



## **REQUEST FOR QUOTATIONS**

**Title:** District Energy System Phase 1 – Containerized Boiler Plant

**Reference No.:** 1220-040-2014-001

## **FOR CONSTRUCTION MINOR WORKS SERVICES**

(Construction Services)

## REQUEST FOR QUOTATIONS

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## REQUEST FOR QUOTATIONS

### 1. INTRODUCTION

The City of Surrey (the "City") invites *Contractors* to provide a quotation on the form attached as Schedule C (the "Quotation") for the supply of the goods (if any) and services described in Schedule A (the "Goods and Services"). The description of the Goods and Services sets out the minimum requirements of the City. A person that submits a Quotation (the "*Contractor*") should prepare a Quotation that meets the minimum requirements, and may as it may choose, in addition, to also include goods, services or terms that exceed the minimum requirements.

### 2. ADDRESS FOR DELIVERY

A Quotation should be labelled with the *Contractor's* name, RFQ title and number. A Quotation should be submitted in the form attached to this RFQ as Schedule C – Form of Quotation.

The *Contractor* may submit a Quotation either by email or in a hard copy, as follows:

#### (a) Email

If the *Contractor* chooses to submit by email, the *Contractor* should submit the Quotation electronically in a single pdf file to the City by email at: [purchasing@surrey.ca](mailto:purchasing@surrey.ca)

PDF emailed Quotations are preferred and the City will confirm receipt of emails. Note that the maximum file size the City can receive is 10Mb. If sending large email attachments, *Contractors* should phone to confirm receipt. A *Contractor* bears all risk that the City's equipment functions properly so that the City receives the Quotation.

#### (b) Hard Copy

If the *Contractor* chooses NOT to submit by email, the *Contractor* should submit one original unbound Quotation and two (2) copies (three (3) in total) which should be delivered to the City at the office of:

Name: Richard D. Oppelt,  
Purchasing Manager  
at the following location:

Address:  
Surrey City Hall (**New City Hall**)  
Main Reception Counter – Ground Floor  
13450 104 Ave, Surrey, BC, Canada, V3T 1V8

Due to our move to the New City Hall we will be accepting hard copy Proposals/Quotations from February 24, 2014 onwards ONLY. PDF emailed Proposals/Quotations will be accepted at any time until the closing date.

**3. DATE**

The City would prefer to receive Quotations on or before **Monday March 03, 2014**. The City's office hours are 8:30 a.m. to 4:00 p.m., Monday to Friday, except statutory holidays.

**4. INQUIRIES**

All inquiries related to this Request for Quotations ("RFQ") should be directed in writing to:

Name: Sharif Fahmy,  
Purchasing Section  
at the following location:

Address: City of Surrey, **(New City Hall)**  
Main Reception Counter – Ground Floor  
13450 104 Avenue, Surrey, B.C. V3T 1V8

Fax: 604-599-0956  
E-mail for PDF Files: [purchasing@surrey.ca](mailto:purchasing@surrey.ca)

**5. ADDENDA**

If the City determines that an amendment is required to this RFQ, the City's Representative will issue a written addendum by posting it on the BC Bid Website at [www.bcbid.gov.bc.ca](http://www.bcbid.gov.bc.ca) (the "BC Bid Website") and the City Website at [www.surrey.ca](http://www.surrey.ca) (the "City Website") that will form a part of this RFQ. It is the responsibility of *Contractor* to check the BC Bid Website and the City Website for addenda. The only way this RFQ may be added to, or amended in any way, is by a formal written addendum. No other communication, whether written or oral, from any person will affect or modify the terms of this RFP or may be relied upon by any *Contractor*. By delivery of a Quotation, the *Contractor* is deemed to have received, accepted and understood the entire RFQ, including any and all addenda.

**6. NO CONTRACT**

This RFQ is simply an invitation for quotations (including prices and terms) for the convenience of all parties. It is not a tender and no obligations of any kind will arise from this RFQ or the submission of Quotations. The City may negotiate changes to any terms of a Quotation, including terms in Schedule A, Schedule B and Schedule C and including prices, and may negotiate with one or more *Contractors* or may at any time invite or permit the submission of quotations (including prices and terms) from other parties who have not submitted Quotations.

**7. ACCEPTANCE**

A Quotation will be an offer to the City which the City may accept at any time by signing the copy of the Quotation and delivering it to the *Contractor*. A Quotation is not accepted by the City unless and until both the authorized signatory and the purchasing representative have signed the agreement on behalf of the City. Delivery of the signed Quotation by the City may be by fax or pdf email. In that event, the resulting Agreement will be comprised of

the documents included in the definition of Agreement in Schedule B – Construction *Contract* – Minor Works.

**8. CONTRACTOR'S EXPENSES**

*Contractors* are solely responsible for their own expenses in preparing and submitting Quotations, and for any meetings, negotiations or discussions with the City or its representatives and *Consultants*, relating to or arising from the RFQ. The City will not be liable to any *Contractor* for any claims, whether for costs, expenses, losses or damages, or loss of anticipated profits, incurred by the *Contractor* in preparing and submitting a Quotation, or participating in negotiations for a *Contract*, or other activity related to or arising out of this RFQ.

**9. CONTRACTOR'S QUALIFICATIONS**

By submitting a Quotation, a *Contractor* represents that it has the expertise, qualifications, resources, and relevant experience to supply the Goods and Services. Tradesmen engaged in the performance of the Services shall be qualified in accordance with the requirements of the Tradesman Qualification Act and all pertinent licensing requirements required by the Ministry of Municipal Affairs.

**10. CONFLICT OF INTEREST**

A *Contractor* must disclose in its Quotation any actual or potential conflicts of interest and existing business relationships it may have with the City, its elected or appointed officials or employees. The City may rely on such disclosure.

**11. SOLICITATION OF COUNCIL MEMBERS, CITY STAFF AND CITY CONSULTANTS**

*Contractors* and their agents will not contact any member of the City Council, City staff or City *Consultants* with respect to this RFQ, other than the contact person named in Section 4, at any time prior to the award of a *Contract* or the cancellation of this RFQ.

**12. CONFIDENTIALITY**

All Quotations become the property of the City and will not be returned to the *Contractor*. All Quotations will be held in confidence by the City unless otherwise required by law. *Contractors* should be aware the City is a "public body" defined by and subject to the Freedom of Information and Protection of Privacy Act of British Columbia.

**13. SIGNATURE**

The legal name of the person or firm submitting the Quotation should be inserted in the Quotation. The Quotation should be signed by a person authorized to sign on behalf of the *Contractor* and include the following:

- (a) If the *Contractor* is a corporation then the full name of the corporation should be included, together with the names of authorized signatories. The Quotation should be executed by all of the authorized signatories or by one or more of them provided that a copy of the corporate resolution authorizing those persons to execute the Quotation on behalf of the corporation is submitted;

- (b) If the *Contractor* is a partnership or joint venture then the name of the partnership or joint venture and the name of each partner or joint venturer should be included, and each partner or joint venturer should sign personally (or, if one or more person(s) have signing authority for the partnership or joint venture, the partnership or joint venture should provide evidence to the satisfaction of the City that the person(s) signing have signing authority for the partnership or joint venture). If a partner or joint venturer is a corporation then such corporation should sign as indicated in subsection (a) above; or
- (c) If the *Contractor* is an individual, including a sole proprietorship, the name of the individual should be included.

#### 14. **CONTRACT TIME**

The Work under the *Contract* is to be completed by **November 30, 2014**. The *Contractor* will provide an estimated Construction Schedule in Schedule C section 12 to coincide with the completion date.

Should the *Contractor* fail to complete the Work under the *Contract* within the time specified, the City will be entitled to compensation from the *Contractor*, including but not limited to deductions from payments for the following:

- a) Any expenses or damages which are incurred by the City as a result of the *Contractor's* failure to complete the work under this *Contract* within the time specified; and/or
- b) 5% penalty to the total cost of the project for every week the project is delayed.

Extensions can be granted upon approval by the *Owner*.

#### 15. **CONSENT OF SURETY AND BID BOND**

- (a) The *Contractor* shall, no later than ten (10) business days after receipt of "Notice of Award", provide to the *Owner* a Performance Bond and a Labour and Material Payment Bond, each in the amount of 50% of the *Contract Price*, or as otherwise agreed to in writing from the *Owner*. The cost of all Bond premiums shall be included in the List of Separate Prices, Schedule C - Fees and Payment.
- (c) The forms of these Bonds should be those issued by the Canadian Construction Documents Committee as follows:

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

#### 16. **AVAILABILITY OF SITE**

The *Place of the Work*, is available for the immediate commencement of the Services. The anticipated start date is **March 17, 2014**. The *Contractor* will schedule the Services accordingly.

#### 17. **CONSULTANT**

The *Consultant*:

Kerr Wood Leidal Associates Ltd.  
200 – 4185 Still Creek Drive  
Burnaby, BC, V5C 6G9

Phone: 604-294-2088  
Fax: 604-294-2090  
Email: [AFahmy@kwl.ca](mailto:AFahmy@kwl.ca)  
Attention: Ayman Fahmy, P.Eng., PMP

## SCHEDULE A – SPECIFICATIONS OF GOODS AND SCOPE OF SERVICES

**PROJECT TITLE:** District Energy System Phase 1 – Containerized Boiler Plant

**PROJECT No.:** 1220-040-2014-001

### 1. SPECIFICATIONS OF GOODS AND SCOPE OF SERVICES REQUIRED

The scope of services includes the provision of all labour, supervision, materials, plant, equipment, layout, survey, permits, and inspections, to design, supply, deliver, off load into position, commission, test, and set into operation a containerized boiler plant. Furnish certificates confirming work conforms to requirements of Authorities having jurisdiction.

Optional Scope: Operation and maintenance of the containerized boiler plant for one (1) year (not including supply of gas or electricity costs).

Job site location is 10357 133 St., Surrey, B.C.

The general components of the work include mechanical and electrical equipment for a new containerized boiler plant, and related works.

The detailed scope of work is as described on the *Contract Drawings* (listed below), and List of Specifications (Schedule A-1).

The lack of and/or omission of detailed specifications does not minimize the acceptable levels of service and only the best commercial practices are acceptable.

The City reserves the right to add, delete or change areas of the work, and may do so upon giving written notification to the *Contractor*. If these changes cause an increase or a reduction in the costs as laid out in Schedule C form of Quotation, said costs should be adjusted and, when agreed upon, incorporated into the agreement.

*Contractor* to comply with all BC Plumbing Code, BC Fire Marshal, BC Workers' Compensation Board, National Building Code of Canada, BC Boiler Inspector, BC Electrical Inspector, National Fire Protection Association, British Columbia Safety Authority, and any other authorities having local jurisdiction. Failure to abide by these rules and regulations will result in being immediately escorted from the work site.

### 2. CONTRACT DRAWINGS (e.g. Architectural; Mechanical; Electrical and Structural)

The following *Drawings* are included as part of this RFQ.






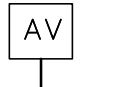



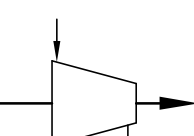
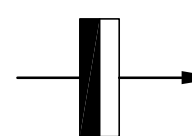




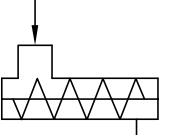
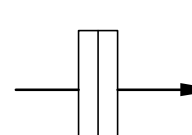
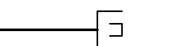



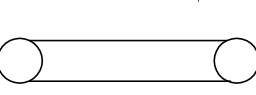
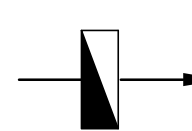
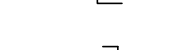


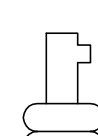

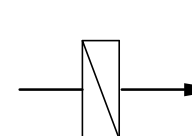
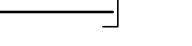


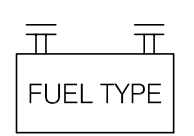

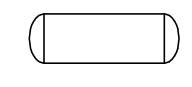




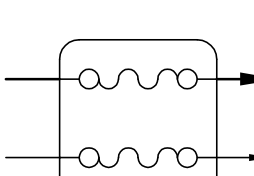
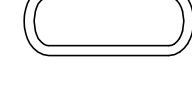
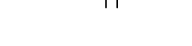


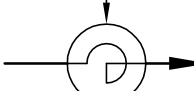
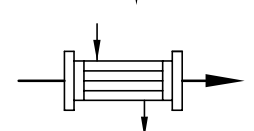

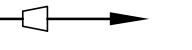


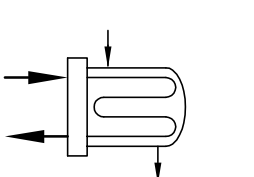
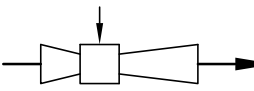
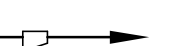


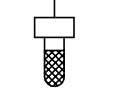

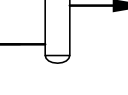

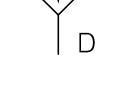





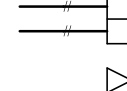

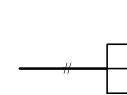

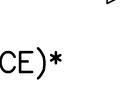


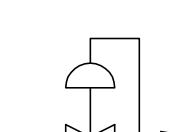
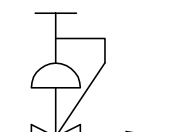
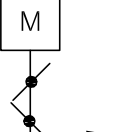

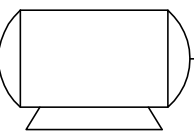
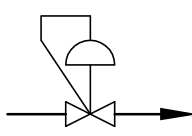
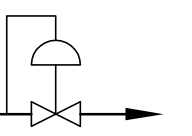
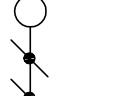
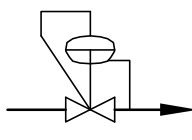
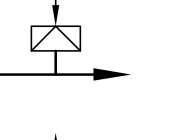
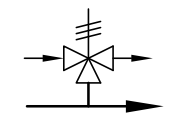
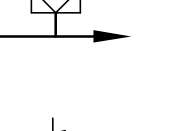
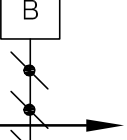
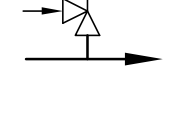
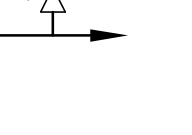
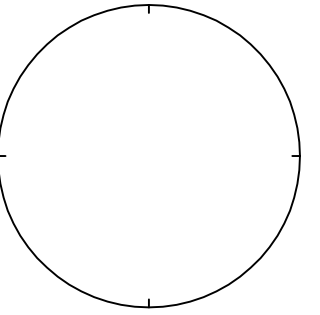

DRAWING NUMBER SPECIFICATION	DRAWING INDEX/TITLE	DATE RELEASED
P01	471.265-500-C01-P01-Rev0	2014-02-11
P02	471.265-500-C01-P02-Rev0	2014-02-11
P03	471.265-500-C01-P03-Rev0	2014-02-11



AT FULL SIZE THIS BAR MEASURES 100mm. ALL SCALES REFERENCED TO FULL SIZE.

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VALVES				PUMPS		EQUIPMENT		EQUIPMENT (CONT)		PIPELINE DEVICES		MECHANICAL GENERAL NOTES																																	
	THREE WAY VALVE		NEEDLE VALVE		PUMP, CENTRIFUGAL		BLOWER OR CENTRIFUGAL FAN		SILENCER		AUTOMATIC AIR VENT	<div>1. AT NO POINT SHOULD THERE BE ANY FLUSHING THROUGH BOILERS OR ENERGY METERS ON THE PRIMARY OR SECONDARY MECHANICAL SYSTEMS.</div> <div>2. THE DESIGN &amp; INSTALLATION OF THE PIPING IS TO COMPLY WITH THE ASME B31.1 CODE FOR POWER PIPING &amp; CSA B51.</div> <div>3. THE MECHANICAL CONTRACTOR IS TO ENSURE THAT THE SPECIFIED STRAINER MESH SIZE IS INSTALLED PRIOR TO THE SYSTEM START-UP.</div> <div>4. CONTRACTOR TO PERFORM HYDROSTATIC TESTING ON ALL PIPING AT 1.5 TIMES THE MAXIMUM OPERATING PRESSURE.</div> <div>5. REFER TO MECHANICAL SPECIFICATION FOR COMPLETE DESCRIPTION OF ALL PIPE FITTINGS AND VALVES.</div> <div>6. CONTRACTOR TO INSTALL MANUAL AIR VENTS AT THE HIGHEST POINTS &amp; DRAIN VALVES AT THE LOWEST POINTS OF ALL PIPING SYSTEMS. REFER TO SPECIFICATION FOR COMPLETE DESCRIPTION OF ALL VENT &amp; VALVE INSTALLATION PROCEDURES.</div> <div>7. CONTRACTOR TO PIPE ALL PRESSURE RELIEF VALVES TO THE NEAREST FLOOR DRAIN.</div> <div>8. CONTRACTOR TO VERIFY ALL THE FINAL LOCATION OF ALL SENSORS WITH MECHANICAL CONSULTANT.</div> <div>9. LOCATIONS OF ALL CONTROL PANELS TO BE MOUNTED AS PER SITE COORDINATION WITH MECHANICAL CONSULTANT &amp; OWNER.</div> <div>10. CONTRACTOR TO RUN WIRING TO FIELD DEVICES AS WELL AS CONTROL PANEL TERMINATIONS.</div> <div>11. SUPPORT PIPING IMMEDIATELY AT THE BOILER OUTLETS VIA STANCHIONS OR HANGERS. CONTRACTOR TO PROVIDE ADDITIONAL SUPPORT FOR EQUIPMENT INCLUDING STRAINERS, CONTROL VALVES, FLOW METER'S, ETC.</div> <div>12. CONTRACTOR TO REFER TO ANVL PRODUCT CATALOGUE FOR ALL HANGER &amp; SUPPORT FIGURES.</div> <div>13. ALL DRAWINGS TO BE READ IN CONJUNCTION WITH PROJECT SPECIFICATIONS.</div> <div>14. ALL GAUGES TO BE MOUNTED IN A WAY TO BE VISIBLE FOR A PERSON STANDING ON THE FLOOR.</div> <div>15. ALL PIPING WILL BE REGISTERED WITH BCSA. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE INSPECTIONS ACCORDINGLY.</div> <div>16. ALL DRAIN VALVES SHALL BE MINIMUM NPS 20 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.</div> <div>17. CONTRACTOR TO HAVE A PROFESSIONAL ENGINEER REGISTERED IN BRITISH COLUMBIA CERTIFY THAT WORK COMPLIES WITH SEISMIC REQUIREMENTS AS PER B.C. BUILDING CODE.</div> <div>18. CONTRACTOR TO SUPPLY AND INSTALL A WELDED END CAP FOR ALL FUTURE CONNECTIONS.</div> <div>19. SCHEMATIC IS BASED ON 3 MWt PLANT DESIGN CAPACITY. A SIMILAR DESIGN WITH ADDITIONAL EQUIPMENT COULD BE UTILIZED IF THE PLANT CAPACITY IS INCREASED TO 5 MWt.</div> <div>20. ALL PIPING TO BE INSULATED AND JACKETED PER SPECIFICATIONS.</div>																																	
	GATE VALVE OR UNSPECIFIED (NORMALLY OPEN)		CHECK VALVE		PUMP, GEAR		COMPRESSOR		SLIDE GATE (NORMALLY CLOSED)		STEAM VENT																																		
	GATE VALVE OR UNSPECIFIED (NORMALLY CLOSED)		REDUCED PRESSURE BACKFLOW PREVENTER		PUMP, ROTARY LOBE		CONVEYOR, SCREW		SLIDE GATE (NORMALLY OPEN)		QUICK CONNECTOR																																		
	PLUG VALVE (NORMALLY OPEN)		DOUBLE CHECK VALVE BACKFLOW PREVENTER		PUMP, SUBMERSIBLE		CONVEYOR, BELT		SLUICE GATE (NORMALLY CLOSED)		CAP OR PLUG																																		
	BALL VALVE (NORMALLY OPEN)		PUMP DISCHARGE VALVE (TRIPLE DUTY)		PUMP, VERTICAL		DIFFUSER HEADER		SLUICE GATE (NORMALLY OPEN)		BLIND FLANGE																																		
	BALL VALVE (NORMALLY CLOSED)		GAUGE OR ROOT VALVE		FUEL TYPE ENGINE		FLAP GATE		TANK, PRESSURE		REDUCER (CONCENTRIC)																																		
	BUTTERFLY VALVE (NORMALLY OPEN)		KNIFE GATE VALVE		GENERATOR		HEAT EXCHANGER, PLATE TYPE		TANK, DOUBLE WALLED		REDUCER (ECCENTRIC)																																		
	BUTTERFLY VALVE (NORMALLY CLOSED)		BALANCING COCK		HEAT EXCHANGER, SPIRAL TYPE		HEAT EXCHANGER, STRAIGHT TUBE TYPE		TANK, GENERAL		FLEXIBLE CONNECTION																																		
	BUTTERFLY DAMPER VALVE		CIRCUIT BALANCING VALVE		HEAT EXCHANGER, U-TUBE TYPE		INJECTOR				STRAINER																																		
	GLOBE VALVE (NORMALLY OPEN)		MUD VALVE								FOOT VALVE																																		
	GLOBE VALVE (NORMALLY CLOSED)										AIR SEPARATOR																																		
	DIAPHRAGM VALVE										PIPE TO NEAREST DRAIN																																		
	ANGLE VALVE										CALIBRATION CHAMBER																																		
	FLOAT VALVE										PULSATION DAMPENER																																		
ACTUATORS																																													
	MOTOR ACTUATOR		PNEUMATIC CYLINDER (DOUBLE ACTING)																																										
	SOLENOID		PNEUMATIC CYLINDER (PILOT ACTUATED)																																										
	DIAPHRAGM (PRESSURE BALANCE)*		PNEUMATIC CYLINDER (SINGLE ACTING, SPRING OPPOSED)																																										
	HAND WHEEL																																												
	DIAPHRAGM (SPRING OPPOSED)*	* REFER TO SELF ACTUATED REGULATOR BELOW FOR PILOTING AND TAPS																																											
SELF ACTUATED REGULATORS OTHER DEVICES																																													
	PRESSURE REDUCING REGULATOR WITH EXTERNAL PRESSURE TAP		PRESSURE REDUCING REGULATOR, SELF CONTAINED, WITH HAND ADJUSTMENT		M	MOTORIZED CONTROL DAMPER		MOTOR1		MOTOR2																																			
	BACKPRESSURE REGULATOR, SELF CONTAINED		BACK PRESSURE REGULATOR WITH EXTERNAL PRESSURE TAP			BALANCING DAMPER																																							
	DIFFERENTIAL PRESSURE REDUCING REGULATOR WITH INTERNAL AND EXTERNAL TAPS		RUPTURE DISK (VACUUM)																																										
	PRESSURE AND VACUUM RELIEF VALVE		RUPTURE DISK (PRESSURE)		B	BACKDRAFT DAMPER																																							
	VACUUM RELIEF VALVE		PRESSURE RELIEF VALVE																																										
				ALL DIMENSIONS ARE IN METRES ALL PIPE SIZES ARE IN MILLIMETRES				 ENGINEERING DEPARTMENT CITY OF SURREY		BENCH MARK - S. M. # T. B. M. - S. I. P.		ELEV. ELEV.	SEAL	SCALE: HOR. VERT. NTS NTS DATE FEB. 11/14	SUPPLY PROJECT NUMBER																														
				<table><tr><th>REVISION</th><th>DESCRIPTION</th><th>BY</th><th>DATE</th><th>APPROVED</th></tr><tr><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td></tr></table>				REVISION	DESCRIPTION	BY	DATE	APPROVED	1					2					3					4					5					TITLE CITY OF SURREY DISTRICT ENERGY SYSTEM STANDARD PIPING SYMBOLS		DRAWING NUMBER C01-P01 C01-P02 C01-P03		DESCRIPTION STANDARD PIPING SYMBOLS, NOTES & DRAWING LIST STANDARD INSTRUMENTATION SYMBOLS HEATING HOT WATER SCHEMATIC WITH CONDENSING AND NON-CONDENSING BOILERS		SHEET 1 OF 3	
REVISION	DESCRIPTION	BY	DATE	APPROVED																																									
1																																													
2																																													
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										DESTROY ALL PRINTS BEARING PREVIOUS NUMBERS		REVISION 0																																	

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AT FULL SIZE THIS BAR MEASURES 100mm. ALL SCALES REFERENCED TO FULL SIZE.

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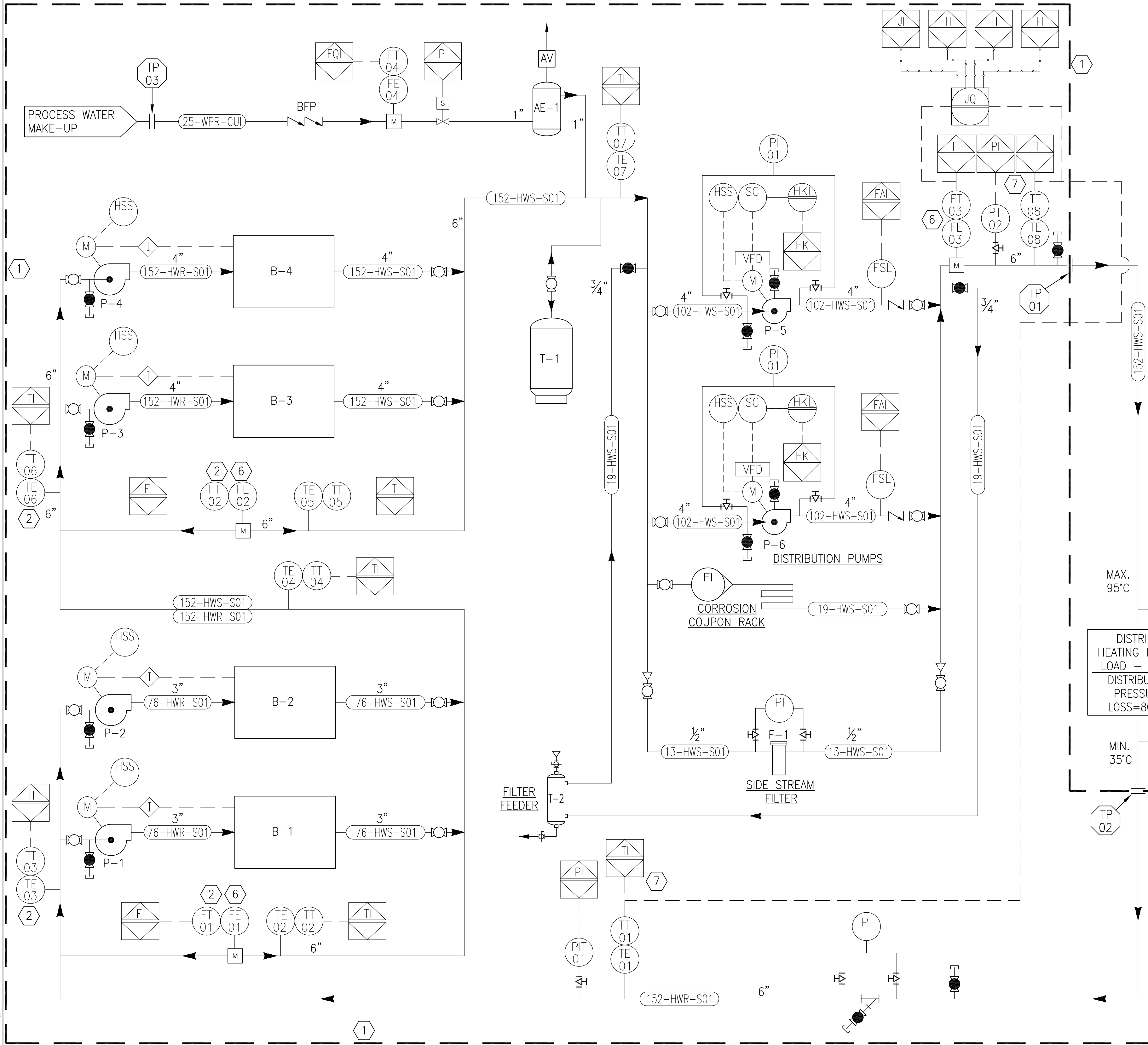
FUNCTIONAL IDENTIFICATION MATRIX					INSTRUMENT AND FUNCTION SYMBOLS		PRIMARY ELEMENT SYMBOLS				MISCELLANEOUS SYMBOLS																																				
FIRST LETTER		SUCCEEDING-LETTERS																																													
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER																																										
A	ANALYSIS		ALARM				FIELD MOUNTED INSTRUMENT					INTERLOCK – SEE CONTROL STRATEGY DESCRIPTION																																			
B	BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE		INSTRUMENT WITH TWO SERVICE OR FUNCTION					PURGE CONNECTION																																			
C	USER'S CHOICE			CONTROL OR CONTROLLER	CLOSED								MANUAL RESET																																		
D	USER'S CHOICE	DIFFERENTIAL					MAIN PANEL MOUNTED INSTRUMENT. ACCESSIBLE					SAMPLE PORT																																			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)						VARIABLE AREA FLOW INDICATOR (ROTAMETER)																																						
F	FLOW RATE	RATIO (FRACTION)					INSTRUMENT MOUNTED BEHIND MAIN CONTROL PANEL. NOT READILY ACCESSIBLE					ANNUNCIATOR HORN																																			
G	USER'S CHOICE		GLASS VIEWING DEVICE						CORIOLIS MASS FLOWMETER				GROUND																																		
H	HAND				H-HIGH-(ALARM) HH-HIGH-(SHUTDOWN)		INSTRUMENT MOUNTED ON LOCAL OR AUXILIARY PANEL. ACCESSIBLE		VORTEX FLOW SENSOR			DIAPHRAGM SEAL																																			
I	CURRENT (ELECTRICAL)		INDICATE						MAGNETIC FLOWMETER			SONIC FLOWMETER (DOPPLER OR TRANSIT TIME)		FIRE HYDRANT & VALVE																																	
J	POWER	SCAN					INSTRUMENT MOUNTED BEHIND LOCAL OR AUXILIARY PANEL. NOT READILY ACCESSIBLE		POSITIVE DISPLACEMENT METER			VARIABLE FREQUENCY DRIVE																																			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION					THERMAL MASS FLOW ELEMENT			AVERAGING PITOT TUBE		TIE-IN POINT ( REFER TO SECTION 01110 )																																	
L	LEVEL		LIGHT		L-LOW-(ALARM) LL-LOW-(SHUTDOWN) MIDDLE, INTERMEDIATE USER'S CHOICE OPEN		FIELD MOUNTED DISPLAY		SINGLE PORT PITOT TUBE			FUTURE SCOPE LIMIT																																			
M	USER'S CHOICE	MOMENTARY							PROPELLER OR TURBINE METER																																						
N	USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE		DISPLAY MOUNTED ON LOCAL OR AUXILIARY CONTROL PANEL																																								
O	USER'S CHOICE		ORIFICE, RESTRICTION POINT (TEST) CONNECTION						CORROSION COUPON RACK																																						
P	PRESSURE, VACUUM						PROGRAM LOGIC CONTROLLER (PLC) MOUNTED IN MAIN CONTROL PANEL																																								
Q	QUANTITY	INTEGRATE, TOTALIZE							PROGRAM LOGIC CONTROL (PLC) MOUNTED IN LOCAL OR AUXILIARY CONTROL PANEL																																						
R	RADIATION		RECORD				COMPUTER – INTERNAL SYSTEM FUNCTION																																								
S	SPEED, FREQUENCY	SAFETY		SWITCH					COMPUTER – INTERNAL SYSTEM FUNCTION. ACCESSIBLE TO OPERATOR																																						
T	TEMPERATURE			TRANSMIT			COMPUTER – INTERNAL SYSTEM FUNCTION. ACCESSIBLE TO OPERATOR																																								
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION																																										
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVRE			PILOT LIGHT																																								
W	WEIGHT, FORCE		WELL																																												
X	UNCLASSIFIED	X AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED		PILOT LIGHT																																								
Y	EVENT, STATE, PRESENCE	Y AXIS		RELAY, COMPUTE, CONVERT																																											
Z	POSITION, DIMENSION	Z AXIS		DRIVER, ACTUATOR, UNCLASSIFIED – FINAL CONTROL ELEMENT																																											
PIPING SERVICE IDENTIFICATION			INSTRUMENTATION IDENTIFICATION					INSTRUMENT SIGNAL SYMBOLS		LINE DESIGNATIONS		CROSS REFERENCING																																			
<p>PIPES ARE LABELED WITH THE FOLLOWING TAG</p> <p><b>DDD-SSS-MMMM</b></p> <p>WHERE    DDD    NOMINAL DIAMETER (mm)              SSS    SERVICE CODE              MMM    MATERIAL CODE</p> <p>SERVICE CODES</p> <p>CPR – CLARIFIED PROCESS RETURN HWR – HOT WATER RETURN HWS – HOT WATER SUPPLY NG – NATURAL GAS PR – PROPANE SAN – SANITARY SEWAGE SLT – PROCESS TAILINGS STM – STORM WATER WDC – POTABLE WATER WF – FIRE WATER WFR – FRESH WATER WPR – PROCESS WATER WW – WASTE WATER</p> <p>MATERIAL CODES (REFER TO PIPING SPEC SHEETS IN DIV. 15 OF SPECIFICATIONS FOR DETAILS)</p> <p>CUI – COPPER TUBING, TYPE L SEAMLESS 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</p>			<p>OUTPUT</p> <p>FUNCTIONAL IDENTIFICATION CODE</p> <p>OPERATING FUNCTION*</p> <p>BASIC INSTRUMENT</p> <p>LOOP NUMBER</p> <p>PANEL LOCATION OR ANALYTICAL FUNCTION*</p> <p>INPUT</p> <p>* OPTIONAL</p> <p>FUNCTIONAL IDENTIFICATION CODE</p> <p>SEE FUNCTIONAL IDENTIFICATION MATRIX ABOVE</p>					<p>INSTRUMENT SUPPLY, PROCESS TAPS</p> <p>PNEUMATIC SIGNAL</p> <p>ELECTRIC SIGNAL</p> <p>CAPILLARY TUBE OR FILLED SYSTEM</p> <p>ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)</p> <p>ELECTROMAGNETIC OR SONIC SIGNAL (UNGUIDED)</p> <p>SOFTWARE OR DATA LINK</p> <p>MECHANICAL LINK</p> <p>HYDRAULIC</p>	<p>PRIMARY PROCESS FLOW</p> <p>SECONDARY PROCESS FLOW</p> <p>HEAT TRACED PIPING</p> <p>STEAM PIPING</p> <p>CONDENSATE PIPING</p> <p>EXISTING PIPING AND EQUIPMENT</p> <p>EXISTING PIPING AND EQUIPMENT TO BE REMOVED</p> <p>ENCLOSURE / AREA BOUNDARY</p> <p>VENDOR PACKAGE BOUNDARY</p>	<p>A LINE THAT CONTINUES TO DRAWING M1003 IS SHOWN AS:</p> <p>A LINE CONTINUING FROM DRAWING M1002 IS SHOWN AS:</p>																																					
			<p>ALL DIMENSIONS ARE IN METRES ALL PIPE SIZES ARE IN MILLIMETRES</p> <table><tr><th>REVISION</th><th>DESCRIPTION</th><th>BY</th><th>DATE</th><th>APPROVED</th></tr><tr><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td>2</td><td></td><td></td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td></tr></table>						REVISION	DESCRIPTION	BY	DATE	APPROVED	1					2					3					4					5					6					<p><b>KERR WOOD LEIDAL</b> consulting engineers</p> <p>FOSDICK &amp; HILMER <b>CONSULTING ENGINEERS</b> 309 VINE STREET, SUITE 50    CINCINNATI, OHIO 45202 TELEPHONE (513)241-5640    FAX (513)241-3659</p>	<p>ENGINEERING DEPARTMENT</p> <p>CITY OF SURREY</p>	<p>BENCH MARK – S. M. # T. B. M. – S. I. P.</p> <p>ELEV. ELEV.</p> <p>SEAL</p> <p>TITLE</p> <p>CITY OF SURREY DISTRICT ENERGY SYSTEM STANDARD INSTRUMENTATION SYMBOLS</p>	<p>SCALE: HDP. NTS VERT. NTS</p> <p>DATE FEB. 11/14</p> <p>SURREY PROJECT NUMBER</p> <p>DRAWN CHECKED NEM L. B.</p> <p>SURREY DRAWING NUMBER</p> <p>DESIGNED CHECKED RDT CONTRACT</p> <p>C01-P02</p> <p>PLANNING D&amp;C AS BUILT SHEET 2 OF 3</p> <p>APPROVED AMF DESTROY ALL PRINTS BEARING PREVIOUS NUMBERS</p> <p>REVISION 0</p>
REVISION	DESCRIPTION	BY	DATE	APPROVED																																											
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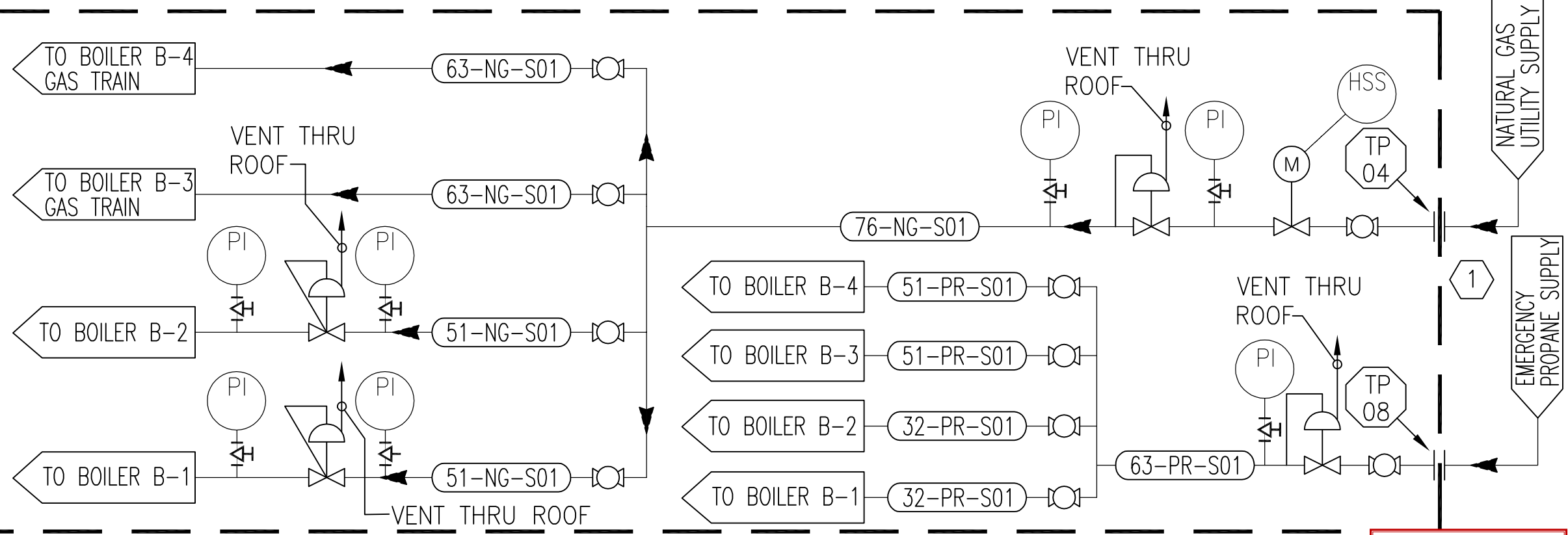


