install all required conduit, wiring, electrical fittings and connections for all motors and other electrical equipment, even though such motors and other electrical equipment may be supplied by others. Where required by the drawings or applicable regulations, disconnect switches, starters, overload relays and other necessary protective devices are to be supplied and installed by the electrical contractor. Motors and controls shall be furnished by the supplier of the driven equipment. The electrical contractor shall include all work and connections required to make the system complete and operational.

.2 The electrical equipment may include but not be limited to such items as grille motors and interlocks, storefront and interior signage, starting devices, motor controllers, float switches, alarm devices or systems, push buttons, exhaust fans, data systems, intercoms and stereo systems.

.3 The electrical contractor is to confirm motor (or other equipment) location and sizes with the trade supplying the motor (or other equipment) before commencing any associated electrical work.

1.16 Tests

.1 All portions of electrical work are to be tested for satisfactory operation.

.2 Before energizing any portion of the electrical system, the electrical trade shall perform Megger tests on all feeders and branch circuits. Any problems discovered by such testing are to be corrected by the electrical trade and the circuits in question retested. The results of all final testing shall be provided to the engineer in report form.

.3 Upon project completion, and immediately prior to final inspection and takeover, the electrical trade shall check the load balance on all feeders and at distribution centres, load centres, and panels. These checks are to be carried out by turning on all loads and checking load current balance. If load unbalance exceeds 15 %, the circuits are to be reconfigured as necessary to balance the loads.

1.17 Painting and Finishes

.1 All electrical fittings, supports, hanger rods, pullboxes, channel frames, conduit racks, outlet boxes, brackets, and clamps are to have a galvanized finish or a paint finish over corrosion-resistant primer.

.2 All panels are to be factory-finished with spray-on air dry enamel. All enamel to be applied over corrosion-resistant primer. Matte or flat type finish paint will not be accepted. All panels or similar factory-finished units that are scratched or marked during installation are to be touched up with matching spray-on air dry lacquer and, if required to provide a satisfactory job, to be completely refinished.

.3 All 120/208 V panelboards, pullboxes, and other electrical cabinets and boxes are to be finished in gray enamel.

1.18 EMT Conduit

.1 Where required by the Canadian electrical code, all wire and cable is to be installed in EMT conduit.

.2 Unless otherwise noted, EMT conduit are to be concealed in all finished areas. In service areas, conduit and EMT shall be run on surface unless indicated otherwise.

.3 Surface mounted EMT conduit are to be installed parallel to structural lines, and, where bends occur in parallel runs, they shall be concentric.

.4 Raceways are to be installed free from dents and bruises and shall have their ends capped, plugged, or sealed as necessary to prevent entrance of dirt or moisture.

.5 In all areas subject to moisture, watertight fittings must be used.

.6 All raceway, except where otherwise indicated, shall be sized in accordance with the Canadian electrical code.

.7 Teck90 or seal tight flexible conduit is be utilized for connections to motors and motor controllers.

.8 All underground conduit systems are to be of approved RPVC schedule 40 conduit, complete with installed bonding conductor, and installed at or below the depth required by code. Provide 150mm clean sand bedding above and 75mm below conduits and continuous marking tape 300mm below grade. Provide suitable backfill and compaction.

1.19 Expansion Joints

.1 Where conduits are installed in concrete slabs or cross structural expansion joints, an approved expansion fitting shall be installed.

1.20 Wire and Cable

.1 All building wiring is to be RW90, 1000V, copper, except where noted otherwise.

.2 A minimum conductor size of #12 AWG copper is to be used, except where noted otherwise.

.3 All conductors are to be color coded throughout the installation as follows:

- equipment grounding conductor - green
- neutral conductor - white
- 120/208V phase wires - red, black, and blue
- 347/600V phase wires - red, black, and blue

1.21 Wiring Devices & Boxes

.1 Align all devices and plates plumb and level with building structural lines.

.2 All outlet boxes are to be flush mounted except where specified otherwise.

1.22 Location Of Outlets

.1 The engineer reserves the right to change the location of outlets to within 3 m of points indicated on plans without extra charge, provided the electrical contractor is advised before installation is made.

1.23 Pull Boxes

.1 The electrical trade shall supply and install pullboxes as required to suit job conditions. Pullboxes shall conform to Canadian electrical code requirements. Pullboxes to be finished in enamel over corrosion-resistant primer with screw-on or hinged cover. In removable ceiling areas, pullboxes are to be installed above the ceiling.

1.24 Supports

.1 All conduit, raceways, and other electrical equipment shall be securely and adequately supported, in accordance with the Canadian electrical code.

.2 Where inserts are required in concrete, expansion inserts, lead inserts or plastic inserts are to be used in drilled holes. Shot driven pins may be used in structural concrete only with the permission of the engineer.

1.25 Grounding and Bonding

.1 A complete grounding and bonding system shall be supplied and installed in accordance with the Canadian electrical code and the electrical inspection department.

.2 All metal parts not carrying current, including but not limited to, secondary feeder circuits, equipment and panelboard enclosures, metal raceways, pull and junction boxes, shall be properly grounded. Metal raceways shall utilize double locknuts and other fittings where necessary to provide ground continuity.

.3 A separate ground conductor shall be installed in all raceway feeder runs, flexible conduit, and in conduit installed in slab or underground.

1.26 Panels

.1 Provide complete panelboards. Unless otherwise indicated panelboards are to be 120/208V, 3PH, 4W or 347/600V, 3Ø, 4W solid neutral design with sequence style

bussing and full capacity neutral with bolt-on circuit breakers. Where double neutrals are indicated on the single line diagram, provide 200% rated neutral panelboards.

.2 Provide all circuit breakers indicated plus a minimum of 2x15A 1P spares in each panel. Circuit breakers to be rated minimum 25KA I.C. unless otherwise indicated and be series rated.

.3 Panels are to be flush mounted in public areas and surface mounted in service rooms, all complete with all trim, lockable doors and installation hardware. Provide drip shields in areas with sprinklers.

.4 Updated typewritten panel directories shall be provided for all panels.

.5 Utilize existing panelboards as indicated on the drawing. Reuse existing breakers where possible. Provide new breakers as required.

.6 Balance panel load for each phase A, B, & C. Allow for relocating circuits within panel board to balance the load.

1.27 Fire Alarm System (Not in use)

1.28 Seismic Protection

.1 The electrical trade shall provide seismic restraint and anchorage for all equipment and services in accordance with the current edition of the B.C. building code, and all applicable building bylaws.

.2 If requested provide certified professionally sealed shop and placement drawings where applicable for all electrical equipment and equipment assemblies showing the methods of attachment to the particular structure for each piece of equipment and assembly and provide anchorage/attachment details approved and sealed by a B.C. registered professional engineer.

.3 Include in the tendered price all services of a professional engineer including but not limited to providing letters of assurance for the project in respect of the seismic restraint of all electrical materials and equipment, conducting the necessary site reviews and providing a letter at the conclusion of the project, confirming that all seismic restraints for the electrical works have been installed in accordance with the engineer's instructions. Pay all associated fees as required. Approved seismic engineers are Leon Bell of Bell Engineering, Clint Low of BBP and Micky Wang of M.Wang Engineering. Seismic engineer shall provide proof of insurance and credentials if requested.

1.29 Communications (Voice, Data & TV) & Security Rough-In

.1 No conduit run shall exceed two 90 degree bends and one 45 degree sweeping bend.

.2 All communication backboards are to be 21mm thick, G1s, and painted with fire retardant paint to match color of the room.

.3 The installation of communications equipment, and conduit to be used for communication wires, shall comply in all respects with the requirements of Telus and Shaw and to EIA/TIA telecommunication standards.

.4 Provide double gang box c/w single gang mud ring, outlet boxes and empty conduits c/w pull string for communications outlets as shown on the drawings.

.5 Install 3/4" EMT conduits from each wall or floor mounted communication outlet (unless noted otherwise) to the accessible ceiling space above c/w bushing at both ends.

1.30 Identification

.1 Identify all major pieces of equipment, including but not limited to panelboards, electrical cabinets, and breakers in panelboards with engraved Lamacoid labels, black lettering on white background.

.2 Provide typewritten directories in all panels.

.3 Provide Lamacoid nameplate on each panel cover to identify panel name, number of phases, voltage, current rating and source of feeder.

.4 Identify branch circuit wires to meet code requirements.

.5 Fire alarm breaker to be painted red and clearly identified.

1.31 Alternates

.1 All requests for alternates shall be submitted to the engineer not less than 5 days prior to the close of tender.

.2 The contractor shall assume full responsibility for ensuring that alternate products meet all space, weight, connection, power, wiring, and performance requirements.

1.32 Power Distribution

.1 Install a complete power distribution system including underslab conduit, service connections, grounding, distribution equipment, and panelboards.

1.33 Communication Cabling

.1 Cat 6 UTP cable shall be four pair, unshielded, twisted, 22 AWG to 24 AWG, 100 ohm FT4, solid copper by panduit or approved equal. Transmission requirements shall meet or exceed all requirements of TIA/EIA-568-B.2 for category 6 cabling and components.

.2 Cat 5e UTP cable shall be four pair, unshielded, twisted, 22 AWG to 24 AWG, 100 ohm FT4, solid copper by panduit or approved equal. Transmission requirements shall meet or exceed all requirements of TIA/EIA-568-B.2 for category 5E cabling and components.

.3 Patch panels shall be modular patch panel. 24-port or 48-port, high density individual cut-outs for snap in type female 8P/8W.

.4 Free standing equipment racks (quantity required as per drawings): free standing 2133.6mm (84") high rack units, gangable. Must provide 482.6mm (19") rack mounted capability for rack mountable components. Must provide 1955.8mm (77") of vertical mounting space. Must have threaded mounting holes (EIA) front and rear. Must be seismic zone 4 rated.

.5 Cat 3 shall be 24 AWG, solid copper, cat. 3, FT4.

1.34 Fire Stopping

.1 After installation of the electrical, all penetrations of fire zones for conduits, sleeves, cable trays, pokethru's etc. Shall be sealed using material and methods that meet the requirements of ULC standards CAN/ULC-S115 and installed according to manufacturer's specifications. The fire stop material shall allow for re-enterable access. CSA T530 Appendix B shall be used as a guide. Before installation, contractor shall identify a fire stopping system suitable for the installation. Contractor shall obtain shop drawings of the fire stop system from manufacturer and should on site, upon request, be able to produce fire stop shop drawings for consultant. Allow for 2% destructive testing of the fire stopping installation.

.2 Label fire stop penetrations with product used and CUL system number with sticker.

END OF SECTION

Table of Contents

PART 1 GENERAL

1.1 General Requirements

.1 All work shall be performed by qualified tradesmen working for a reputable Contracting company experienced in this type of work and shall be strictly in accordance with the best commercial practice.

.2 Coordinate work with the Contractor's working schedule and cooperate to achieve the earliest possible completion of the work.

.3 Supply all relevant materials, tools and labour to complete all work outlined below.

.4 All electrical work to be performed by a Registered Electrical and Inspection Contractor under provisions of British Columbia Electrical Safety Act.

1.2 Codes and Permits

.1 The following bodies have jurisdiction over this project.

.1 British Columbia Safety Authority (BCSA).

.2 BC Building Code

.3 CSA Canadian Electrical Code

1.3 Work Included

.1 Receive, handle and store all Owner supplied materials as directed by the Owner. Tracking of Owner supplied equipment received by the contractor will be the contractor’s responsibility.

.2 Installation of all Owner supplied materials as per manufacturer recommendations.

.3 Supply and install all wiring, conduit, cable trays, equipment, controls and accessories as listed in the project schematics, drawings and specifications and as required to connect all owner supplied equipment and create an operable system.

.4 Supply and installation of transformers as required providing appropriate power supply to Owner supplied control panels.

1.4 Equipment Delivery

.1 Coordinate equipment delivery with other trades.

.2 The Contractor is responsible for the following work under this contract:
.1 Coordinating delivery of Owner-supplied equipment with vendors.
.2 Inspection and acceptance of equipment following delivery.
.3 Report any visible damage to the contract administrator immediately.
.4 Offloading of Owner-supplied equipment.
.5 Transport equipment to Owner’s designated storage area.
.6 Track all received equipment.

1.5 Drawings and Specifications

.1 Contract drawings for mechanical work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment and wiring. Care shall be taken to ensure that the installation is in accordance with detailed drawings, where given, and that the installation meets code requirements.

.2 It is intended that these specifications and drawings shall cover the complete electrical installation ready for uninterrupted operation. Consequently, minor details not necessarily shown or specified, but necessary for the proper functioning of the installation shall be included in the Contractor's estimate.

1.6 Owner Supplied Equipment

.1 Equipment to be supplied by the Owner includes (Refer to project drawings):
- .1 Leak detection panels
- .2 Control panels
- .3 Temperature sensors/transmitters
- .4 Pressure sensors/transmitters
- .5 Flow meters/transmitters

.2 All documentation delivered with owner supplied equipment is to be stored by Contractor and delivered to the Owner along with instruction and service manuals for mechanical equipment.

1.7 Related Work

.1	16009 – Basic Electrical Methods	Division 16
.2	All Mechanical Sections	Division 15

1.8 Shop Drawings

.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 on drawings clearances for operation, maintenance, and replacement of operating equipment devices.

1.9 Quality Control

.1 Provide CSA certified equipment and material for all works.

PART 2 PRODUCTS

2.1 Wiring and Cable

.1 Contractor shall provide and install all wiring and cable required to produce a complete and operable system.

.2 Provide wire and cable as noted in Section 16009 1.20 (Wire and Cable) of the Basic Electrical Methods.

2.2 Wiring Terminations

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.3 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.

2.4 Equipment Identification

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: 3mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core.

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.2 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.3 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.4 Terminal cabinets and pull boxes: indicate system and voltage.

.5 Transformers: indicate capacity, primary and secondary voltages.

2.5 Junction Boxes

.1 Indoor junction boxes shall be constructed of Aluminum, NEMA1 construction with screw off cover plate. For indoor applications with a fire sprinkler system a NEMA4 construction to be employed.

.2 Provide sufficient space inside the cabinet to suit the conduit entrance and cable installed. Contractor may adjust dimensions to suit the equipment and wiring.

.3 Mount all junction boxes securely. Where the wall is not flat, strut shall be used for support to allow the cabinet to be installed without stress applied to structure.

2.6 Conduit and EMT

.1 Contractor shall provide and install protective conduit for all wiring in accordance with Section 16009 1.18 (Conduit and EMT) of the Basic Electrical Methods.

2.7 Relays and Switches

.1 Contractor to provide all relays and switches needed to create a complete and operable system.

2.8 Transformers

.1 Provide transformers required for power supply to leak detection surveillance units (230V/50Hz supply required).

2.9 Supports

.1 Where inserts are required in concrete, expansion inserts, lead inserts or plastic inserts are to be used in drilled holes. Shot driven pins may be used in structural concrete only with the permission of the Consultant.

2.10 Cable Tray

.1 Provide cable trays supported and braced in accordance with the Code for support of all cable and wiring.

.2 Cable trays shall terminate within two feet of serviced equipment. Provide protective conduit for wiring between the termination of the cable tray and the serviced equipment.

2.11 Finishes

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

PART 3 EXECUTION

3.1 Installation

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

.3 Support all electrical equipment in accordance with the Canadian Electrical Code

.4 Provide seismic restraint and anchorage for all equipment in accordance with the current edition of the BC Building Code and all applicable building bylaws.

.5 Provide grounding and bonding in accordance with the Canadian Electrical Code and as specified in Section 16009 1.26 (Grounding and Bonding) of the Basic Electrical Methods.

3.2 Cutting and Patching

.1 The general contractor will be responsible for all cutting and patching required for electrical installation. Do not cut structural members without permission from the Consultant.

.2 All penetrations shall be sealed with approved fire stop material.

3.3 Nameplates and Labels

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.4 Commissioning of Equipment

.1 During startup and commissioning of all electrical and mechanical systems, the contractor shall have an electrician on hand to address any electrical issues that may arise in a timely manner.

END OF SECTION

APPENDIX 3 - DRAWINGS

(Attached)

AT FULL SIZE THIS BAR MEASURES 100mm. ALL SCALES REFERENCED TO FULL SIZE.

VALVES

- THREE WAY VALVE
- GATE VALVE OR UNSPECIFIED (NORMALLY OPEN)
- GATE VALVE OR UNSPECIFIED (NORMALLY CLOSED)
- PLUG VALVE (NORMALLY OPEN)
- PLUG VALVE (NORMALLY CLOSED)
- BALL VALVE (NORMALLY OPEN)
- BALL VALVE (NORMALLY CLOSED)
- NO BUTTERFLY VALVE (NORMALLY OPEN)
- NC BUTTERFLY VALVE (NORMALLY CLOSED)
- BUTTERFLY DAMPER VALVE
- GLOBE VALVE (NORMALLY OPEN)
- GLOBE VALVE (NORMALLY CLOSED)
- DIAPHRAGM VALVE
- ANGLE VALVE
- FLOAT VALVE
- NEEDLE VALVE
- CHECK VALVE
- REDUCED PRESSURE BACKFLOW PREVENTER
- DOUBLE CHECK VALVE BACKFLOW PREVENTER
- PUMP DISCHARGE VALVE (TRIPLE DUTY)
- GAUGE OR ROOT VALVE
- KNIFE GATE VALVE
- BALANCING COCK
- CIRCUIT BALANCING VALVE
- MUD VALVE

ACTUATORS

- M MOTOR ACTUATOR
- S SOLENOID
- DIAPHRAGM (PRESSURE BALANCE)*
- HAND WHEEL
- DIAPHRAGM (SPRING OPPOSED)*
- PNEUMATIC CYLINDER (DOUBLE ACTING)
- PNEUMATIC CYLINDER (PILOT ACTUATED)
- PNEUMATIC CYLINDER (SINGLE ACTING, SPRING OPPOSED)

* REFER TO SELF ACTUATED REGUALTORS BELOW FOR PILOTING AND TAPS

PUMPS

- PUMP, CENTRIFUGAL
- PUMP, GEAR
- PUMP, ROTARY LOBE
- PUMP, SUBMERSIBLE
- PUMP, VERTICAL
- PUMP, RECIPROCATING POWER

EQUIPMENT

- BLOWER OR CENTRIFUGAL FAN
- COMPRESSOR
- CONVEYOR, SCREW
- CONVEYOR, BELT
- DIFFUSER HEADER
- FUEL TYPE ENGINE
- FLAP GATE
- GENERATOR
- HEAT EXCHANGER, PLATE TYPE
- HEAT EXCHANGER, SPIRAL TYPE
- HEAT EXCHANGER, STRAIGHT TUBE TYPE
- HEAT EXCHANGER, U-TUBE TYPE
- INJECTOR
- MIXER, VENTURI
- M MOTOR1
- MOTOR2

EQUIPMENT (CONT)

- SILENCER
- SLIDE GATE (NORMALLY CLOSED)
- SLIDE GATE (NORMALLY OPEN)
- SLUICE GATE (NORMALLY CLOSED)
- SLUICE GATE (NORMALLY OPEN)
- TANK, PRESSURE
- TANK, DOUBLE WALLED
- TANK, GENERAL

PIPELINE DEVICES

- AV AUTOMATIC AIR VENT
- STEAM VENT
- QUICK CONNECTOR
- CAP OR PLUG
- BLIND FLANGE
- REDUCER (CONCENTRIC)
- REDUCER (ECCENTRIC)
- FLEXIBLE CONNECTION
- STRAINER
- FOOT VALVE
- AIR SEPARATOR
- D PIPE TO NEAREST DRAIN
- CALIBRATION CHAMBER
- PULSATION DAMPENER
- T STEAM TRAP
- LIQUID SEPARATOR
- FLOW STRAIGHTENING VANES
- SIGHT GLASS

SELF ACTUATED REGULATORS OTHER DEVICES

- PRESSURE REDUCING REGULATOR WITH EXTERNAL PRESSURE TAP
- BACKPRESSURE REGULATOR, SELF CONTAINED
- DIFFERENTIAL PRESSURE REDUCING REGULATOR WITH INTERNAL AND EXTERNAL TAPS
- PRESSURE AND VACUUM RELIEF VALVE
- VACUUM RELIEF VALVE
- PRESSURE RELIEF VALVE
- PRESSURE REDUCING REGULATOR, SELF CONTAINED, WITH HAND ADJUSTMENT
- BACK PRESSURE REGULATOR WITH EXTERNAL PRESSURE TAP
- RUPTURE DISK (VACUUM)
- RUPTURE DISK (PRESSURE)
- M MOTORIZED CONTROL DAMPER
- BALANCING DAMPER
- B BACKDRAFT DAMPER

MECHANICAL GENERAL NOTES

1. AT NO POINT SHOULD THERE BE ANY FLUSHING THROUGH HEAT EXCHANGERS OR FLOW METERS ON THE PRIMARY OR SECONDARY MECHANICAL SYSTEMS.
2. THERE SHOULD BE NO WELDING TO ANY OF THE HEAT EXCHANGER UNITS.
3. THE DESIGN & INSTALLATION OF THE PRIMARY DISTRICT HEATING PIPING IS TO COMPLY WITH THE ASME B31.1 CODE FOR POWER PIPING & CSA B51.
4. THE DESIGN & INSTALLATION OF THE SECONDARY BUILDING SIDE HEATING SHALL COMPLY WITH THE SPECIFICATIONS, AND THE ASME B31.9 CODE FOR POWER PIPING.
5. THE MECHANICAL CONTRACTOR IS TO ENSURE THAT THE SPECIFIED STRAINER MESH SIZE IS INSTALLED PRIOR TO THE SYSTEM START-UP.
6. CONTRACTOR TO PERFORM HYDROSTATIC TESTING ON ALL PIPING AT 1.5 TIMES THE MAXIMUM OPERATING PRESSURE.
7. REFER TO MECHANICAL SPECIFICATION FOR COMPLETE DESCRIPTION OF ALL PIPE FITTINGS AND VALVES.
8. CONTRACTOR TO INSTALL MANUAL AIR VENTS AT THE HIGHEST POINTS & DRAIN VALVES AT THE LOWEST POINTS OF ALL PIPING SYSTEMS. REFER TO SPECIFICATION FOR COMPLETE DESCRIPTION OF ALL VENT & VALVE INSTALLATION PROCEDURES.
9. CONTRACTOR TO PIPE ALL PRESSURE RELIEF VALVES TO THE NEAREST FLOOR DRAIN (UNLESS STATED OTHERWISE).
10. CONTRACTOR TO COORDINATE LOCATION OF ALL PIPING INSTALLATION WITH OTHER TRADES TO AVOID ANY MAJOR INTERFERENCES.
11. CONTRACTOR TO ALLOW FOR FIELD RUNNING OF PIPE TO AVOID ANY MAJOR PIPING, DUCTWORK, LIGHTING, UTILITIES, ETC. ROUTING ON DRAWINGS IS SUGGESTED ROUTING.
12. CONTRACTOR TO COORDINATE THE LOCATION OF ELECTRICAL SUPPLY FOR THE CONTROLS WITH OTHER TRADES.
13. CONTRACTOR TO VERIFY ALL THE FINAL LOCATION OF ALL SENSORS WITH MECHANICAL CONSULTANT.
14. LOCATIONS OF ALL CONTROL PANELS TO BE MOUNTED AS PER SITE COORDINATION WITH CONSULTANT & OWNER.
15. CONNECT TO EXISTING ELECTRICAL POWER DEDICATED FOR PANELS WITHIN THE MECHANICAL ROOM WHERE APPLICABLE.
16. ALL OWNER SUPPLIED MATERIALS TO BE INSTALLED AND WIRED BY CONTRACTOR.
17. CONTRACTOR TO RUN WIRING (INCLUDING POWER WIRING WHERE APPLICABLE) TO FIELD DEVICES AS WELL AS CONTROL PANEL TERMINATIONS.
18. SUPPORT PIPING IMMEDIATELY AT THE HEAT EXCHANGER OUTLETS VIA STANCHIONS OR HANGERS. CONTRACTOR TO PROVIDE ADDITIONAL SUPPORT FOR EQUIPMENT INCLUDING STRAINERS, CONTROL VALVES, FLOW METER'S, ETC.
19. CONTRACTOR TO REFER TO ANVIL PRODUCT CATALOGUE FOR ALL HANGER & SUPPORT FIGURES.
20. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH PROJECT SPECIFICATIONS.
21. ALL GAUGES TO BE MOUNTED IN A WAY TO BE VISIBLE FOR A PERSON STANDING ON THE FLOOR.
22. ALL DRAIN VALVES SHALL BE MINIMUM NPS 19 mm UNLESS OTHERWISE INDICATED. WITH HOSE END MALE THREADED AND PROVIDED WITH CAP AND CHAIN. ALL DRAIN BALL VALVES SHALL BE SIZED TO WITHSTAND THE MAXIMUM PRESSURE OF THE CONNECTED SYSTEM.
23. ALL STRAINER SCREEN/MESH SIZES FOR BRAZED PLATE HEAT EXCHANGERS ARE TO BE 4 mm (5/32") STAINLESS STEEL PERFORATED SCREEN WITH 0.5 mm (30) MESH.
24. ALL STRAINER SCREEN/MESH SIZES FOR PLATE HEAT EXCHANGERS ARE TO BE 1 mm (3/64") STAINLESS STEEL PERFORATED SCREEN.
25. CONTRACTOR TO HAVE A PROFESSIONAL ENGINEER REGISTERED IN BRITISH COLUMBIA CERTIFY THAT WORK COMPLIES WITH SEISMIC REQUIREMENTS AS PER B.C. BUILDING CODE.