Equipment List				
Item	Name	Description	Manufacturer / Model	Capacity
B-1	Boiler No. 1	Condensing, gas fired	AERCO International, BMK 3000	0.82 MWt (2,790,000 Btuh)
B-2	Boiler No. 2	Condensing, gas fired	AERCO International, BMK 3000	0.82 MWt (2,790,000 Btuh)
B-3	Boiler No. 3	Non-Condensing, gas fired	Thermogenics, Thermocoil	2.45 MWt (8,369,000 Btuh)
B-4	Boiler No. 4	Non-Condensing, gas fired	Thermogenics, Thermocoil	2.45 MWt (8,369,000 Btuh)
P-1	Pump No. 1	Inline Centrifugal	B&G Series 80	375 GPM @ 20 TDH, 5 HP
P-2	Pump No. 2	Inline Centrifugal	B&G Series 80	375 GPM @ 20 TDH, 5 HP
P-3	Pump No. 3	Inline Centrifugal	B&G Series 80	400 GPM @ 35 TDH, 7.5 HP
P-4	Pump No. 4	Inline Centrifugal	B&G Series 80	400 GPM @ 35 TDH, 7.5 HP
P-5	Pump No. 5	Inline Centrifugal w/VFD	B&G Series 80	350 GPM @ 120 TDH, 15 HP
P-6	Pump No. 6	Inline Centrifugal w/VFD	B&G Series 80	350 GPM @ 120 TDH, 15 HP
P-7	Pump No. 7	Inline Centrifugal w/VFD	B&G Series 80	100 GPM @ 75 TDH, 5 HP
T-1	Tank No. 1	Expansion Tank		3 M <sup>3</sup> , 21 PSI SET PRESSURE
AE-1	Tank No. 2	Air Eliminator		5 Gal.
T-2	Tank No. 3	Filter Feeder		
BFP		Backflow Preventer		
F-1	Filter No. 1	Side Stream Filter		

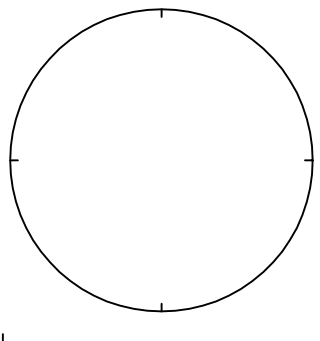
SPECIFIC NOTES:

- ALL EQUIPMENT, PIPING, CONTROLS, INSTRUMENTATION, AND POWER DISTRIBUTION GEAR INSIDE DASHED BOX TO BE FABRICATED AND INSTALLED INSIDE A 1 TO 2 HIGH-CUBE OR CUSTOMIZED (ANY LENGTH) SHIPPING CONTAINER. ALL EQUIPMENT AND SYSTEM'S SHALL BE PRESSURE TESTED TO 240 PSIG AND COMMISSIONED AT THE MANUFACTURER'S SHOP PRIOR TO SHIPPING.
- NOT PART OF BASE BID. PROVIDE ALTERNATE BID PRICING FOR FLOW ELEMENTS AND TRANSMITTERS NOS. 01 AND 02 AND TEMPERATURE ELEMENT AND TRANSMITTERS NOS. 03 AND 06.
- INSTALLED AT REMOTE LOCATION ON DISTRIBUTION LOOP.
- DETERMINATION OF THE NEED AND SIZE OF A THIRD DISTRIBUTION PUMP IS PENDING FUTURE SYSTEM PRESSURE LOSS CALCULATIONS.
- ASSUMPTIONS FOR CONCEPT DEVELOPMENT ONLY. CONTRACTOR CAN UTILIZE ALTERNATE MANUFACTURER OR EQUIPMENT TYPE TO MEET OVERALL REQUIREMENTS
- ENSURE STRAIGHT 10 PIPE DIAMETERS (10 D) UPSTREAM AND 5 PIPE DIAMETERS (5 D) DOWNSTREAM OF FLOW METERS.
- TEMPERATURE TRANSMITTERS NO. 01 AND 08 AND FLOW TRANSMITTER NO. 03 SHALL BE FURNISHED TOGETHER FROM A SINGLE MANUFACTURER AS A PACKAGED BTO METERING SYSTEM.
- PIPING, VALVES AND PRV'S FOR EMERGENCY PROPANE USE TO BE COORDINATED WITH THE MECHANICAL CONSULTANT BASED ON INDIVIDUAL BOILER REQUIREMENTS.

TEMPORARY ENERGY CENTRE



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**KERR WOOD LEIDAL**  
consulting engineers

FOSDICK & HILMER CONSULTING ENGINEERS  
309 VINE STREET, SUITE 50 CINCINNATI, OHIO 45202  
TELEPHONE (513)241-5640 FAX (513)241-3659

ALL DIMENSIONS ARE IN METRES  
ALL PIPE SIZES ARE IN MILLIMETRES

REVISION	DESCRIPTION	BY	DATE	APPROVED
1				
2				
3				
4				
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6				



ENGINEERING  
DEPARTMENT

CITY OF SURREY

BENCH MARK - S.M. #  
T.B.M. - S.I.P.

ELEV.  
ELEV.

SEAL

TITLE  
CITY OF SURREY  
DISTRICT ENERGY SYSTEM  
PROCESS AND INSTRUMENTATION DIAGRAM

SCALE: HDP, VERT. NTS	DATE: FEB. 11/14	SUPPLY PROJECT NUMBER
DRAWN CHECKED NEM	L.B.	SUPPLY DRAWING NUMBER
DESIGNED CHECKED RDT	CONTRACT	C01-P03
PLANNING D&C	AS BUILT	SHEET 3 OF 3
APPROVED AMF	DESTROY ALL PRINTS BEARING PREVIOUS NUMBERS	REVISION 0

**SCHEDULE A-1 LIST OF SPECIFICATIONS (131 pages)**

## **LIST OF SPECIFICATIONS**

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01780 CLOSE OUT

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13120 ENCLOSURE

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15010 BASIC MECHANICAL METHODS  
15098 PIPING  
15099 PIPE SPECIFICATION SHEETS  
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15109 VALVE SPECIFICATION SHEETS  
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15280 PRIMARY FIELD INSULATION  
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### **DIVISION 16 ELECTRICAL**

16010 ELECTRICAL GENERAL REQUIREMENTS  
16905 CONTROLS

**END OF SECTION**

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## **PART 1 INTRODUCTION**

### **1.1 Overall Scope of Supply**

- .1 The Contractor is requested to design, build, deliver, install and commission a complete, operable containerized boiler package (CBP) to the City of Surrey. This package will be referred to as Package C01.
- .2 The Contractor is requested to submit an optional monthly price for operation and maintenance of the package.
- .3 Supply of the concrete pad, electrical, natural gas and sewer services will be by others.
- .4 Supply of the connection from the District Energy System will be by others.
- .5 The purpose of the plant is to supply hot water to a district energy system.
- .6 This Specification package covers boilers, pumps, process mechanical piping, fittings, valves, supports and appurtenances, electrical and controls, and enclosure as shown on the drawings and described in the related Sections, for a transportable, fully enclosed boiler plant.

### **1.2 Related Sections**

- .1 Read this Section in conjunction with all sections shown in Section 00010 – Table of Contents. 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.

### **1.3 Submissions**

- .1 Submit Compliance Statement.
- .2 Submit Quotation Form.
- .3 Complete Technical Data Sheet.
- .4 A Mechanical Room Layout drawing and a system P&ID in both CAD and PDF format.
- .5 Submit manufacturer's literature and catalogue information.
- .6 Submit shop drawings including:
  - .1 Dimensions,
  - .2 Materials of construction,
  - .3 Performance data, and
  - .4 Design ratings.

### **1.4 Schedule**

- .1 Refer to the "Work Schedule" in the Front-End.

## **1.5 Addenda**

- .1 Addenda or corrections issued during the bid period shall become part of the RFQ Documents.

## **1.6 Variations**

- .1 Subject to the requirements given herein, the Contractor may submit for consideration, alternative specifications for the Work. These shall be listed accordingly in the Bid Form. The acceptability of proposed variations/exceptions will be in the sole judgement of the Owner.

## **1.7 Evaluation Criteria**

- .1 To be considered for selection vendors must provide a quotation for a system that complies with the minimum criteria for selection listed in Table 1.7.1. However, vendors are encouraged to exercise creativity in optimizing the system to meet the optional criteria listed in table 1.7.2. Systems that meet all the compliance criteria and also maximize the additional evaluation criteria score will be favoured for selection.

**Table 1.7.1: Technical Compliance Criteria**

<b>Criteria</b>	<b>Name</b>	<b>Description</b>
a)	Qualifies for Unsupervised Operation	Sum of fire-side heating surface area of all boilers less than 150 m <sup>2</sup> .
b)	Minimum Design Capacity	Plant must have an output design capacity of at least 3 MW <sub>th</sub> .
c)	Turndown	Plant must be able to modulate between a minimum load of 85 kW up to the design capacity.
d)	Redundancy	Plant must be able to meet 70% of design capacity with the largest boiler out of service.
e)	Canadian Registration	Boilers must have Canadian Registration Numbers.
f)	Low Return Temperature Tolerance	System must be designed such that non-condensing boilers (where applicable) are protected from low return temperatures in the range of 35°C to 50°C.
g)	Supply Temperature	Maximum supply temperature of the boilers shall be 95°C. Minimum supply temperature of the boilers shall be 85°C
h)	Design for Mobility	Plant shall be fully contained within no more than two standard-size shipping containers or one customized container. Enclosure / design shall be suitable for road transportation and meet the road transport restrictions.
i)	Design for Serviceability	Plant layout shall provide minimum manufacturer's service clearance on all equipment as per published supplier recommendations.
j)	Maximum Allowable Working Pressure	At a minimum all components shall have a Maximum Allowable Working Pressure of 160 PSIG



**Table 1.7.2: Additional Technical Evaluation Criteria**

Criteria	Name	Description
k)	Maximized design capacity	Total boiler capacity maximized up to 5MW <sub>th</sub> within the container size and heating surface area constraints.
l)	Maximized design efficiency	Higher efficiency will be favored. Refer to evaluation equation in section 1.9
m)	Compact design	Plant contained within one standard-size shipping container (may be any standard size).

**Table 1.7.3: Contractor & Equipment Evaluation Criteria**

Criteria	Name	Description
n)	Contractor References	Provide three (3) project references of similar scope and nature, completed by the contractor within the last five (5) years.
o)	Boiler References	Provide three (3) project references for each type of boiler included in the submission.
p)	Local Boiler Representative	Having a local representative within 2 hour travel time will be favored

## **1.8 Cost Sensitivity**

- .1 The Owner is sensitive to the cost of the package, however as outlined in the preceding section, cost is not the sole deciding factor. The owner will be inclined to select the quotation that is compliant with the performance specifications herein, conforms to all governing codes and regulations, and is competitively priced.

## **1.9 Evaluation Equation**

- .1 Submissions will be evaluated on technical criteria using equation 1.9.1, below. Submissions that maximize their technical score, while also meeting all other compliance criteria, codes and standards, and supply the required references will be favoured for selection.
- .2 The basis for efficiency evaluation is the nominal efficiency of a non-condensing boiler and the basis for footprint evaluation is the footprint of a 48' high-cube shipping container.

### **Equation 1.9.1**

$$\text{Technical Score} = 7x \frac{\text{Design Capacity (kW)}}{\text{Package Price (\$1000)}} + \frac{\text{Efficiency} - e}{0.84} + \frac{38\text{m}^2}{\text{Footprint of Package (m}^2\text{)}} + \frac{\text{Supply Temperature (}^\circ\text{C)}}{85^\circ\text{C}}$$

\* at 50% load and 50°C return temperature

**1.10 Discrepancies and Omissions**

- .1 If a bidder is in doubt as to the meaning of the specifications or RFQ documents, or finds omissions or discrepancies therein, they shall submit a request for interpretation or correction thereof to the Consultant.

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## **PART 1 GENERAL**

### **1.1 Insurances and Bonds**

- .1 Promptly submit Bond and Insurance Certificates as required to the *Owner's Project Manager*. Progress draws will not be paid before these documents have been submitted. Insurance Certificates shall name the *City of Surrey* as additional insured.
- .2 All submittals required to be submitted within 15 days of award of contract.

### **1.2 Schedule**

- .1 Refer also to Section 00011 Introduction – Schedule.
- .2 A fabrication schedule is required for this project. The Contractor shall prepare the schedule as follows:
  - .1 After award of contract and before commencement of the Work, a first project meeting will be held with the *Project Manager*, Consultant, Contractor, and Subcontractors in attendance. The Contractor shall prepare a preliminary and proposed sequence of fabrication and fabrication schedule, for presentation at this meeting. Timing of service interruptions, phases and sequence of the Work, etc., and any clarifications with respect to scheduling will be brought forward and discussed at this time.
  - .2 Following this meeting the Contractor shall submit his schedule, to include required staging and sequencing of the Work and also detailed scheduling for mechanical, plumbing and electrical work, etc., to the Project Manager for final acceptance. The schedule shall include any instructions resulting from the first project meeting.
  - .3 In order to improve the work schedule or eliminate unforeseen problems, modifications to the schedule may be suggested by the *Project Manager*, Consultant or the Contractor during the contract and such modifications may be implemented by mutual agreement. Schedules must be updated and reissued monthly to reflect the agreed changes.
  - .4 The contractor shall submit monthly project schedule updates, both in hard copy and electronic form. The schedule shall detail task start, duration, and completion dates, and percent complete of each task. It shall highlight critical tasks, task linkages, and order/delivery dates for major equipment components. An up-to-date schedule submitted both in print and electronically, is required with all progress claims.

### **1.3 Progress Reports/Daily Reports**

- .1 The Contractor shall, from the date of commencement of the Work, maintain a careful daily record of the progress of the Work. This record shall be open to inspection by the *Consultant* or the *Owner* at all reasonable times and shall, if requested, be turned over to the *Consultant* at Substantial Performance of the Work. The record shall show all pertinent data such as:
  - .1 Commencement, progress and completion of various portions of the work,
  - .2 Dates of all meetings and their purpose,
  - .3 Dates of visits by government authorities, inspectors, utility companies and the like,
  - .4 Record of work force employed,
  - .5 Materials causing delay,
  - .6 Clarifications or questions, and
  - .7 Safety program records

### **1.4 Shop Drawings, Samples and Product Data**

- .1 All Shop Drawings and Samples are to be submitted to the *Consultant* and the *Owner* for review.
- .2 Unless specifically requested Samples need not be submitted to *the City*. Product data is not normally required to be submitted to *the City*. The exception to this is the Manufacturers Safety Data sheet (MSD) for all toxic or potentially toxic materials.

### **1.5 Inspection and Test Reports**

- .1 Testing Reports shall be submitted to the Contractor with copies to the *Consultant*.

### **1.6 Reviewed Shop Drawings**

- .1 One complete set of reviewed Shop Drawings is to be kept at the work site for reference by *Consultants* and Inspectors

### **1.7 Submittal Format**

- .1 All submission to the Consultant shall be electronic in pdf format.
- .2 All Record drawings shall be submitted in CAD (\*.dwg) and pdf.

### **1.8 Post-Award Submittals**

- .1 Provide submittals for the equipment listed in Table 1.9.1
- .2 Where equipment is not listed in the table, immediately notify the Consultant for addition of the equipment to the list. Provide submittals for the omitted equipment in accordance with the project specifications.

**Table 1.9.1**

<b><u>Equipment</u></b>
System pumps and motor(s)
Boilers drawings and data sheet
Pump(s) VFD
<b><u>PIPING</u></b>
Welders Qualifications
Welding Procedures
Hydrostatic testing procedure
Flushing Plan
Gasket(s)
Strainer(s)
Sample mill certificate
<b><u>HOT WATER VALVES</u></b>
Needle valve(s)
Check valve(s)
Ball valve(s)
Ball valve(s)
Backflow preventer(s)
Pressure relief valve(s)
Slam shut valve(s)
<b><u>HANGERS AND SUPPORTS</u></b>
Spec sheets and dimensional drawings
<b><u>HOT WATER PIPE CONDITIONING</u></b>
Chemical(s)
Insulation / jacketing
<b><u>CONTROLS</u></b>
Differential pressure transmitter(s)
Pressure transmitter(s)
Temperature sensor(s)
Flow meter(s)
Field instrument(s)
Energy meter
<b><u>CONTAINER</u></b>
Ventilation fan(s)

Container dimensional drawings and materials of construction
<b><u>GENERAL</u></b>
Operation and maintenance manuals

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## **PART 1 GENERAL**

### **1.1 General**

- .1 The Consultant will issue Substantial Performance for the Contract or subcontracts within 10 days of a request by the Contractor, provision of supporting scope and financial information (relative to subcontracts) and at such time as the work is substantially complete as defined by the Builders Lien Act.
- .2 This will then enable the 55-day holdback period to commence for the 10% of the Contract Price that must be withheld by the Owner in accordance with the Builders Lien Act.
- .3 A deficiency holdback, in addition to the 10 percent holdback for Builders Liens, may be retained to cover the costs of any incomplete items. The deficiency holdback may be based on twice the value of the uncompleted work as determined by the Contract Administrator.

### **1.2 Final Completion of the Work**

- .1 The Consultant will issue a Final Certificate for Payment upon completion of the entire work, including deficiencies, to the satisfaction of the Owner.

### **1.3 Payment of Holdback Upon Substantial Performance of the Work**

- .1 Payment of the lien holdback (other than deficiency holdback) for the Contract or Subcontracts will be made in accordance with the B.C. Builders Lien Act and after the following are complete:
  - .1 Expiry of the holdback period.
  - .2 Submission by the Contractor to the Owner of a Statutory Declaration that all accounts have been paid by the Contractor and that no liens exist in regard to work under this contract.
  - .3 Submission by the Contractor to the Owner of a statement from Workers' Compensation Board that all accounts are paid in full.

### **1.4 Final Payment Upon Completion of the Work**

- .1 The final payment (including deficiency holdback) will be made after issuance of the Final Certificate for Payment.
- .2 The Contractor has submitted all project close out submittals.

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## **PART 1 GENERAL**

### **1.1 Work Included**

- .1 This section includes all materials, equipment and labour to furnish, install and test the pumping system complete with the pumps, motors, mounting bases, piping, valves and appurtenances, as indicated on the contract drawings and herein specified.
- .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 00011 | Introduction                |
| .2 | Section 15007 | Non-condensing Boilers      |
| .3 | Section 15008 | Condensing Boilers          |
| .4 | Section 15009 | Containerized Boiler Plant  |
| .5 | Section 15098 | Piping                      |
| .6 | Section 15099 | Piping Specification Sheets |
| .7 | Section 15260 | Pipe Hangers and Supports   |
| .8 | Section 15800 | Commissioning               |

### **1.3 Quality Assurance and Reference Standards**

- .1 Pumps shall be designed, fabricated and tested in accordance to Hydraulic Institute (HI) Standards.
- .2 Work shall be carried out only by qualified tradesmen.
- .3 Coupled pumps shall be aligned by a qualified millwright and alignment certified.
- .4 Ensure pumps operate at specified system fluid temperatures without vapour binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25% of midpoint of published maximum efficiency curve.
- .5 Motors shall be high efficiency and inverter only as specified in section 16010.
- .6 Each pump shall be tested in accordance with Hydraulic Institute (HI) standards for Rotodynamic Pumps for Hydraulic Performance Acceptance Tests (2011) for measurement of flow, head, power input to the pump, and Net Positive Suction Head Required. The substitution of a model pump for the test will not be acceptable.
- .7 The pumps shall be tested at the pump manufacturer's testing facility and testing shall be "non-witnessed". The test results shall be summarized in a report and one

electronic pdf copy of the certified results of all tests shall be submitted to and approved by the Engineer prior to shipping the pumping units.

- .8 Pumps shall meet Hydraulic Institute grade "1B".

#### **1.4 Submittals**

- .1 Submit shop drawings including the manufacturer's literature and catalogue information for all pumps and motors prior to ordering any materials.
- .2 Submit list of recommended spare parts with current prices for pumps and equipment.
- .3 Submit with shop drawings certified pump curves showing pump performance characteristics with pump and system operating point plotted for constant speed pumps. For variable speed pumps, provide curves at 25%, 50%, 75% and 100% of maximum speed.
- .4 Show the following points on the pump curves: minimum flow, operating point, best efficiency point, and maximum flow.
- .5 Duty point for all pumps shall not exceed 85% of end curve. Include NPSH curve. Show pump weights, dimensions, clearance for operation and maintenance, motor and pump operating efficiencies and electrical power characteristics.
- .6 Where pumps are operated in conjunction with others such as parallel pumps, show all operating points on the pump curve.
- .7 Motor general arrangement drawing, terminal box for power wiring and terminal box for thermistor connection.

#### **1.5 Delivery, Storage and Handling**

- .1 All components subject to damage from handling or exposure to weather shall be suitable packaged.

## **PART 2 PRODUCTS**

### **2.1 General**

- .1 All products shall be new, undamaged and free from rust and defects.
- .2 All products of a similar nature shall be the product of a single manufacturer.
- .3 Statically and dynamically balance rotating parts.
- .4 Construction shall permit complete servicing without breaking piping or motor connections.

### **2.2 Pumps and Motors**

- .1 Contractor to select pumps to meet the final intended use meeting the specifications here in
- .2 Provide lifting hooks on all equipment.

### 2.3 Horizontal Double Suction Pumps

- .1 Design shall allow removal of impeller/shaft assembly without removing motor or disconnecting piping.
- .2 Pumps shall meet the following specification:

General	
Description	Double suction, base mounted centrifugal pump
Reference Standard	Hydraulic Institute
Connection Style	Flanged to ASME B16.1, class 150
Seal	Mechanical seal, replaceable without removing the motor. Designed for closed system with positive suction pressure. Select for temperature, pressure and service as recommended by the manufacturer.
Tappings	Tapping for vent top of casing.
Coupling	Flexible, spacer or non-spacer type. Include a flange motor sleeve section that can be disassembled and removed without removing pump and motor. Provide coupling guard with removable section for inspection and lubrication.
Bearings	Grease lubricated ball or roller bearings of adequate capacity to carry all axial and radial loads. Provide grease nipples. Rated for AFBMA 9, L50 life of 200,000 hours.
Conditions of Service	
Pumps operating together shall be in parallel	
Pressure rating	Refer to Pump Schedule
Temperature rating	Refer to Pump Schedule
Service	Refer to Pump Schedule
Ambient temperature	Select pump and motor for continuous operation at 40°C
Performance	
Type of Drive	Refer to Pump Schedule
Design Capacity	Refer to Pump Schedule
Design Head	Refer to Pump Schedule
NPSHa at Design	Closed system with min 15 psi static pressure
Design Impeller Speed	1800 - 3600 RPM
Pump curve	<ul style="list-style-type: none"> <li>- Pump curve shall be non-drooping</li> <li>- Duty point shall be between the mid-point and the best efficiency point on the curve</li> <li>- Casing and motor selection to allow 10% increase in head by changing the impeller</li> </ul>

<b>Materials</b>	
Casing	Cast or Ductile iron
Impeller	Cast bronze, enclosed type
Shaft	Carbon steel shafts and stainless steel shaft sleeves. Shafts to be threaded for locking on shaft sleeve. Sleeve shall butt against impeller hub, extend through the seal box and be secured in place with lock nuts threaded on the shaft.
Shaft Sleeve	Stainless steel
Wearing Rings	Bronze, renewable casing and impeller wearing rings
Coating	Factory primed and painted with epoxy or enamel suitable to design temperature
<b>Motor</b>	
Design	<p>Motors shall be of premium efficiency / Inverter duty</p> <p>Size the motor to be non-overloading for the entire pump curve. Operation within service factor (1.15) allowance is prohibited</p> <p>The pumps shall be controlled by a variable frequency drive where indicated</p> <p>575-volt, 3-phase</p> <p>Motor bearings shall be in accordance with Nema M-1 Part 31</p> <p>Provide stainless steel nameplate stating all ratings including bearing data</p> <p>Provide cable entry terminal box and ground lug on motor frame</p> <p>Coat as per pump</p>
Enclosure	Totally Enclosed, fan cooled (TEFC)
Emergency stop	Provide a lockable emergency stop button within 1.0 m of the pump motor (for P-5 and P-6 only)

## 2.4 Horizontal End Suction Pumps

- .1 Design shall allow removal of impeller/shaft assembly without removing motor or disconnecting piping.
- .2 Pumps shall meet the following specification:

General	
Description	End suction centrifugal pump
Reference Standard	Hydraulic Institute (HI)
Connection Style	Flanged to ASME B16.1, class 150
Seal	Mechanical seal designed for closed system with positive suction pressure. Select for temperature, pressure and service as recommended by the manufacturer.
Coupling	Spacer type couplings with rubber sleeve. Design shall be for back pull-out. Provide coupling guard with removable section for inspection and lubrication.
Bearings	Grease lubricated ball or roller bearings of adequate capacity to carry all axial and radial loads. Provide grease nipples. Rated for AFBMA 9, L50 life of 200,000 hours.
Conditions of Service	
Pumps operating together shall be in parallel	
Pressure rating	Refer to Pump Schedule
Temperature rating	Refer to Pump Schedule
Service	Refer to Pump Schedule
Ambient temperature	Select pump and motor for continuous operation at 40°C
Performance	
Type of Drive	Refer to Pump Schedule
Design Capacity	Refer to Pump Schedule
Design Head	Refer to Pump Schedule
NPSHr at Design	Closed system with sufficient static pressure
Design Impeller Speed	1800 - 3600 RPM
Pump curve	<ul style="list-style-type: none"> <li>- Pump curve shall be non-drooping</li> <li>- Duty point shall be between the mid-point and the best efficiency point on the curve</li> </ul>
Materials	
Casing	Cast or Ductile iron
Impeller	Cast bronze

Shaft	Carbon steel shafts and stainless steel shaft sleeves.
Wearing Rings	Bronze, renewable casing and impeller wearing rings
Coating	Factory primed and painted with epoxy or enamel suitable to design temperature
<b>Motor</b>	
Design	<p>Motors shall be of premium efficiency Inverter duty</p> <p>Size the motor to be non-overloading for the entire pump curve. Operation within service factor (1.15) allowance is prohibited</p> <p>575-volt, 3-phase</p> <p>Motor bearings shall be in accordance with Nema M-1 Part 31</p> <p>Provide stainless steel nameplate stating all ratings including bearing data</p> <p>Provide cable entry terminal box and ground lug on motor frame</p> <p>Coat as per pump</p>
Enclosure	Totally Enclosed, fan cooled (TEFC)

## 2.5 Vertical Inline Pumps

- .1 Pumps shall meet the following specification:

<b>General</b>	
Description	Double suction, end suction centrifugal pump
Reference Standard	Hydraulic Institute
Connection Style	Flanged to ASME B16.1, class 250
Seal	Mechanical seal, replaceable without removing the motor. Designed for closed system with positive suction pressure. Select for temperature, pressure and service as recommended by the manufacturer.
Coupling	Rigid, split, spacer type coupling. Allow the removal from pump and motor shafts, leaving enough space between the shafts to replace the mechanical seal components without disturbing the pump or motor.