DRAWING LIST

DRAWING NUMBER	DESCRIPTION
P01	STANDARD PIPING SYMBOLS, NOTES & DRAWING LIST
P02	STANDARD INSTRUMENTATION SYMBOLS
P03	PROCESS & INSTRUMENTATION DIAGRAM – 100 W. 1st. AVENUE (WALL CENTRE)
P04	PROCESS & INSTRUMENTATION DIAGRAM – 215 W. 2nd. AVENUE (B.C. HOUSING)
P05	PROCESS & INSTRUMENTATION DIAGRAM – 99 W. 2nd. AVENUE

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	0	MAY30/12	AC	DHA		

Rev. No.	Date	Designed	Drawn	Checked	Description of Revision

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CITY OF VANCOUVER
SOUTHEAST FALSE CREEK NEU EXPANSION
PROCESS AND INSTRUMENTATION DIAGRAM
STANDARD PIPING SYMBOLS, NOTES & DRAWING LIST

KWL Project No. 042.067 | Scale NONE | Sheet 1 of 5 | Rev. No. 0 | P01 Drawing Number

Client: City of Vancouver

PRINTED ON 100% RECYCLED BOND

June 4, 2012

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FUNCTIONAL IDENTIFICATION MATRIX

	FIRST LETTER		SUCCEEDING–LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	USER'S CHOICE			CONTROL OR CONTROLLER	CLOSED
D	USER'S CHOICE	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE		GLASS VIEWING DEVICE		
H	HAND				H–HIGH–(ALARM) HH–HIGH– (SHUTDOWN)
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		L–LOW–(ALARM) LL–LOW– (SHUTDOWN)
M	USER'S CHOICE	MOMENTARY			MIDDLE, INTERMEDIATE
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
O	USER'S CHOICE		ORIFICE, RESTRICTION POINT (TEST) CONNECTION		OPEN
P	PRESSURE, VACUUM				
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVRE	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE, PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED – FINAL CONTROL ELEMENT	

PIPING SERVICE IDENTIFICATION

PIPES ARE LABELED WITH THE FOLLOWING TAG

DDD–SSS–MMM

WHERE DDD NOMINAL DIAMETER (mm)
SSS SERVICE CODE
MMM MATERIAL CODE

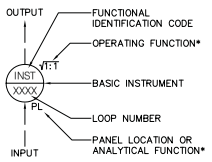
SERVICE CODES

CPR – CLARIFIED PROCESS RETURN
HWR – HOT WATER RETURN
HWS – HOT WATER SUPPLY
SAN – SANITARY SEWAGE
SLT – PROCESS TAILINGS
STM – STORM WATER
WDC – POTABLE WATER
WF – FIRE WATER
WFR – FRESH WATER
WPR – PROCESS WATER
WW – WASTE WATER

MATERIAL CODES (REFER TO PIPING SPEC SHEETS IN DIV. 15 OF SPECIFICATIONS FOR DETAILS)

HDPE1 – HDPE, DR 11
HDPE2 – HDPE, DR 9
STL1 – STEEL, SCHED. 40
DI1 – DUCTILE IRON, PRESSURE CLASS 350
PVC1 – PVC, C900
PVC2 – PVC, DR35 GRAVITY PIPE
S01 – CARBON STEEL PROCESS PIPING
S04 – PRE–INSULATED CARBON STEEL PROCESS PIPING

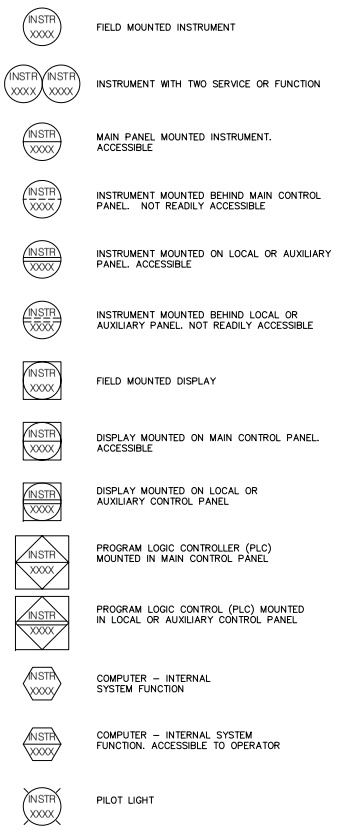
INSTRUMENTATION IDENTIFICATION



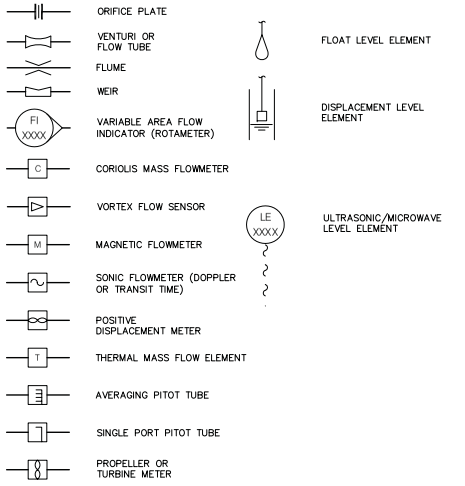
FUNCTIONAL IDENTIFICATION CODE

SEE FUNCTIONAL IDENTIFICATION MATRIX ABOVE

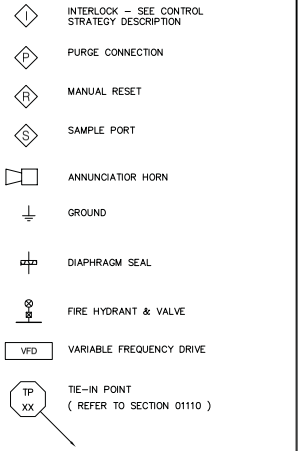
INSTRUMENT AND FUNCTION SYMBOLS



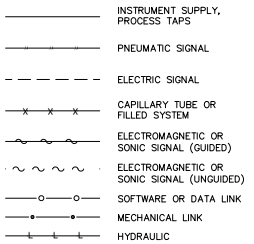
PRIMARY ELEMENT SYMBOLS



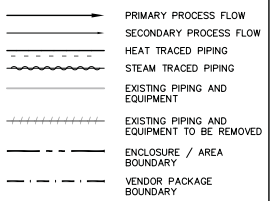
MISCELLANEOUS SYMBOLS



INSTRUMENT SIGNAL SYMBOLS



LINE DESIGNATIONS



CROSS REFERENCING

A LINE THAT CONTINUES TO DRAWING M1003 IS SHOWN AS:

M1003
TO [PROCESS / EQUIPMENT DESCRIPTION]

A LINE CONTINUING FROM DRAWING M1002 IS SHOWN AS:

M1002
FROM [PROCESS / EQUIPMENT DESCRIPTION]

AT FULL SIZE THIS BAR MEASURES 100mm. ALL SCALES REFERENCED TO FULL SIZE.

May 30, 2012

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ISSUED INFORMATION	Issued for	Issue	Date	Issued By
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	0	MAY30/12	AC	DHA								

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CITY OF VANCOUVER
SOUTHEAST FALSE CREEK NEU EXPANSION
PROCESS AND INSTRUMENTATION DIAGRAM
STANDARD INSTRUMENTATION SYMBOLS

KWL Project No. 042.067 Scale NONE
Sheet 2 of 5 Rev. No. 0
P02 Drawing Number
Client: City of Vancouver
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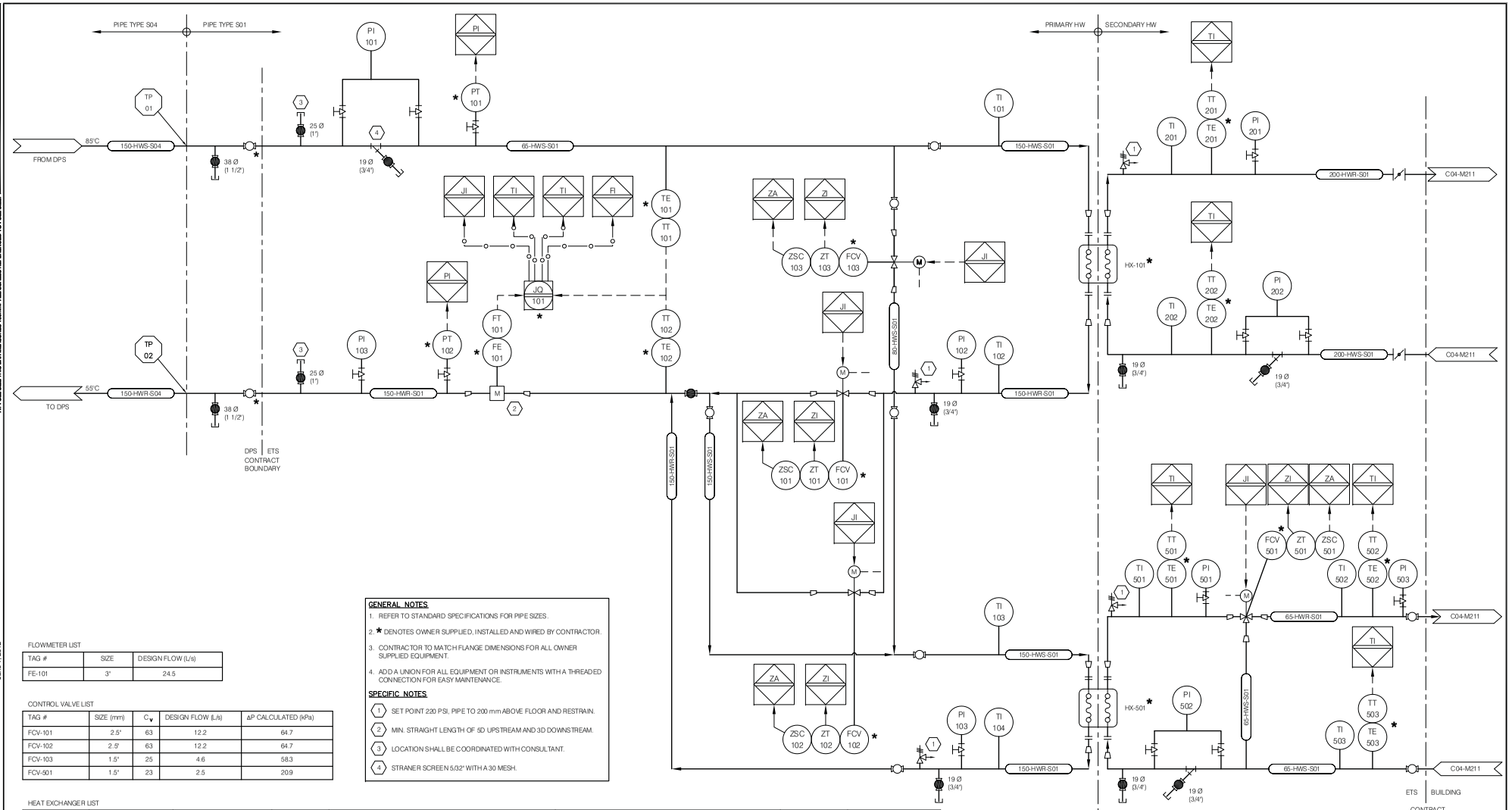

AT FULL SIZE THIS BAR MEASURES 100mm. ALL SCALES REFERENCED TO FULL SIZE.

June 1, 2012

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GENERAL NOTES

1. REFER TO STANDARD SPECIFICATIONS FOR PIPE SIZES.
2. * DENOTES OWNER SUPPLIED, INSTALLED AND WIRED BY CONTRACTOR.
3. CONTRACTOR TO MATCH FLANGE DIMENSIONS FOR ALL OWNER SUPPLIED EQUIPMENT.
4. ADD A UNION FOR ALL EQUIPMENT OR INSTRUMENTS WITH A THREADED CONNECTION FOR EASY MAINTENANCE.

SPECIFIC NOTES

1. SET POINT 220 PSI, PIPE TO 200 mm ABOVE FLOOR AND RESTRAIN.
2. MIN. STRAIGHT LENGTH OF 5D UPSTREAM AND 3D DOWNSTREAM.
3. LOCATION SHALL BE COORDINATED WITH CONSULTANT.
4. STRANER SCREEN 5/32" WITH A 30 MESH.

FLOWMETER LIST

TAG #	SIZE	DESIGN FLOW (L/s)
FE-101	3"	24.5

CONTROL VALVE LIST

TAG #	SIZE (mm)	C_v	DESIGN FLOW (L/s)	ΔP CALCULATED (kPa)
FCV-101	2.5"	63	12.2	64.7
FCV-102	2.5"	63	12.2	64.7
FCV-103	1.5"	25	4.6	58.3
FCV-501	1.5"	23	2.5	20.9

HEAT EXCHANGER LIST

EQUIP. #	NOMINAL LOAD (kW)	DESIGN PRESSURE (kPa)	NOZZLE SIZE	PRIMARY SIDE					SECONDARY SIDE					SIZE L x W x H (mm)	MODEL
				FLUID	T_{IN} (°C)	T_{OUT} (°C)	FLOW (L/s)	ΔP MAX (kPa)	FLUID	T_{IN} (°C)	T_{OUT} (°C)	FLOW (L/s)	ΔP MAX (kPa)		
HX-101	2500	1600	4" CL. 300 FLG	WATER	85	60	24.6	35	WATER	55	70	40.4	35	796 x 363 x 864	AIC L300 - 336WJM
HX-501	570	1600	2" NPT	WATER	65	35	4.6	35.4	WATER	5	60	2.5	10.8	537 x 300 x 1194	AIC A200X-IG1-64/58-DW

ISSUED INFORMATION	Issued for	Issue	Date	Issued By
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	0	MAY30/12	AC	DHA		

Rev. No.	Date	Designed	Drawn	Checked	Description of Revision

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CITY OF VANCOUVER
SOUTHEAST FALSE CREEK NEU EXPANSION
PROCESS AND INSTRUMENTATION DIAGRAM
100 W 1st. AVENUE (WALL CENTRE)

KWL Project No. 042.067 | Scale NONE | P03 Drawing Number
Sheet 3 of 5 | Rev. No. 0
Client: City of Vancouver

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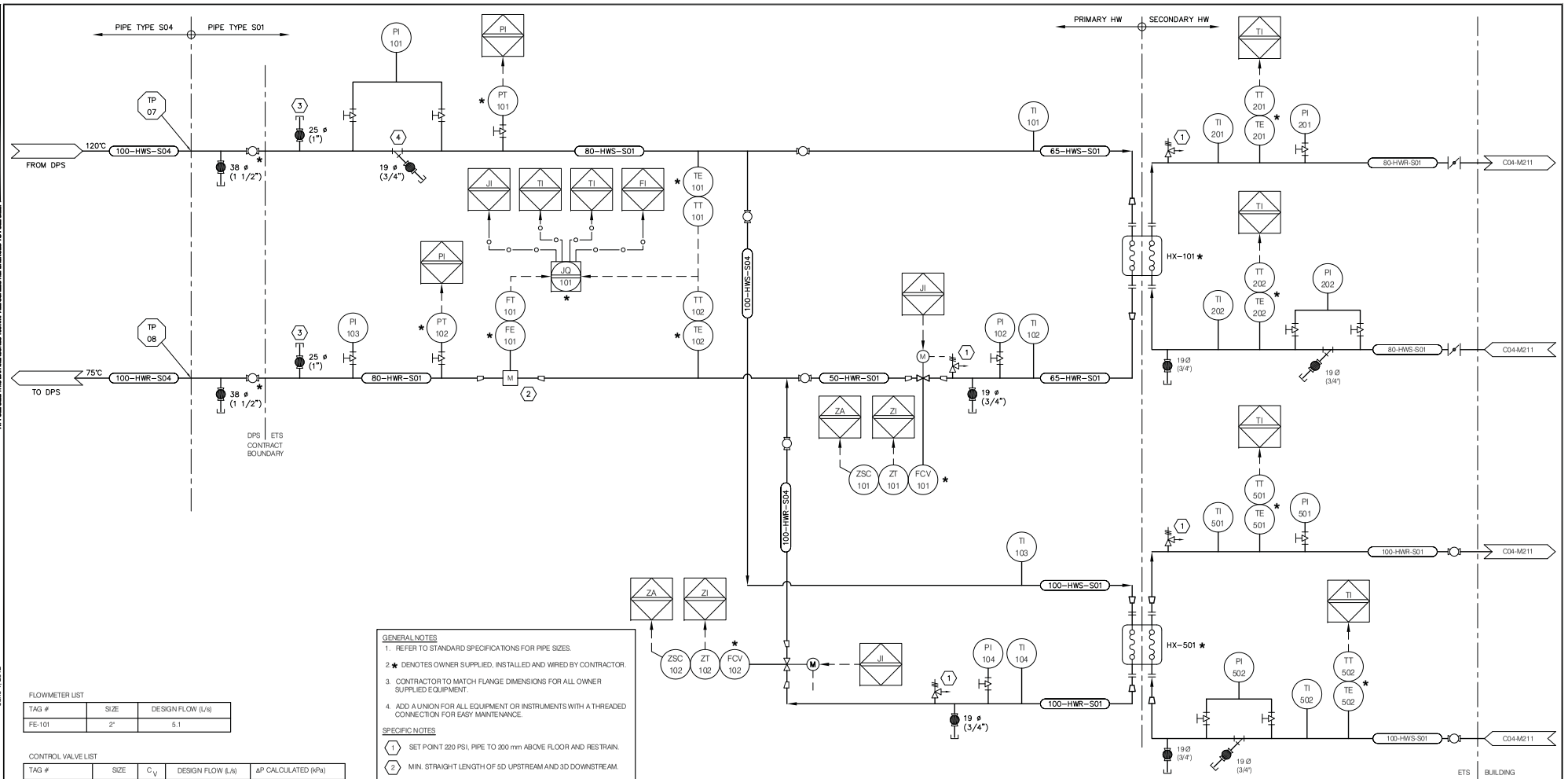

GENERAL NOTES

1. REFER TO STANDARD SPECIFICATIONS FOR PIPE SIZES.
2. * DENOTES OWNER SUPPLIED, INSTALLED AND WIRED BY CONTRACTOR.
3. CONTRACTOR TO MATCH FLANGE DIMENSIONS FOR ALL OWNER SUPPLIED EQUIPMENT.
4. ADD A UNION FOR ALL EQUIPMENT OR INSTRUMENTS WITH A THREADED CONNECTION FOR EASY MAINTENANCE.

SPECIFIC NOTES

1. SET POINT 220 PSI, PIPE TO 200 mm ABOVE FLOOR AND RESTRAIN.
2. MIN. STRAIGHT LENGTH OF 5D UPSTREAM AND 3D DOWNSTREAM.
3. LOCATION SHALL BE COORDINATED WITH CONSULTANT.
4. STRAINER SCREEN 5/32" WITH A 30 MESH.

FLOWMETER LIST

TAG #	SIZE	DESIGN FLOW (L/s)
FE-101	2"	5.1

CONTROL VALVE LIST

TAG #	SIZE	C_V	DESIGN FLOW (L/s)	ΔP CALCULATED (kPa)
FCV-101	1.5"	25	4.1	45.7
FCV-102	1.25"	16	3.4	77.3

HEAT EXCHANGER LIST

EQUIP. #	NOMINAL LOAD (kW)	DESIGN PRESSURE (kPa)	NOZZLE SIZE	PRIMARY SIDE					SECONDARY SIDE					SIZE L x W x H (mm)	MODEL
				FLUID	T_{IN} (°C)	T_{OUT} (°C)	FLOW (L/s)	ΔP MAX (kPa)	FLUID	T_{IN} (°C)	T_{OUT} (°C)	FLOW (L/s)	ΔP MAX (kPa)		
HX-101	500	1600	3" CL. 300 FLANGE	WATER	85	55	4.1	35	WATER	50	70	6.1	35	250 x 255 x 463	AIC LC110 - 100HUM
HX-501	420	1600	2" NPT	WATER	65	50	6.7	25.1	WATER	45	60	6.7	25	1029 x 300 x 1194	AIC A200X-IS1-140/102-DW

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CITY OF VANCOUVER
SOUTHEAST FALSE CREEK NEU EXPANSION
PROCESS AND INSTRUMENTATION DIAGRAM
215 W 2nd. AVENUE (B.C. HOUSING)

KWL Project No. 042.067 | Scale NONE | P04 Drawing Number
Sheet 4 of 5 | Rev. No. 0
Client: City of Vancouver
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AT FULL SIZE THIS BAR MEASURES 100mm. ALL SCALES REFERENCED TO FULL SIZE.