<b>Conditions of Service</b>	
Pumps operating together shall be in parallel	
Pressure rating	Refer to Pump Schedule
Temperature rating	Refer to Pump Schedule
Service	Refer to Pump Schedule
Ambient temperature	Select pump and motor for continuous operation at 40°C
<b>Performance</b>	
Type of Drive	Refer to Pump Schedule
Design Capacity	Refer to Pump Schedule
Design Head	Refer to Pump Schedule
NPSHr at Design	Closed system with sufficient static pressure
Design Impeller Speed	1800 - 3600 RPM
Pump curve	<ul style="list-style-type: none"> <li>- Pump curve shall be non-drooping</li> <li>- Duty point shall be between the mid-point and the best efficiency point on the curve</li> </ul>
<b>Materials</b>	
Casing	Cast or ductile iron
Impeller	Cast bronze
Shafts	Carbon steel shafts and stainless steel shaft sleeves
Wearing Rings	Bronze, renewable casing and impeller wearing rings
Coating	Factory primed and painted with epoxy or enamel suitable to design temperature
<b>Motor</b>	
Design	<p>Designed for vertical-mounting applications.</p> <p>Motors shall be of premium efficiency / Inverter duty</p> <p>Size the motor to be non-overloading for the entire pump curve. Operation within service factor (1.15) allowance is prohibited</p> <p>The pumps shall be controlled by a variable frequency drive where indicated.</p> <p>575-volt, 3-phase</p> <p>Motor bearings shall be in accordance with Nema M-1 Part 31</p> <p>Lubricate motor bearings with sight level oilers or grease fittings.</p> <p>Provide stainless steel nameplate stating all ratings including bearing data</p> <p>Provide cable entry terminal box and ground lug on</p>

	motor frame
	Coat as per pump
Enclosure	Totally Enclosed, fan cooled (TEFC)

## **2.6 Nameplate**

- .1 Each pumping unit shall have a stainless steel or aluminium nameplate located in an easily visible location on the discharge head (rivet in place). The nameplate shall include at least the following data:
  - (a) manufacturer's name
  - (b) year of manufacture
  - (c) model number
  - (d) serial number
  - (e) rated capacity (litres per minute)
  - (f) rated TDH (metres)
  - (g) speed at rated capacity
  - (h) shut off head
  - (i) bearing numbers
  - (j) weight (pump, column, shaft and discharge head).

## **2.7 Spare Parts**

- .1 The following spare parts shall be provided for each pump:

4 sets	all gaskets for pump
2 sets	mechanical seals
1 set	all bearings

# **PART 3 EXECUTION**

## **3.1 Installation and Acceptance Tests**

- .1 The pumping units shall be installed in accordance with the instructions of the manufacturer.
- .2 Installation shall include furnishing the required oil and grease for initial operation. The grades of oil and grease shall be in accordance with the manufacturer's recommendations.
- .3 Ensure that pumps are installed such that no piping or equipment loads are imposed on the pump body. Provide stanchions or hangers for this purpose. Refer to manufacturer's installation instructions for details.
- .4 Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge lines 100 mm and larger.
- .5 Check and align pumps prior to start up.
- .6 Shave or replace pump impellers to meet actual operating conditions.

- .7 Where remote control panels are used, pump contractor shall allow for wiring from panel to pumps.
- .8 Provide spacer at inlet and outlet on vertical in-line pumps and complete with screen diffuser.
- .9 Provide seismic restraint for pumps.
- .10 Secure control panel for seismic loads.
- .11 VFDs are to be installed where required by the equipment schedules and drawings. Ensure compatibility with pump motor/VFD combination

## **PART 4 PUMP SCHEDULE**

- .1 Contractor shall size and select pumps to provide optimum system operation.
- .2 Contractor shall furnish pumps to meet the following criteria:

	<b>Type A</b>	<b>Type B</b>
Pump ID	P-1, P-2, P-3, P-4	P-5, P-6
No. required	4	2
Pressure Rating	1,104 kPa (160 psi)	1,104 kPa (160 psi)
Temperature Rating	120 °C	120 °C
Service	Treated hot water at 95 °C (203 °F)	Treated hot water at 95 °C (203 °F)
Type of Drive	Constant speed	Variable frequency drive, located inside container
Design Capacity	Sized for corresponding boiler flow rate	70% of peak flow for CBP total capacity for a 35°C
Design Head	Sized for corresponding boiler pressure drop (including piping)	54 PSI (125 ft)
Notes	Pump shall be automated / interlocked with corresponding boiler	Provide an emergency push button within 1 m from the motor

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 Summary**

- .1 This Section includes packaged, factory-fabricated and assembled, gas-fired, non-condensing boilers, trim and accessories for generating hot water.

### **1.2 Scope**

- .1 Provide as part of the containerized boiler package hot water non-condensing boiler(s) as herein specified, condensing boiler(s) as specified in Section 15008 or a combination of the two as required to meet the compliance criteria in specification Section 00011.
- .2 Fabricate and deliver FOB to job site.
- .3 Provide warranty, maintenance and service as per the Front-end.
- .4 Provide additional services as specified: testing, start-up assistance, and commissioning.

### **1.3 Quality Assurance**

- .1 ASME Compliance: Condensing boilers must be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers".
- .2 ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."

### **1.4 Bids**

- .1 To be considered, the boilers offered shall meet the performance requirements of this specification as a minimum. Vendor shall comply with other requirements to the greatest extent possible and shall include with bid a description of deviations from this specification.
- .2 To be considered the boilers shall have a Canadian Registration Number.
- .3 Provide with the bid alternate pricing for an extended three (3) year warranty service contract, parts and labor included.

### **1.5 Vendor Suggested Alternates**

- .1 It is the intent of this specification to provide high quality, low maintenance equipment. The manufacturer is permitted and encouraged to provide alternates that will increase efficiency, lower price, or reduce space required. To be fully responsive, the manufacturer shall bid as specified, then list any proposed alternates with a reason for the proposed change, a technical discussion of the performance of the proposed alternate, along with the cost and schedule implications of the proposed alternate.

- .2 Owner may, or may not, at his sole option, consider vendor suggested alternates in determining the lowest and best quotation.

#### **1.6 Submittals**

- .1 Product Data: Include performance data, operating characteristics, furnished specialties and accessories.
  - (a) Prior to flue vent installation, Contractor calculations and drawings must be submitted to Consultant to thoroughly demonstrate that size and configuration conform to recommended size, length and footprint for each submitted boiler.
- .2 Efficiency Curves: At a minimum, submit efficiency curves for 100%, 75%, 50%, and 25% input firing rates at incoming water temperatures of 38°C, 49°C, 60°C and 71°C. Submit test procedures along with efficiency ratings.
- .3 Pressure Drop Curve: Submit pressure drop curve for flows ranging from 30% to 100% of boiler flow rate.
- .4 Shop Drawings: For boilers, boiler trim and accessories include:
  - (a) Plans, elevations, sections, details and attachments to other work.
  - (b) Wiring Diagrams for power, signal and control wiring.
- .5 Source Quality Control Test Reports: Reports shall be included in submittals.
- .6 Field Quality Control Test Reports: Reports shall be included in submittals.
- .7 Operation and Maintenance Data: Data to be included in boiler emergency, operation and maintenance manuals.
- .8 Warranty: as specified in this Section.
- .9 Other Informational Submittals:
  - (a) ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.
- .10 List of reference installations.

#### **1.7 Warranty**

- .1 Warranty: Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.
  - (a) Warranty Period for Non-Condensing Boilers:
    - a. The pressure vessel/heat exchanger shall carry a 10-year from shipment, prorated, limited warranty against any failure due to condensate corrosion, thermal stress, mechanical defects or workmanship.
    - b. The burner shall carry a 5-year warranty.

- c. Manufacturer labeled control panels are conditionally warranted against failure for (2) two years from shipment.
  - d. All other components are conditionally guaranteed against any failure for 18 months from shipment or 12 months of start-up.
- (b) Clearly state any deviation from standard warranty or cost increase due to extended warranty on the proposal submitted with the bid.

## **PART 2 MATERIALS AND EQUIPMENT**

### **2.1 Manufacturers**

- .1 Basis-of-Design Product: Thermogenics Thermocoil Coil Tube Boiler TGH250. Subject to compliance with requirements, manufacturers offering similar products will be considered.

### **2.2 General**

- .1 Hot water boiler shall be a fire tube or water tube skid mounted type and shall be designed for operating and design conditions as specified herein.
- .2 It is intended that the equipment and its component parts shall be a regular commercial product of the manufacturer and his suppliers. The items furnished shall be new and unused. Where more than one unit of an item is required, then all shall be provided by the same manufacturer. The manufacturer's nameplate indicating model number, serial number and performance data shall be permanently affixed to all equipment furnished under this contract.
- .3 Material shall be as specified herein. Material not specified shall be in accordance with the applicable provisions of the ASME Boiler and Pressure Vessel Code. Components not covered shall be of the best quality material used for the purpose in commercial practice. Material shall be free from all defects and imperfections that may affect the serviceability and appearance of the finished product.

### **2.3 Size, Capacity and Pressure**

- .1 Hot water boiler design pressure shall be 160 psig minimum. Boiler and appurtenances shall be designed to operate with a combined capacity as specified in Sections 00011 and 15009.
- .2 Hot water boiler performance shall be based upon a combustion air temperature of 80 deg F, and natural gas with a higher heating value of 1030 BTU/cu ft and a specific gravity of 0.6.

### **2.4 Combustion Air Blower**

- .1 Provide a factory mounted, motor driven combustion air blower with optional VFD control.

- .2 Blower shall be non-overloading type capable of providing sufficient draft for the boiler and stack.
- .3 Blower Status:
  - a) Provide Green (running) and Red (stopped) Allen-Bradley Bulletin 800 or equivalent pilot lamps to indicate blower running status. Lamps shall be equipped with "push-to-test" feature.
  - b) Provide terminals prewired to a normally open blower motor overload contact for Owner's connection.
  - c) Provide terminals prewired to a normally open blower motor starter engaged contact for Owner's connection.

## **2.5 Burner**

- .1 Provide a forced draft burner package designed to fire natural gas and propane. Gas regulated supply pressure will be between 2 psig and 5 psig.
- .2 Burner shall be a natural gas pilot ignited burner and shall be fully automatic for full modulating firing on natural gas.
- .3 Minimum boiler turndown shall be 10:1
- .4 Burner and flame monitoring system shall comply with all provisions of NFPA standard 8501.
- .5 At maximum continuous rating stack emissions from boiler shall not exceed the following:

Pollutant	Emissions	Fuel
Particulate	0.0075 lb/mm BTU Heat Input	Natural Gas
CO	0.080 lb/mm BTU Heat Input	Natural Gas
NOx	0.080 lb/mm BTU Heat Input	Natural Gas
- .6 Burner management and flame safeguard system shall safely purge, light-off and shutdown the burner and monitor the pilot flame, main flame and appropriate limit devices during operating conditions. The system shall have a built-in safety system that provides a purge period commencing with the damper proved open and a pilot trial commencing with a fire light-off damper position.
- .7 Burner package shall include but not be limited to the following:
  - (a) Burner management and flame safeguard system shall safely purge, light-off and shutdown the burner and monitor the pilot flame, main flame and appropriate limit devices during operating conditions.
  - (b) The system shall have a built-in safety system that provides a purge period commencing with the damper proved open and a pilot trial commencing with a fire light-off damper position.



## **2.6 Burner Management and Flame Safeguard System**

- .1 The burner management and flame safeguard system shall comply with the latest regulations of IRI and NFPA 8501 and shall be fully tested and operationally sound prior to shipment.
- .2 The burner management and flame safeguard system shall be a Siemens LMV52 series, or approved equal, with the expanded annunciator system. The system shall include automatic burner sequencing, flame supervision, status indication, first-out annunciation, and self diagnosis. Burner management system shall also include a Modbus Networking Module.
- .3 The main flame scanner shall be an IR, auto-checking scanner. Provide a flame signal strength meter to measure the input signal to the scanner.
- .4 Combustion safeguard system shall perform the following functions at a minimum:
  - (a) Purge the Boiler volume a minimum of four times and a minimum of seven seconds with controls proved at high fire.
  - (b) Prove combustion air flow exists during purge cycle.
  - (c) Prove the return of all controls to the minimum fire position for light-off.
  - (d) Provide discrete "dry contact" outputs to Owner's control system for:
    1. Purge Position
    2. Minimum fire
    3. Release to modulate
  - (e) Provide discrete "dry contact" inputs from Owner's control system to:
    1. Initiate boiler start sequence
    2. Initiate boiler shutdown
  - (f) Shut down the pilot flame after a set time trial for main flame ignition has been proved.
  - (g) Shut off the fuel supply to both the pilot and main flames in the event of any of the following conditions occur:
    - 1) Loss/lack of flame after end of timed trial for ignition
    - 2) Low gas pressure
    - 3) High gas pressure
    - 4) Low combustion air flow
    - 5) Loss of flame scanner or relay
    - 6) Low water flow (Differential Pressure Control)
    - 7) High stack temperature
    - 8) High coil temperature (coil tube boiler only)

- (h) Provide discrete "dry contact" outputs for all of the above shutdown conditions pre-wired to control panel terminal blocks for Owner's connection.
- .5 Provide a low flow cutoff differential pressure switch, wired into the burner control circuit, to prevent burner operation if flow rate falls below the designated safe level. It shall allow for automatic restart when the flow returns to normal.
- .6 For coil tube boilers provide a high coil temperature cutoff switch for each coil, wired into the burner control circuit, to prevent burner operation if coil temperature rises above the designated safe level. It shall require manual resetting of burner flame safeguard control before allowing restart and further automatic operation.

## **2.7 Control Panel**

- .1 Provide a factory mounted and wired NEMA 12 control panel with all wiring for external connections brought to identified terminal blocks. Panel shall contain motor starters with overload protection, flame safeguard controller, control switches, control voltage transformer, control circuit fuse, terminal strips for all entering and leaving wiring, indicating lights and accessories.
- .2 Control panel shall be furnished with a single point auxiliary contact for remote alarm indication of combustion safety failure.
- .3 Control panel shall be furnished complete with the following indicators at a minimum:
  - a) Control power on light
  - a) Burner on light
  - b) Flame out light and audible alarm
  - c) High coil temperature light and audible alarm (coil tube boiler only)
  - d) Low combustion air pressure light and audible alarm
  - e) High water level light
  - f) Pilot lights for forced draft blower status.
  - g) Form A dry contact for connection of each annunciated alarm to an external monitoring system.
  - h) Terminals for the connection of an external dry contact closure to initiate start and stop sequences to the burner management system.

## **2.8 Boiler Trim**

- 1. Safety valves and water relief valves shall be provided in accordance with ASME Code. Valves shall be Consolidated, Crosby, Kunkle or approved equal. Valves shall be Class 150 and shall have flanged inlet and outlet connections.

## **2.9 Piping, Fuel Trains and Controls**

- .1 The main gas and pilot gas piping trains shall be factory assembled, wired, tested and skid mounted. Piping trains shall include all pressure regulating valves, safety shut off and vent valves, safety shut off and alarm switches, manual shut off valves,

and solenoid valves required for a complete gas and pilot train. Piping shall be arranged in a neat and accessible manner. Gas pressure to piping train will be between 2 psig and 5 psig.

## **2.10 Electrical Requirements**

- .1 All electrical components of the boiler including transformers, switches, motor starters, etc., shall be factory mounted and wired inside the control panel or otherwise convenient junction boxes mounted on the boiler skid. Refer to Division 16 for package electrical requirements.

## **PART 3 EXECUTION**

### **3.1 Field Quality Control**

- .1 Perform tests and inspections and prepare test reports.
  - (a) Manufacturer's Field Service: The Supplier shall provide a factory-authorized service representative to inspect components, assemblies and equipment installations, including connections, and to assist in testing.
- .2 Tests and Inspections: The Contractor will perform the following tests and inspections and the manufacturer's service representative shall assist:
  - (a) Perform installation and start-up checks according to manufacturer's written instructions.
  - (b) Perform hydrostatic test. Repair leaks and retest until no leaks exist.
  - (c) Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
  - (d) Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
    - a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
    - b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- .3 Remove and replace malfunctioning units and retest as specified above.
- .4 Thermal Load Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance adjusting system to suit actual load conditions. Provide up to two visits to Project during off-peak load periods to make adjustments.

.5 Performance Tests:

- (a) The boiler manufacturer is expected to provide partial load thermal efficiency curves. These thermal efficiency curves must include at least three separate curves at various firing rates. If these curves are not available, it is the responsibility of the boiler manufacturer to complete the following performance tests:
  - a. A factory-authorized service representative shall inspect component assemblies and equipment installations, including connections, and conduct performance testing.
  - b. Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.
- (b) Perform field performance tests to determine capacity and efficiency of boilers.
  - a. Test for full capacity.
  - b. Test for boiler efficiency at low fire, 20, 40, 60, 80, and 100% of full capacity. Repeat tests until results comply with requirements indicated.
- (c) Provide analysis equipment required to determine performance.
- (d) Notify Consultant in advance of test dates.
- (e) Document test results in a report and submit to Consultant.

## **PART 4 NON-CONDENSING BOILER TECHNICAL BID TABULATION**

The attached bid tab will be used as part of the technical evaluation in addition to the mechanical room layout and system P&ID drawings required in Section 00011. In order for a bid to be considered complete the vendor must fill out and attach the following bid tab for each option proposed by the vendor. If a specific piece of equipment is not part of the proposal mark N/A on the form.

		Units or Possible Answer
Manufacturer		
Model		
Type		Firetube/Watertube
Net output each boiler		BTUH
Proposed quantity of non-condensing boilers		
Boiler dimensions		LxWxH
Turndown ratio per boiler		xx : x
Heating surface per boiler		sq m
Tube Construction		Stainless, copper
HX construction		Stainless, aluminum
HX warranty		years
Burner warranty		years
Other warranties		-----
• State part(s)		years
Adjustable temperature control (min/max)		deg C /deg C
Water flow (min/max)		gpm/gpm
Pressure rating		psig@degC
Electrical requirements		V/PH/HZ/A/FLA
Nearest manufacturer's representative		
• Name		
• Address.		City, Province/State
• Phone number		
Minimum boiler efficiencies (complete table below for listed entering water temperatures and firing rates at a 11 deg C delta T)		
EWT	100% Fire	50% Fire
71 °C/160 °F		
60 °C/140 °F		
49 °C/120 °F		
38 °C/100 °F		
27 °C/80 °F		
Bidder to list any exceptions to the specifications in the space below:		

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 Summary**

- .1 This Section includes packaged, factory-fabricated and assembled, gas-fired, fire-tube condensing boilers, trim and accessories for generating hot water.

### **1.2 Scope**

- .1 Provide as part of the containerized boiler package hot water condensing boiler(s) as herein specified, non-condensing boiler(s) as specified in Section 15007 or a combination of the two as required to meet the compliance criteria in specification Section 00011.
- .2 Fabricate and deliver FOB to job site.
- .3 Provide warranty, maintenance and service as per the Front-end
- .4 Provide additional services as specified: testing, start-up assistance, and commissioning.

### **1.3 Quality Assurance**

- .1 ASME Compliance: Condensing boilers must be constructed in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers".
- .2 ASHRAE/IESNA 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."
- .3 DOE compliance: Minimum efficiency shall comply with 10 CF 430, Subpart B, Appendix N, "Uniform Test Method for Measuring the Energy Consumption of Furnaces and Boilers".

### **1.4 Bids**

- .1 To be considered, the boilers offered shall meet the performance requirements of this specification as a minimum. Vendor shall comply with other requirements to the greatest extent possible and shall include with bid a description of deviations from this specification.
- .2 To be considered the boilers shall have a Canadian Registration Number.
- .3 Provide with the bid alternate pricing for an extended three year warranty service contract, parts and labor included.

### **1.5 Vendor Suggested Alternates**

- .1 It is the intent of this specification to provide high quality, low maintenance equipment. The manufacturer is permitted and encouraged to provide alternates that will increase efficiency, lower price, or reduce space required. To be fully responsive, the manufacturer shall bid as specified, then list any proposed alternates with a reason for the proposed change, a technical discussion of the

performance of the proposed alternate, along with the cost and schedule implications of the proposed alternate.

- .2 Owner may, or may not, at his sole option, consider vendor suggested alternates in determining the lowest and best quotation.

#### **1.6 Submittals**

- .1 Product Data: Include performance data, operating characteristics, furnished specialties and accessories.
  - (a) Prior to flue vent installation, Contractor calculations and drawings must be submitted to Consultant to thoroughly demonstrate that size and configuration conform to recommended size, length and footprint for each submitted boiler.
- .2 Efficiency Curves: At a minimum, submit efficiency curves for 100%, 75%, 50% and 25% input firing rates at incoming water temperatures of 38 °C, 49 °C, 60 °C and 71 °C. Submit test procedures along with efficiency ratings.
- .3 Pressure Drop Curve: Submit pressure drop curve for flows ranging from 30% to 100% of boiler flow rate.
- .4 Shop Drawings: For boilers, boiler trim and accessories include:
  - (a) Plans, elevations, sections, details and attachments to other work.
  - (b) Wiring Diagrams for power, signal and control wiring.
- .5 Source Quality Control Test Reports: Reports shall be included in submittals.
- .6 Field Quality Control Test Reports: Reports shall be included in submittals.
- .7 Operation and Maintenance Data: Data to be included in boiler emergency, operation and maintenance manuals.
- .8 Warranty: as specified in this Section.
- .9 Other Informational Submittals:
  - (a) ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by authorities having jurisdiction, and document hydrostatic testing of piping external to boiler.
- .10 List of reference installations.

#### **1.7 Warranty**

- .1 Warranty: Boilers shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.
  - (a) Warranty Period for Condensing Boilers:
    - a. The pressure vessel/heat exchanger shall carry a 10-year from shipment, prorated, limited warranty against any failure due to condensate corrosion, thermal stress, mechanical defects or workmanship.



- b. Manufacturer labeled control panels are conditionally warranted against failure for (2) two years from shipment.
  - c. All other components are conditionally guaranteed against any failure for 18 months from shipment or 12 months of start-up.
- (b) Clearly state any deviation from standard warranty or cost increase due to extended warranty on the proposal submitted with the bid.

## **PART 2 PRODUCTS**

### **2.1 Manufacturers**

- .1 Basis-of-Design Product: AERCO International, BMK 3000. Subject to compliance with requirements, manufacturers offering similar products will be considered.

### **2.2 Construction**

- .1 Description: Boiler shall be natural gas fired, fully condensing type. Power burner shall have full modulation. Minimum firing rate shall be stated on the bid form. Boiler efficiency shall increase with decreasing load (output), while maintaining setpoint. Boiler shall be factory-fabricated, factory-assembled and factory-tested, condensing boiler with heat exchanger sealed pressure-tight, built on a steel base, including insulated jacket, flue-gas vent, combustion-air intake connections, water supply, return and condensate drain connections, and controls.
- .2 The heat exchanger shall be ASME stamped for a working pressure not less than 160 psig.
- .3 Pressure Vessel. The boiler water connections shall be 150-pound, ANSI rated. Inspection openings in the pressure vessel shall be in accordance with ASME Section IV pressure vessel code.
- .4 Burner. The burner shall produce less than 20 ppm of NOx corrected to 3% excess oxygen. There shall be no moving parts within the burner itself. A modulating air/fuel valve shall meter the air and fuel input.
- .5 Exhaust Manifold: The exhaust manifold shall be of corrosion resistant cast aluminum or 316 stainless steel. The exhaust manifold shall have a collecting reservoir and a gravity drain for the elimination of condensation.
- .6 Blower: The boiler shall include a variable-speed centrifugal fan to operate during the burner firing sequence and pre-purge the combustion chamber.
- .7 Motor Sizes: Size motors large enough so driven load will not require a motor to operate in the service factor range above 1.0. Motors shall be premium efficiency.
- .8 Ignition: Ignition shall be via spark ignition with 100 per cent main-valve shutoff and electronic flame supervision.

### **2.3 Controls**

- .1 The boiler control system shall be segregated into three components: Control Panel, Power Box and Input/Output Connection Box. The entire system shall be Underwriters Laboratories recognized.
- .2 The control panel shall consist of individual circuit boards using state-of-the-art surface-mount technology in a single enclosure. These circuit boards shall include:
  - (a) A display board incorporating LED display to indicate temperature and a vacuum fluorescent display module for all message enunciation
  - (b) A CPU board housing all control functions
  - (c) An electric low-water cutoff board with test and manual reset functions
  - (d) A power supply board
  - (e) An ignition /stepper board incorporating flame safeguard control
  - (f) A connector board
  - (g) Each board shall be individually field replaceable.
- .3 The combustion safeguard/flame monitoring system shall use spark ignition and a rectification-type flame sensor.
- .4 The control panel hardware shall support both RS-232 and RS-485 remote communications.
- .5 The controls shall annunciate boiler and sensor status and include extensive self-diagnostic capabilities that incorporate status messages and separate fault messages.
- .6 The control panel shall incorporate three self-governing features designed to enhance operation in modes where it receives an external control signal by eliminating nuisance faults due to over-temperature, improper external signal or loss of external signal. These features include:
  - (a) Setpoint high limit: Allows for a selectable maximum boiler outlet temperature and acts as temperature limiting governor. Setpoint limit is based on a PID function that automatically limits firing rate to maintain outlet temperature within a 0 to 10 degree selectable band from the desired maximum boiler outlet temperature.
  - (b) Setpoint Low Limit: Allows for a selectable minimum operating temperature.
  - (c) Failsafe Mode: Failsafe mode allows the boiler to switch its mode to operate from an internal setpoint if its external control signal is lost, rather than shut off. This is a selectable mode, enabling the control can to shut off the unit upon loss of external signal, if so desired.
- .7 The boiler control system shall incorporate the following additional features for enhanced external system interface, via BACnet MS/TP:
  - (a) System start temperature feature
  - (b) Pump delay timer

- (c) Auxiliary start delay timer
  - (d) Auxiliary temperature sensor
  - (e) Analog output feature to enable simple monitoring of temperature setpoint, outlet temperature or fire rate
  - (f) Remote interlock circuit
  - (g) Delayed interlock circuit
  - (h) Fault relay for remote fault alarm.
- .8 Each boiler shall include an electric, single-seated combination safety shutoff valve/regulator with proof of closure switch in its gas train. Each boiler shall incorporate dual over-temperature protection with manual reset, in accordance with ASME Section IV and CSD-1.
- .9 The Boiler Manufacturer shall supply as part of the boiler package a completely integrated control system to control all operation and energy input of the multiple boiler heating plant. The control system shall be comprised of a microprocessor based control utilizing the MODBUS protocol to communicate with the Boilers via the RS-485 port. One controller shall have the ability to operate up to 7 boilers.
- .10 The controller shall have the ability to vary the firing rate and energy input of each individual boiler throughout its full modulating range to maximize the condensing capability and thermal efficiency output of the entire heating plant. The controller shall control the boiler outlet header temperature within  $\pm 1$  °C. The controller shall be a PID type controller and uses Ramp Up/Ramp Down control algorithm for accurate temperature control with excellent variable load response. The controller shall provide contact closure for auxiliary equipment such as system pumps and combustion air inlet dampers based upon outdoor air temperature.
- .11 The controller shall have the following anti-cycling features:
- (a) Manual designation of lead boiler and last boiler.
  - (b) Lead boiler rotation at user-specified time interval.
  - (c) Delay the firing/shutting down of boilers when header temperature within a predefined deadband.
  - (d) When set on Internal Setpoint Mode, temperature control setpoint shall be fully field adjustable from the boiler's minimum to maximum operating temperature. When set on Indoor/Outdoor Reset Mode, the controller will operate on an adjustable inverse ratio in response to outdoor temperature to control the main header temperature. Reset ratio shall be fully field adjustable from 0.3 to 3.0 in operation. When set on 4ma to 20ma Temperature Control Mode, the controller will operate the plant to vary header temperature setpoint linearly as an externally applied 4-20 ma signal is supplied.
  - (e) All of the above points shall be available to an external control system via BACnet MS/TP.
- .12 When set on MODBUS Temperature Control Mode, the controller will operate the plant to vary header temperature setpoint as an external communication utilizing the

MODBUS protocol is supplied via the RS-232 port. The controller shall have a vacuum fluorescent display for monitoring of all sensors and interlocks. Non-volatile memory backup of all control parameters shall be internally provided as standard. The controller will automatically balance the sequence of operating time on each boiler by a first-on first-off mode and provide for setback and remote alarm contacts. Connection between central boiler control system and individual boilers shall be twisted pair low voltage wiring, with the boilers 'daisy- chained' for ease of installation.

## **2.4 Electrical Power**

- .1 Controllers, Electrical Devices and Wiring: Electrical devices and connections are specified in Division 16 sections.
- .2 Single-Point Field Power Connection: Factory-installed and factory-wired switches, motor controllers, transformers and other electrical devices shall provide a single-point field power connection to the boiler.
- .3 Electrical Characteristics:
  - (a) Voltage: 600 V
  - (b) Phase: 3 Ph
  - (c) Frequency: 60 Hz
  - (d) Full-Load Current 9.0 Amps.

## **2.5 Venting**

- .1 The exhaust vent must be UL Listed for use with Category III and IV appliances and compatible with operating temperatures up to 248 °C, positive pressure, condensing flue gas service. UL-listed vents of Al 29-4C stainless steel must be used with boilers.
- .2 The minimum exhaust vent duct size for each boiler shall comply with CSA B149.1-10 requirements.
- .3 The minimum sealed combustion air duct size for each boiler shall comply with CSA B149.1-10 requirements.
- .4 Follow guidelines specified in manufacturer's venting guide.

## **2.6 Source Quality Control**

- .1 Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions and carbon monoxide in flue gas, and to achieve combustion efficiency. Perform hydrostatic testing.
- .2 Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.
- .3 If boilers are not factory assembled and fire-tested, the local vendor is responsible for all field assembly and testing.

- .4 Allow Owner access to source quality-control testing of boilers. Notify Consultant fourteen days in advance of testing.

## **PART 3 EXECUTION**

### **3.1 Field Quality Control**

- .1 Perform tests and inspections and prepare test reports.
  - (a) Manufacturer's Field Service: The Supplier shall provide a factory-authorized service representative shall inspect components, assemblies and equipment installations, including connections, and to assist in testing.
- .2 Tests and Inspections: The Contractor will perform the following tests and inspections and the manufacturer's service representative shall assist:
  - (a) Perform installation and start-up checks according to manufacturer's written instructions.
  - (b) Perform hydrostatic test. Repair leaks and retest until no leaks exist.
  - (c) Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
  - (d) Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
    - a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level and water temperature.
    - b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- .3 Remove and replace malfunctioning units and retest as specified above.
- .4 Thermal Load Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance adjusting system to suit actual load conditions. Provide up to two visits to Project during off-peak load periods to make adjustments.
- .5 Performance Tests:
  - (a) The boiler manufacturer is expected to provide partial load thermal efficiency curves. These thermal efficiency curves must include at least three separate curves at various firing rates. If these curves are not available, it is the responsibility of the boiler manufacturer to complete the following performance tests:
    - a. A factory-authorized service representative shall inspect component assemblies and equipment installations, including connections, and conduct performance testing.
    - b. Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.