June 4, 2012

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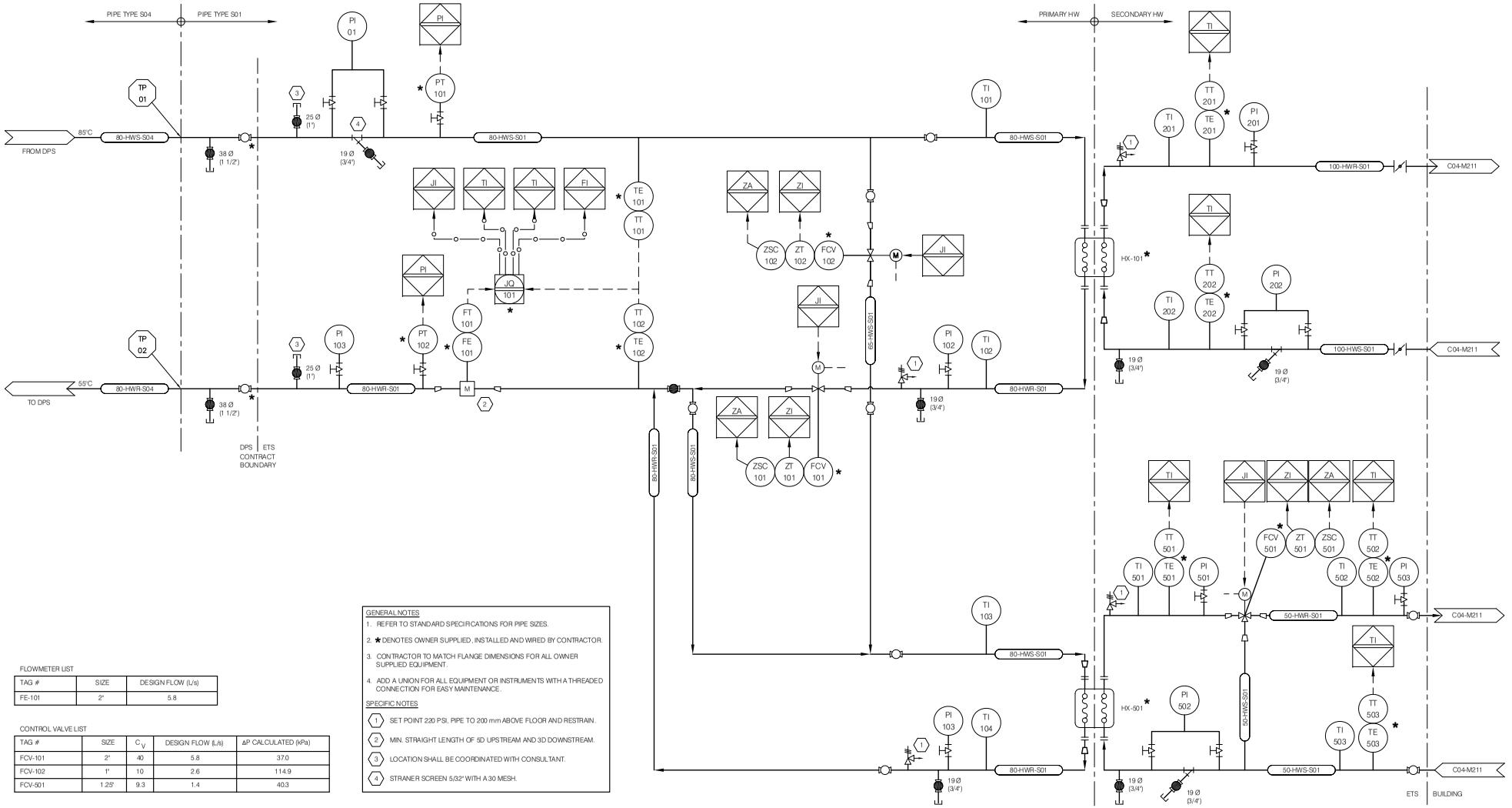

GENERAL NOTES

1. REFER TO STANDARD SPECIFICATIONS FOR PIPE SIZES.
2. ★ DENOTES OWNER SUPPLIED, INSTALLED AND WIRED BY CONTRACTOR.
3. CONTRACTOR TO MATCH FLANGE DIMENSIONS FOR ALL OWNER SUPPLIED EQUIPMENT.
4. ADD A UNION FOR ALL EQUIPMENT OR INSTRUMENTS WITH A THREADED CONNECTION FOR EASY MAINTENANCE.

SPECIFIC NOTES

1. SET POINT 220 PSI, PIPE TO 200 mm ABOVE FLOOR AND RESTRAIN.
2. MIN. STRAIGHT LENGTH OF 5D UPSTREAM AND 3D DOWNSTREAM.
3. LOCATION SHALL BE COORDINATED WITH CONSULTANT.
4. STRAINER SCREEN 5/32" WITH A 30 MESH.

FLOWMETER LIST

TAG #	SIZE	DESIGN FLOW (L/s)
FE-101	2"	5.8

CONTROL VALVE LIST

TAG #	SIZE	C_V	DESIGN FLOW (L/s)	ΔP CALCULATED (kPa)
FCV-101	2"	40	5.8	37.0
FCV-102	1"	10	2.6	114.9
FCV-501	1.25"	9.3	1.4	40.3

HEAT EXCHANGER LIST

EQUIP. #	NOMINAL LOAD (kW)	DESIGN PRESSURE (kPa)	NOZZLE SIZE	PRIMARY SIDE					SECONDARY SIDE					SIZE L x W x H (mm)	MODEL
				FLUID	T_{IN} (°C)	T_{OUT} (°C)	FLOW (L/s)	ΔP MAX (kPa)	FLUID	T_{IN} (°C)	T_{OUT} (°C)	FLOW (L/s)	ΔP MAX (kPa)		
HX-101	600	1600	3" CL. 300 FLANGE	WATER	85	60	5.8	35	WATER	55	70	9.7	35	250 x 255 x 463	A/C LC110 - 100HUM
HX-501	320	1600	2" NPT	WATER	65	35	2.6	25.23	WATER	5	60	1.4	8.04	437 x 300 x 1194	A/C A200X-IG1-47/38-DW

ISSUED INFORMATION	Issued for	Issue	Date	Issued By
	Reference			
	Approvals			
	Tender	T0	MAY30/12	AMF
	Permits			
	Construction			
	Record Drawings			

REVISION INFORMATION	Rev. No.	Date	Designed	Drawn	Checked	Description of Revision	Rev. No.	Date	Designed	Drawn	Checked	Description of Revision
	0	MAY30/12	AC	DHA								

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Fax: 604-294-2090
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CITY OF VANCOUVER
SOUTHEAST FALSE CREEK NEU EXPANSION
PROCESS AND INSTRUMENTATION DIAGRAM
99 W 2nd. AVENUE

KWL Project No. 042.067 | Scale NONE | P05 Drawing Number
Sheet 5 of 5 | Rev. No. 0
Client: City of Vancouver
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AT FULL SIZE THIS BAR MEASURES 100mm. ALL SCALES REFERENCED TO FULL SIZE.

June 4, 2012

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APPENDIX 4 – HEAT EXCHANGER SPECIFICATIONS

(Attached)

PRELIMINARY HEAT EXCHANGER SELECTIONS

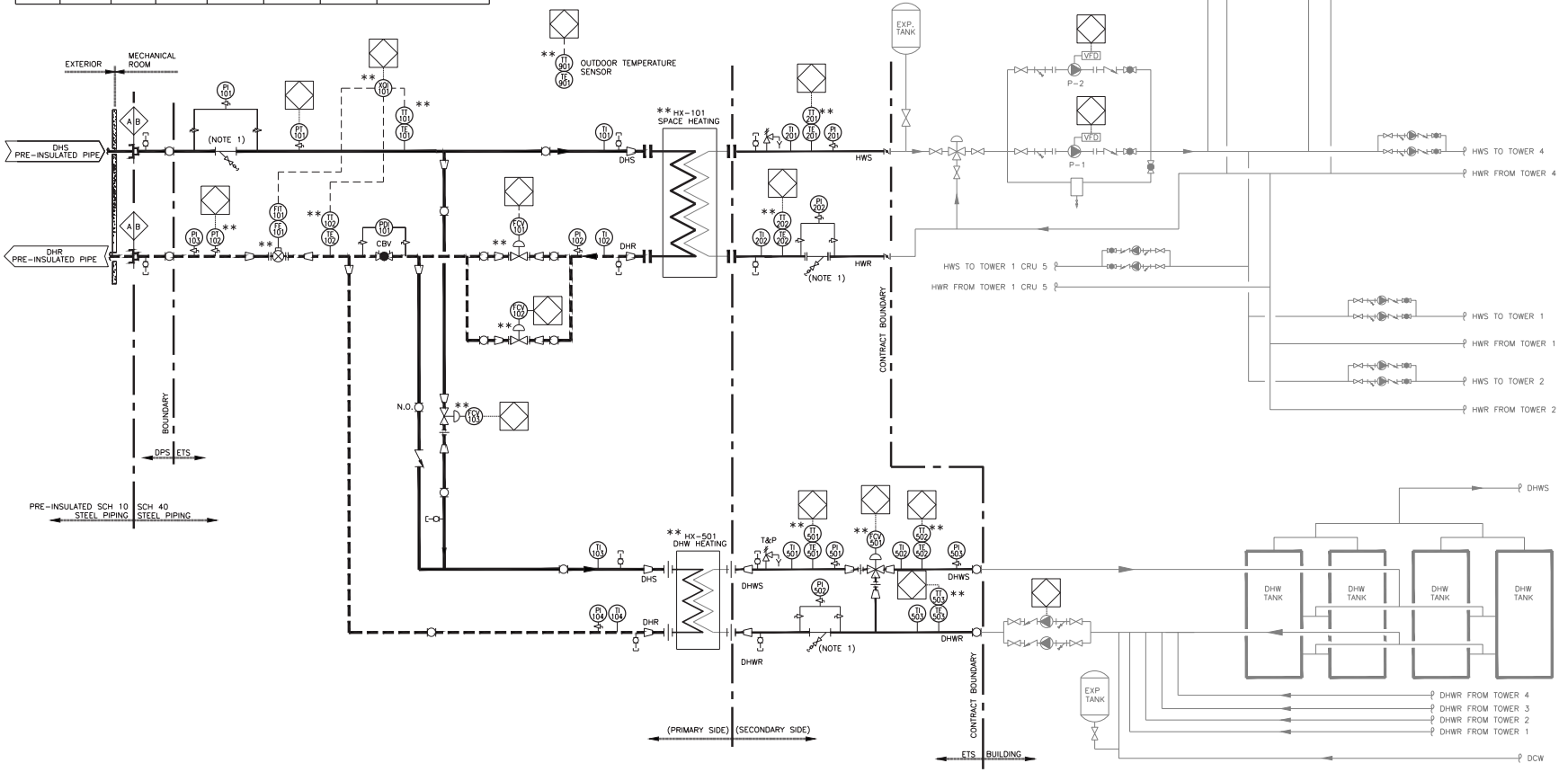
TAG NO.	SERVICE	DESIGN LOAD (kW)	DESIGN PRESSURE (bar)	PRIMARY (HOT) SIDE					SECONDARY (COLD) SIDE					STANDARD OF ACCEPTANCE MANUFACTURER AND MODEL	APPROX. SIZE [LxWxH] (mm)	APPROX. EMPTY WEIGHT (kg)
				FLOW (L/s)	CONNECTION SIZE (mm)	CONN. SPEC	TEMP (°C/°C)	PRESSURE DIFFERENTIAL(kPa)	FLOW (L/s)	CONNECTION SIZE (mm)	CONN. SPEC	TEMP (°C/°C)	PRESSURE DIFFERENTIAL(kPa)			
HX-101	HEATING	2500	16	24.4	TBD	TBD	85/60	35 max	40.4	TBD	TBD	55/70	35 max	ALFA LAVAL, CB SERIES	-- x -- x --	--
HX-501	DHW	570	16	4.6	TBD	TBD	65/35	50 max	2.5	TBD	TBD	5/60	35 max	ALFA LAVAL, M6 MDFD	-- x -- x --	--

PRELIMINARY CONTROL VALVE SELECTIONS

TAG NO.	SERVICE	Cv	dP CALC. (kPa)	FLOW (L/s)	SIZE (mm)	NORMAL VALVE POSITION	SELECTED MANUFACTURER AND MODEL
FCV-101	HEATING	63	64.7	12.2	65	L.P.	SIEMENS FLOWRITE VF 599 WITH SKD- OR SKB-62 ACTUATOR
FCV-102	HEATING	63	64.7	12.2	65	L.P.	SIEMENS FLOWRITE VF 599 WITH SKD- OR SKB-62 ACTUATOR
FCV-103	DHW PRIMARY	25	58.3	4.6	40	N.C.	SIEMENS FLOWRITE VF 599 WITH SKD- OR SKB-62 ACTUATOR
FCV-501	DHW SECONDARY	23	20.9	2.5	40	N.C.	SIEMENS MXG461B

PRELIMINARY ENERGY METER SELECTION

TAG NO.	SERVICE	DESIGN FLOW (L/s)	SIZE (mm)	SELECTED MANUFACTURER AND MODEL
FE-101	HEATING AND DHW	24.4	80	ENDRESS+HAUSER PROLINE PROMAG 53P FLOW METER
TE-101 TE-102	-	-	-	KAMSTRUP MATCHED PAIR PT-500 (4-WIRE) TEMPERATURE SENSORS
XQI-101	-	-	-	KAMSTRUP MULTICAL 601 CALCULATOR



NOTES:

1. STRAINER WITH 5/32" PERFORATED STAINLESS STEEL SCREEN AND 20 MESH LINER.

LEGEND:

PIPE BREAK SPECIFICATION

A - PRE-INSULATED SCH 10 STEEL PIPING

B - SCH 40 STEEL PIPING

** - EQUIPMENT SUPPLIED BY OWNER
N.O. - NORMALLY OPEN
N.C. - NORMALLY CLOSED
F.L. - FAIL LAST POSITION

STAMP:

REVISIONS

DATE	REMARKS	NO.	INIT.
MAR 30/2012	REVISED ISSUE FOR 50%	B	B.S.
MAR 09/2012	ISSUE FOR 50% REVIEW	A	B.S.

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CLIENT:

CITY OF VANCOUVER

CONSULTANT:

FVB ENERGY INC
13220 ST. ALBERT TRAIL NW
EDMONTON, ALBERTA T5L 4W1
TEL: (780) 453-3410
FAX: (780) 453-3682

PROJECT TITLE:
SOUTH EAST FALSE CREEK
NEU DISTRICT HEATING EXPANSION

SHEET TITLE:
ENERGY TRANSFER STATION
HEATING SCHEMATIC
100 W 1ST AVE (WALL CENTRE)

DGN: M. GALLOWAY	SCALE: NTS
DWN: M. GALLOWAY	JOB NO.: 212205
APPR: B. SKAGESTAD	DATE: FEB 09/2012

DWG NO.: M-2205-001

PRELIMINARY HEAT EXCHANGER SELECTIONS

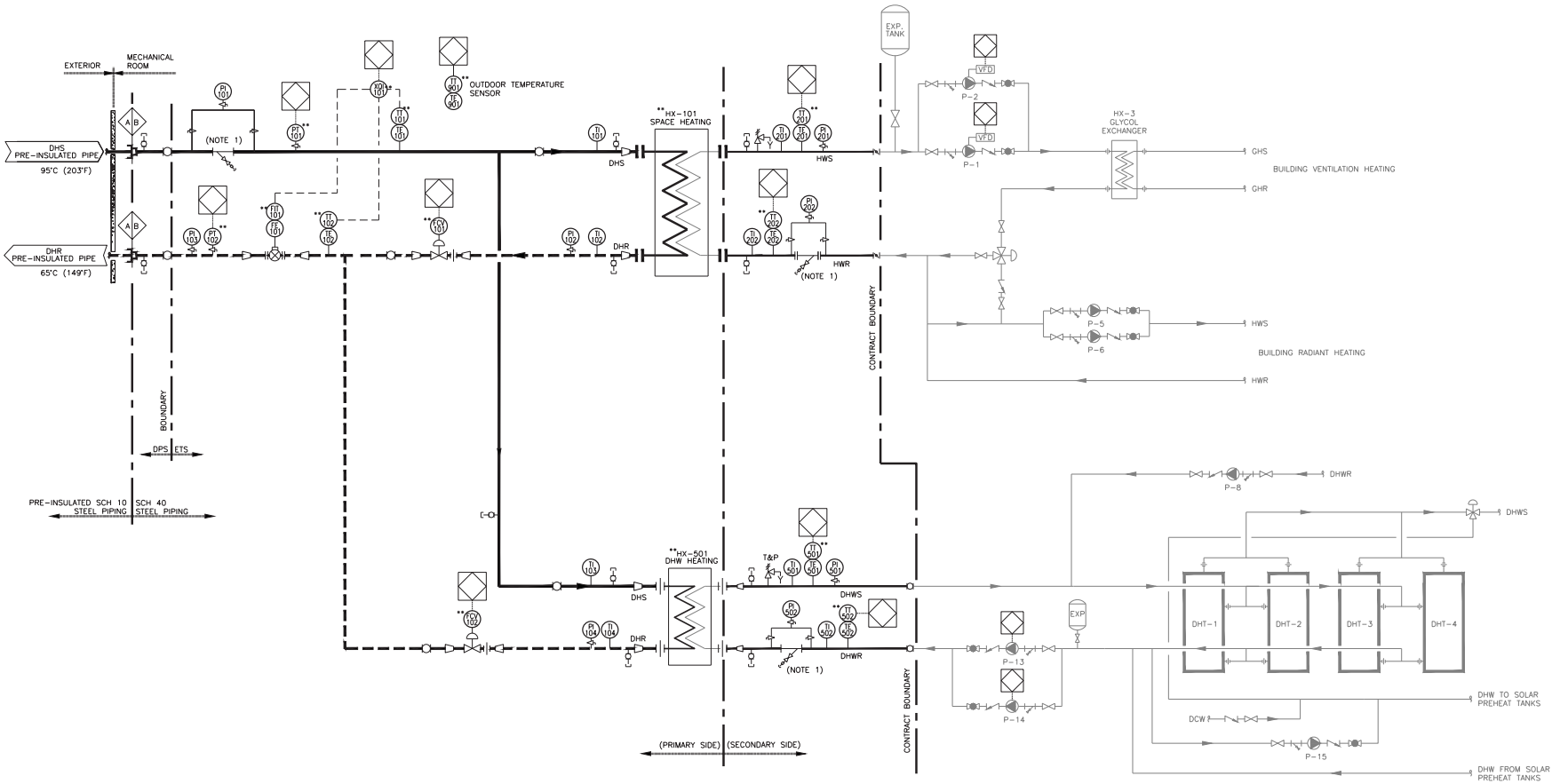
TAG NO.	SERVICE	NOMINAL CAPACITY (kW)	DESIGN PRESSURE (bar)	PRIMARY (HOT) SIDE					SECONDARY (COLD) SIDE					STANDARD OF ACCEPTANCE MANUFACTURER AND MODEL	APPROX. SIZE [LxWxH] (mm)	APPROX. EMPTY WEIGHT (kg)
				FLOW (L/s)	CONNECTION SIZE (mm)	CONN. SPEC	TEMP (°C/°C)	PRESSURE DIFFERENTIAL(kPa)	FLOW (L/s)	CONNECTION SIZE (mm)	CONN. SPEC	TEMP (°C/°C)	PRESSURE DIFFERENTIAL(kPa)			
HX-101	HEATING	500	16	4.1	TBD	TBD	85/55	35 max	6.1	TBD	TBD	50/70	35 max	ALFA LAVAL, CB SERIES	-- x -- x --	--
HX-501	DHW	420	16	6.8	TBD	TBD	65/50	50 max	6.8	TBD	TBD	45/60	35 max	ALFA LAVAL, M6 MDFD	-- x -- x --	--

PRELIMINARY CONTROL VALVE SELECTIONS

TAG NO.	SERVICE	Cv	dP CALC. (kPa)	FLOW (L/s)	SIZE (mm)	NORMAL VALVE POSITION	SELECTED MANUFACTURER AND MAKE
FCV-101	HEATING	25	45.7	4.1	40	L.P.	SIEMENS FLOWRITE VF 599 WITH SKD- OR SKB- ACTUATOR
FCV-102	DHW PRIMARY	16	77.3	3.4	32	N.C.	SIEMENS FLOWRITE VF 599 WITH SKD- OR SKB- ACTUATOR

PRELIMINARY ENERGY METER SELECTION

TAG NO.	SERVICE	DESIGN FLOW (L/s)	SIZE (mm)	SELECTED MANUFACTURER AND MODEL
FE-101	HEATING AND DHW	5.1	50	ENDRESS+HAUSER PROLINE PROMAG 53P FLOW METER
TE-101 TE-102	-	-	-	KAMSTRUP MATCHED PAIR PT-500 (4-WIRE) TEMPERATURE SENSORS
XQI-101	-	-	-	KAMSTRUP MULTICAL 601 CALCULATOR



NOTES:

1. STRAINER WITH 5/32" PERFORATED STAINLESS STEEL SCREEN AND 20 MESH LINER.

LEGEND:

PIPE BREAK SPECIFICATION

A - PRE-INSULATED SCH 10 STEEL PIPING

B - SCH 40 STEEL PIPING

** - EQUIPMENT SUPPLIED BY OWNER
N.O. - NORMALLY OPEN
N.C. - NORMALLY CLOSED
F.L. - FAIL LAST POSITION

STAMP:

REVISIONS

DATE	REMARKS	NO.	INIT.
MAR 30/2012	REVISED ISSUE FOR 50%	B	B.S.
MAR 09/2012	ISSUE FOR 50% REVIEW	A	B.S.

This document is the property of FVB Energy Inc. and the information hereon is not to be used or copied except for the specific project it was issued, without the written authorization of FVB Energy Inc.

CLIENT:

CITY OF VANCOUVER

CONSULTANT:

FVB ENERGY INC
13220 ST. ALBERT TRAIL NW
EDMONTON, ALBERTA T5L 4W1
TEL: (780) 453-3410
FAX: (780) 453-3682

PROJECT TITLE:
SOUTH EAST FALSE CREEK
NEU DISTRICT HEATING EXPANSION

SHEET TITLE:
ENERGY TRANSFER STATION
HEATING SCHEMATIC
215 W 2ND AVE (BC HOUSING)

DGN: M. GALLOWAY	SCALE: NTS
DWN: M. GALLOWAY	JOB NO.: 212205
APPR: B. SKAGESTAD	DATE: FEB 09/2012

DWG NO.: M-2205-002

PRELIMINARY HEAT EXCHANGER SELECTIONS

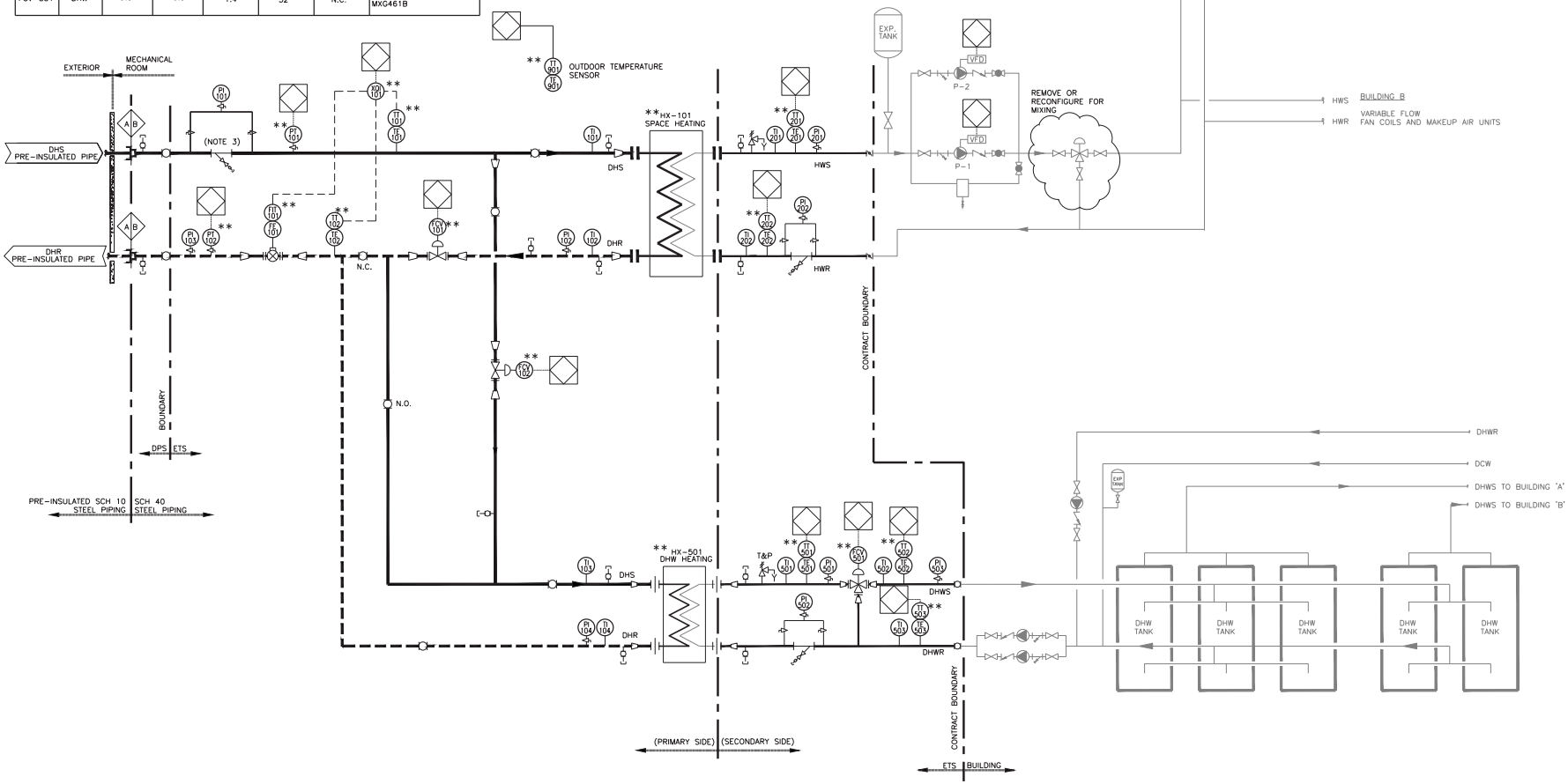
TAG NO.	SERVICE	DESIGN LOAD (kW)	DESIGN PRESSURE (bar)	PRIMARY (HOT) SIDE					SECONDARY (COLD) SIDE					SELECTED HEX MANUFACTURER AND MODEL	APPROX. SIZE [LxWxH] (mm)	APPROX. EMPTY WEIGHT (kg)
				FLOW (L/s)	CONNECTION SIZE (mm)	CONN. SPEC	TEMP (°C/°C)	PRESSURE DIFFERENTIAL(kPa)	FLOW (L/s)	CONNECTION SIZE (mm)	CONN. SPEC	TEMP (°C/°C)	PRESSURE DIFFERENTIAL(kPa)			
HX-101	HEATING	600	16	5.8	TBD	TBD	85/60	35 max	9.7	TBD	TBD	55/70	35 max	ALFA LAVAL, CB SERIES	-- x -- x --	--
HX-501	DHW	320	16	2.6	TBD	TBD	65/35	50 max	1.4	TBD	TBD	5/60	35 max	ALFA LAVAL, M6 MDFD	-- x -- x --	--