- (b) Perform field performance tests to determine capacity and efficiency of boilers.
  - a. Test for full capacity.
  - b. Test for boiler efficiency at low fire, 20, 40, 60, 80, and 100% of full capacity. Repeat tests until results comply with requirements indicated.
- (c) Provide analysis equipment required to determine performance.
- (d) Notify Consultant in advance of test dates.
- (e) Document test results in a report and submit to Consultant.

## **PART 4 CONDENSING BOILER TECHNICAL BID TABULATION**

The attached bid tab will be used as part of the technical evaluation in addition to the mechanical room layout and system P&ID drawings required in Section 00011. In order for a bid to be considered complete the vendor must fill out and attach the following bid tab for each option proposed by the vendor. If a specific piece of equipment is not part of the proposal mark N/A on the form.

		Units or Possible Answer
Manufacturer		
Model		
Type		Firetube/Watertube
Net output per boiler		BTUH
Proposed quantity of condensing boilers		
Boiler dimensions		LxWxH
Turndown ratio per boiler		xx : x
Heating surface per boiler		sq m
Tube Construction		Stainless, copper
HX construction		Stainless, aluminum
HX warranty		years
Other warranties		-----
• State part(s)		years
Adjustable temperature control (min/max)		deg C /deg C
Water flow (min/max)		gpm/gpm
Pressure rating		psig@degC
Electrical requirements		V/PH/HZ/A/FLA
Nearest manufacturer's representative		
• Name		
• Address.		City, Province/State

• Phone number			
Minimum boiler efficiencies (complete table below for listed entering water temperatures and firing rates at a 11 deg C delta T)			
<b>EWT</b>	<b>100% Fire</b>	<b>40% Fire</b>	<b>5% Fire</b>
71°C / 160°F			
60°C / 140°F			
49°C / 120°F			
38°C / 100°F			
27°C / 80°F			
Bidder to list any exceptions to the specifications in the space below:			

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 Work Included**

- .1 Design, fabricate, coat, supply and erect on site a prefabricated, steel self-framed building or container to enclose the containerized boiler package (CBP) and as specified herein.
- .2 Enclosure may consist of one to two high-cube (any length) or customized “sea can” shipping containers. The Contractor is not restricted to using a shipping container, however the enclosure must be structurally designed such that the entire plant may be easily transported.
- .3 Scope of supply includes but is not limited to:
  - Framing system,
  - Roof and walls,
  - Insulation,
  - Finishes,
  - Doors and openings, and
  - Building penetrations.
- .4 Building shall be installed on a concrete foundation provided by others. Mounting of the CBP on the concrete foundation is the responsibility of the concrete foundation contractor.
- .5 Delivery and off-loading of the CBP onto the concrete pad is the responsibility of the Contractor.
- .6 Commissioning and start-up of the CBP is the responsibility of the Contractor.

### **1.2 Related Work**

- |    |                            |               |
|----|----------------------------|---------------|
| .1 | Pumps – Hot Water          | Section 15300 |
| .2 | Containerized Boiler Plant | Section 15009 |
| .3 | Piping                     | Section 15098 |

### **1.3 System Description**

- .1 Clear span rigid framed structure with metal-clad walls and roof.
- .2 Design shall conform to BC Building Code 2012 Division B, Part 4. Enclosure is categorized as a High Importance Building as per Table 4.1.2.1.
- .3 Design components and members to withstand dead load, live loads, wind, snow and seismic loads. Load combinations shall be calculated in accordance with the BC Building Code. The building enclosure manufacturer shall be responsible for determining all design loads. Enclosure shall be structurally sound to support the load within and, if necessary, additional steel work shall be installed to enhance structural strength.

- .4 Make provision for accommodation of mechanical and electrical equipment required for the intended function of the containerized plant. Design structure to accommodate equipment and piping. Provide suitable access panels for boiler access.
- .5 Adequate space shall be allowed between boilers, pumps and equipment for safe and easy access by personnel.
- .6 Design building enclosure to provide for thermal movement of component materials caused by ambient temperature range of 65°C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .7 No water penetration to interior environment permitted at wall and roof assemblies. Enclosure shall be weather proof and vandal proof.
- .8 Provide doors for personnel access.
- .9 Provide suitable access for boiler removal.
- .10 CBP design shall allow of lifting the entire unit with a lifting hook.
- .11 Provide gas leak detection devices.

#### **1.4 Reference Standards and Quality Assurance**

- .1 Building shall be designed in accordance with the Building Code of British Columbia 2012.
- .2 Design and fabrication shall be in accordance with the following standards:

CSA CAN3	- S16.1 - Steel Structures for Buildings (Limit States Design)
CSA S136	- Design of Light Gauge Steel Structural Members
CSA W47	- Welding Qualification Code
CSA W59	- General Specifications for Welding of Steel Structures
CSA G40.20-M	- General Requirements for Rolled or Welded Structural Quality Steel
CSA G40.21-M	- Structural Quality Steel
CSA G164	- Galvanizing of Irregularly Shaped Articles
CSA S157	- Aluminum Fabrication and Assembly
- .3 Welding shall be performed only by qualified operators.
- .4 Building supplier shall be certified by C.S.S.B.I.

#### **1.5 Submittals**

- .1 Clearly indicate details of at least the following:
  - Design criteria,
  - All dimensions,
  - Structural members and connection details,
  - Cambers and loadings,
  - Column base details and anchor bolt size and layout requirements,
  - Roof and wall cladding type and gauge,
  - Insulation type and R value,
  - Framed openings and doors,
  - Schedule of materials and finishes,

- Accessories,
  - Fasteners, welds, sealants, seams and flashing, and
  - Foundation reactions.
- .2 Shop drawings shall be sealed by a Professional Engineer registered in the Province of British Columbia.
  - .3 Submit manufacturer's catalogue information and specifications for standard proprietary items.
  - .4 Provide C.S.S.B.I. Certificate of Design.
  - .5 Submit colour chart for finishes.
  - .6 Name of fabricator and erector, evidence of plant certification, qualifications of welders and name of the fabricator's Professional Engineer.
  - .7 Mill certificates giving the chemical and physical properties of materials to be used in the work.
  - .8 Vendor shall provide recommendation for all anchor bolts and loads at each foundations anchor point.

#### **1.6 Delivery, Storage and Handling**

- .1 Use methods approved by the manufacturer.
- .2 Protect equipment and materials from all damage.
- .3 Store materials on pallets, and cover with tarpaulins.

#### **1.7 Site Conditions**

- .1 Erect building on a concrete slab foundation (by others).
- .2 Climatic conditions for design shall be as given in the Building Code of British Columbia.
- .3 Seismic design will be to the Building Code of British Columbia.

#### **1.8 Scheduling of the Work**

- .1 Cooperate with all other trades performing work on or in the enclosure, including mechanical, electrical and HVAC.

#### **1.9 Alternatives**

- .1 Alternative materials and finishes may be accepted at the sole discretion of the Owner. Alternatives will be evaluated for acceptance either prior to 10 days before quotation closing (in which case acceptance will be indicated in an addendum), or negotiated after contract award. In the absence of a quotation-period addendum, the building shall be quoted in accordance with these specifications.

#### **1.10 Warranty**

- .1 The building enclosure manufacturer shall furnish a written one-year guarantee covering material and workmanship, colour finish and the application of the roof and

walls against any water leakage. Such guaranties shall cover the full cost of materials and labour to replace or repair defective materials. Contractor to submit an optional price for an additional one-year warranty period.

## **PART 2 PRODUCTS**

### **2.1 Anchor Bolts**

- .1 Anchor bolts shall be:
  - .1 Hot dip galvanized; or
  - .2 Stainless steel, alloy 304.
- .2 Plated bolts are not acceptable.
- .3 Size, embedment and layout shall be as specified by the Building Supplier.
- .4 Select anchor bolts for a design life of 10 years.

### **2.2 Structural Steel**

- .1 General
  - .1 All structural mill sections or welded-up plate sections shall be designed in accordance with CSA S16.1 and the BCBC.
- .2 Primary Framing
  - .1 Frames shall consist of welded-up plate section columns and roof beams complete with necessary splice plates for bolted field assembly.
    - All base plates, cap plates, compression splice plates and stiffener plates shall be factory welded into place and have the connection holes shop fabricated.
    - Columns and roof beams shall be fabricated complete with holes in webs and flanges for the attachment of secondary structural members and bracing except for field work as noted on manufacturer's erection drawings.
  - .2 All bolts for field assembly of frame members shall be high strength bolts as indicated on erection drawings.
  - .3 The endwall structural members shall be cold-formed channel members as required by design criteria.
  - .4 Endwall frames shall consist of endwall corner posts, endwall roof beams and endwall posts as required by design criteria.
    - All splice plates and base clips shall be shop fabricated complete with bolt connection holes. All base plates, cap plates, compression splice plates and stiffener plates shall be factory welded into place and have the connection holes shop fabricated.
    - Beams and posts shall be shop fabricated complete with holes for the attachment of secondary structural members except for field work as noted on manufacturer's erection drawings.

.5 Intermediate frames shall be substituted for end-wall roof beams when specified.

- Necessary endwall posts and holes for connection to the intermediate frame used in the endwall shall be shop fabricated.

.3 Secondary Structural Members

.1 Purlins and Girts:

- Purlins and girts shall be "Z" shaped, precision roll formed.
- Outer flange of all girts shall contain factory-punched holes for panel connections.
- Outer flange of purlins shall contain factory-punched holes for panel connections.

.2 Eave Struts:

- Eave Struts shall be factory prepunched "C" sections.

.3 Bracing:

- Bracing shall be located as required.
- Diagonal bracing shall be hot-rolled rod of size required, and attached to columns and roof beams with suitably designed connections.
- Optional fixed base wind posts or pinned base portal frames may be substituted for wall rod bracing on buildings as required.
- Flange braces, purlin braces, etc., when required, shall be cold-formed and installed to suit.

**2.3 Roof and Wall Cladding**

.1 Provide roof and wall assemblies consisting of exterior cladding panels, vapour barrier and interior liner panel.

**2.4 Doors**

.1 Provide steel doors to facilitate operation and maintenance of the equipment inside, and in accordance with the following:

- .1 Doors and frames painted to match enclosure,
- .2 Lock sets and hardware,
- .3 Check chains, weather stripping and thresholds,
- .4 Door closers, and
- .5 Insulated with minimum R-Value of 5.

**2.5 Accessories**

.1 Provide flashings, curbs, metal closures, trims and other miscellaneous items matching adjacent surfaces for quality of finish. Material thickness shall be from manufacturer's standard for the use intended.

**2.6 Combustion Air**

.1 Provide combustion air supply to the boiler in accordance with CSA B149.1 code requirements for free area of air intakes.

## **2.7 Ventilation Equipment**

- .1 Provide framed openings for ventilation equipment as required keeping the temperature inside the building enclosure at 40°C or below when one boiler is in operation during summer conditions.
- .2 Provide minimum ventilation to boiler space as required by CSA B149.1 Natural Gas Installation code.

## **2.8 Backup Heating Equipment**

- .1 Provide electrical space heater to maintain plant temperature at 18°C at Greater Vancouver design temperatures.

## **2.9 Lighting**

Provide a combination of overhead fluorescent type lighting and lower level white task lighting to:

- .1 Provide lighting illumination levels to ensure safe working conditions, safe passage and the identification of hazards or obstructions.
- .2 Provide illumination levels adequate for the operation and maintenance of all equipment within the enclosure.
- .3 General lighting level of 500 Lux.

## **2.10 Fire Detection & Protection**

- .1 Provide fire detection within the enclosure.
- .2 Fire detection shall trigger both a local alarm and a network alarm.
- .3 Provide two (2) portable fire extinguishers with the enclosure.
- .4 Provide gas detection connected to a visual and audible alarm system within the enclosure.

## **2.11 Sanitary Drain**

- .1 Provide a sanitary sewer connection to dispose of water discharged from boiler relief valves and package drains. Relief and package drains shall be piped to a common collection basin where it will be tempered before discharging to the sanitary service.

# **PART 3 EXECUTION**

## **3.1 General**

- .1 Erect all prefabricated metal building components in strict conformance with manufacturer's printed specifications.
- .2 Secure enclosure assemblies to material fabricator's instructions, ensuring a completed installation free from noise, rattles, wind whistles, or noise due to thermal movement.

- .3 Install all equipment, doors, door frames, and hardware.
- .4 The enclosure shall be designed for disassembly and transportation using semi tractor-trailers for re-use at other locations.
- .5 Maintain manufacturers' recommended clearances for boilers and all other equipment.

### **3.2 Flashing, Closures and Trim**

- .1 Flashing and/or trim shall be furnished at the corners and eaves, at framed openings, and wherever necessary to provide weather-tightness and a finished appearance.

### **3.3 Accessories and Equipment**

- .1 Ensure all penetrations through building enclosure are sealed air and weather tight and that enclosure integrity is maintained.

### **3.4 Painting**

- .1 Shop Coating of Structural Steel
  - .1 Coat all structural steel as appropriate for the service life of the structure.
- .2 Field Coating
  - .1 Field coat all metal not supplied with a factory coating.
  - .2 This includes structural steel, galvanized doors and frames and other items as required.
  - .3 Touch-up coatings damaged during construction.

### **3.5 Cleaning**

- .1 Remove excess sealant and dirt by use of recommended solvent and detergent.

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 Work Included**

- .1 This Section covers boilers, pumps, process mechanical piping, fittings, valves, supports and appurtenances, electrical and controls, as shown on the drawings and described in the related Sections, for a skid mounted, fully enclosed containerized boiler plant.
- .2 Design, build, deliver, install and commission a complete containerized boiler plant.
- .3 Read this Section in conjunction with the Drawings and Contract Documents. Refer to Section 00010 – Table of Contents. Where there is a conflict, the Engineer shall be notified to resolve it. The Engineer has the right to apply the more stringent requirement in such cases.

### **1.2 Delivery, Storage and Handling**

- .1 The Contractor is responsible for the following work under this contract:
  - .1 Inspection and acceptance of equipment following delivery.
  - .2 Ensuring equipment conforms to the project specifications.
  - .3 Protect equipment and materials against theft, injury or damage from all causes after delivery, before installation and after installation.
  - .4 All materials and equipment stored on site shall be stored as per manufacturer recommendations.
  - .5 Protect equipment outlets, pipe and duct openings with temporary plugs, caps and canvas.
  - .6 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 the time the item is put into operation or tested.
  - .7 Protect enclosure from all damage.

### **1.3 Related Work**

- |    |                         |                   |
|----|-------------------------|-------------------|
| .1 | General Requirements    | Divisions 00 & 01 |
| .2 | All Mechanical Sections | Division 15       |
| .3 | Electrical              | Division 16       |

## **PART 2 PERFORMANCE**

### **2.1 Boiler Plant Requirements**

- .1 Boilers are to be natural gas fired.
- .2 Boilers shall have the flexibility to switch to propane during emergencies.
- .3 Boiler plant to supply a minimum of 3.00 MW thermal energy in the form of hot water at 95°C at 285 GPM and differential pressure of 500 kPa.
- .4 Boiler supply temperature is not to exceed 99°C
- .5 Boiler relief valves are set at 1,035 kPag (150 psig).
- .6 To be supplied as a single or multiple, containerized unit(s).
  - .1 Containers to be pre-engineered or designed to meet local building code.

### **2.2 Service Connections**

- .1 Hot Water Supply:
  - .1 Supplied at 65 °C to 95°C.
  - .2 Flanged 6" diameter connection (Refer to Section 15099 Type S01 for connection details).
  - .3 Pipe work and insulation from the termination point to skid enclosure shall be the responsibility of the contractor. Termination point location is in the vicinity of the skid enclosure and is shown on the Drawing and at the Site.
- .2 Hot Water Return:
  - .1 Returned at 35 °C to 55°C.
  - .2 6" diameter flanged connection (Refer to Section 15099 Type S01 for connection details).
  - .3 Pipe work and insulation from the termination point to skid enclosure shall be the responsibility of the contractor. Termination point location is in the vicinity of the skid enclosure and is shown on the Drawing and at the Site.
- .3 Domestic Water Supply
  - .1 Municipal potable water service 50 mm diameter.
- .4 Natural Gas
  - .1 Gas supply will be brought to a point external to the skid enclosure by the Owner as shown on the Drawings. At this point a meter is installed by the gas supplier.
  - .2 Connection from the metered utility termination to the skid enclosure will be by others.

- .5 Sanitary Sewer:
  - .1 Provide services for connection to the municipal sewer at the following locations inside the enclosure:
    - Vicinity of the Pumps,
    - Vicinity of the Backflow Prevention Valve, and
    - Vicinity of the Boiler.
  - .2 Owner shall provide a 150 mm diameter PVC sanitary sewer connection, buried and capped, in the vicinity of the skid enclosure for Contractor to connect the services. Service connections shall match existing material and size.
  - .3 Connection of the services to the sewer is the responsibility of the Contractor.
- .6 Electrical:
  - .1 A single point junction box with 600 V, 3-Phase, 60 Hz.
  - .2 Electrical supply will be brought to a point external to the skid enclosure by Others as shown on the Drawings.
- .7 Backup power
  - .1 Manual power transfer switch with a junction box on the exterior of the enclosure suitable for connection to a portable generator.
- .8 Propane
  - .1 Connection on the exterior of the enclosure suitable for connection to an emergency propane supply.

## **PART 3 PRODUCTS**

### **3.1 General**

- .1 All products shall conform to the 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.
- .4 Equipment to be installed in the arrangement specified in the Contract Documents and Drawings.
- .5 Equipment to be installed with adequate clearance for operation and maintenance, respecting manufacturers specified clearances.
- .6 Follow supplier installation recommendations for all equipment
- .7 Registration of the boiler and all piping with the BCSA is the responsibility of the Contractor.
- .8 Contractor is responsible for the boiler plant compliance with BCSA requirements as well as the requirements of other authorities as per the RfQ documents.

### **3.2 Boilers**

- .1 Select multiple boilers to meet the minimum thermal capacity as stated in 2.1 above.
- .2 Multiple boilers shall be selected to provide adequate turndown to meet a minimum output of 85 kW.
- .3 Multiple boilers shall be selected to provide 70% of design capacity with the largest boiler out of service.
- .4 Total fire-side heating surface area of all boilers within the plant shall not exceed the limit for unsupervised plant operation of 150 m<sup>2</sup>. Contractor to submit manufacturers heating surface area specifications.
- .5 Boilers are not required to be condensing.
- .6 If non-condensing boilers are selected, design return piping to allow for mixing supply and return water to raise boiler return temperature to the minimum required by the boiler manufacturer.

### **3.3 Pumps**

- .1 Provide pumps as specified in Section 15300.

### **3.4 Expansion Tank**

- .1 Design requirements:
  - .1 Vertical, bladder type.
  - .2 Replaceable membrane made of heavy duty butyl rubber.
  - .3 All carbon steel construction with internal epoxy coating or hot dip galvanized after fabrication.
  - .4 Rated for 150 psig working pressure and 120°C maximum temperature.
  - .5 Designed and built as per ASME Section VIII, division 1 or as per CE norms for pressure vessel 97/23/EG.
  - .6 Has a CRN.
- .2 Accessories:
  - .1 Pressure indicator with isolation valve on air side.
  - .2 Charging valve.
  - .3 Lifting lugs.
  - .4 Flanged water connection at bottom of tank.
  - .5 Drain valve on water side.
  - .6 Membrane rupture detector.

### **3.5 Make-up Water**

- .1 One make-up water connection and manual isolation valve for the process hot water system. The containerized boiler plant will have potable water service and will have a water meter and backflow preventer.

### **3.6 Water Treatment**

- .1 One chemical pot feeder.

### **3.7 Air Separation**

- .1 Provide a means of automatic and continuous air removal from the hot water piping.

### **3.8 Side Stream Filtration**

- .1 Provide side stream filtration across the distribution pumps that re-circulate approximately 2% of the design flow rate.

### **3.9 Controls**

- .1 All necessary controls required for the intended operation of the boiler package in conformance with Section 16905.

### **3.10 Enclosure**

- .1 All products shall be supplied as a single skid mounted assembly inside a weatherproof enclosure as specified in Section 13120.
- .2 Provide minimum ventilation requirements as required by CSA B149.1.
- .3 Provide heating and ventilation required to maintain a minimum ambient temperature of no less than 15°C during winter conditions and no greater than 40°C during summer conditions inside the enclosure. The ambient temperature shall be controlled via a room temperature sensor and controller. The sensor shall also control the motorized outside air dampers which will be integral to the natural ventilation strategy, whenever the enclosure's temperature exceeds 40°C during summer conditions.
- .4 Provide combustion air supply to the boilers in accordance with CSA B149.1 and allow for some form of combustion air preheating.
- .5 Provide lighting illumination levels to ensure safe working conditions, safe passage and the identification of hazards or obstructions, and to enable the operation and maintenance of equipment.
- .6 Provide fire detection with local and network alarms.
- .7 Provide gas detection device incorporated into the building management system and connected to the visual and audible alarm system within the enclosure and in a convenient position on the face of the enclosure. The signal shall be relayed to the central building management system operated by the Owner/Owner's Representative. All sensors and controllers shall be a proprietary product and BACnet compatible.

### **3.11 Painting and Identification**

- .1 Shop coatings (to be applied before delivery) are specified in Division 15 with each item of material or equipment.
- .2 Identification logic:
  - .1 Identify each system and system component according to the nomenclature used on the drawings and specifications. Identification to be consistent throughout the project.
- .3 Labels (Identification):
  - .1 Provide lamicoid plastic labels with black face and white centre, 100 mm x 35 mm x 2.5 mm thickness.
  - .2 Gauges and Panels: engrave with 6 mm high lettering. Note for electrical switch gear, coordinate with Division 16.
  - .3 Systems: engrave with 25 mm high lettering.
- .4 Legend and direction of flow arrows shall consist of adhesive backed labels, yellow colour, with minimum 20 mm high black lettering equal to Brady System B-500, vinyl cloth labels for non-insulated surfaces; and Brady B 946 for insulated surfaces.
- .5 Identify piping with labels, colour bands, and flow arrows. Provide identification at 15 m maximum intervals, before and after pipes pass through walls, at all sides of tees, behind access doors and in equipment rooms as required. 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 Apply at minimum one coat of rust inhibitive paint to ferrous supports and site-fabricated work.

### **3.12 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 by the Contractor, at the discretion of the Engineer.
- .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.

### **3.13 Electrical Power Connections and Wiring**

- .1 Electrical Motors:

- .1 Supply mechanical equipment complete with electrical motors.
  - .2 All electrical systems to be CSA and CSA labelled.
  - .3 Provide motors designed, manufactured, and tested in accordance with the latest edition of the following codes and standards: NEMA, EEMAC, CSA, CEC Part 1, IEEE and ANSI. All motors to be approved for use in the designated area classification by the Provincial Electrical Protection Branch. All motors intended for use with a variable speed drive (variable frequency drive) shall be inverter only rated.
  - .4 Minimum certified motor efficiency shall be 95%.
  - .5 Enclosure: Totally enclosed, fan cooled (TEFC).
  - .6 Motor shall be non-overloading for the entire operation range of the equipment driven.
- .2 All power and control wiring shall be completed by the Contractor.
  - .3 Plant shall be equipped with all necessary connections and switches to enable connection to a portable generator.
  - .4 All starting and disconnect switches will be provided under Division 16, unless stated otherwise in Division 15. Any additional control relays or switches and their wiring required to ensure the operation of the specified systems shall be provided under Division 16.

### **3.14 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.

## **PART 4 EXECUTION**

### **4.1 General Installation Requirements**

- .1 The energy centre will be designed with consideration to the latest edition of the following codes and standards where applicable:
  - .1 ANSI/ASME B31.9 Building Services Piping Code.
  - .2 ANSI/ASME Heating Boilers Code, Section IV.
  - .3 ANSI/ASME Boiler and Pressure Vessel Code, Section VIII.
  - .4 ASHRAE Standard 90.1 - Energy Standards for Buildings.
  - .5 British Columbia Building Code.
  - .6 City of Surrey Noise Standards.
  - .7 CSA B51 –Boiler, Pressure Vessel, and Pressure Piping Code.
  - .8 CSA C22.1-2002 – Canadian Electrical Code, British Columbia Electrical Safety Code and Bulletins, and regulations of the local inspection authority.

- .9 CSA B149.1 – Propane and Natural Gas Installation Code.
- .10 Greater Vancouver Regional District Air Quality Management Bylaw No. 1082.
- .11 Greater Vancouver Regional District Boilers and Process Heaters Emission Regulation Bylaw No. 1087.
- .12 Installation shall conform to the provisions of latest release of ASME B31.1 and CSA B51.
- .13 The National Fire Safety Code and the Fire Safety Regulations of the Province of British Columbia.
- .14 Safety Standards for Electrical Equipment, Canadian Electrical Code, Part II
- .15 The Environmental Protection and Enhancement Act enforced by British Columbia Environment.
- .16 The Power Engineer, Boiler, Pressure Vessel, and Refrigeration Safety Regulation (Power Engineers Regulation), as enforced by BC Safety Authority in the Province of British Columbia.

#### **4.2 Permitting and Regulatory**

- .1 The following list summarizes the permitting requirements that may apply to the energy centre:
  - .1 British Columbia Safety Authority (BCSA).
  - .2 Air emission Permit from Greater Vancouver Regional District.
  - .3 Maximum plant sound (noise) level – In accordance with City Bylaws.
  - .4 City of Surrey Building Permit.
- .2 The containerized boiler plant supplier will be responsible for providing the following permits or approvals:
  - .1 Engineer stamped drawings related to the supplied packages as required for building permit application.
  - .2 BCSA inspection, registrations and approvals as required by Provincial safety regulations including boiler, fuel and pressure piping.
  - .3 Transportation/delivery permits to site.

#### **4.3 Start Up and Commissioning:**

- .1 The Contractor shall be responsible for the start-up, testing and commissioning of the Containerized Boiler Plant as a whole, and including all mechanical, electrical and control systems supplied or installed under this contract. This shall include but is not limited to:
  - .1 Boilers,
  - .2 Pumps,
  - .3 Natural gas train, and
  - .4 Control valves.



#### 4.4 Tie-In List

.1 The following connections to the containerized boiler plant are required:

Tie-In #	Description	Drawing #	Location	Type of Connection	Packages		Tie-in <sup>4</sup> Contractor	Notes
TP 01	Hot Water Supply	P03	Note 1	Flanged	C01	C02	C02	Note 3
TP 02	Hot Water Return	P03	Note 1	Flanged	C01	C02	C02	Note 3
TP 03	Domestic Water Supply	P03	Note 2	Plain End	C01	C02	C02	N/A
TP 04	Natural Gas	P03	Note 1	Flanged	C01	C02	C02	Note 3
TP 05	Sanitary Sewer		Note 2	Plain End	C01	C02	C02	N/A
TP 06	Electrical		Note 2	Junction Box	C01	C02	C02	Note 5
TP 07	Backup Power		Note 1	Junction Box	C01	C02	Note 6	Note 5
TP 08	Propane		Note 1	Flanged	C01	C02	Note 6	Note 3

**General Notes:**

1. Outside the enclosure. Penetrations shall be water tight.
2. Buried and capped in the vicinity of the enclosure.
3. Flange shall be anchored within the package and should be designed to accept maximum loads as per API standard 610 / ISO 13709, Table 4.
4. Tie-in contractor to supply gaskets to match flange service and perform a hydrotest to 1.5 times the design pressure.
5. Junction box connections shall be NEMA 3X (suitable for damp location). Outlets and fittings for exposed conduit systems shall be FD and FS conduits where mechanical protection is required. Boxes shall be colour coded and shall have appropriate sized color coded covers with labels.
6. Emergency connections only. Contractor shall provide couplings suitable for the intended service for future emergency connection.

**END OF SECTION**

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## **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 Owner (and other Contractors where applicable) 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 Seismic design shall be as per BC Building Code (2012).
- .5 In case of a discrepancy the following order shall be followed:
  - .1 Specifications.
  - .2 Piping & Instrumentation Diagrams (P&IDs).

### **1.2 Intent**

- .1 Provide complete, fully tested and operational mechanical systems to meet the requirements described herein and in complete accord with applicable codes and ordinances. Coordinate work with the Owner (and other Contractors where applicable) working schedule and cooperate to achieve the earliest possible completion of the work.
- .2 Contract documents and drawings of this Division are diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material and installation quality and are not detailed installation instructions.
- .3 Should inconsistencies exist such as the drawings disagreeing with themselves or with the specifications, the better quality and/or greater quantity of work or materials shall be estimated upon, performed and furnished unless otherwise ordered by the Owner's Engineer in writing during the bidding period.
- .4 Install equipment to provide access and ease of maintenance.
- .5 Provide seismic restraints for all required equipment, piping and expansion tanks.
- .6 Furnish a written guarantee stating that all work executed in this contract will be free from defective workmanship and materials for a period of one (1) year from the date of Substantial Performance. The Contractor shall, at his own expense, repair and replace any work which fails or becomes defective during the term of the guarantee/warranty, providing such work is not due to improper usage. The period of guarantee specified shall not in any way supplant any other guarantees of a longer period but shall be binding on work not otherwise covered.
- .7 If the equipment is used during construction, the guarantee or guarantee period shall not be shortened or altered.

- .8 Provide shall mean "supply and install".
- .9 Contractor Shall:
  - .1 Identify and confirm all support locations.
  - .2 Provide any supplemental structural steel required for pipe supports.
  - .3 Provide support details sealed and signed by a licensed structural engineer in BC for pipe sizes larger than 80 mm. Such details shall confirm the structure used is suitable for the pipe attachments and resulting loads.
  - .4 Provide a sign off for the finished installation by a licensed structural engineer in BC to meet local seismic requirements.

### **1.3 Technical Requirements**

- .1 The Technical Requirements herein shall be used in conjunction with or supersede any similar requirements in the mechanical specifications and/or drawings.
- .2 All as-built records for the mechanical system shall be electronic in a single file in PDF format compiled and submitted by the mechanical contractor to the Owner and Owner's Engineer for review and approval.
- .3 Contractor shall compile a list of all equipment installed on the project with manufacturers, model numbers and local contact information. This information shall be included in the Mechanical Maintenance Manuals.
- .4 All variable frequency drives shall have low harmonic content and harmonic filters. Maximum acceptable harmonic content as per IEEE Standard 519 and 1100.
- .5 Contractor to furnish the following spare parts to the Owner and provide a receipt that all spare parts have been sent and received to the consultant.
  - .1 One casing joint gasket for each size pump.
  - .2 Suppliers and parts shall be locally available.
- .6 Provide one set of special tools required to service equipment as recommended by manufacturers.

### **1.4 Codes and Permits**

- .1 All work shall comply with provincial, municipal bylaws and authorities having jurisdiction. The following bodies have jurisdiction over this project.
  - .1 City of Surrey Permits & Inspections.
  - .2 British Columbia Safety Authority (BCSA).
  - .3 BC Plumbing Code.
- .2 All piping installation shall be in accordance to ASME B31.1 and CSA 51.
- .3 Obtain all permits and pay all fees applicable to the work.
- .4 Contractor shall arrange for inspections of the work by the authorities having jurisdiction and shall provide certificates indicating Final Approval.

- .5 Contractor shall provide schedule B1/B2 letters of assurance for seismic engineering.
- .6 The Canadian Registration Number (CRN) is required for all equipment and piping within the container.
- .7 The mechanical scope of work for the containerized boiler plant shall be registered in accordance with CSA B51 "Boiler, Pressure Vessel and Pressure Piping Code" by the contractor as per the BC Safety Authority requirements.
- .8 FortisBC gas permit.

### **1.5 Drawings and specifications**

- .1 Contract drawings for mechanical work are in part diagrammatic. They convey the scope of work and indicate the general arrangement of equipment, piping and ductwork. Care shall be taken to ensure that the installation is in accordance with detailed drawings, wherever applicable, 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.
- .3 Any deviation from the piping and instrumentation drawings shall be coordinated in writing with the Engineer.

### **1.6 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.
- .2 Shop drawings shall show:
  - .1 Outside dimensions,
  - .2 Total net assembled weight,
  - .3 Materials of construction,
  - .4 Welded joints,
  - .5 Coatings and finishes, and
  - .6 Electrical data (where applicable).
- .3 Shop drawings shall include the seal of a Professional Engineer 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 the approval of the detailed 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 Engineer 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 Engineer, 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.

### **1.7 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, including but not limited to the following:
  - .1 Boilers,
  - .2 Control valves,
  - .3 Manual Valves,
  - .4 Pumps, and
  - .5 All other mechanical systems.
- .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 numbers and serial numbers.
  - .4 Maintenance and operating instructions where applicable
  - .5 Electrical connection drawings, control schematic, control shop drawings and sequence of operations for all major equipment.

### **1.8 Equal and Alternate Equipment**

- .1 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.
- .2 Where two or more items of equipment or materials of similar design are to be installed, they shall be the products of one manufacturer.
- .3 Equipment, other than that specified, which has been approved by the Engineer as "equal" 5 days prior to the closing of quotation period may be substituted at the Contractor's discretion provided aforementioned conditions are met.

- .4 Equipment, other than that specified, which may be approved by the Engineer as an "alternate" following the closing of the quotation period, may be substituted by the Contractor at the discretion of the Engineer provided suitable adjustment of contract price is negotiated.
- .5 Equipment, other than that specified, which has been installed but not approved by the Engineer, may be rejected. In this case the equipment shall be removed, and approved equipment installed, at the Contractor's expense.
- .6 The Contractor shall be responsible for all expenses incurred in the work of other trades made necessary because of substitution.

### **1.9 Related Work**

- .1 General Requirements                      Section Divisions 00 & 01
- .2 Enclosure                                      Division 13
- .3 All Mechanical Sections                      Division 15
- .4 Electrical                                        Division 16

### **1.10 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 Work which does not conform to standards accepted by the Owner's Engineer and the trade may be rejected by the Engineer. The Contractor shall redo rejected work to the accepted standard at no cost to the Owner.
- .4 Work shall be carried out only by qualified tradesmen.
  - .1 Submit qualifications.
  - .2 Welders shall meet British Columbia Safety Authority (BCSA) requirements.
- .5 Conform to all standard specifications referenced herein.

### **1.11 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.

#### **1.12 Submittals**

- .1 Provide shop drawings for all fabricated steel piping, supports and appurtenances, in accordance with Section 01330.
- .2 Submit manufacturers' literature and catalogue information for all valves and equipment.
- .3 Bid Requirements:
  - .1 Bid Form (Refer to Division 00)
  - .2 Compliance Statements for project specifications
  - .3 Product Data
  - .4 Mechanical Room Layout
  - .5 System P&ID.
- .4 Post Award Requirement
  - .1 Update all relevant Bid Submittals
  - .2 Quality Control Plan
  - .3 Product Data
    - .1 Manufacturer's name,
    - .2 Technical Data sheets, and
    - .3 Quality certifications.
  - .4 Shop Drawings
  - .5 Submit welder qualifications (WPQ) and welding procedures (WPS) as specified by ASME B31.1 Section 127.5.
  - .6 Delivery Schedule
  - .7 Mill Certificates
  - .8 Supplier Installation Guidelines
  - .9 Isometrics inside containerized boiler plant
  - .10 Submit list of recommended spare parts with current prices for valves and equipment
  - .11 Samples: Welders must demonstrate their qualifications and be certified. Witnessed welding will be required.

#### **1.13 Substantial and Total Performance**

- .1 Prior to requesting an inspection for Substantial Performance, provide a complete list of items which are deficient.



- .2 The following shall be an outline checklist of the minimum requirements to be met by the contractor prior to the Owner's Engineers' Substantial Performance by the contractor.
- Inspection:
- .1 Complete Commissioning Checklists.
  - .2 Balancing Report.
  - .3 Final Plumbing Inspection Certificate from local plumbing inspector.
  - .4 Controls Commissioning, Checklist and 15 day trend logs for all major equipment.
  - .5 Fire stopping.
  - .6 Seismic Engineers inspection of all Seismic restraints and schedule C letters of assurance.
  - .7 Final As-Built Drawings ready for review.
  - .8 Maintenance and operation manuals, ready for review.
- .3 Prior to Total Performance Inspection provide declaration in writing that deficiencies noted at time of substantial performance inspection have been corrected and the following items completed prior to the total performance inspection:
- .1 Submit final water balance reports.
  - .2 Submit final operating and maintenance manuals.
  - .3 Complete final calibration.
- .4 The Owner's Engineer shall visit as they see fit, for the purpose of total performance inspection.

**END OF SECTION**

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## **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 Engineer shall be notified to resolve it. The Engineer has the right to apply the more stringent requirement in such cases.
- .4 All piping shall be cleaned, tested and protected before leaving the factory.

### **1.2 Related Work**

- .1 Section 15010 Basic Mechanical Methods
- .2 Section 15099 Pipe Specification Sheets
- .3 Section 15108 Valves
- .4 Section 15109 Valve Specification Sheets
- .5 Section 15280 Insulation for Field-insulated Piping
- .6 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 Delivery, Storage and Handling**

- .1 Protect all piping and valves from weather and from all damage.

### **1.6 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 Section 15099 - 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:
  - .1 Forged steel to ASTM A105 and ASTM A181
  - .2 Provide raised-face flange, except when matching an equipment or instrument connection.
- .2 Dimensions:
  - .1 NPS 24 and less: to ASME B16.5.
  - .2 NPS 30 and above: to ASME B16.47, series A.
  - .3 Other dimension and/or drilling pattern standard may be required to mate equipment flanges.
  - .4 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:
  - .1 To ASTM A193 B-7 and A194-2H.
- .4 Gaskets :
  - .1 Material: stainless steel with graphite filler material.
  - .2 Thickness: steel 3.2 mm (1/8"), graphite 4.8 mm (3/16").
  - .3 Rating: refer to Section 15099.
  - .4 Conforms to ASME B16.20.
  - .5 Gaskets to be one piece full diameter flange with precision located holes to match the flange bolt pattern.

- .6 Install to supplier recommendations.

### **2.3 Strainers**

- .1 "Y" Type.
- .2 Rating: refer to Section 15099.
- .3 Screen shall be 5/32 inch.
- .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 flange gaskets, isolation gaskets to the following requirements:
  - .1 Gaskets to be full diameter flange insulating gaskets with precision located holes to match the flange bolt pattern, phenolic with nitrile seal elements.
  - .2 Insulating sleeves to be 0.79 mm thick wall, polyethylene.
  - .3 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 & Engineered 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 (Hot Water)**

- .1 110 mm dial gauge with black lettering (dual scale kPa and PSI).
- .2 Range: 0 – 1,379 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 (Hot Water)**

- .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 Installation**

- .1 General:
  - .1 Installation shall conform to the provisions of latest release of ASME B31.1 and CSA B51.
  - .2 Installation shall conform to the British Columbia Safety Authority (BCSA).
  - .3 Follow supplier installation recommendations.
  - .4 Provide standard weight iron pipe size brass nipples and adapters where copper lines connect to fixtures.
  - .5 Pipe to pipe branch connections shall not be used.
  - .6 Ream all cut tube and pipe ends to the full inside diameter at the tube or pipe to remove burrs.
  - .7 Remove any burrs on the outside of cut tube and pipe ends.
  - .8 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.
  - .9 Spring supports shall be locked during testing. Follow supplier recommendations for locking methods.
- .2 Isometrics:
  - .1 Provide detailed isometric schematics of the piping system.
    - i. Provide one isometric schematic for each line, and
    - ii. Provide Weld Maps for all welds.
  - .2 The isometric schematic shall contain the following data as a minimum:

- All shop weld joints and field weld joints
  - i. Online valves type and location
  - ii. Pipe supports type and location
  - iii. Pipe anchor points location
  - iv. Straight piping sections length and elevation, and branch angles, and
  - v. Isometric spool numbering.
- .3 The Weld Maps shall contain the following data as a minimum
  - i. Welder ID no. for shop-welded joints
  - ii. Weld number
  - iii. Weld joints subjected to non-destructive test (NDT), and
  - iv. Welding procedure specification number.
- .3 Permissible Threaded Pipe and Bolt Assemblies:
  - .1 All threaded pipe shall be free of metal shavings. Excess cutting oil shall be removed from pipe.
  - .2 Only use a Teflon paste type pipe lubricant for threaded assembly. Teflon tape is prohibited.
  - .3 Teflon tape and alternate paste or liquid lubricants are unacceptable.
  - .4 When utilizing machine-threaded assemblies for piping connection (i.e. flanges), an anti-seize lubricant shall be applied to machine threads.
  - .5 All machine-threaded assemblies shall be a minimum of Grade 5 material domestic manufacture.
- .4 Permissible Welded Assemblies:
  - .1 Weld rings:
    - i. Prepare pipe as recommended by manufacturer.
  - .2 Butt welds:
    - i. Prepare pipe ends in accordance with ASME B31.1.
  - .3 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 Engineer acceptance.
    - iii. Remove slag from inside pipe following installation on 6 inch and larger shop fabrications.
  - .4 Sockets:
    - i. Small diameter sockets for instruments, vent, drain, etc. to be rated for 3,000 PSI.
  - .5 Caps:
    - i. Use butt-welded caps installed in accordance with ASME B31.1.
  - .6 Elbows:
    - i. Use butt-welded fittings.
    - ii. Elbows to be long radius only, except where indicated on drawings or as stated in Section 15099
  - .7 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 for types S01 and S03 unless indicated otherwise.
    - Install flat-on-bottom for types S02 unless indicated otherwise.
- .8 Tees: required at branch connections where a standard reducing tee fitting is available.
- .5 Welder Qualifications
  - .1 Qualify welding process and operator for piping according to ASME "Boiler and Pressure Vessel Code", section IX: "Welding and Brazing Qualifications".
  - .2 On-line welder qualification will be applied by radiographing the first three different production welds of each welder.
  - .3 Comply with provisions of ASME B31 series "Code of Pressure Piping".
- .6 Pipe Welding:
  - .1 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.
  - .2 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.
  - .3 Each welder's certificate of qualification shall be supplied to the Engineer before any welding is performed.
  - .4 Provide welding procedure specification and procedure qualification record for each type of weld joint to be used.
  - .5 Each welder shall identify his/her work by stamping each weld, indicating joint number and welder ID number. The contractor's name (in abbreviation form or initial), shall prefix the welder's number, thus identifying the entire work. Each welder shall identify his/her work by stamping each weld, indicating joint number and welder ID number. The contractor's name (in abbreviation form or initial), shall prefix the welder's number, thus identifying the entire work.
  - .6 Tack welds during fabrication shall be made by certified welders
  - .7 Each welder must carry an identification badge while working. Badge shall be presented to the Engineer representative on request.
- .7 Process Piping:
  - .1 Install systems in accordance with ASME B31.1 and CSA B51
  - .2 Perform welding in accordance with ASME Standards
  - .3 Pitch at 1 mm/m for drainage and air elimination

### **3.3 Quality Control**

- .1 Delivery on site of all piping and fittings:
  - .1 Prior to delivery, the Mill Test Report (MTR) shall be submitted to the Engineer for review and acceptance of material.



- .2 Upon delivery to the site of all pipes, the Contractor shall verify that the materials received match the MTR submitted by the Contractor's supplier and that it complies with the specifications.
- .3 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.
- .4 The Contractor shall protect pipe and fittings from oxidation due to the elements or water.
- .2 Pre-fabrication of piping spools:
  - .1 The Contractor shall maintain a proper control and traceability documentation to verify compliance with the applicable codes and standards and with the Specifications.
  - .2 The Engineer shall be provided free access to the Contractor's fabrication shop at any time during the fabrication of the piping spools.
  - .3 The Engineer will review the produced piping spools and control the documents at the Contractor's Workshop prior to delivery on site.
  - .4 When the piping spools are fabricated on site instead of at the Contractor's shop, the same requirements apply.
- .3 Welder's qualifications:
  - .1 Welder certificates shall be 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.
  - .2 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.
  - .3 The Owner's representative may disqualify any welder based on observed competence and/or ability to complete quality work.
  - .4 Contractors shall utilize the following ASME forms. All copies shall be submitted to the Engineer 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.
  - .5 Provide welding procedures and welding procedure qualification for each type of weld joint to be used.
  - .6 Each welder shall identify his/her work by stamping each weld, indicating joint number and welder ID number. The contractor's name (in abbreviation form or initial), shall prefix the welder's number, thus identifying the entire work.
  - .7 Each welder must carry an identification badge while working. Badge shall be presented on request.
  - .8 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
- .9 Weld radiographic examination:
- i. 20% of all welded joints for above ground and 100% for all underground shall undergo radiographic examination. Contractor shall coordinate with the Engineer for all welds to be tested.
  - ii. Any rejected weld shall be repaired and tested at the Contractor's expense. The Engineer shall select an extra weld for inspection for every rejected weld by the same welder at no extra cost to the Owner.
  - iii. Excessive rejected welds by the same welder may disqualify a welder from any further work on site, at the discretion of the Engineer.
  - iv. Where radiographic examination is not possible, ultrasonic examination may be used, with the Engineer's permission.
- .10 Ultrasonic examination may be used:
- i. To verify the minimum pipe thickness after grinding.
  - ii. For 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.
- .11 Magnetic particle examination may be used:
- i. For fillet welds.
  - ii. Any re-beveling.
  - iii. On completion of weld repairs.
  - iv. On removal of arc strikes.

### **3.4 Pressure tests**

- .1 General
- .1 The use of additives, liquids, compounds and similar substances in pipe systems to provide a leak free system is prohibited.
  - .2 Valves shall not be used for dead ending a pressure test pipe section. Blind flanges / end caps can be utilized.
  - .3 Pressure Test limits shall be as per Section 15099.
- .2 Pressure test requirements:
- .1 All piping shall be hydro-tested as indicated by the Engineer.
  - .2 Initial and final pressure tests shall be witnessed by the Owner Representative.
  - .3 Notify the Engineer one week prior to scheduled test date.
  - .4 Submit piping pressure test method statement prior to proceeding to any pressure test.

- .5 Submit test report for all pressure tests.
- .6 All Primary piping shall be registered with British Columbia Safety Authority (BCSA). It is the responsibility of the Contractor to coordinate with BCSA for all relevant tests inspections.
- .7 Process piping pressure test:
  - i. 1,655 kPa (240 PSI).
- .8 Costs for pressure testing shall be borne by the Contractor.
- .9 Contractor to hire approved third party for pressure testing.
- .10 All pressure testing for underground piping shall include a timer chart assembly.

### **3.5 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.

### **3.6 Tolerances for Pipe Installation**

- .1 Install inside piping precisely to the 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.

### **3.7 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.

### **3.8 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 Engineer.
- .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		Hot Water (above ground)
Operating Pressure rating		1,104 kPa (160 psi)
Temperature rating		120°C
Test Condition		1,655 kPa (240 psi) for 120 minutes
Item	Sizes	Specification
Basic Material & Reference Standard	2 inch and less	<ul style="list-style-type: none"> <li>Plain Ends</li> <li>ASTM A106, grade A seamless, or</li> <li>ASTM A53, grades B seamless</li> </ul>
	2½ inch to 12 inch	<ul style="list-style-type: none"> <li>Beveled ends</li> <li>ASTM A106, grade A seamless, or</li> <li>ASTM A53, grade B seamless or electric resistance welded</li> </ul>
	14 inch and above	<ul style="list-style-type: none"> <li>Beveled ends</li> <li>ASTM A106, grade A seamless, or</li> <li>ASTM A53, grade B seamless or electric resistance welded, or</li> <li>API 5L double submerged arc welded</li> </ul>
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 15280
<b>Notes</b>		
1. All exterior piping (e.g. within a manhole) 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).		

**END OF SECTION**

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## **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 | Hot Water Piping            |
| .2 | Section 15099 | Piping Specification Sheets |
| .3 | Section 15109 | Valves 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:

AR	-	Air Release
BP	-	Backflow Preventer
BV	-	Ball Valve
CV	-	Check Valve
NV	-	Needle Valve
PR	-	Pressure Reducing/Relief Valve
SV	-	Slam Shut 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 2,200 mm or higher above finished floor level.
- .2 Extend chain to an elevation of 1,500 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.
- .3 All vents and drains shall be furnished with a plug.
- .4 Provide drains at all low points and for all strainers.
- .5 Provide vents at all high points.

**3.4      Check Valves**

- .1    One Check valve shall be installed downstream each pump or as stated in the drawings.
- .2    Provide a minimum of three (3) diameters of straight length upstream of check valves.

**END OF SECTION**



<b>Automatic Air Release Valve</b>	<b>AR-01</b>
<b>General</b>	
Description	Lever type air release valve
Basic Material & Reference Standard	Cast iron ASTM A126, Class B
Ends	NPT female connections
Pressure rating	1,104 kPa (160 psi)
Temperature rating	120°C
Size Range	3/4" inlet, 3/8" outlet
Service	Hot Water
<b>Materials</b>	
Body	Cast iron ASTM A126, Class B
Cover	Cast iron ASTM A126, Class B
Float	304 stainless steel
Float Arm	304 stainless steel
Valve Head	EPDM
Coating	Epoxy
Note	For locations higher than 2.2 m, valve discharge piping with a BV-01 valve shall be routed to 1.5 m above floor level. Piping size to match valve outlet.
<b>Approved Models</b>	
Spirax Sarco 13WHS	

<b>Double Check Backflow Preventer</b>	<b>BP-01</b>
<b>General</b>	
Description	Reduced Pressure Zone Backflow Preventer
Basic Material & Reference Standard	316 Stainless Steel
Ends	NPT
ANSI Class	n/a
Pressure rating	1,104 kPa (160 psi)
Temperature rating	75 deg. C
Size Range	8 - 50 mm
Service	Domestic water
<b>Materials</b>	
Body	Bronze
<b>Notes</b>	
1. Provide bronze strainer	
<b>Approved Models</b>	
Watts Series 009QT-s	Approved equal

<b>Ball Valve</b>	<b>BV-01</b>
<b>General</b>	
Description	Two-piece steel ball valve
Basic Material & Reference Standard	Carbon steel
Ends	Socket welded for NPS 1" and above Threaded for NPS 7/8" and below (refer to 15099)
Pressure rating	1,104 kPa (160 psi)
Temperature rating	120°C
Size Range	½" to 1½"
Service	Hot water vents and drains
<b>Materials</b>	
Body	Carbon steel, 2-piece
Ball	Stainless steel, full port
Seat	Teflon
Shaft	Stainless steel (note 1)
<b>Operator</b>	
Handle	Epoxy coated steel
<b>Notes</b>	
1. Blowout-proof shaft required.	
<b>Standard of Acceptance</b>	
Apollo Valves Series 72-140	

<b>Ball Valve</b>	<b>BV-02</b>
<b>General</b>	
Description	Welded Ball Valves
Basic Material & Reference Standard	Carbon Steel
Ends	Beveled weld end / Flanged
Pressure rating	1,104 kPa (160 psi)
Temperature rating	120°C
Size Range	1" to 6"
Service	Hot Water
<b>Materials</b>	
Body	Sch 40 Carbon Steel
Ball	304 Stainless Steel
Seats	O-Ring Teflon (PTFE)
Shaft	304 Stainless Steel
<b>Operator</b>	
Lever actuator	<ul style="list-style-type: none"> <li>Epoxy coated steel construction.</li> <li>Provision for padlocking.</li> </ul>
<b>Notes</b>	
<b>Standard of Acceptance</b>	
API – Broen Ballomax	Armour Valve – Bohmer

<b>Silent Check Valve</b>	<b>CV-01</b>
<b>General</b>	
Description	Wafer Type Silent Check Valve
Basic Material & Reference Standard	Carbon Steel
Ends	Wafer type
ANSI Class	150 or 300
Pressure rating	1,104 kPa (160psi)
Temperature rating	120 deg C
Size Range	2 inch to 10 inch
Service	Discharge of Hot Water Pumps
<b>Materials</b>	
Body	Carbon Steel
Trim	Stainless steel
Spring	Stainless steel
<b>NOTES</b>	
1.	
<b>STANDARD OF ACCEPTANCE</b>	
Mueller 103-MDT	

<b>Needle Valve</b>	<b>NV-01</b>
<b>General</b>	
Description	Needle Valves
Basic Material & Reference Standard	Carbon Steel
Ends	NPT
Pressure rating	10,000 kPa @ 37°C
Temperature rating	120°C
Size Range	1/2"
Service	Hot Water gauges only
<b>Materials</b>	
Body	Sch 40 Carbon Steel
Stem	416 Stainless Steel
Packing	Teflon
<b>Standard of Acceptance</b>	
Kertotest N28	

<b>Pressure Relief Valve</b>	<b>PR-01</b>
<b>General</b>	
Description	Direct-operated, spring loaded pressure relief valve
Basic Material & Reference Standard	Bronze B584 Alloy 84400
Ends	3/4"-1.5" NPT inlet
Pressure rating	1,104 kPa (160 psi)
Temperature rating	120°C
Size Range	3/4"
Service	Hot Water
Setting	150 psi
<b>Materials</b>	
Body	Bronze
Disc/Retainer	Stainless Steel
Seat/Seal	Buna-N
<b>Approved Models</b>	
Kunkle model 918	

<b>Slam Shut Valve</b>	<b>SV-01</b>
<b>General</b>	
Description	Pressure control valve
Basic Material & Reference Standard	CSA 6.18, CSA 6.22
Ends	Flanged
Pressure rating	1,104 kPa (160 psi)
Temperature rating	60°C
Size Range	12 – 25 mm
Service	Natural Gas and Propane
Setting	15 psi
<b>Materials</b>	
Body	Steel
Shutter	Steel
O-ring	MBR nitrile rubber or FKM
Diaphragm	MBR nitrile rubber or FKM
Springs	Steel
<b>Approved Models</b>	
Bryan Donkin Model 290	Emerson BM5
Approved equal	

<b>Main gas pressure regulator</b>	<b>PR-02</b>
<b>General</b>	
Description	Natural gas pressure reducing regulator
Basic Material & Reference Standard	Cast iron
Ends	Class 150 flanged
Pressure rating	862 kPa (125 psi)
Outlet Pressure Range	2 to 10 psig
Temperature Rating	-29°C to 82°C
Size Range	3" inlet, 3" outlet
Service	Natural gas
<b>Materials</b>	
Body	Cast iron ASTM A126, Class B
Cage	CF8M stainless steel
Seat Ring	316 stainless steel
Actuator	Steel casing with steel bonnet
Pilot	Aluminum
<b>Approved Models</b>	
Fisher 1098-EGR	

<b>Condensing boiler gas pressure regulator</b>	<b>PR-03</b>
<b>General</b>	
Description	Natural gas pressure reducing regulator
Basic Material & Reference Standard	Cast iron
Ends	NPT
Pressure rating	1,207 kPa (175 psi)
Temperature rating	-30°C to 66°C
Outlet pressure range	14" to 4" W.C.
Size Range	1.5" inlet, 1.5" outlet
Service	Natural gas
<b>Materials</b>	
Body	Gray cast iron
<b>Approved Models</b>	
Fisher CS820	Approved equal

**END OF SECTION**



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## **PART 1 GENERAL**

### **1.1 Section Includes**

- .1 Hangers and supports for mechanical piping.

### **1.2 Related Sections**

- .1 Division 15 Section: 15098 – Hot Water Piping.
- .2 Division 15 Section: 15099 – Piping Specification Sheets.

### **1.3 References**

- .1 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.
- .2 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.
- .3 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**

- .1 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.
- .2 Certifications:
  1. Product certificates signed by Manufacturer certifying materials comply with specified performance characteristics, criteria, and physical requirements. Certificates shall meet specific code requirements and shall be available upon request.
- .3 Shop Drawings:
  1. Bases, hangers and supports.
  2. Connections to equipment and structure.
  3. Structural assemblies.
- .4 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, precautions against cleaning materials, and methods detrimental to finishes and performance.

#### **1.5 Quality Assurance**

- .1 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.
- .2 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.
- .3 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**

- .1 Store products in Manufacturer's unopened packaging until ready for installation.
- .2 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**

- .1 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**

- .1 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, any other rights the 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 Contractor is fully responsible for the support of his piping and equipment within the package boundary.
- .3 The contractor is to coordinate loads at the piping interface points with the balance of the plant designer.

### **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. 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 recommended by the Manufacturer 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	
		Copper Pipe (mm)	Steel Pipe (mm)
1/2 to 1 (12 to 25)	3/8 (10)	1,500	2,100
1.25 to 2 (30 to 50)	1/2 (13)	1,800	2,500
2.5 to 4 (65 to 100)	5/8 (16)	-	3,750
5 to 8 (125 to 200)	3/4 (19)	-	4,250
10 to 12 (200 to 300)	1 (25)	-	6,000

- .2 For calculated loads, rod diameters may be sized in accordance with Table 3 of MSS SP-58, 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 When practical, locate hangers immediately adjacent to any change of direction of pipe. Total length of pipe between supports shall be less than three-fourths the full hanger span.
- .5 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 the table in Section 3.3 above, 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 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.

(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 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.

### **3.6 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 shall be 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  $\frac{1}{2}$ " (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.
- .10 All hangers shall be oversized to allow for specified insulation thickness

### **3.7 Horizontal Movement**

- .1 Angularity of rod hanger resulting from horizontal movement of pipe work from cold to hot position shall not exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is greater than ½" (12.7 mm), offset pipe hanger and support so that rod hanger is vertical in hot position.

### **3.8 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.

### **3.9 Protection**

- .1 Protect installed products until completion of project.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.

**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.
- .2 All insulation within the package is for heat conservation and shall be provided by the package supplier.

### **1.2 Related Work**

- .1 Section 15098 Piping
- .2 Section 15099 Piping Specification Sheets
- .3 Section 15108 Valves
- .4 Section 15109 Valve Specification Sheets
- .5 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 with same thickness of adjacent pipe covering. Unions, drain piping and drain 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" (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 that are not factory insulated. All the following components shall be insulated using this product.
  - .1 Strainers.
  - .2 Expansion joints / compensators / threaded unions.
  - .3 Flanged valves.
- .2 Insulation blankets for hot water components 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, and
  - .2 Pipe surface is clean and dry.

### **3.2 Installation of Pipe Insulation**

- .1 Install insulation in accordance with ANSI/NFPA 90A, ANSI/NFPA 90B, 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 the 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, 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 every branch.
- .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 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 Representative 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 Representative must confirm satisfactory results of water analysis.
- .4 Upon pipe conditioning completion, the Chemical Supplier Representative 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 Chemical Supplier recommendation for 24 hours.

### **3.3 Flushing**

- .1 Contractor to ensure all boilers, 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 boilers, 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.

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## **PART 1 GENERAL**

### **1.1 General**

- .1 This section describes the commissioning of the mechanical system and outlines the duties and responsibilities of the team.
- .2 The commissioning process shall be applied to all products, equipment and systems provided under this Division.
- .3 Work specified in this section shall be performed by an Agency specializing in this type of work as part of this scope of work.

### **1.2 Scope**

- .1 Demonstration of equipment and systems operations.
- .2 Instruction seminars for Owner's personnel.
- .3 System start-up, testing and operational checking.

### **1.3 Quality Assurance**

- .1 Work specified shall be performed by an Independent Agency specializing in this type of work.
- .2 Within (20) twenty days of the award of the General Contract, supply the name, qualifications, and experience of the commissioning co-ordinator for the review and approval of the Consultant.

## **PART 2 THE COMMISSIONING PROCESS**

### **2.1 The Commissioning Team**

- .1 The Commissioning Team shall be formed and consist of:
  - (a) The Commissioning Agent.
  - (b) The Consultant's representative.
  - (c) The Owner's staff representative.

### **2.2 Commissioning Schedule**

- .1 Within three (3) months of commencing with the project work the commissioning agent shall review design intent and intended commissioning procedures with the Engineer. Two months prior to the date of scheduled substantial performance submit a detailed plan identifying the orderly progression of the prestart commissioning check and subsequent commissioning performance check of each sub-system, leading up to the ultimate commissioning of entire systems.

- .2 Submit a schedule for the commissioning phase of the work. This schedule shall show:
  - (a) Completion dates for each trade.
  - (b) Timing of the various phases of the commissioning, testing and demonstration process.
  - (c) Submission dates for the various documents required prior to verification of commissioning by the Consultant.
  - (d) Prepare a commissioning statement in which each of the four (4) phases that the process is perceived to be worked through. In sequence, the phases are expected to be:
    - Phase 1 - System Readiness.
    - Phase 2 - System Start-Up, Testing, etc.
    - Phase 3 - Verification of System Commissioning.
    - Phase 4 - Demonstration and Instruction.
- .3 With the commissioning schedule noted above, submit a copy of all commissioning worksheets to be used during the commissioning process.
- .4 Each phase is applicable to each major and separate system making up the work in Division 15 including controls and Division 16 interface as applicable.

## **PART 3 COMMISSIONING PHASES**

### **3.1 Phase 1**

- .1 Before starting any of the separate systems, provide written verification stating that the specific system is ready for start-up and the following conditions have been met:
  - (a) Copies of all test and certificates have been submitted to the Consultant.
  - (b) All safety controls installed and fully operational (dry run test).
  - (c) Flushing, chemical cleaning (as required), charging, fluid operating (as required), are complete.
  - (d) Equipment lubrication and pre-start checks are complete.
  - (e) Adjusting vibration isolation and seismic restraints completed.
  - (f) Alignment of drives (direct and belt) completed.
  - (g) Control functional checks, including all alarms performed.
  - (h) Start-up verification checks by manufacturers representatives completed.
  - (i) All deficiencies to be recorded, reviewed by the commissioning team and, subsequently corrected before proceeding to the next phase, Phase 2.

### **3.2 Phase 2**

- .1 System Commissioning shall include but not necessarily be limited to:
  - (a) Activation of all systems.
  - (b) Testing and adjustment of all systems.
  - (c) As in the case of the System Readiness Phase, all deficiencies are to be recorded, reviewed by the Commissioning team and, subsequently, corrected. The process at the point of the deficiency shall be repeated before proceeding forward.
  - (d) Phase 2 is concluded when the installation is in full working order and acceptable for use. The work will include the following:
    - a. Set up all automatic temperature control devices.
    - b. Set up all pumps.
    - c. Adjust vibration isolators and earthquake restraints as necessary.
    - d. All other new equipment being ready for operation.
  - (e) Fine Tuning:

Setting up automatic controls for accurate response and precise sequencing.
  - (f) Testing:

All items and functions to be later demonstrated to the Owners representatives.

### **3.3 Phase 3**

- .1 Verification of Commissioning.
  - (a) Verification of commissioning by the Consultant shall not commence until the commissioning process, Phase 2, has been totally completed. Submit test procedure completion test certificates at the time of requesting the commencement of the verification procedure. The verification process will include the demonstration of the following:

Operation of all equipment and systems, under each mode of operation, including:

    - Boilers,
    - Pumps, and
    - Controls.
- .2 At the completion of Phase 3, the Contractor shall submit the following to the Consultant:
  - (a) A letter certifying that all work specified under this contract is complete, clean and operational in accordance with the specification and drawings.

- (b) A copy of Phase 2 Verification Certificates provided by the specialist trades for submission to the Consultant.
- (c) Record drawings as specified.
- (d) A letter from the testing and balancing agency certifying that all necessary data for inclusion in operating and maintenance manuals has been received.
- (e) A statement confirming completion of EMCS acceptance test.
- .3 Upon receipt of all documents and a satisfactory outcome of the verification procedure, the Consultant will provide a Certificate of Verification for Phase 3.
- .4 Substantial Performance may, thereupon, be declared.

### **3.4 Phase 4**

- .1 Demonstration and Acceptance shall not commence until the commissioning process Phase 3 has been successfully completed - verification certificate issued and Substantial Performance declared. The demonstration process is a statement of satisfaction from the Consultant and Owner upon completion. Total Performance will not be accomplished without this achievement.

## **PART 4 EXECUTION**

### **4.1 Systems to be Commissioned**

- .1 Piping - pressure tests, insulation, identification, water balance, hangers, expansion, earthquake restraints.
- .2 Pumps - alignment, rotation, motor current draw, piping connections, flow and pressure test.
- .3 Boilers - pressure tests, insulation, identification, earthquake restraints.
- .4 Control Valves - Installation, controls, capacity modulation, connection to EMCS, identification.
- .5 Controls - commissioning of controls by Controls Contractor under the supervision of the commissioning co-ordinator.
- .6 Earthquake restraints for all piping and equipment.

### **4.2 General**

- .1 Independent Agency shall chair the demonstration and instruction sessions.
- .2 Contractor shall arrange for presentation and demonstration of mechanical equipment and systems by appropriate specialists and shall ensure that required manufacturer's representatives are in attendance.

### **4.3 Demonstrations**

- .1 Demonstrate specific starting and general maintenance requirements for each major piece of equipment. Ensure all labeling and identification is completed.