PRELIMINARY CONTROL VALVE SELECTIONS

TAG NO.	SERVICE	Cv	dP CALC. (kPa)	FLOW (L/s)	SIZE (mm)	NORMAL VALVE POSITION	SELECTED MANUFACTURER AND MAKE
FCV-101	HEATING	40	37.0	5.8	50	F.L.	SIEMENS FLOWRITE VF 599 WITH SKD- OR SKB- ACTUATOR
FCV-102	DHW	10	114.9	2.6	25	N.C.	SIEMENS FLOWRITE VF 599 WITH SKD- OR SKB- ACTUATOR
FCV-501	DHW	9.3	40.3	1.4	32	N.C.	SIEMENS MXG461B

PRELIMINARY ENERGY METER SELECTION

TAG NO.	SERVICE	DESIGN FLOW (L/s)	SIZE (mm)	SELECTED MANUFACTURER AND MODEL
FE-101	HEATING AND DHW	5.8	50	ENDRESS+HAUSER PROLINE PROMAG 53P FLOW METER
TE-101 TE-102	-	-	-	KAMSTRUP MATCHED PAIR PT-500 (4-WIRE) TEMPERATURE SENSORS
XQI-101	-	-	-	KAMSTRUP MULTICAL 601 CALCULATOR



NOTES:

1. STRAINER WITH 5/32" PERFORATED STAINLESS STEEL SCREEN AND 20 MESH LINER.

LEGEND:

PIPE BREAK SPECIFICATION

A - PRE-INSULATED SCH 10 STEEL PIPING

B - SCH 40 STEEL PIPING

** - EQUIPMENT SUPPLIED BY OWNER
N.O. - NORMALLY OPEN
N.C. - NORMALLY CLOSED
F.L. - FAIL LAST POSITION

STAMP:

REVISIONS

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MAR 30/2012	ISSUE FOR 50% REVIEW	A	B.S.

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CONSULTANT:
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TEL: (780) 453-3410
FAX: (780) 453-3682

PROJECT TITLE:
SOUTH EAST FALSE CREEK
NEU DISTRICT HEATING EXPANSION

SHEET TITLE:
ENERGY TRANSFER STATION
HEATING SCHEMATIC
99 W 2ND AVE

DGN: M. GALLOWAY	SCALE: NTS
DWN: M. GALLOWAY	JOB NO.: 212205
APPR: B. SKAGESTAD	DATE: FEB 09/2012

DWG NO.: M-2205-003

APPENDIX 5 – NEU CONSTRUCTION – PHASE 1

(Attached)

ATTENTION

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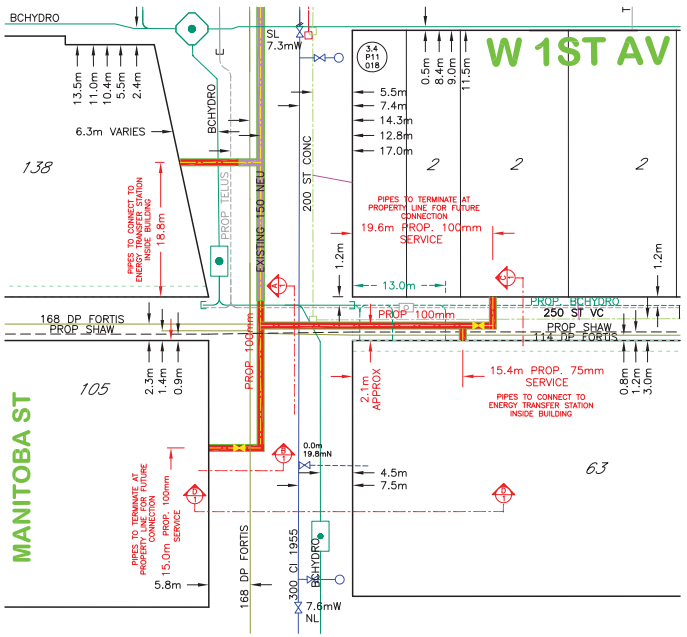
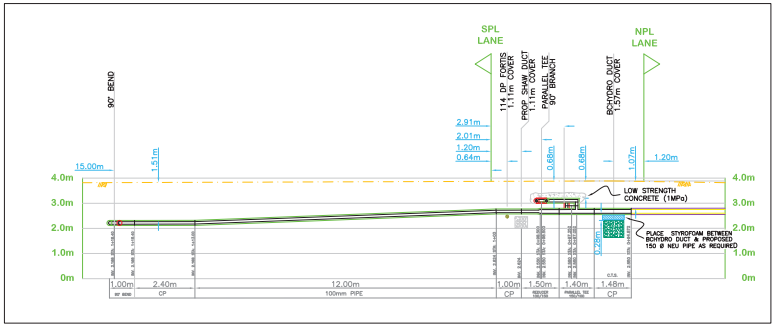
MAINTAIN MIN 0.3m VERTICAL CLEARANCE FROM ALL EXISTING FORTIS GAS MAINS

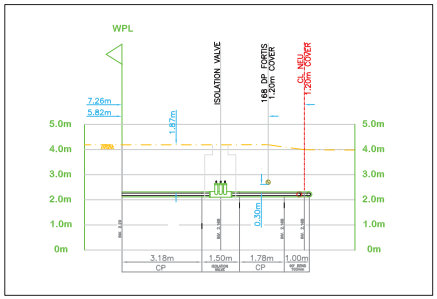
PHASE 1



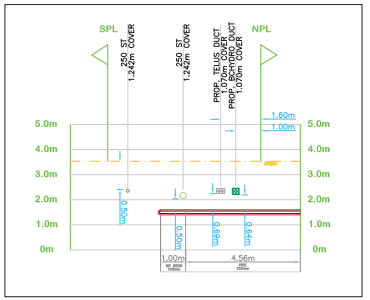
PROFILE CROSS-SECTION A 1
MANITOBA ST
SCALE 1:100



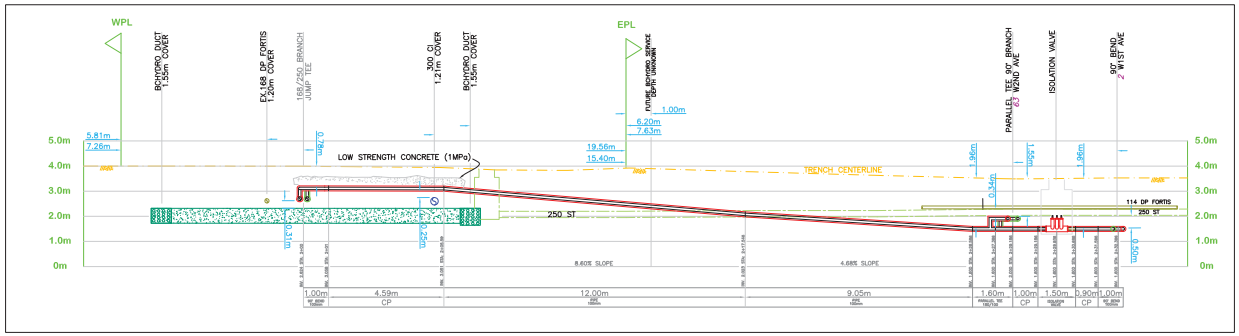
PROFILE CROSS-SECTION B 1
SERVICE FOR *105* WEST 2ND LANE NORTH
SCALE 1:100



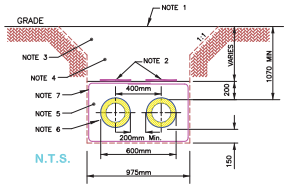
PROFILE CROSS-SECTION C 1
SERVICE FOR *2* WEST 1st LANE SOUTH
SCALE 1:100



PROFILE CROSS-SECTION D 1
LANE NORTH OF WEST 2ND AVE
SCALE 1:100



TYPICAL TRENCH CROSS-SECTION PARALLEL DISTRICT HEATING PIPES



1. TRENCH FILL
   20mm MINUS, COMBINED, CRUSHED AGGREGATE (C.O.V. #9) OR ENGINEER APPROVED NATIVE SOIL BACKFILL COMPACTED TO 95% MODIFIED PROCTOR.
2. PIPE ZONE
   20mm MINUS, COMBINED, CRUSHED AGGREGATE (C.O.V. #9) COMPACTED TO 95% MODIFIED PROCTOR. FOR POLYBAGGED INSTALLATIONS USE SAND (COV #17) COMPACTED TO 95% MODIFIED PROCTOR.
3. OVER-EXCAVATION ZONE (IF REQUIRED)
   80 mm MINUS CRUSHED TAILINGS (COV#13) COMPACTED TO 95% MODIFIED PROCTOR, OR DRAIN ROCK (COV#15) IF GROUNDWATER IS A PROBLEM.
4. GEOTEXTILE FABRIC LAYER
   PLACE ABOVE OVER-EXCAVATION ZONE ONLY IF SAND IS USED IN THE PIPE ZONE ABOVE DRAIN ROCK IN THE OVER-EXCAVATION ZONE. USE TYPE OF FABRIC AS SPECIFIED BY ENGINEER.
5. PROTRUDING ROCK, BOULDERS, LARGE STONES, FOREIGN MATERIAL AND SHORING MUST BE REMOVED TO MAINTAIN A MINIMUM CLEARANCE OF 150mm AROUND ALL PIPES, VALVES AND FITTINGS BEFORE COMPACTION.