- .2 Demonstrate the following systems, in the form of instruction seminars and contractor-guided tour of the facility.
  - (a) Control Systems.
- .3 Demonstrate the following pieces of equipment:
  - (a) Pumps,
  - (b) Boilers,
  - (c) Control Valves, and
  - (d) Control System.
- .4 Prepare a schedule identifying the proposed sequence of demonstration. Sequence of demonstration shall correspond to full system starting. Submit for review by Engineer one month prior to demonstration.
- .5 Answer all questions raised by Owner at demonstrations; if unable to satisfactorily answer questions immediately, provide written response within three (3) days.
- .6 Provide Operation and maintenance manuals.

**END OF SECTION**

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## **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 City of Surrey Permits & Inspections.
  - .2 British Columbia Safety Authority (BCSA).
  - .3 BC Building Code.
  - .4 CSA Canadian Electrical Code.

### **1.3 Work Included**

- .1 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.
- .2 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 equipment with vendors.
  - .2 Inspection and acceptance of equipment following delivery.
  - .3 Report any visible damage to the contract administrator immediately.
  - .4 Offloading of 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 Supplied Equipment**

- .1 Equipment to be supplied by the contractor includes (Refer to project drawings):
  - .1 Boilers.
  - .2 Pumps.
  - .3 Pump VFDs.
  - .4 Leak detection panels.
  - .5 PLC panels.
  - .6 Temperature sensors/transmitters.
  - .7 Pressure sensors/transmitters.
  - .8 Flow meters/transmitters.
- .2 All documentation delivered with 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 General Requirements                      Section Divisions 0 & 1
- .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 All wiring shall be copper unless stated otherwise.
- .3 A minimum gage #18 AWG copper 3 wire cable shall be utilized unless stated otherwise for all controls service.
- .4 A minimum gage #12 AWG copper 3 wire cable shall be utilized unless stated otherwise for all power service.

### **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: 3 mm 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 Junction boxes shall be constructed of Aluminum, NEMA3X construction with screw off cover plate.
- .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 supply and install electric metallic tubing conduit for all wiring.
- .2 Flexible conduit can be utilized near terminations to a maximum length of 500 mm
- .3 Seal tight all connections.

## **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.

## **2.12 Uninterruptible Power Supply (UPS)**

- .1 Provide UPS with relay outputs indicating when battery is in use and when there is a UPS fault. These outputs shall be connected to the PLC such that the UPS status can be determined remotely.

- .2 Provide double-conversion type UPS.
- .3 Provide UPS capable of powering connected equipment (Control Panels and accessories) for a period not less than 120 minutes.

## **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 All metal components (including but not limited to panels, equipment, metallic raceways, junction boxes) shall be grounded. Ground continuity shall be ensured.

### **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 start-up 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**

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## **PART 1 GENERAL**

### **1.1 Scope**

- .1 This section covers the supply, termination and commissioning of the controls for the Containerized Boiler Plant Package.

### **1.2 Work Included**

- .1 This Section includes all labour, equipment, materials and incidentals for the supply, installation and commissioning of an operable Controls & Automation as shown on the drawings and specified herein.
- .2 Vendor shall fabricate / manufacture / supply all products / equipment as per the schedule in Part 5 in accordance with the specifications herein.
- .3 All panels and instruments shall be factory assembled, cleaned, inspected, and successfully tested prior to shipping.
- .4 The Containerized Boiler Plant shall have its own stand alone Control Panel that will maintain the sequence of operation outlined in Part 4.

### **1.3 Design Conditions**

- .1 Ambient temperature: 40°C.
- .2 Service Fluid Medium: treated water.
- .3 Design Pressure: 1,04 kPa (160 PSI).
- .4 Design temperature: 120°C.

### **1.4 Quality Assurance and Reference Standards**

- .1 Work shall be carried out only by qualified tradesmen licensed to practise in the jurisdiction of the Work.
- .2 Conform to all applicable standard specifications including but not limited to those referenced herein.

### **1.5 Local Authority & Jurisdiction**

The following bodies have jurisdiction over this project.

- .1 City of Surrey Permits & Inspections.
- .2 Latest CSA and Canadian electrical codes.
- .3 BC building Code with amendments.
- .4 Work Safe BC and BC safety Authority.

## **1.6 Warranty and Compliance**

- .1 All products / materials included in this scope shall include a one (1) year warranty from the date that the certificate of substantial completion to the installing contractor is signed or two (2) years from date of delivery to site; whichever come first.
- .2 It is the responsibility of the supplier to immediately replace any material found non-compliant to the project specifications after delivery to site.
- .3 It is the responsibility of the supplier to repair / correct any failure within the warranty period due to factory / manufacturing defects. Provisions shall be employed to maintain normal operation of the system.
- .4 Refer to Warranty requirements in the Front End.

## **1.7 Vendor Submittals**

- .1 Submit a Compliance Statement.
- .2 Submit Quotation Form.
- .3 Submit manufacturer's literature and catalogue information.
- .4 Submit shop drawings, including:
  - .1 Dimensions, shipping and operating weights.
  - .2 Materials of construction.
  - .3 Performance Data Sheets.
  - .4 Design ratings.
- .5 List of recommended spare parts where applicable.
- .6 After award and a minimum of 2 weeks before delivery, Vendor to submit a list of all shipped equipment and any loose materials included in the shipment.
- .7 After award, submit 2 hard copies and 1 soft copy of the Operation and Maintenance manuals.

## **1.8 Units**

- .1 All suppliers and contractors shall follow the SI metric system for all submissions and correspondence.

## **1.9 Schedule**

- .1 All products / materials included in this scope shall be delivered as per the "work Schedule" as stated in the City of Surrey Front-End.

## **1.10 Discrepancies and Omissions**

- .1 If a bidder is in doubt as to the meaning of the specifications or bid documents, or finds omissions or discrepancies therein, they shall submit a request for interpretation or correction thereof to the Owner. If discrepancies are not clarified the more stringent specification will be applied.



### **1.11 Addenda**

- .1 Addenda or corrections issued during the bid period shall become part of the Bid Documents.

### **1.12 Variations**

- .1 Subject to the requirements given herein, the bidder may submit for consideration, alternative specifications for the Work. These shall be listed accordingly in the Bid Form. The acceptability of proposed variations/exceptions will be in the sole judgement of the Owner.
- .2 The Vendor is encouraged to propose variations that can reduce the cost of the Controls & Automation system. Each variation proposed and the resulting price reduction compared to the originally specified system shall be listed accordingly in the Bid Form. The acceptability of proposed variations/exceptions will be in the sole judgement of the Owner.

## **PART 2 PRODUCTS**

### **2.1 General**

- .1 Refer to Design Conditions in Part 1.

### **2.2 Boiler Plant Control Panel**

- .1 BACnet IP protocol.
- .2 Refer to Part 4 for functional description.
- .3 Communicate with and power (where applicable) all instruments and energy meter within the ETS.
- .4 Communicate with an existing central control panel.
- .5 Enclosure NEMA 3X.
- .6 Control Panel shall allow for a clear space for inclusion of a MODBUS (or equivalent) communication card.
  - .1 Standard of Acceptance: Kara BACnet Gateway V2.2.

### **2.3 Pressure Transmitters (PT)**

- .1 Provide pressure transmitters to include the following general characteristics:
  - .1 Material of construction of all wetted parts shall be SS 316,
  - .2 Voltage surge protection.
  - .3 Over pressure protection to 1.5 of the design pressure.
  - .4 Stainless steel data plate to indicate instrument number.
  - .5 ½" NPT process connectors.
  - .6 NEMA 4 enclosure.
  - .7 Operator zero and span adjustment. Capability of adjusting zero span positively or negatively.

- .8 Remote configuration feature.
- .2 Input and Output characteristics shall be as follows:
  - .1 Supply voltage of 24 volts DC (loop powered).
  - .2 4 to 20mA output.
- .3 Accuracy limits shall be as follows:
  - .1 Accuracy to  $\pm 0.5\%$  of calibrated span including the combined effect of repeatability and hysteresis.
  - .2 Drift (over six months) less than  $\pm 0.3\%$  of calibrated span.
  - .3 Drift (due to temperature) less than  $\pm 0.5\%$  of calibrated span.
- .4 Standard of Acceptance:
  - .1 ABB.
  - .2 Endress – Hauser.
  - .3 Rosemount.
  - .4 Setra.
  - .5 Approved equal.

## **2.4 Differential Pressure Transmitter (DPT)**

- .1 Material of construction of all wetted parts shall be SS 316.
- .2 Voltage surge protection.
- .3 Over pressure protection to 1.5 of the design pressure.
- .4 Diaphragm isolation with adjustable internal damping.
- .5 NEMA 3X enclosure.
- .6 Supply transmitter with attached 3-valve manifold.
- .7 Operator zero and span adjustment.
- .8 Stainless steel data plate to indicate instrument number.
- .9 Input and Output characteristics shall be as follows:
  - .1 Supply voltage of 24 volts DC (loop powered)
  - .2 4 to 20mA output.
- .10 Accuracy limits shall be as follows:
  - .1 Accuracy to  $\pm 0.5\%$  of calibrated span.
- .11 Standard of Acceptance:
  - .1 ABB
  - .2 Endress – Hauser
  - .3 Rosemount
  - .4 Approved equal.

## **2.5 Temperature Transmitter (TT)**

- .1 Provide 3-wire Resistive Temperature Detector (RTD) probe as follows:

- .1 316 stainless steel sheath spring loaded RTD probe compatible with vendor supplied thermowells extending to 40% - 60% of the service pipe diameter.
- .2 ¾" NPT 316 SS tapered thermowell with a 2" extension for the pipe insulation
- .3 NEMA 4 enclosure.
- .2 Accuracy limits shall be as follows:
  - .1 Accuracy, repeatability and linearity to  $\pm 0.25\%$  of calibrated span.
  - .2 Transmitter calibrated for 3 wire PT 100 ohm platinum RTD input.
  - .3 4 - 20mA (loop powered, 24VDC) isolated output.
- .3 Stainless steel data plate to indicate instrument number.
- .4 Standard of Acceptance:
  - .1 ABB
  - .2 Endress – Hauser
  - .3 Approved equal.

## **2.6 Flow Meter (FE)**

- .1 The flow meter shall be ultra-sonic or tube type magnetic flow meters with ANSI Class 150 or 300 RF flange ends with drilling and dimensions conforming to ANSI B16.1
- .2 Materials of Construction:
 

.1 Flanges	-	Carbon Steel
.2 Metering tube	-	SS 316
.3 Electrodes	-	Stainless steel
.4 Liner	-	Teflon
- .3 Accuracy (minimum)
  - .1  $\pm 1\%$  of flow meter range (corresponding to velocities of 0.3 to 10 meters per second) for each flow meter.
- .4 Electrical Power 120 volt AC +/-20% at 60 Hz or 24 VDC.
- .5 The flow meter shall have the following construction and features:
  - .1 4 - 20mA Active Output Current
  - .2 Digital Display - 2 line (minimum) display
  - .3 Remote configuration feature.
- .6 Complete dimensional prints, electrical schematics and technical literature for the ultra-sonic or magnetic flow meter, transmitter and associated components shall be submitted for the Engineer's approval prior to placing order for supply.
- .7 Stainless steel data plate to indicate instrument number.
- .8 Standard of Acceptance:
  - .1 Endress-Hauser
  - .2 ABB

- .3 Siemens
  - .4 Kamstrup
  - .5 Approved Equal.
- .9 All flow meters shall be the same model and supplied by a single supplier.

## **PART 3 EXECUTION**

### **3.1 General**

- .1 Refer to Supplier recommendations for the installation of all controls components.
- .2 Contractor shall receive, inspect, handle and store all equipment supplied by the Vendor at the storage facility provided by the Owner.
- .3 All flow meters and control valves shall be field insulated using an insulation blanket.

### **3.2 Transmitters**

- .1 Transmitters shall be stored by the Contractor on site in a clean heated and secure environment.
- .2 Mount in accordance with the manufacturer's detailed instructions.
- .3 Mount as shown on P&IDs.
- .4 Piping connections will be completed by C02 Contractor.
- .5 Confirm, and if necessary adjust, the factory calibrated zero suppression/elevation and range for each pressure transmitter.

### **3.3 Flow meters**

- .1 Minimum straight length of 5D upstream and 3D downstream for magnetic flow meters; minimum straight length of 10D upstream and 5D downstream for ultrasonic flow meters.
- .2 Flow meters shall not be placed on a vertical pipe if the flow is towards gravity.
- .3 Flow meters shall have an accuracy of  $\pm 2\%$ .

## **PART 4 FUNCTIONAL DESCRIPTION**

### **4.1 System Overview**

- .1 The controls architecture for this package is to control the operation of the boilers and circulation pumps for the supply of hot water to the distribution piping system.
- .2 Monitored variables:
  - .1 Boiler operation
  - .2 Pump operation
  - .3 Supply water pressure
  - .4 Return water pressure

- .5 Supply water temperature
- .6 Return water temperature
- .7 Package flow rate
- .8 Load differential pressure.
- .3 The following components will be provided with dedicated controllers:
  - .1 Pumps
  - .2 Boilers.
- .4 Additional control components include:
  - .1 Flow meters
  - .2 Temperature and pressure sensors.
- .5 The Containerized Boiler Plant will have its own standalone controls system that will enable seamless operation in case communication is lost with the central control system.
- .6 Control system will be designed for remote monitoring.
- .7 The plant will be equipped with an auto-dialer to call out operating staff when they are not in attendance at the plant. The auto-dialer will allow for a minimum of 6 unique call out message.

#### **4.2 Distribution Pumps**

- .1 Automatic mode:
  - .1 Pumps to modulate flow to maintain a set differential pressure monitored by a sensor located at a remote location.
  - .2 Pump staging to ensure no equipment cycling and first in first out (FIFO) logic.
- .2 Semi-automatic mode:
  - .1 Pumps to modulate based on a load differential pressure point by the user.
- .3 Manual mode:
  - .1 User to set pump speed.

#### **4.3 Boiler Staging**

- .1 Pump Protection
  - .1 Pump motor shall be hard wired to a flow switch to prevent dry run or shut off flow over 5 seconds.
  - .2 Boiler shall start/stop pump to meet boiler requirements
- .2 Instrumentation Indication
  - .1 Refer to P&ID's for instrumentation indication requirements.
- .3 Alarms Schedule
  - .1 Hot water return temperature low limit.
  - .2 Hot water return temperature high limit.

- .3 Hot water supply temperature low limit.
- .4 Hot water supply temperature high limit.
- .5 High pressure limit.
- .6 Low pressure limit.
- .7 Low differential pressure limit.
- .8 High flow limit.
- .9 Low ambient temperature.
- .10 Boiler failure.
- .11 Pump failure.
- .12 Gas detection.
- .4 Emergency Shutdown
  - .1 Provide emergency shutdown buttons.

#### **4.4 Overall Sequence of Operation**

- .1 Overview.
- .2 The heating hot water system shall consist of two condensing boilers, two non-condensing boilers, four primary loop pumps, and two secondary loop pumps with VFD.
- .3 The intent is for the two non-condensing boilers to remain off until the hot water supply temperature set-point (HWSTSP) or system demand exceeds the capacity of the condensing boilers.
- .4 Temperature Reset.
- .5 The control system shall modulate the boiler firing rates to provide a constant hot water supply temperature set point (HWSTSP) which will be reset proportionally from 95°C down to 60°C as outside air temperature varies from -14°C up to 21°C.
- .6 Primary System (Increasing Load).
- .7 The two condensing boilers and non-condensing boilers will operate together in order to maintain the hot water supply temperature set point (HWSTSP) to the system.
- .8 The control scheme shall prioritize a condensing boiler as the first boiler to start and shall start the condensing boiler and its associated constant volume primary pump. The boiler firing rate shall be modulated in order to maintain the leaving HWSTSP.
- .9 If the HWSTSP is not satisfied within a five minute time, an additional condensing boiler and its associated constant volume primary pump shall be started. Once two boilers are started operating, the boiler firing rate shall be identical and modulate together in order to maintain the HWSTSP.
- .10 If the HWSTSP is not satisfied within a five minute time of the second condensing boiler start, an additional non-condensing boiler and its associated constant volume

primary pump shall be started. In this scenario, the two condensing boilers should be at 100% firing rate and still not able to achieve the desired HWSTSP. The non-condensing boiler firing rate shall be modulated in order to achieve the HWSTSP.

- .11 If the HWSTSP is not satisfied within a five minute time of the first non-condensing boiler being started, an additional non-condensing boiler and its associated constant volume primary pump shall be started. Once two non-condensing boilers are started operating, the boiler firing rates of both non-condensing boilers shall be identical and modulate together in order to maintain the HWSTSP.
- .12 Primary System (Decreasing Load).
- .13 As the load decreases, the condensing boilers become capable of maintaining the HWSTSP without use of the non-condensing boilers. As the supply temperature leaving the condensing boilers is able to maintain the HWSTSP, the non-condensing boiler firing rate will continue to drop. Once the firing rates for two non-condensing boilers are lower than 40%, stop a non-condensing boiler and associated primary pump.
- .14 As the system demand continues to drop, a single operating non-condensing boiler will reduce its firing rate to 0% (thus cycling off). Once the remaining non-condensing boiler firing rate is lower than 5%, stop the non-condensing boiler and associated primary pump.
- .15 The control system can either decide to maintain two condensing boilers operating to maintain the system demand, or to stop a condensing boiler based on firing rates of less than 40%.
- .16 Secondary System.
- .17 The control system shall modulate the variable speed secondary pumps to maintain an operator-entered differential pressure at the end of the distribution piping system. A differential pressure transmitter (DPT) shall be installed at the end of the heating hot water piping system. The DPT shall produce an alarm whenever the measurement is below the desired setpoint for 5 minutes. The DPT shall be monitored and used by a controller to provide an output signal varying the secondary pumps' speed as necessary to maintain the desired DPT.

## **END OF SECTION**

**SCHEDULE B  
SAMPLE CONSTRUCTION *CONTRACT***

**Title: District Energy System Phase 1 – Containerized Boiler Plant**

**AGREEMENT No.: 1220-040-2014-001**

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**CCDC2  
Stipulated Price *Contract*  
2008**

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and

**SUPPLEMENTARY GENERAL CONDITIONS  
As Supplemented by the City of Surrey**



**SCHEDULE B – SAMPLE AGREEMENT**

**AGREEMENT SCHEDULE 1 – LIST OF *DRAWINGS***

(Complete listing of all *Drawings*, plans and sketches that are part of the *Contract Documents*)

<b>TITLE</b>	<b>DRAWING NO.</b>	<b>DATE</b>	<b>REVISION DATE</b>	<b>REVISION NO.</b>

## **SCHEDULE B – APPENDIX 1**

### **SUPPLEMENTARY GENERAL CONDITIONS**

#### **(SUPPLEMENTARY GENERAL CONDITIONS ARE MODIFICATIONS TO CCDC 2 – 2008 STIPULATED PRICE CONTRACT)**

The Standard Construction Document for Stipulated Price *Contract*, 2008 English version, consisting of the Agreement Between *Owner* and *Contractor*, Definitions, and General Conditions of the Stipulated Price *Contract*, Parts 1 to 15 inclusive, governing same is hereby made part of these *Contract Documents*, with the following amendments, additions and modifications. Where these amendments, additions, and modifications specifically reference a change to the Agreement, Definitions, or General Conditions, these amendments, additions and modifications shall govern.

#### **AGREEMENT BETWEEN OWNER AND CONTRACTOR**

##### **ARTICLE A-4 - CONTRACT PRICE**

1. Refer to Article A-4.1:

Delete entirely and substitute the following:

“The *Contract Price*, which excludes *Value Added Taxes*, will be the sum of the *Cash Allowances* and *Approved Prices* as indicated on Appendix A – *Contract Prices* as approved pursuant to GC 3.1.3. For reference Appendix A – *Contract Prices* shows an indicative *Contract Price* but for certainty the parties anticipate that actual final *Contract Price* will be a different amount.”

##### **ARTICLE A-5 PAYMENT**

2. Refer to Article A-5.1:

Insert “ten” and “10” respectively in the two blanks.

3. Refer to Article A-5.3:

Delete Article A-5.3, including all of 5.3.1 and 5.3.2, in its entirety.

4. Refer to Article A-6.1:

Delete the first paragraph entirely and substitute the following:

“*Notices in Writing* required or permitted to be given under the *Contract Documents* will be considered to have been sufficiently given to a party if delivered by hand or courier, or by prepaid first class mail, by receipt-able email, or if transmitted by facsimile to the address or facsimile number of that party as set out below. The *Notice in Writing* will be deemed to have been received:

- .1 on the date of delivery if delivered by hand or courier during normal business hours of the receiver on a *Working Day*, upon receipt by a responsible representative of the receiver, and if not delivered during normal business hours, upon commencement of normal business hours on the next *Working Day*;
- .2 five (5) calendar days after the date on which it was mailed, provided that if the fifth day is not a *Working Day*, then the *Notice in Writing* will be deemed to have been received on the next *Working Day* following the fifth day; and
- .3 on the date of delivery if delivered by facsimile during normal business hours of the receiver on a *Working Day*, upon receipt at the facsimile number, and if not

delivered during normal business hours, upon commencement of normal business hours on the next *Working Day*, except that the sender of a facsimile bears all risk that the receiver's facsimile equipment will function properly and that the facsimile will actually be received by the receiver.

- .4 on the date of transmission by email providing electronic receipt is confirmed by the sender

An address for a party may be changed by *Notice in Writing* to the other party in accordance with this Article setting out the new address."

## DEFINITIONS

5. Refer to Paragraph 4:

Delete the definition of *Consultant* entirely and substitute the following:

**"4. Consultant**

The *Consultant* is the person or entity engaged by the *Owner* as identified in the *Contract Documents*, and includes the *Consultant's* authorized representative."

6. Refer to Paragraph 6:

In the definition of *Contract Documents* immediately before the word "amendments" in the second line, insert "written".

7. Refer to Paragraph 9:

In the definition *Contractor* delete the first sentence and substitute: "*Contractor* means the person or entity identified as the "Construction Manager" in the executed Canadian Construction Association CCA-5 Form of Agreement."

8. Refer to Paragraph 24:

Delete entirely and substitute the following:

"*Value Added Taxes* means such sum as shall be levied upon the *Contract Price* for Goods and Services Tax (GST) or Harmonized Sales Tax (HST) as may be applicable pursuant to the *Excise Tax Act*."

9. New Paragraph 27:

Add the following:

**"27. Approved Prices**

*Approved Prices* has the meaning set out in GC 3.1.3."

10. New Paragraph 28:

Add the following:

**"28. Builders Lien Act**

*Builders 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 *Place of the Work*."

11. New Paragraph 29:

Add the following:

**"29. Cash Allowance**

*Cash Allowance* has the meaning set out in GC 3.1.3."

12. New Paragraph 30:

Add the following:

**"30. Certificate of Substantial Performance**

*A Certificate of Substantial Performance* is a certificate of completion as defined in the *Builders Lien Act*, issued by the *Consultant*."

13. New Paragraph 31:

Add the following:

**"31. Construction Schedule**

*Construction Schedule* means the schedule prepared by the *Contractor* for the performance of the *Work* as set out in Appendix "C" attached hereto including any amendments to the *Construction Schedule* made pursuant to the *Contract Documents*."

14. New Paragraph 32:

Add the following:

**"32. General Requirements**

*General Requirements* means the line items as listed in Appendix B – General Requirements."

15. New Paragraph 33:

Add the following:

**"33. Overhead**

*Overhead* means all costs associated with management, supervision, insurance, bonding, as-built preparation and warranty, administration and supervision at the *Place of the Work* (including the provision of and maintaining office coordination, office costs, supervision, site trailer, telephone service, and long distance charges) courier, permits, insurance and bonding costs (including premium increases), small tools and general office supplies as required for the performance of the *Work*."

16. New Paragraph 34:

Add the following:

**"34. Total Performance of the Work**

*Total Performance of the Work* means when all *Work*, including all deficiencies but excluding any correction of completed *Work* that appears during the 1 year warrantee period or other on-going warranty or guarantee obligations as provided by the *Contract Documents*, has been performed as required by the *Contract Documents*, as certified by the *Consultant*."

## GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

### PART 1 GENERAL PROVISIONS

#### GC 1.1 CONTRACT DOCUMENTS

17. Refer to GC 1.1.3:

Delete entirely and substitute the following:

"1.1.3 The *Contract Documents* are complementary, and what is required by any one will be binding as if required by all, provided that nothing contained in the technical *Specifications* or *Drawings* amends the *Contract*, the General Conditions or the Supplementary Conditions. Information contained in the technical *Specifications* or *Drawings* may only expand upon, augment or define a method of implementation described in the *Contract*, the General Conditions or the Supplementary Conditions."

18. Refer to GC 1.1.7.1:

Delete entirely and substitute the following:

- "1 The order of priority of documents, from highest to lowest, shall be:
- (1) Agreement between the *Owner* and the *Contractor*,
  - (2) Addenda,
  - (3) Definitions,
  - (4) Supplementary General Conditions,
  - (5) General Conditions,
  - (6) Appendix "A" – *Contract Price*
  - (7) Appendix "B" – *General Requirements*
  - (8) Appendix "C" – *Construction Schedule*
  - (9) Appendix "D" – List of *Drawings* and *Specifications*
  - (10) Appendix "E" – Prime *Contractor* Designation – Letter of Understanding
  - (11) Appendix "F" – Risk, Health & Safety (Responsibility of *Contractors*)
  - (12) Appendix "G" – Site Safety Plan & Emergency Response Information, including Key Personnel of Construction Team
  - (13) Performance Bond
  - (14) Appendix "I" – Confirmation of Vehicle Insurance
  - (15) Appendix "J" – Traffic Management Plan
  - (16) Appendix "K" – Statutory Declaration
  - (17) Appendix "L" – Workers' Compensation Board Clearance Letter
  - (18) Appendix "M" – Certificate of Substantial Performance of the work
  - (19) Appendix "N" – Notice of Certificate of Completion

19. New GC 1.1.11:

Add the following:

"1.1.11 The *Contractor* shall be responsible for all *Work* as required by the *Contract Documents*."

20. New GC 1.1.12:

Add the following:

"1.1.12 All instructions given by or on behalf of the *Consultant* or the *Owner* under the *Contract Documents* shall be given to the *Contractor* and the *Contractor* shall be responsible for giving such instructions to *SubContractors* as may be necessary for the due and proper performance of the *Work* being performed by *SubContractors*."

#### **GC 1.4 ASSIGNMENT**

21. Refer to GC 1.4.1:

Delete entirely and substitute the following:

"1.4.1 The *Contractor* shall not assign or transfer their interest in the *Contract* or any portion thereof, directly or indirectly, without the prior written consent of the *Consultant* and the *Owner*."

#### **PART 2 ADMINISTRATION OF THE CONTRACT**

##### **GC 2.2 ROLE OF THE CONSULTANT**

22. Refer to GC 2.2.7:

Delete the words "Except with respect to GC 5.1 - FINANCING INFORMATION REQUIRED OF THE *OWNER*" from the first line.

23. Refer to GC 2.2.10:

After the words "reasonable time." add the following words:

"Notwithstanding any other provision in the *Contract Documents*, any interpretation, finding, determination, ruling or decision of any kind made by the *Consultant* will not be final and may be disputed by either party pursuant to Part 8 - DISPUTE RESOLUTION."

##### **GC 2.3 REVIEW AND INSPECTION OF THE WORK**

24. Refer to GC 2.3.4:

In the first line, delete the word "special", and replace with "review", and at the end of the sentence, add "review", before the third instance of "inspections".

#### **PART 3 EXECUTION OF THE WORK**

##### **GC 3.1 CONTROL OF THE WORK**

25. Refer to GC 3.1.1:

After the words "*Contract Documents*" in line 2, insert the words "in a good and workmanlike manner and in accordance with accepted industry practice".

26. New GC 3.1.3:

Add the following:

"3.1.3 The parties have collaborated to prepare Appendix A – *Contract Price* as follows:  
.1 the total scope of *Work* has been divided into the line items as set out in column #2 of Appendix A – *Contract Price*. All elements of the *Work* will be allocated,

without duplication, to one of the line items, regardless of the description listed in column #2;

- .2 a cash allowance (each a **"Cash Allowance"**) has been determined for certain line items as set out in column #3 of Appendix A – *Contract Price*, which represents the parties' best estimate for the cost of performing the *Work* related to a line item;
- .3 the *Contractor* will not proceed with the *Work* related to a given line item without the *Owner's* prior written approval, and will not be entitled to any payment for such line item *Work* prior to the *Owner* agreeing to an approved fixed price (the **"Approved Price"**) for that line item, established as described below. The *Approved Prices*, when approved, will be inserted into column # 4 of Appendix A – *Contract Price*, and as full payment for the performance of such *Work*, the *Approved Price* will be included in the *Contract Price* (in substitution for the *Cash Allowance* for that line item), and paid by the *Owner* in accordance with the terms of this *Contract*. For certainty the *Cash Allowances* are intended to be indicative and the *Contractor* will not be entitled to payment of any *Cash Allowance* amount;
- .4 for certainty an *Approved Price* may change the *Contract Price* but does not change the *Contract Time*;
- .5 the *Owner* agrees to use its best commercial efforts to review and agree on proposed *Approved Prices* within fifteen (15) *Working Days* of submission for approval by the *Contractor*."

27. New GC 3.1.4:

Add the following

"3.1.4 The *Approved Prices* for each line item in Appendix A – *Contract Price* will be established as follows:

- .1 *Approved Prices* have been agreed to and fixed as follows:
  - (1) for line item 1 for the *Contractor's* fee and *Overhead* owing by the *Owner* with respect to the *Total Performance of the Work*;
  - (2) for line item 2 for the *Contractor's* Fixed General Requirements;
  - (3) for line item 3 for the scope of the work
- .2 for all of the *Work* relating to each of the line items 4 (Extended dewatering, ESC, and ongoing maintenance beyond the duration of phase I) through to and including line item 7 (Construction of temporary access roads) the *Contractor* will obtain competitive market prices (generally at least three) from prequalified arms-length *SubContractors* and *Suppliers*, in *Work* packages as the *Contractor* may decide in consultation with the *Owner*, and provide the *Owner* with a recommendation of the *SubContractor* or *Supplier*, at fixed *Contract Prices*, (including all *Overhead* and profit payable to the *SubContractor* and *Supplier*) for approval by the *Owner*, which approval will not be unreasonably withheld;
3. upon written approval by the *Owner*, the *Contractor* will enter into a subContract with the approved *SubContractor* or *Supplier* and the subContract Price will be added to column #4 as an *Approved Price* in substitution for the *Cash Allowance* for that line item;
- .4 the *Contractor* will perform the *Work* only by the use of *SubContractors* and *Suppliers* approved by the *Owner* as described in this GC;
- .5 with the *Owner's* prior written consent, the *Contractor* may exclude minor items from the scope of a *Contract* with a *SubContractor* or *Supplier* for any line item of the *Work* in Appendix A – *Contract Prices* and performed by the *Contractor* for fixed *Approved Prices* as agreed by the *Owner*."

28. New GC 3.1.5:

Add the following:

- "3.1.5 The *Contractor* agrees that the total *Contract Price* as set out in Appendix A – *Contract Price*, as of the date of execution of this *Contract*, is a reasonable estimate of the actual total cost of the *Work*, and accordingly the *Contractor* will use all reasonable commercial efforts, including cooperating with the *Owner* at the *Contractor's* cost to:
- .1 obtain *SubContractor* and *Supplier* prices, for the line items of the *Work* that for each line item is no greater than the corresponding *Cash Allowance*;
  - .2 if a *SubContractor* or *Supplier* price exceeds the corresponding *Cash Allowance*, cooperate with the *Owner* to perform value engineering or take other appropriate steps so that the actual total *Contract Price* does not exceed the total *Contract Price* as set out in Appendix A – *Contract Price* as of the date of the execution of this *Contract*.
  - .3 for clarity pursuant to GC 3.1.3, upon written approval of the *Owner* of the proposed sub*Contract Price* (Approved Price), such sub*Contract* will be paid by the *Owner* as part of the *Contract Price*, whether such sub*Contract Price* is greater or less than the corresponding *Cash Allowance*."

29. New GC 3.1.6:

Add the following:

- "3.1.6 If at any time agreement on an *Approved Price* or other matter under this GC 3.1 is not achieved between the parties then the *Owner* may, at its election, determine the amount of the *Approved Price*, and the *Contractor* will proceed with the *Work* without interruption or delay without prejudice to the *Contractor's* right to dispute such determination under Part 8 of the *Contract*."

**GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS**

30. Refer to GC 3.2.4:

In line 2, after the words "*Contractor* shall" insert the words "as part of the *Work*, without additional cost to the *Owner*".

**G.C. 3.5 CONSTRUCTION SCHEDULE**

31. Refer to GC 3.5:

Delete entirely and substitute the following:

- "3.5.1 The *Contractor* shall:
- .1 commence the *Work* promptly following the date of execution of this agreement; and
  - .2 pursue the *Work* diligently to ensure that each of the milestone events for the completion of each component of the *Work* as identified in the *Construction Schedule*, as amended from time to time in accordance with paragraph 3.5.2 is achieved at or before the time specified therefore in the *Construction Schedule*.
- 3.5.2 The *Construction Schedule* sets out the schedule in accordance and with which the *Contractor* is to carry out the *Work* provided for in the *Construction Schedule*.
- 3.5.3 The *Contractor* will submit to the *Consultant* and the *Owner's* project manager from time to time an update of the *Construction Schedule* to amend the milestone events for the completion of the relevant *Work* provided that no such amendment of the *Construction Schedule* shall amend the *Contract Time* (except to reflect any extension of the *Contract Time* agreed to in writing by the *Owner*).



- 3.5.4 If in the reasonable opinion of the *Consultant* or the *Contractor* at any time the actual progress of the *Work* does not conform with the *Construction Schedule*, then, within ten (10) *Working Days* the *Contractor* shall:
- .1 provide the *Consultant* with a report identifying the reasons for such nonconformity with the *Construction Schedule*;
  - .2 submit to the *Consultant* for review a revised *Construction Schedule*, which shall:
    - (1) be in accordance with Good Industry Practice;
    - (2) satisfy the design and construction requirements of the *Contract Documents*; and
    - (3) provide for the *Work* to be pursued diligently in accordance with Paragraph 3.5.1.
- 3.5.5 The *Owner* may at any time as a *Change* request a revision to the *Construction Schedule* to accelerate the performance of the *Work* or any component thereof, provided the parties agree to a change in *Contract Price*

### **GC 3.6 SUPERVISION**

32. Refer to GC 3.6.1:

After the words "valid reason" insert the words "and with the consent of the *Consultant*, which consent will not be unreasonably withheld".

33. New GC 3.6.3:

Add the following:

"3.6.3 The *Contractor* will, upon the request of the *Consultant* or *Owner*, remove any superintendent who, in the opinion of the *Consultant* or *Owner* acting reasonably, is incompetent or has been guilty of improper conduct, and will forthwith designate another replacement superintendent who is acceptable to the *Consultant* acting reasonably."

34. New GC 3.6.4:

Add the following:

"3.6.4 If the *Contractor* breaches GC 3.6 – SUPERVISION then the *Consultant* may refuse to issue any certificates referred to in GC 5.3 – PROGRESS PAYMENT until a superintendent acceptable to the *Consultant* has returned to the *Place of the Work*."

### **GC 3.7 SUBCONTRACTORS AND SUPPLIERS**

35. Refer to GC 3.7.2:

Add the following at the end:

"The *Contractor* shall not employ any *SubContractor* or *Supplier*, or change a *SubContractor*, or *Supplier* without the written approval of the *Owner*, which approval will not be unreasonably withheld."

36. Refer to GC 3.7.4:

Add the following at the end:

In line 2 after the words "required change", add the following words:

"The *Contractor* will not employ any *SubContractor*, or change a *SubContractor*, without the prior written approval of the *Consultant*, which approval will not be unreasonably withheld."

37. New GC 3.7.7:

Add the following:

"3.7.7 The *Contractor* will provide only personnel who have qualifications, experience, and capabilities to perform the *Work*."

**GC 3.8 LABOUR AND PRODUCTS**

38. New GC 3.8.4:

Add the following:

"3.8.4 "Immediately upon receiving from the *Consultant* a written notice stating the *Consultant's* reasonable objection to the work conduct of any superintendent, foreman or worker at the *Place of the Work*, the *Contractor* will remove such persons from the *Place of the Work*."

**GC 3.9 DOCUMENTS AT THE SITE**

39. Refer to GC 3.9.1:

"3.9.1 In the first line, immediately after the words "*Contract Documents*," insert "reviewed shop *Drawings*,".

**GC 3.10 SHOP DRAWINGS**

40. Refer to GC 3.10.1:

Add the following at the end:

"The *Shop Drawings* provided by the *Contractor* will be complete and show the entire extent of the relevant portion of the *Work*."

41. Refer to GC 3.10.2:

Delete entirely and substitute the following:

"3.10.2 The *Contractor* will provide *Shop Drawings* to the *Consultant* to review in an orderly sequence, properly referenced including date, drawing number and revision numbers as applicable, and sufficiently in advance so as to give the *Consultant* a reasonable opportunity to review without causing a delay to the *Work* or the work of other *Contractors*."

42. New GC 3.10.13:

Add the following:

"3.10.13 Upon *Substantial Performance of the Work*, the *Contractor* will submit all reviewed and revised *Shop Drawings electronically to the Consultant to be retained as part of the Owner's permanent record of the Work*."

43. New GC 3.10.14:

"3.10.14 The *Contractor* will not proceed with the *Work* to which a *Shop Drawing* applies before the *Consultant* has reviewed and returned the shop drawing as provided by GC 3.10.12."

**GC 3.11 USE OF WORK**

44. New GC 3.11.3:

Add the following:

"3.11.3 The *Owner* reserves the right to take possession of and use any completed or partially completed portion of the building, regardless of the time of completion of the entire *Work*, providing that doing so does not interfere with the *Contractor's Work*. Such taking possession or use of the buildings or part thereof shall not be construed as *Substantial Performance* of the *Work* or part thereof, or as final certificate for payment, or as an acknowledgement of fulfillment of the *Contract*."

45. New GC 3.11.4:

Add the following:

"3.11.4 The *Contractor* shall schedule the operations for completion of portions of the *Work* as designated for the *Owner's* occupancy, prior to *Substantial Performance of the Work*. There will only be one date of *Substantial Performance of the Work* for the *Contract*."

**PART 4 ALLOWANCES**

**GC 4.1 CASH ALLOWANCES**

46. Refer to GC 4.1.3:

After the word "authorized" insert the words "in advance". Add the following at the end:

"When *Cash Allowances* are converted to *Approved Prices* any documents, *Drawings*, *Specifications* that are the basis of the solicitation revising *Cash Allowances* to *Approved Prices* are listed in the *Change Order* as an addition to the *Contract Documents*."

47. Refer to GC 4.1.4:

Delete entirely and substitute the following:

"4.1.4 Where the actual cost of the *Work* under any *Cash Allowance* exceeds the amount of the allowance, any unexpended amount from other cash allowances shall be reallocated, at the *Consultant's* direction, to cover the shortfall, and, in that case, there shall be no additional amount added to the *Contract Price* for *Overhead* and profit. Only where the actual cost of the *Work* under all *Cash Allowances* exceeds the total amount of all cash allowances shall the *Contractor* be compensated for the excess incurred and substantiated, plus an amount for *Overhead* and profit on the excess only, as set out in the *Contract Documents*."

48. Refer to GC 4.1.5:

Delete entirely and substitute the following:

"4.1.5 The net amount of the unexpended *Cash Allowances*, after providing for any reallocations as contemplated in paragraph 4.1.4, shall be deducted from the *Contract Price* by *Change Order* without any adjustment for the *Contractor's Overhead* and profit on such amount."

49. New GC 4.1.8:

Add the following:

"4.1.8 All *Work* under *Cash Allowance* is to be competitively bid unless directed by the *Owner*. The *Contractor* shall keep records and submit a monthly update on expenditures towards *Cash Allowance* including unallocated amounts."

## **GC 4.2 CONTINGENCY ALLOWANCE**

50. Refer to GC 4.2.2:

Delete entirely.

## **PART 5 PAYMENT**

### **GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER**

51. Refer to GC 5.1:

Delete GC 5.1, including all of GC 5.1.1 and GC 5.1.2, in its entirety.

### **GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT**

52. Refer to GC 5.2.3:

Add the following at the end.

"The *Contractor* will identify separately, with reference to the applicable *Change Order*, any application for payment for *Work* performed pursuant to a *Change Order*. No payment for extras or changes will be made before the issuance of the applicable *Change Order*."

53. New GC 5.2.8:

Add the following:

"5.2.8 Prior to making an application for payment, the *Contractor* will provide a updated *Construction Schedule* in accordance with paragraph 3.5.1.2 of GC 3.5 – *CONSTRUCTION SCHEDULE*."

### **GC 5.3 PROGRESS PAYMENT**

54. Refer to GC 5.3.1.2:

Delete entirely and substitute the following:

"5.3.1.2    "the *Consultant* will issue to the *Owner* and copy to the *Contractor*, no later than five (5) calendar days after the receipt of the application for payment in the amount applied for, or in such other amount as the *Consultant* determines to be properly due. If the *Consultant* amends the application, the *Consultant* will promptly advise the *Contractor* in writing giving the reasons for the amendment."

55.    Refer to GC 5.3.1.3:

Delete entirely and substitute the following:

"5.3.1.3    the *Owner* to make payment to the *Contractor* on account as provided in Article A-5 of the Agreement - PAYMENT net thirty (30) calendar days from invoice date after receipt by the *Consultant* of the *Contractor's* invoice on a best commercial efforts basis."

56.    New GC 5.3.2:

Add the following:

"5.3.2        The *Owner* may set off from payments owing to the *Contractor* costs, expenses and damages the *Owner* incurs or suffers  
              .1    as a result of the *Contractor's* wrongful or negligent act or omission, including a breach of this *Contract*; or  
              .2    which the *Owner* incurs on the *Contractor's* behalf."

57.    New GC 5.3.3:

Add the following:

"5.3.3        If at any time prior to the expiry of the 45 calendar day filing period after *Substantial Performance* of the *Work* a builders lien is filed by a party or person working under the *Contractor* (including a *SubContractor*, Sub sub*Contractor*, supplier, or worker of the *Contractor*) against the lands upon which the *Project* is constructed, the *Contractor* shall take steps to have the lien removed from title to the *Owner's* property within ten (10) *Working Days* after becoming aware of the lien. If the *Contractor* fails to remove the lien from title, the *Owner* may take steps to post security for the lien, by making application pursuant to the *Builders Lien Act*. In such case the *Contractor* will be responsible for the costs incurred by the *Owner* in removing the lien and such costs may be deducted from any payment then or thereafter due to the *Contractor*. Provided however, that this clause shall not apply to any lien filed by any other *Contractor*, or anyone working under any other *Contractor*."

58.    New GC 5.3.4:

Add the following:

"5.3.4        In addition to builders lien holdbacks, the *Owner* may retain holdbacks to cover deficiencies in the *Work*, in an amount equal to twice the amount the *Consultant* estimates as the total cost to complete the deficiencies."

**GC 5.5 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK**

59    Refer to GC 5.5.3:

Delete entirely.

60. Refer to GC 5.5.4:

Delete entirely and substitute the following:

"5.5.4 The builders lien holdback is due and payable on the first day following the expiration of the holdback period subject to the *Owner's* right to retain out of the holdback amount:  
.1 amounts required to satisfy any liens filed with respect to the *Work*;

**GC 5.6 PROGRESSIVE RELEASE OF HOLDBACK**

61. Refer to GC 5.6.1:

Delete the last sentence that begins in line 5 that for reference reads: "The *Owner* may retain...enforceable against the *Owner*." and substitute the following:

"The *Owner* may retain out of a holdback amount:  
.1 amounts required to satisfy any liens filed with respect to the *Work*;

62. New GC 5.6.4:

Add the following:

"5.6.4 The *Contractor* will provide all necessary documentation reasonably required by the *Consultant* to determine amounts of such sub*Contract* work and verify substantial performance of such sub*Contract* work."

**GC 5.7 FINAL PAYMENT**

63. Refer to GC 5.7.2:

At the end of the first sentence add:

"The application by the *Contractor* for payment upon *Total Performance* of the *Work* shall only be made after the inclusion of the following:  
(1) a Statutory Declaration, completed in duplicate, that all accounts due have been paid;  
(2) A letter from the Workers' Compensation Board confirming that the *Contractor* is in good standing."

64. Refer to GC 5.7.4:

Delete "no later than five (5) calendar days after the issuance of a final certificate for payment" and substitute with "net thirty (30) calendar days after receipt by the *Consultant* of the *Contractor's* invoice, on a best commercial efforts basis".

65. New GC 5.7.5:

Add the following:

"5.7.5 The *Consultant* will not issue the final certificate for payment until the *Contractor* has submitted a release from the Workers Compensation Board covering work of the *Contract* to completion, plus inspections and approval certificates of all authorities with jurisdiction."

66. New GC 5.7.6:

Add the following:

- "5.7.6 The issuance of a final certificate for payment in no way relieves the *Contractor* from correcting defects or deficiencies not apparent at the time the certificate is issued."

## **GC 5.8 WITHHOLDING OF PAYMENT**

67. Refer to GC 5.8.1:

In line 2 after the word "performed," add the words "subject to the *Builders Lien Act*".

## **PART 6 CHANGES IN THE WORK**

### **GC 6.1 OWNER'S RIGHT TO MAKE CHANGES**

68. New GC 6.1.3 and GC 6.1.4:

Add the following:

- "6.1.3 Whenever the *Consultant* delivers a written request to the *Contractor* for a quotation of a possible change, the *Contractor* will within ten (10) *Working Days* after receiving such request provide to the *Consultant* in writing a quotation of the value of the contemplated change (increase or decrease) and a statement of the effect, if any, of the contemplated change on the *Construction Schedule*. The *Contractor's* written quotation and statement will be interpreted to include all costs, including any indirect or "impact" effects, and all effects on the *Construction Schedule*. The *Contractor* will not be entitled to claim on account of any cost or effect not included specifically in the quotation and statement unless the quotation and statement specifically itemize and describe such indirect effects."
- "6.1.4 The method of adjustment and the amount of adjustment of the *Contract Price* for the proposed change shall be determined on one or more of the following methods:
- .1 By unit prices agreed upon;
  - .2 By estimate by the *Contractor* and mutual agreement between the *Contractor* and the *Owner* of a lump sum."

### **GC 6.2 CHANGE ORDER**

69. Refer to 6.2.1:

Add the following:

"Subject to GC 3.1.3," before the beginning of GC 6.2.1."

70. New GC 6.2.3:

Add the following:

- "6.2.3 If the method of valuation, measurement, change in *Contract Price* and change in *Contract Time* cannot be promptly agreed upon and the change is required to be proceeded with, then the *Consultant* in the first instance will determine the method of valuation, measurement, the change in *Contract Price* and *Contract Time* and the *Contractor* shall promptly proceed with the change. The *Contractor* may dispute the *Consultant's* determinations as specified in GC 8.2."

71. New 6.2.4:

Add the following:

- "6.2.4 The value of a change in the *Work* shall be determined in one or more of the following methods as selected by the *Consultant* in consultation with the *Owner*.
- .1 by estimate and acceptance in a lump sum;
  - .2 where unit prices are set out in the *Contract Documents* or subsequently agreed upon, in accordance with such unit prices;
  - .3 by costs and a percentage fee for overhead and profit.
1. *Contractor's* Overhead and profit on expenditures from Allowances, including Extra Work paid for from the Contingency Sum, shall be included in the Bid *Contract Price*.
  2. For Changes in the Work not covered by Allowances the *Contractor's* Overhead and profit shall be 10% on work performed directly by the *Contractor*, and 5% on work performed by sub trades.
  3. The Sub*Contractor's* allowance for Overhead and profit shall be 5% of the actual cost of all Sub*Contractor's* Changes in the Work, as determined by this Paragraph.
  4. Where the Change involves the substitution of one type of product for another the "actual cost" of the change, whether credit or extra, shall be the net difference in the "actual cost" defined above."

**GC 6.3 CHANGE DIRECTIVE**

72. Refer to GC 6.3.6:

Delete entirely and substitute the following:

- "6.3.6 The adjustment to the *Contract Price* for a change carried out by way of a *Change Directive* will be determined as follows:
- .1 the value of the *Work* covered or affected by the *Change Directive*, either as an increase or a decrease in the *Work*, will be valued in accordance with GC 6.3.7;
  - .2 if the change described in the *Change Directive* results in a net increase in the *Contractor's* cost to perform the *Work* (being the net of additions and deletions to the *Work* covered by the *Change Directive*) then the mark-up as provided by GC 6.3.8 will apply to valuation of such cost increase;
  - .3 if the change described in the *Change Directive* results in a net decrease in the *Contractor's* cost to perform the *Work* (being the net of additions and deletions to the *Work* covered by the *Change Directive*) then no mark-up on account of *Overhead* or profit will apply to valuation of such cost decrease."

73. Refer to GC 6.3.7:

Delete line 1 (which for reference reads "The cost of performing...actual cost of the following:") and substitute the following:

"The direct costs incurred by the *Contractor* (if the *Contractor* directly performs the *Work*) or alternatively the Sub*Contractor* that directly performs the *Work* of a *Change Directive*, of all of the following, without mark-up for *Overhead* or profit except as expressly set out in paragraph 6.3.8:"

74. Refer to GC 6.3.7.6:

Add at the end "at market rates as compared to third party rental *Suppliers*";



75. Refer to GC 6.3.7.7:

Delete entirely.

76. New GC 6.3.14:

Add the following:

"6.3.14 The markups on account of *Overhead* and profit on the direct costs of performing a *Change Directive* will be as follows:

1. *Contractor's* Overhead and profit on expenditures from Allowances, including Extra Work paid for from the Contingency Sum, shall be included in the *Bid Contract Price*.
2. For Changes in the Work not covered by Allowances the General *Contractor's* Overhead and profit shall be 10% on work performed directly by the General *Contractor*, and 5% on work performed by sub trades.
3. The Sub*Contractor's* allowance for Overhead and profit shall be 5% of the Actual Cost of all Sub*Contractor's* Changes in the Work, as determined by this Paragraph.

## **GC 6.5 DELAYS**

77. Refer to GC 6.5.3.3:

After the words "abnormally adverse weather conditions" insert the words: "(being weather conditions that affect the *Place of the Work* that is more severe or of a longer duration than the weather conditions that a person experienced with the *Place of the Work* would reasonably anticipate and that has a materially adverse effect on the *Contractor's* performance of the *Work*)".

78. Refer to GC 6.5.4:

At the end after the words "...shall be necessary." add the following:

"No claim for additional payment arising from a delay will be payable to the *Contractor* unless the *Contractor* has prepared, or caused to be prepared, records of all *Work* and the costs of the *Work*, on a daily basis as the *Work* proceeds, and submits such records in support of the claim."

79. New GC 6.5.6:

Add the following:

"6.5.6 The *Owner* may, at any time, give written direction to the *Contractor* for the *Contractor* to accelerate the *Work*, in which event the *Contractor* will use reasonable best efforts to proceed with the *Work* more quickly, which may include hiring additional labour and equipment and/or working additional hours or shifts. If at the time of such direction by the *Owner* the *Contractor* is behind the approved *Construction Schedule* due to a cause within the *Contractor's* control, then the cost of such acceleration shall be borne by the *Contractor*. If at such time the *Contractor* is not behind the *Construction Schedule*, or is not behind due to a cause within the *Contractor's* control, then the cost of such acceleration shall be for the account of the *Owner*."

80. New GC 6.5.7:

Add the following:

"6.5.7 If, for any reason, the *Contractor* deems it necessary to accelerate the *Work*, then the *Contractor* will provide written notice of its intention to accelerate at least 24 hours prior to commencing any acceleration and the parties agree that there will be no change to the *Contract Price*."

81. New GC 6.5.8:

Add the following:

"6.5.8 In the event of a delay which results in a stoppage of the *Work*, the *Contractor* will take all reasonable steps to protect the *Work* for the entire period of the delay. The cost of such protection shall be paid as follows the *Owner* unless and to the extent the delay was caused by the *Contractor*."

## **PART 7 DEFAULT NOTICE**

### **GC 7.1 OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT**

82. Refer to GC 7.1.1:

After the word "bankrupt", insert the words "commits an act of bankruptcy or threatens to commit an act of bankruptcy".

83. Refer to GC 7.1.2:

Delete the words "and if the *Consultant* has given a written statement to the *Owner* and *Contractor* that sufficient cause exists to justify such action" from the second and third lines.

### **GC 7.2 CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT**

84. Refer to GC 7.2.3.1:

Delete entirely.

85. Refer to GC 7.2.3.4:

Delete the words "except for GC 5.1 – FINANCING INFORMATION REQUIRED OF THE *OWNER*".

### **GC 7.3 OWNER'S RIGHT TO COMPLETE THE WORK AND FIX DEFICIENCIES**

86. New GC 7.3:

Add the following:

7.3.1 If the *Owner*, acting reasonably, determines at any time that the *Contractor* will not be able to complete the *Work* by the date of *Substantial Performance of the Work* listed in the *Contract Documents*, the *Owner* may, on five (5) *Working Days* written notice to the *Contractor* and without invalidating the *Contract*, perform or cause to be performed some or all of such remaining *Work*.

7.3.2 If the *Owner*, acting reasonably, determines that the *Contractor* is not proceeding diligently to correct the outstanding deficiencies, the *Owner* may, on five (5) *Working*

Days written notice to the *Contractor* and without invalidating the *Contract*, correct or cause to be corrected some or all of such remaining deficiencies.

- 7.3.3 If the *Owner* exercises its rights under either GC 7.3.1 or GC 7.3.2, the *Contractor* will forthwith pay the *Owner* for all reasonable costs and expenses incurred to complete the *Work* or correct the deficiencies and without limitation of any of the *Owner's* rights, the *Owner* may set off such amounts from any amounts owing by the *Owner* to the *Contractor*."

## **GC 8.2 NEGOTIATION, MEDIATION AND ARBITRATION**

87. Delete all clauses in this section in their entirety and substitute with the following:

- 8.2.1 The parties will make reasonable efforts to resolve any dispute, claim, or controversy arising out of this agreement or related to this agreement ("**Dispute**") using the dispute resolution procedures set out in this section.

### **Negotiation**

The parties will make reasonable efforts to resolve any *Dispute* by amicable negotiations and will provide frank, candid and timely disclosure of all relevant facts, information and documents to facilitate negotiations.

### **Mediation**

If all or any portion of a *Dispute* cannot be resolved by good faith negotiations within thirty (30) days, either party may by notice to the other party refer the matter to mediation. Within seven (7) days of delivery of the notice, the parties will mutually appoint a mediator. If the parties fail to agree on the appointment of the mediator, then either party may apply to the British Columbia International Commercial Arbitration Centre for appointment of a mediator. The parties will continue to negotiate in good faith to resolve the *Dispute* with the assistance of the mediator. The place of mediation will be Surrey, British Columbia. Each party will equally bear the costs of the mediator and other out-of-pocket costs, and each party will bear its own costs of participating in the mediation.

### **Litigation**

If within ninety (90) days of the request for mediation the *Dispute* is not settled, or if the mediator advises that there is no reasonable possibility of the parties reaching a negotiated resolution, then either party may without further notice commence litigation.

88. Refer to GC 8.2.7:

Delete Entirely.

89. Refer to GC 8.2.8:

Delete Entirely.

## **PART 9 PROTECTION OF PERSONS AND PROPERTY**

### **G.C. 9.1 PROTECTION OF WORK AND PROPERTY**

90. Refer to GC 9.1.1:

Delete entirely and substitute the following:

"9.1.1 The *Contractor* shall protect the *Work* and the *Owner's* property and property adjacent to the *Place of the Work* from damage which may arise as a result of the *Contractor's* operations under the *Contract*, and the *Contractor* shall be responsible for such damage as provided for in the *Contract*."

91. Refer to GC 9.1.3:

Delete entirely and substitute the following:

"9.1.3 The *Contractor* shall, at its own cost, correct or replace any defective work done or *Product* provided by it."

## **GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES**

92. Refer to GC 9.2.1:

Delete entirely and substitute the following:

"For the purposes of applicable environmental legislation, the *Owner* will be responsible for toxic or hazardous substances and materials present at the *Place of the Work* at the commencement of the *Work*. The *Contractor* will be responsible for toxic or hazardous substances brought onto the *Place of the Work* after commencement of the *Work*."

93. Refer to GC 9.2.5:

Delete entirely and substitute the following:

"9.2.5 If the *Contractor*:

- .1 encounters toxic or hazardous substances at the *Place of the Work*; or
- .2 has reasonable ground to believe that toxic or hazardous substances are present at the *Place of the Work*;

which were not identified in the *Contract Documents* then the *Contractor* will:

- (1) take all reasonable steps, including stopping the *Work* if necessary, to ensure that no person's exposure to any toxic or hazardous substances exceeds the exposure permitted by applicable law; and
- (2) immediately report the circumstances in writing to the *Consultant* and the *Owner* in writing."

94. Refer to GC 9.2.6:

Delete entirely and substitute the following:

"9.2.6 The *Owner* in consultation with the *Contractor* will retain a qualified independent expert to investigate and provide an opinion on:

- .1 the necessary steps required by applicable legislation to remove and dispose of any toxic or hazardous substances at the *Place of the Work* that must be moved in order to proceed with the *Work*; and
- .2 whether such toxic or hazardous substances were present prior at the *Place of the Work* prior to the commencement of the *Work*, or whether they were brought to the *Place of the Work* by the *Contractor*."

95. Refer to GC 9.2.7:

Delete entirely and substitute the following:

"9.2.7 If the *Owner* and *Contractor* agree, or if the expert referred to in GC 9.2.6 determines, that the toxic or hazardous substances were not brought onto the *Place of the Work* by the *Contractor* or anyone for whom the *Contractor* is responsible:

- .1 the *Contractor* will within ten (10) *Working Days* prepare and deliver to the *Owner*, with a copy to the *Consultant*, a plan for the safe removal from the *Place of the Work* and disposal of the toxic or hazardous substances and the *Owner* will, within five (5) *Working Days* of receipt of such plan, approve the plan or provide reasons to the *Contractor* why the *Owner* did not approve the plan;
- .2 having received approval from the *Owner*, the *Contractor* will promptly take all necessary steps, in accordance with applicable legislation in force at the *Place of the Work*, to safely remove and dispose of the toxic or hazardous substances in accordance with the approved plan;
- .3 the *Contractor* will make good any damage to the *Work*, the *Owner's* property or property adjacent to the *Place of the Work* as provided in GC 9.1.3 of GC 9.1 – PROTECTION OF WORK AND PROPERTY;
- .4 the *Owner* will reimburse the *Contractor* for the costs of all steps taken pursuant to GC 9.2.5 and 9.2.7;
- .5 the *Owner* will extend the *Contract Time* for such reasonable time as the *Consultant* may recommend in consultation with the *Contractor* and the expert referred to in GC 9.2.6 and reimburse the *Contractor* for reasonable costs incurred as a result of the delay; and
- .6 the *Owner* will indemnify the *Contractor* as required by GC 12.1 – INDEMNIFICATION."

96. Refer to GC 9.2.8:

Delete entirely and substitute the following:

"9.2.8 If the *Owner* and *Contractor* agree, or if the expert referred to in GC 9.2.6 determines, that the toxic or hazardous substances were brought onto the *Place of the Work* by the *Contractor* or anyone for whom the *Contractor* is responsible the *Contractor* will:

- .1 within ten (10) *Working Days* prepare and deliver to the *Owner*, with a copy to the *Consultant*, a plan for the safe removal from the *Place of the Work* and disposal of the toxic or hazardous substances and the *Owner* will, within five (5) *Working Days* of receipt of such plan, approve the plan or provide reasons to the *Contractor* why the *Owner* did not approve the plan;
- .2 having received approval from the *Owner*, promptly take all necessary steps, in accordance with applicable legislation in force at the *Place of the Work*, to safely remove and dispose of the toxic or hazardous substances in accordance with the approved plan;
- .3 make good any damage to the *Work*, the *Owner's* property or property adjacent to the *Place of the Work* as provided in paragraph 9.1.3 of GC 9.1 – PROTECTION OF WORK AND PROPERTY;
- .4 reimburse the *Owner* for reasonable costs incurred by the *Owner* with regard to the expert under paragraph 9.2.6; and
- .5 indemnify the *Owner* as required by GC 12.1 – INDEMNIFICATION."

#### **GC 9.4 CONSTRUCTION SAFETY**

97. New GC 9.4.2:

Add the following:

"9.4.2 The *Contractor* shall remove forthwith from the *Place of the Work* any person who engages in misconduct or is incompetent or negligent in the performance of any duties, or whose presence on the site is otherwise undesirable."

## **GC 9.5 MOULD**

98. Refer to GC 9.5.2:

In line 2, after the words "*Contractor's* operations under the *Contract*" insert the words "or the operations of any *SubContractor* or any person for whom the *Contractor* is responsible in law,"

99. Refer to GC 9.5.3:

Delete entirely and substitute the following:

- "9.5.3 If the *Owner* and *Contractor* agree, or if the expert referred to in paragraph 9.5.1.3 determines, that the presence of mould at or within the *Place of the Work* was not caused by the *Contractor's* operations under the *Contract*, or the operations of any *SubContractor* or any person for whom the *Contractor* is responsible in law:
- .1 the *Contractor* shall take all reasonable and necessary steps to safely remediate or dispose of the mould;
  - .2 the *Contractor* shall make good any damage to the *Work*, the *Owner's* property or property adjacent to the *Place of the Work* as provided in paragraph 9.1.3 of GC 9.1 – PROTECTION OF WORK AND PROPERTY;
  - .3 the *Owner* shall reimburse the *Contractor* for the costs of all steps taken pursuant to paragraphs 9.5.3.1 and 9.5.3.2;
  - .4 the *Owner* shall 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;
  - .5 the *Owner* shall indemnify the *Contractor* as required by GC 12.1 – INDEMNIFICATION."

## **PART 10 GOVERNING REGULATIONS**

### **GC 10.2 LAWS, NOTICES, PERMITS, AND FEES**

100. Refer to GC 10.2.1:

Add the following at the end:

"This *Contract* shall be construed according to the laws of British Columbia. The *Contractor* will undertake all *Work* in full compliance with all applicable laws, including without limitation all building codes, regulations and bylaws."

101. Refer to GC 10.2.2:

Add the following to the end after the words "responsibility of the *Contractor*."

"The *Owner* will obtain and pay for the building permit, and the *Owner* will obtain and pay for permanent easements and rights of servitude."

## **PART 11 – INSURANCE AND CONTRACT SECURITY**

### **G.C. 11.1 INSURANCE**

102. Delete all clauses in GC 11 entirely and substitute with the following:

“11.1.1 The *Contractor* will procure and, during the progress of the Work, maintain Commercial General Liability Insurance adding the *Owner* and the *Owner's Consultant* as additional insureds. A valid Certificate of Insurance, approved by the *Owner's Risk Management Division*, shall be provided prior to the commencement of the *Work*.

The *Contractor* shall notify the *Owner's Consultant* and *Owner* immediately where an incident occurs that may give rise to a claim. Where an accident occurs that gives rise to a claim, the *Contractor* shall, at the *Contractor's* cost, provide notices, proofs of loss and such other documentation as the insurer may require for processing the claim under the CGL

**(a) Commercial General Liability Insurance (CGL)**

- 1) The *Contractor* shall provide Commercial General liability coverage for losses arising out of operations of the *Contractor* including bodily injury (including death resulting there from) and personal injury sustained by any person or persons, or because of injury to or destruction of property arising out of any operations in connection with the *Contract*, in an amount not less than \$5,000,000 per occurrence and in the aggregate with respect to products and completed operations and provide coverage for, among other things, such general categories as:

- .01 Broad Form Property Damage Liability
- .02 Premises and Operations Liability
- .03 Elevator and Hoist Liability ( as applicable)
- .04 Broad Form Products and Completed Operations Liability
- .05 Blanket *Contractual* Liability
- .06 Contingent Employer's Liability
- .07 Non-owned Automobile Liability
- .08 Cross Liability Clause
- .09 Employees as additional insureds
- .10 Sudden and Accidental Pollution Liability (\$2,000,000)
- .11 Medical Payments Coverage
- .12 Fire Fighting Expense Coverage
- .13 Excavation, pile driving, shoring, blasting, underpinning and/or demolition work included (as required)

- 2) The CGL will also include 24 months of completed operations coverage which will commence upon *Substantial Performance of the Work*.
- 3) The deductible under such insurance shall not exceed \$10,000 per occurrence.
- 4) The *Contractor* shall ensure that all sub-*Contractors* provides and maintain CGL coverage with limits and terms as specified in para 1 and name the *Owner* and the *Owner's Consultant* as additional insureds. The *Owner* reserves the right to request copies of the Certificates of Insurance from the *SubContractors*.