BILL OF MATERIALS
PIPE, VALVES, HYDRANTS & FITTINGS

REQ'D	ITEM	REQ'D	ITEM

PROJECT WBS – XXXX

ALL CHARGES TO BE POSTED AGAINST THIS NETWORK NUMBER

WATERWORKS NETWORK – 30012872

WATERMAIN

GROUP PROJECT – XXXX | *ASSET GROUP – TB2010-034:WMN*

DESIGN NOTES
1. ALL WORK IS TO BE DONE IN ACCORDANCE WITH THE CITY OF VANCOUVER WATERWORKS MANUAL UNLESS NOTED OTHERWISE.
2. ALL CHANGES MUST BE APPROVED BY THE ENGINEERING DEPARTMENT WATERWORKS DESIGN BRANCH.
3. ALL DISTANCES ARE IN MILLIMETERS UNLESS NOTED OTHERWISE.
4. CUT & PLUG ALL ABANDONED WATERMAINS WITH WOODEN PLUGS.
5. COMPLETE TIE-INS USING APPROPRIATE RADIUS BENDS. CUT SPOOL PIECES TO SUIT AND ROLL BENDS, AS REQUIRED, TO ADJUST FOR LINE AND GRADE.
6. INSTALL THRUST BLOCKS AT ALL FITTINGS OR AS SHOWN ON THE DESIGN DRAWING. ALL THRUST BLOCKS TO BE SIZED IN ACCORDANCE WITH THE CITY OF VANCOUVER WATERWORKS MANUAL RELATIVE TO INSITU SOIL CONDITIONS.
7. INSTALL WATERMAIN LINE VALVES AT THE PROPERTY LINES OF STREET INTERSECTIONS UNLESS NOTED OTHERWISE.
8. PRESSURE TESTING AND CHLORINATING OF NEW AND REPAIRED WATERMAINS IS TO BE CONDUCTED IN ACCORDANCE WITH CITY OF VANCOUVER APPROVED PROCEDURES. ALL PRESSURE TEST AND CHLORIMATION RESULTS ARE TO BE RECORDED ON THE CITY OF VANCOUVER PERMANENT RECORD FORMS.
9. NOTIFY THE CITY OF VANCOUVER LAND SURVEY BRANCH AT LEAST 48 HOURS IN ADVANCE IF ANY SURVEY MONUMENTS OR LEAD PLUGS ARE TO BE REMOVED OR DESTROYED DURING CONSTRUCTION.
10. MINIMUM CLEARANCE TO OTHER UTILITIES IS 300 MILLIMETERS UNLESS APPROVED BY THE ENGINEER.
11. SMALL SERVICES ARE NOT SHOWN.
12. STREET LIGHTING IS SHOWN IN APPROXIMATE LOCATION.

WATERWORKS OPERATIONS – AS BUILT DETAILS

DATE STARTED _____
DATE FINISHED _____
TYPE OF SOIL _____ CLAY, PEAT, NATIVE OTHER, IMPORTED
AM'T OF COVER _____
PIPE TYPE _____
CLEANED & CHLORINATED _____
FOREMAN _____
TRUCK # _____

COMMENTS _____

GIS DETAILS
GIS DATE _____ GIS INITIALS _____

SYMBOL LEGEND

EXISTING GATE VALVE	PROPOSED GATE VALVE
EXISTING FIRE HYDRANT	PROPOSED FIRE HYDRANT
EXISTING TEE	PROPOSED TEE
EXISTING CROSS	PROPOSED CROSS
EXISTING PLUG	PROPOSED WOODEN PLUG
EXISTING REDUCER	PROPOSED WATERMAIN
EXISTING BEND	PROPOSED CAP
ABANDON EXISTING GATE VALVE	PROPOSED REDUCER
REMOVE EXISTING FIRE HYDRANT	PROPOSED THRUST BLOCK
ABANDON EXISTING REDUCER	PROPOSED SLEEVE

NO.	DATE	REVISION	BY
	31/5/12	ISSUE FOR TENDER	

CITY OF VANCOUVER WATER WORKS ENGINEERING SERVICES

APPROVED FOR CONSTRUCTION
DATE
WATERWORKS ENGINEER
UTILITY CHECK:
SEWER CHECK:

CITY OF VANCOUVER – ENGINEERING SERVICES

DIV./BR: WAT, SEW & YDS WATER DESIGN
DATE: APR 19/13 DESIGN: LJ
DWG: LJ OPS. CHK:
REFS:

NEU CONSTRUCTION
MANITOBA STREET
LANE NORTH OF WEST 2ND AVE

SCALE: 1:600
DIRECTORY: Y:\WATER\PROJ...\CONST...\2012\
DWG. NO. AB 1710
SHEET ... OF ... REVISION ...

THIS PRINT SUPERSEDES ALL PRINTS OF THIS DRAWING BEARING PREVIOUS REVISION NUMBERS

DATE: 2012-06-06 - 8:43am (enl2)
PATH: Y:\WATER\Projects\Construction\2012\NEU\NEU.dwg
LAYOUT: Manitoba

APPENDIX 6 – FUTURE NEU CUSTOMER CONNECTIONS

(Attached)

DATE: 2012-06-06 - 8:36am (enlj2)
PATH: Y:\WATER\Projects\Construction\2012\NEU\PROP NEU KEY.dwg
LAYOUT: Topobase - Water HP1055

ATTENTION

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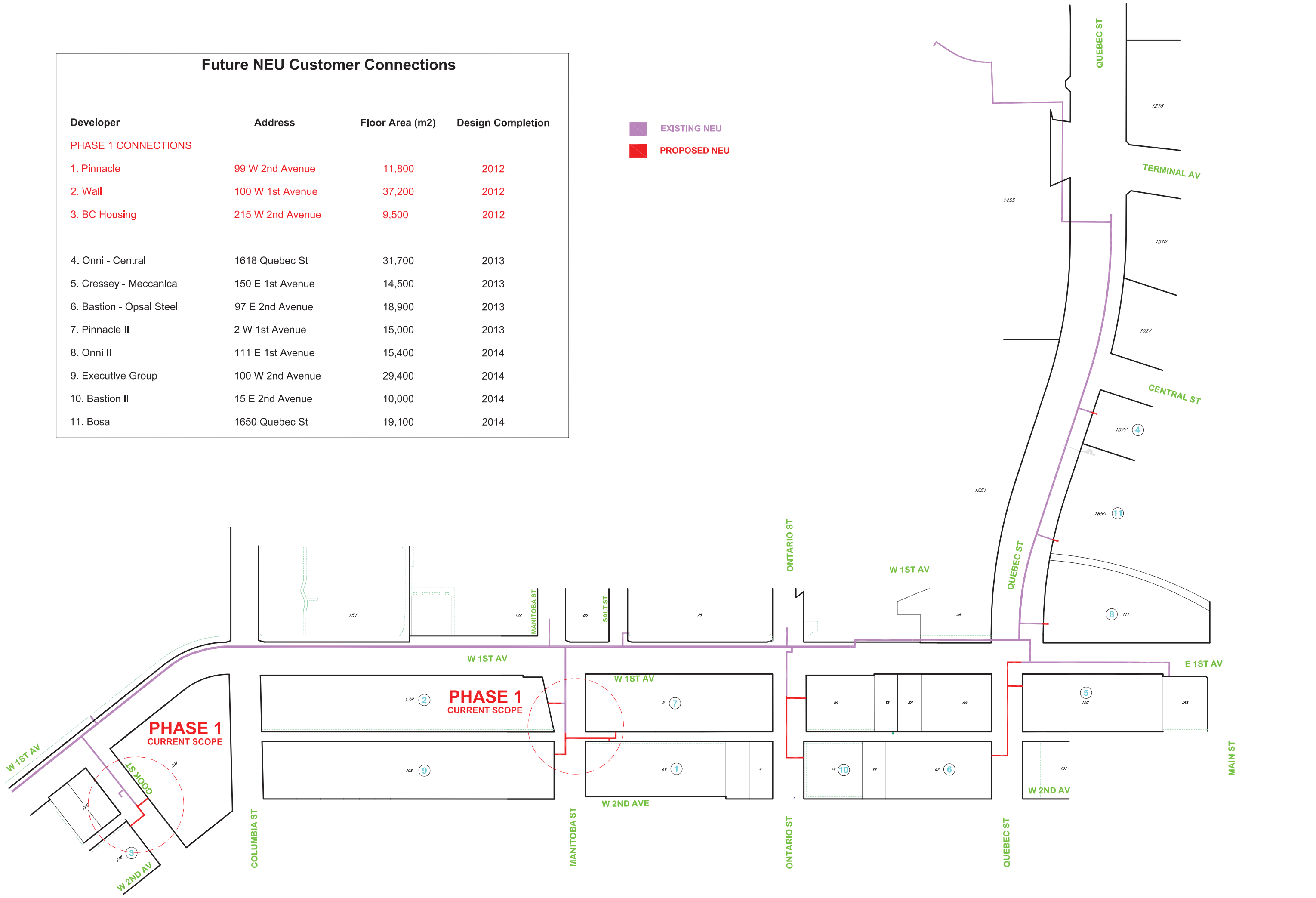
Future NEU Customer Connections

Developer	Address	Floor Area (m2)	Design Completion
PHASE 1 CONNECTIONS			
1. Pinnacle	99 W 2nd Avenue	11,800	2012
2. Wall	100 W 1st Avenue	37,200	2012
3. BC Housing	215 W 2nd Avenue	9,500	2012
4. Onni - Central	1618 Quebec St	31,700	2013
5. Cressey - Meccanica	150 E 1st Avenue	14,500	2013
6. Bastion - Opsal Steel	97 E 2nd Avenue	18,900	2013
7. Pinnacle II	2 W 1st Avenue	15,000	2013
8. Onni II	111 E 1st Avenue	15,400	2014
9. Executive Group	100 W 2nd Avenue	29,400	2014
10. Bastion II	15 E 2nd Avenue	10,000	2014
11. Bosa	1650 Quebec St	19,100	2014

EXISTING NEU
PROPOSED NEU



1. TRENCH FILL
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BILL OF MATERIALS

PIPE, VALVES, HYDRANTS & FITTINGS

REQ'D	ITEM	REQ'D	ITEM

PROJECT WBS – XXXX
ALL CHARGES TO BE POSTED AGAINST THIS NETWORK NUMBER
WATERWORKS NETWORK – XXXX
WATERMAIN
GROUP PROJECT – XXXX | ASSET GROUP – TB2010-034:WMN

DESIGN NOTES

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6. INSTALL THRUST BLOCKS AT ALL FITTINGS OR AS SHOWN ON THE DESIGN DRAWING. ALL THRUST BLOCKS TO BE SIZED IN ACCORDANCE WITH THE CITY OF VANCOUVER WATERWORKS MANUAL RELATIVE TO INSITU SOIL CONDITIONS.
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DATE STARTED ____
DATE FINISHED ____
TYPE OF SOIL CLAY, PEAT, NATIVE OTHER, IMPORTED
AM'T OF COVER ____
PIPE TYPE ____
CLEANED & CHLORINATED ____
FOREMAN ____
TRUCK # ____
COMMENTS ____

GIS DETAILS

GIS DATE ____ GIS INITIALS ____

SYMBOL LEGEND

EXISTING GATE VALVE
EXISTING FIRE HYDRANT
EXISTING TEE
EXISTING CROSS
EXISTING PLUG
EXISTING REDUCER
EXISTING BEND
ABANDON EXISTING GATE VALVE
REMOVE EXISTING FIRE HYDRANT
ABANDON EXISTING REDUCER
PROPOSED GATE VALVE
PROPOSED FIRE HYDRANT
PROPOSED TEE
PROPOSED CROSS
PROPOSED WOODEN PLUG
PROPOSED WATERMAIN
PROPOSED CAP
PROPOSED REDUCER
PROPOSED THRUST BLOCK
PROPOSED SLEEVE

NO.	DATE	REVISION	BY

CITY OF VANCOUVER WATER WORKS ENGINEERING SERVICES

APPROVED FOR CONSTRUCTION ____ DATE ____
WATERWORKS ENGINEER
UTILITY CHECK:
SEWER CHECK:

CITY OF VANCOUVER – ENGINEERING SERVICES
DIV./BR. WAT, SEW & YDS WATER DESIGN
DATE: MAR 14/12 DESIGN:
DWG: LJ OPS. CHK:
REFS:

NEU
KEY MAP
SOUTH FALSE CREEK

SCALE: 1:500
DIRECTORY: Y:\WATER\PROJ...\CONST...\2012\NEU...
DWG. NO. AB XXXX
SHEET ..1.. OF ..1.. REVISION: ..0..

THIS PRINT SUPERSEDES ALL PRINTS OF THIS DRAWING BEARING PREVIOUS REVISION NUMBERS