**(b) Contractors Equipment**

The *Contractor* and each *SubContractor* shall, at its own expense, obtain and maintain until completion of the *Contract* “all risks” insurance covering all construction equipment owned or rented by them for which they may be responsible.

**(c) Aircraft and Watercraft**

If Aircraft are used in connection with the *Work* performed under the *Contract*, the *Contractor* shall obtain, and provide evidence to the *Owner*, that Aircraft Liability



Insurance is carried on all owned and non-owned aircraft used by the *Contractor* with limits of liability of not less than \$5,000,000 inclusive per occurrence for bodily injury (including passengers), personal injury, death and/or damage to or destruction of property, including loss of use thereof. Such Aircraft Liability Insurance shall contain a cross liability clause by which the liability of any one insured to another insured will be covered as though separate policies were issued to each.

If any Watercraft are used in connection with the *Work* performed under the *Contract* and such watercraft are not small watercraft as defined in and included under the CGL Policy procured by the *Owner*, the *Contractor* shall obtain, and provide evidence to the *Owner*, that (1) Protection and Indemnity Insurance including Pollution Liability and (2) Hull and Machinery Insurance is carried on all owned or non-owned watercraft used by the *Contractor* with Limits of Liability of not less than \$5,000,000 inclusive per occurrence.

The *Contractor* shall ensure the *Contractor*, the *Owner*, the *Owner's Consultant*, and their respective officers, directors, employees, *Consultants* and agents, are added as Additional Insureds to both these policies.

**(d) Marine Cargo Insurance (if applicable)**

Except to the extent that the *Owner* in its sole discretion otherwise expressly agrees in writing to procure some or all marine cargo insurance, if ocean marine cargo is used the *Contractor* and each *SubContractor* shall insure all materials, equipment or other property to be supplied pursuant to the *Contract*, or used in the performance of the *Contract*, and which requires to be transported as ocean marine cargo for their full replacement value subject to the conditions of the Institute Cargo Clauses (All Risks), including war and strikes extension, and including transits and storage where applicable. In addition, if an entire vessel is chartered for shipping equipment then Charterer's Liability insurance shall be provided, in amounts sufficient to protect and indemnify the *Contractor* and its *SubContractors* of all liability arising out of the chartering of such vessel.

**(e) Motor Vehicles**

The *Contractor* and each *SubContractor* shall, at its own expense, obtain and maintain until completion of the *Contract* such insurance as will protect such *Contractor* or *SubContractor* (and others driving any motor vehicles with their consent) against the liability imposed by law upon such *Contractor* or *SubContractor* or other person, for loss or damage including without limitation property damage, personal injuries and death arising from the ownership, use or operation of any motor vehicle used or to be used in connection with the *Work*, on and off the site, whether owned, rented, leased, borrowed or otherwise by such *Contractor* or *SubContractor*.

Without restricting the generality of the foregoing, the *Contractor* and all *SubContractors* shall provide Standard Owner's Form Automobile Policy providing Third Party Liability and Accident Benefits Insurance as provided by the Insurance Corporation of British Columbia ("ICBC") in accordance with the Automobile Insurance Act, with minimum inclusive limits for bodily injury and property damage (third party) of not less than \$3,000,000. If the *Contractor* or its *SubContractors* have equivalent insurance from an insurer other than ICBC, such insurance shall provide no less coverage than that provided by ICBC in accordance with the foregoing.



A confirmation of Insurance (APV47), or equivalent form acceptable to the *Owner*, shall be provided by the *Contractor* and each *SubContractor*.

**(f) Other Insurance**

The *Contractor* and each *SubContractor* shall provide, at its own cost, any additional insurance which it is required by law to provide or which it considers necessary.

The *Contractor* at its cost shall procure such excess insurance to the Commercial General Liability policy, and Builders Risk policy procured by the *Owner* as the *Contractor* considers necessary to fully protect and indemnify the *Contractor* against any liability in excess of the coverage provided pursuant to the aforesaid policies procured by the *Owner*.

**(g) Additional Insureds and Waiver of Subrogation**

All insurance provided by the *Contractor* and the *SubContractors*, other than Workers' Compensation, Automobile insurance and professional errors and omissions insurance, shall:

- .01 have added as additional insureds the *Owner*, the *Owner's Consultant*, the *Contractor* and their respective *Consultants* and *subContractors* engaged in any part of the performance of the *Contract*, and their respective directors, officers, employees, servants, agents, partners, parents, subsidiaries, affiliated or related firms;
- .02 contain a waiver of subrogation as against all Additional Insureds;
- .03 contain a breach of warranty provision whereby a breach of a condition by the *Contractor* or any *SubContractor* will not eliminate or reduce coverage for any other insured; and
- .04 except for any excess Commercial General Liability insurance, be primary insurance with respect to any similar coverage provided by insurance procured by or available to the *Owner*.

**(h) Cancellation**

All insurance provided by the *Contractor* and the *SubContractors*, other than workers' compensation and automobile insurance, shall contain endorsements on the following terms:

"NOTICE: It is hereby understood and agreed that this policy will not be cancelled or reduction in applicable limit without the Insurer(s) giving at least sixty (30) days prior written notice by Registered Mail to the Owner (City of Surrey, 13450 104 Avenue, Surrey, B.C.)."

103. Refer to GC 11.1.2:

Delete entirely and substitute the following:

"11.1.2 Unless specified otherwise, the duration of each coverage and insurance policy shall be from the date of commencement of the *Work* until the date of final certificate for payment."

104. Refer to GC 11.1.3:

Delete entirely and substitute the following:

"11.1.3 The *Contractor* shall, upon request, provide the Trade *Contractor* with proof of coverage and insurance for those coverages and insurances required to be provided by the *Contractor* prior to commencement of the *Work*."

105. Refer to GC 11.1.4:

Delete entirely and substitute the following:

"11.1.4 The *Contractor* and/or his *SubContractors*, as may be applicable, shall be responsible for any deductible amounts under the policies of coverage and insurance except for perils of flood and earthquake."

106. Refer to GC 11.1.5:

Delete entirely and substitute the following:

"11.1.5 The *Contractor* shall provide, maintain and pay for any additional insurance which he is required to provide by law or which he considers necessary to cover risks not otherwise covered by insurance specified in this section."

107. Refer to GC 11.1.6:

Delete entirely and substitute the following:

"11.1.6 The *Contractor* shall provide the *Owner* with proof of insurance for those insurances required to be provided by the *Contractor* prior to the commencement of the *Work* in the form of a completed Certificate of Insurance."

108. Refer to GC 11.1.7:

Delete entirely and substitute the following:

"11.1.7 The *Owner* shall not be responsible for any injury to the *Contractor's* employees or for loss or damage to the *Contractors* or to a *Contractor's* employees', machinery, equipment, tools or supplies which may be temporarily used or stored in, on or about the premises during construction and which may, from time-to-time, or at the termination of the *Contract*, be removed from the premises. The *Contractor* hereby waives all rights of recourse against the *Owner* or any other *Contractor* with regard to damage to the *Contractor's* property."

109. New GC 11.1.9:

Add the following:

"11.1.9 Notwithstanding GC 12.1, the *Contractor*, its *SubContractors*, *Suppliers* and their respective officers, directors, employees, *Consultants* and agents shall not be liable to the *Owner* by reason of breach of *Contract* or in tort, for the following types of loss or damage:

- .1 Loss of use, whether complete or partial, of the *Work* or existing facilities of the *Owner*;
- .2 Loss of *Product*;
- .3 Loss of profit or loss of revenues;
- .4 Any special, indirect, incidental or consequential loss or damage; and
- .5 Any resultant bodily injury or physical injury to tangible property owned by the *Owner* (including the *Work*) or any third party, including all resultant loss of use of that property or loss of use of tangible property that is not physically injured, arising out of the work of, or *Product* used by, the *Contractor*, whether such work

was faulty or not and whether such Product was defective or not, (except that the *Contractor* shall be liable for the cost of replacing its faulty work or defective *Product* as provided by the terms of this *Contract*)  
except to the extent of amounts recoverable under a policy or policies of insurance required to be maintained by the *Contractor*, or provided by the *Owner*, pursuant to the provisions of this *Contract*."

## **GC 11.2 CONTRACT SECURITY**

### **110. New GC 11.2.3, GC 11.2.4, GC 11.2.5 and GC 11.2.6:**

Add the following:

"11.2.3. The *Contractor* will provide "Subguard" insurance. The *Contractor* shall be responsible for all deductibles and costs not reimbursed by the Subguard policy. The *Owner* shall not be obligated to prove any payment to the *Contractor* until such time as written confirmation of Subguard insurance is in place and has been delivered to the *Owner* by the *Contractor*.

11.2.4 The *Owner* will pay the *Contractor* to provide Subguard as follows, which will be added to and included in the *Contract Price*:

- .1 for any sub*Contract* with a *SubContractor* or *Supplier* awarded by the *Contractor* in accordance with the terms of the *Contract* and amount of \$10 per thousand dollars of sub*Contract Price*.

11.2.5 Notwithstanding anything to the contrary, in the event that any proposed *SubContractor* or *Supplier* is not eligible to be covered by Subguard insurance, refuses to be covered by Subguard Insurance, or the Subguard insurer demands an increased premium to insure a particular *SubContractor* or *Supplier*, the *Contractor* shall not be obligated to use such proposed *SubContractor* or *Supplier*, unless:

- .1 the *SubContractor* or *Supplier* (as the case may be) provides the *Contractor* with Acceptable Alternate Security;
- .2 the *Owner* reimburses the *Contractor* for all additional costs associated with providing Acceptable Alternate Security; and
- .3 the *Contractor* has no reasonable objection to the use of the proposed *SubContractor* or *Supplier*. A reasonable objection may be based on any one or more of the following factors: the proposed *SubContractor's* or *Supplier's* qualifications, personnel, experience, track record, financial state, litigation history, and reputation in the industry.

11.2.6 Acceptable Alternate Security means:

- .1 a performance bond and a labour and material payment bond, in CCDC standard forms (221 and 222), each of which shall have a face value of 50% of the *Contract Price* of the *Contract* between the *Contractor* and the *SubContractor* (or *Supplier*, as the case may be), issued by a surety licensed to carry on business of surety in British Columbia; or
- .2 cash, in an amount equal to 20% of the *Contract Price* of the *Contract* between the *Contractor* and the *SubContractor* (or *Supplier*, as the case may be); or
- .3 an unconditional and irrevocable letter of credit, in favour of the *Contractor*, issued by a Canadian bank, in an amount equal to 20% of the *Contract Price* of the *Contract* between the *Contractor* and the *SubContractor* (or *Supplier*, as the case may be), which the *Contractor* may call upon in the event of any act or default by the *SubContractor* or *Supplier*. For the purpose of calling upon the

letter of credit, the *Contractor* shall be entitled, in its sole judgment, to determine whether an act of default has occurred."

## **PART 12 – INDEMNIFICATION, WAIVER OF CLAIMS AND WARRANTY**

### **G.C. 12.1 INDEMNIFICATION**

#### **111. Refer to GC 12.1.1:**

Delete entirely and substitute the following:

- "12.1.1 Without restricting the parties' obligation to indemnify as described in GC 12.1.4 and 12.1.5, and excepting always losses arising out of the independent acts of the party for whom indemnification is sought, the *Owner* and the *Contractor* shall each indemnify and hold harmless the other from and against all claims, demands, losses, costs, damages, actions, suits, or proceedings whether in respect to losses suffered by them or in respect to claims by third parties that arise out of, or are attributable in any respect to their involvement as parties to this *Contract*, provided such claims are:
- .1 caused by:
    - (1) the negligent acts or omissions of the party from whom indemnification is sought or anyone for whose acts or omissions that party is liable; or
    - (2) a failure of the party to the *Contract* from whom indemnification is sought to fulfill its terms or conditions; and
  - .2 made by *Notice in Writing*:
    - (1) within a period of 6 years from the date of *Substantial Performance of the Work* as set out in the certificate of *Substantial Performance of the Work* issued pursuant to paragraph 5.4.2.2 of GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK or within such shorter period as may be prescribed by the Limitation Act of the Province of British Columbia for claims not arising out of latent defects; and
    - (2) within such periods as prescribed by the *Limitation Act* of the Province of British Columbia for claims arising out of latent defects."

#### **112. Refer to GC 12.1.2:**

Delete entirely and substitute the following:

- "12.1.2 The obligation of either party to indemnify as set forth in paragraph 12.1.1 will be limited as follows:
- .1 In respect to losses suffered by the *Owner* and the *Contractor* for which insurance is to be provided by the *Owner* pursuant to GC 11.1 – INSURANCE, the limit of the GENERAL LIABILITY COVERAGE – GC 11.1.1(a) or the limit of the PROPERTY COVERAGE – GC 11.1.1(b) whichever is pertinent to the loss;
  - .2 In respect to losses suffered by the *Owner* and the *Contractor* for which insurance is not required to be provided by either party in accordance with GC 11.1 – INSURANCE, the obligation shall not exceed \$20,000,000;
  - .3 In respect to claims by third parties for direct loss resulting from bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, the obligation to indemnify is without limit. In respect to all other claims for indemnity as a result of claims advanced by third parties, the limits of indemnity set forth in paragraphs 12.1.2.1 and 12.1.2.2 shall apply."

### **GC 12.2 WAIVER OF CLAIMS**

#### **113. Refer to GC 12.2.1:**

Delete entirely and substitute the following:

- "12.2.1 Subject to any lien legislation applicable to the *Place of the Work*, as of the 41st calendar day after the issuance of a certificate of *Substantial Performance of the Work* issued pursuant to paragraph 5.4.2.2 of GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK, the *Contractor* waives and releases the *Owner* from all claims which the *Contractor* has or reasonably ought to have knowledge of that could be advanced by the *Contractor* against the *Owner* arising from the *Contractor's* involvement in the *Work*, including, without limitation, those arising from negligence or breach of *Contract* in respect to which the cause of action is based upon acts or omissions which occurred prior to or on the date of *Substantial Performance of the Work*, except as follows:
- .1 claims arising prior to or on the date of *Substantial Performance of the Work* for which *Notice in Writing* of claim has been received by the *Owner* from the *Contractor* no later than forty (40) calendar days after the issuance of a certificate of *Substantial Performance of the Work* issued pursuant to paragraph 5.4.2.2;
  - .2 indemnification for claims advanced against the *Contractor* by third parties for which a right of indemnification may be asserted by the *Contractor* against the *Owner* pursuant to the provisions of this *Contract*;
  - .3 claims for which a right of indemnity could be asserted by the *Contractor* pursuant to the provisions of paragraphs 12.1.4 or 12.1.5 of GC 12.1 – INDEMNIFICATION; and
  - .4 claims resulting from acts or omissions which occur after the date of *Substantial Performance of the Work*.

114. Refer to GC 12.2.3:

Delete entirely and substitute the following:

- "12.2.3 Subject to any lien legislation applicable to the *Place of the Work*, as of the 41st calendar day after the issuance of a certificate of *Substantial Performance of the Work* issued pursuant to paragraph 5.4.2.2 of GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK, the *Owner* waives and releases the *Contractor* from all claims which the *Owner* has or reasonably ought to have knowledge of that could be advanced by the *Owner* against the *Contractor*, including, without limitation, those arising from negligence or breach of *Contract* in respect to which the cause of action is based upon acts or omissions which occurred prior to or on the date of *Substantial Performance of the Work*, except as follows:
- .1 claims arising prior to or on the date of *Substantial Performance of the Work* for which *Notice in Writing* of claim has been received by the *Contractor* from the *Owner* no later than forty (40) calendar days after the issuance of a certificate of *Substantial Performance of the Work* issued pursuant to paragraph 5.4.2.2;
  - .2 indemnification for claims advanced against the *Owner* by third parties for which a right of indemnification may be asserted by the *Owner* against the *Contractor* pursuant to the provisions of this *Contract*;
  - .3 claims for which a right of indemnity could be asserted by the *Owner* against the *Contractor* pursuant to the provisions of paragraph 12.1.4 of GC 12.1 - INDEMNIFICATION;
  - .4 damages arising from the *Contractor's* actions which result in substantial defects or deficiencies in the *Work*. "Substantial defects or deficiencies" mean those defects or deficiencies in the *Work* which affect the *Work* to such an extent or in such a manner that a significant part or the whole of the *Work* is unfit for the purpose intended by the *Contract Documents*;
  - .5 claims arising pursuant to GC 12.3 - WARRANTY; and

.6 claims arising from acts or omissions which occur after the date of *Substantial Performance of the Work*.

115. Refer to GC 12.2.4:

Delete the first sentence entirely and replace it with the following: "The *Owner* waives and releases the *Contractor* from all claims, other than claims relating to latent defects, referred to in paragraph 12.2.3.4 except claims for which *Notice in Writing* of claim has been received by the *Contractor* from the *Owner* within a period of six years from the date of *Substantial Performance of the Work* should any limitation statute of the Province or Territory of the *Place of the Work* permit such agreement."

116. Refer to GC 12.2.9 and 12.2.10:

Delete entirely.

**Add New PART 13 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT**

**PART 13 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT**

**GC 13.1 FREEDOM OF INFORMATION AND PROTECTION OF PRIVACY ACT**

"13.1.1 All documents submitted to the *Owner* will be in the custody or control of, or becomes the property of the *Owner* and as such are subject to the Freedom of Information and Protection of Privacy Act, R.S.B.C. 1996, c.165."

**Add New PART 14 CONFIDENTIALITY**

**PART 14 CONFIDENTIALITY**

**GC 14.1 CONFIDENTIALITY**

117. New GC 14.1.1:

"14.1.1 Except as provided for by law or otherwise by this agreement, the *Owner* and the *Contractor* will keep strictly confidential any information supplied to, obtained by, or which comes to the knowledge of the *Owner* and the *Contractor* as a result of the provision of the goods or performance of the services and this agreement, and will not, without the prior express written consent of the *Owner*, publish, release, disclose or permit to be disclosed any such information to any person or corporation, either before, during or after termination of this agreement, except as reasonably required to provide the goods or complete the services."

118. New GC 14.1.2:

"14.1.2 The *Contractor* acknowledges that the *Owner* is subject to the *Freedom of Information and Protection of Privacy Act* and agrees to any disclosure of information by the *Owner* required by law."

119. New GC 14.1.3:

"14.1.3 The *Contractor* agrees to return to the *Owner* all of the *Owner's* property at the completion of this agreement, including any and all copies or originals of reports provided by the *Owner*."

120. New GC 14.1.4:

"14.1.4 The *Contractor* shall not publish any statement, paper photograph or document or hold any ceremony with respect to the *Contract* of the *Work* performed under the *Contract* without the prior written approval of the *Owner*."

**Add New PART 15 SEVERABILITY**

**PART 15 SEVERABILITY**

**GC 15.1 SEVERABILITY**

121. New GC 15.1:

"15.1 Any provision of this *Contract* which is found to be illegal, invalid, void, prohibited or unenforceable will be:  
(a) separate and severable from this *Contract*; and  
(b) ineffective to the extent of such illegality, invalidity, avoidance, prohibition or unenforceability; without affecting any of the remaining provisions of this *Contract* which will remain in force, be binding upon the parties and be enforceable to the fullest extent of the law.

**- END OF SUPPLEMENTARY GENERAL CONDITIONS TO CCDC 2 – 2008 -**

## SCHEDULE B - APPENDIX 2

### CONTRACT DRAWINGS

To view/print the *Contract Drawings*:

In the URL, or address field at the top, enter the following address: ftp://ftp.surrey.ca and hit "enter".

Enter "pur" as the User Name, "welcome" as the password and then click "Log On"

<ftp://ftp.surrey.ca>

Log on: pur

Password: welcome

Folder: 1220-040-2014-001 District Energy System Phase 1 – Containerized Boiler Plant

To view this FTP site in Windows Explorer, click **Page**, and then open **FTP Site in Windows Explorer**.



## **SCHEDULE B**

### **APPENDICES 3 THROUGH 11**

Information from Schedule C of the RFQ will be inserted at the time of the award of the *Contract*.

Schedule B – Appendix 3	Schedule of Prices
Schedule B – Appendix 4	Construction Schedule
Schedule B – Appendix 5	Key Personnel, Sub-Contractors, and Material Suppliers

Forms to be included at the time of the award of the *Contract*.

Schedule B – Appendix 6	Prime <i>Contractor</i> Designation
Schedule B – Appendix 7	Risk, Health and Safety
Schedule B – Appendix 8	Statutory Declaration
Schedule B – Appendix 9	Certificate of Substantial Performance
Schedule B – Appendix 10	Notice of Certification of Substantial Performance
Schedule B – Appendix 11	Post Compliance Form Certificate of Substantial Performance



## SCHEDULE C – FORM OF QUOTATION

**RFQ Title: District Energy System Phase 1 – Containerized Boiler Plant**

**RFQ No: 1220-040-2014-001**

### **CONTRACTOR**

Legal Name: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Email: \_\_\_\_\_

TO: City Representative:  
Richard D. Oppelt, Purchasing Manager  
at the following location:

<u>Hand Deliver / Courier</u>	<u>By email / Fax</u>
Address: City of Surrey (New City Hall) Main Reception Counter – Ground Floor 13450 104 Ave, Surrey, BC Canada, V3T 1V8	Fax: 604-599-0956 Email for PDF Files: purchasing@surrey.ca

1. If this Quotation is accepted by the City, a *Contract* will be created as described in:
  - (a) the Agreement;
  - (b) the RFQ; and
  - (c) other terms, if any, that are agreed to by the parties in writing.
2. Capitalized terms used and not defined in this Quotation will have the meanings given to them in the Agreement and RFQ. Except as specifically modified by this Quotation, all terms, conditions, representations, warranties and covenants as set out in the Agreement and RFQ will remain in full force and effect.

3. I/We have reviewed the Sample Agreement (Schedule B). If requested by the City, I/we would be prepared to enter into the Sample Agreement, amended by the following departures (list, if any):

**Section**

**Requested Departure(s) / Alternative(s)**

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4. The City requires that the successful *Contractor* have the following in place **before providing the Work**:

- (a) Workers' Compensation Board coverage in good standing and further, if an "Owner Operator" is involved, personal operator protection (P.O.P.) will be provided,  
Workers' Compensation Registration Number \_\_\_\_\_;
- (b) Prime Contractor qualified coordinator is Name: \_\_\_\_\_  
and Contact Number: \_\_\_\_\_;
- (c) Insurance coverage for the amounts required in the proposed *Contract* as a minimum, naming the City as additional insured and generally in compliance with the City's sample insurance certificate form available on the City's Website [Standard Certificate of Insurance](#);
- d) City of Surrey business license;
- e) If the Proponent's Goods and Services are subject to GST, the *Contractor's* GST Number is \_\_\_\_\_; and
- f) If the *Contractor* is a company, the company name indicated above is registered with the Registrar of Companies in the Province of British Columbia, Canada, Incorporation Number \_\_\_\_\_.

As of the date of this Quotation, we advise that we have the ability to meet all of the above requirements **except as follows** (list, if any):

**Section**

**Requested Departure(s) / Alternative(s)**

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5. The *Contractor* acknowledges that the departures it has requested in Sections 3 and 4 of this Quotation will not form part of the *Contract* unless and until the City agrees to them in writing by initialing or otherwise specifically consenting in writing to be bound by any of them.

### **Changes and Additions to Specifications and Scope:**

6. In addition to the warranties provided in the Agreement, this Quotation includes the

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7. I/We have reviewed the RFQ, Schedule A – Specifications of Goods and Scope of Services. If requested by the City, I/we would be prepared to meet those requirements, amended by the following departures and additions (list, if any):

**Requested Departure(s) / Alternative(s) / Addition(s)**

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

## Fees and Payments

8. The *Contractor* offers to supply to the City of Surrey the Goods and Services for the prices plus applicable taxes as follows:

F.O.B. Destination	Payment Terms: A cash discount of ____% will be allowed if invoices are paid within ____ days, or the ____ day of the month following, or net 30 days, on a best effort basis.	Ship Via:
<b>Item #</b>	<b>Item Name</b>	<b>Total Amount</b>
	To provide all labour, materials, plant and equipment and all other services necessary for the provision of a containerized boiler plant as stated in the specifications and <i>Drawings</i> , at 10357 133 St., Surrey, B.C.	
1	General : Project Management / permitting / insurance	
2	Mobilization / demobilization / delivery	
3	Enclosure cost	
4	Boilers cost	
5	Pumps cost	
6	Piping / supports / insulation / piping accessories	
7	Electrical / controls / programming	
8		
9		
10		
	<b>Note: Overheads, General Conditions and Profit are to be included in the above amounts.</b>	
CURRENCY: Canadian		Subtotal: \$
		GST (5%): \$
		<b>TOTAL QUOTATION PRICE: \$</b>

**List of Optional Alternative Prices:**

9. The following is a list of Alternative Price(s) and forms part of this RFQ, upon the acceptance of any or all of the Alternative Price(s). The Alternative Prices are an addition or a deduction to the Total Quotation Price and do not include GST. DO NOT state a revised Total Quotation Price.

Item #	Item Name	Addition	Deduction
OAP.1	Optional Controls - Refer to <u>Specific Note 2</u> in drawing # (C01-P03)		
OAP.2	Extended one (1) year Warranty for the CBP		
OAP.3	Extended two (2) years Warranty for the CBP		
OAP.4	Annual Operation & Maintenance (excluding utility billing for water, electricity and natural gas)		
OAP.5	Deleting emergency propane connection		

**List of Separate Prices:**

10. The following is a list of Separate Price(s) and forms part of this RFQ, upon the acceptance of any or all of the Separate Price(s). The Separate Prices are an addition or a deduction to the Total Quotation Price and do not include GST. DO NOT state a revised Total Quotation Price.

Item #	Item Name	Addition	Deduction
SP.1	Performance Bond at 50% of total <i>Contract</i> value		
SP.2	Labour and Material Payment Bond at 50% of total <i>Contract</i> value		
SP.3			
SP.4			

**Force Account Labour and Equipment Rates:**

11. *Contractors* should complete the following tables setting out the all-inclusive hourly rates including overhead, profit, small tools and work vehicles (trucks/vans) for approved extras/credits for all applicable categories of labour (use the spaces provided and/or attach additional pages, if necessary):

**Table 1 – Schedule of Labour Rates:**

Labour Category	Straight Time/hr (Plus GST)	Overtime Rate/hr (Plus GST)
.1 Superintendent	\$	\$
.2 Foreman	\$	\$
.3 Journeyman	\$	\$
.4 Apprentice	\$	\$
.5 Skilled Labourer	\$	\$
.5	\$	\$
.6	\$	\$

**Table 2 – Schedule of Equipment Rates:**

No.	Equipment Description	Hourly Rate
		\$
		\$

**Time Schedule:**

12. *Contractors* should provide an estimated schedule, with major item descriptions and time indicating a commitment to perform the *Contract* within the time specified (use the spaces provided and/or attach additional pages, if necessary).

MILESTONE DATES \_\_\_\_\_

ACTIVITY	SCHEDULE									
	1	2	3	4	5	6	7	8	9	10


**Key Personnel & Sub-Contractors:**

13. *Contractor* to provide information on the background and experience of all key personnel proposed to provide the Goods and Services (use the spaces provided and/or attach additional pages, if necessary):

**Key Personnel**

Name: \_\_\_\_\_  
 Experience: \_\_\_\_\_  
 Dates: \_\_\_\_\_  
 Project Name: \_\_\_\_\_  
 Responsibility: \_\_\_\_\_

14. *Contractor* to provide the following information on the background and experience of all sub-Contractors and material suppliers proposed to undertake a portion of the Goods and Services (use the spaces provided and/or attach additional pages, if necessary):

<i>Description Of Goods &amp; Services</i>	<i>Sub-Contractors &amp; Material Suppliers Names</i>	<i>Years Of Working With Contractor</i>	<i>Telephone Number And Email</i>

**Experience and References:**

15. *Contractor's* relevant experience and qualifications in delivering Goods and Services similar to those required by the Agreement (use the spaces provided and/or attach additional pages, if necessary):

\_\_\_\_\_  
 \_\_\_\_\_



16. *Contractor's* references (name and telephone number) (use the spaces provided and/or attach additional pages, if necessary). The City's preference is to have a minimum of three references. Previous clients of the *Contractor* may be contacted at the City's discretion.

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17. I/We the undersigned duly authorized representatives of the *Contractor*, having received and carefully reviewed the RFQ and the Agreement, submit this Quotation in response to the RFQ.

This Quotation is executed by the *Contractor* this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

*CONTRACTOR*

I/We have the authority to bind the *Contractor*.

\_\_\_\_\_  
(Legal Name of *Contractor*)

\_\_\_\_\_  
(Signature of Authorized Signatory)

\_\_\_\_\_  
(Signature of Authorized Signatory)

\_\_\_\_\_  
(Print Name and Position of Authorized Signatory)

\_\_\_\_\_  
(Print Name and Position of Authorized Signatory)



## **ATTACHMENTS**

### **1. Project Completion Deliverable**

## Attachment # 1 - Project Completion Deliverables

Project Name: \_\_\_\_\_

Project Address: \_\_\_\_\_

Date: \_\_\_\_\_

End of Project Walk-through: \_\_\_\_\_

End of Project Walk-through: \_\_\_\_\_

City Representative: \_\_\_\_\_

Contractor/Contractor Rep: \_\_\_\_\_

Department: \_\_\_\_\_

Company Name: \_\_\_\_\_

Contact phone number: \_\_\_\_\_

Contact phone number: \_\_\_\_\_

Fax number: \_\_\_\_\_

Fax number: \_\_\_\_\_

### BUILDING PERMITS – CLOSED OUT

- ☐ Architectural
- ☐ Electrical
- ☐ Mechanical / Plumbing
- ☐ Structural
- ☐ Other

### O&M MANUALS RECEIVED

- ☐ Architectural  
Additional insertions to follow: \_\_\_\_\_
- ☐ Electrical  
Additional insertions to follow: \_\_\_\_\_
- ☐ Mechanical  
Additional insertions to follow: \_\_\_\_\_
- ☐ Other  
Additional insertions to follow: \_\_\_\_\_

### PROJECT CLOSE-OUT

- ☐ Project Summary Report
- ☐ Substantial Completions
- ☐ Deficiencies List
- ☐ Transfer of Utilities (Hydro/Teresan)
- ☐ Notify City of Surrey (604-591-4804)
- ☐ Asset Inventory Forms including HVAC
- ☐ TCA Cost Summary Finance, & Warranty
- ☐ Information sheets & Project summary with graphics

### FALL PROTECTION SYSTEM

- ☐ Installed
  - ☐ Fall Protection plans displayed throughout building as required.
  - ☐ 1 CD containing the Fall Protection Safety System (details & plans)

### E. AS-BUILT DRAWING SUBMITTALS

#### Architectural

- ☐ 1 CD containing AutoCAD As-Built DWG files
- ☐ 1 CD containing scanned sealed As-Built Drawings
- ☐ 1 paper copy of sealed Drawings

#### Electrical

- ☐ 1 CD containing AutoCAD As-Built DWG files
- ☐ 1 CD containing scanned sealed As-Built Drawings
- ☐ 1 paper copy of sealed Drawings

#### Mechanical / Plumbing

- ☐ 1 CD containing AutoCAD As-Built DWG files
- ☐ 1 CD containing scanned sealed As-Built Drawings
- ☐ 1 paper copy of sealed Drawings

#### Structural

- ☐ 1 CD containing AutoCAD As-Built DWG files
- ☐ 1 CD containing scanned sealed As-Built Drawings
- ☐ 1 paper copy of sealed Drawings

#### Civil

- ☐ 1 CD containing AutoCAD As-Built DWG files
- ☐ 1 CD containing scanned sealed As-Built Drawings
- ☐ 1 paper copy of sealed Drawings

#### Landscape

- ☐ 1 CD containing AutoCAD As-Built DWG files
- ☐ 1 CD containing scanned sealed As-Built Drawings
- ☐ 1 paper copy of sealed Drawings

#### Other: \_\_\_\_\_

- ☐ 1 CD containing AutoCAD As-Built DWG files
- ☐ 1 CD containing scanned sealed As-Built Drawings
- ☐ 1 paper copy of sealed Drawings

### F. FIRE SAFETY PLAN

- ☐ Completed
  - ☐ Fire safety floor plans displayed throughout building as required.
  - ☐ 1 CD containing the fire safety plan
  - ☐ 2 paper copies of the fire safety plan

Signed: \_\_\_\_\_

\_\_\_\_\_  
City Representative

\_\_\_\_\_  
Contractor Representative

\_\_\_\_\_  
Internal Representative

\_\_\_\_\_  
Fire Chief/ Representative