Halifax Regional Centre For Education

Purchasing Division

TENDER # 3958

Boiler Replacement-Joseph Howe Elementary

Addendum #1

July 11th, 2018
10:45 A.M.

To: Bidders

From: Aaron Sullivan Manager,
Accounting & Purchasing

Pages: 24 including cover

Phone: 464-2000(ext. 2011)

The bid documents shall be amended and new drawings and clauses added, and shall become part of the contract documents as follows:

MECHANICAL

1.0 Reference Specification Section 22 42 01 – Plumbing Specialties and Accessories

.1 Paragraph 2.1, Item .7; Add:

.4 TACO PAX Series.

2.1 Reference Specification Section 23 21 14 – Hydronic Specialties

.1 Paragraph 2.3, Item .8; Add:

.3 TACO 5900 Series Plus.

.2 Paragraph 2.7, Item .8; Add:

.4 TACO CA Series.

3.1 Reference Mechanical Drawing M-1 – Partial Basement Plan – Demolition

.1 Detail 3/M-1 – General Notes – Removal:

.1 Revise Note 1 by deleting: "useable fuel oil will be removed from the tank by HRCE prior to tank removal".

.2 Add: "Contractor shall remove leftover fuel oil (9,000 litres) from tank and dispose of according to Provincial Regulations".

4.1 Reference Mechanical Drawing M-2 – Partial Basement Plan – New Work

.1 Detail 4/M-2: Provide DI, DO and AO for each VFD on Pumps P-1, P-2, P-3 and P-4.

.2 Detail 4/M-2: Division 25 to provide BACnet protocol translator to permit the boiler controllers to communicate with the EMCS system.

5.1 Reference Specification section 23 51 00 Boilers, Chimneys and Stacks

.1 Item 2.5; Add item:

.4 Cleaver Brooks model CBI and CBILA.

6.0 Reference General Information

.1 Pre-purchased boiler shop drawings, dated July 5, 2018 are attached for information.

.2 Pictures of roof attached for information only.

7.0 Clarification: Questions (Q) and Responses (R)

(Q) .1 Is removal of ceiling asbestos to be included in pricing? And if so the whole ceiling of just the areas where pipe supports are located?

(R) .1 Provide break out price for whole ceiling removals and re-instatement.

(Q) .2 Customer supplied boilers and accessories are located where?

(R) .2 Will be delivered to site.

(Q) .3 Can we receive a list of all equipment supplied by the customer along with their related specs and information?

(R) .3 See shop drawings attached (Addendum 1).

(Q) .4 Is the customer responsible for start-up and boil out of supplied equipment “was it included in the purchase of equipment" or are we to price?

(R) .4 Factory start-up and commissioning was included in pre-purchase, contractor to allow for assistance to factory tech, including boil out if required.

(Q) .5 Should there be expansion joints on the suction and discharge sides of pumps?

(R) .5 Not required.

(Q) .6 Can the boiler supplier give us the information required for the low loss header requirements and specs?

(R) .6 Low loss header specs are in the tender specifications. See Specification Section 23 21 14 - Hydronic Specialties.

End of Addendum #1

PLEASE SIGN BELOW AND RETURN WITH BID DOCUMENTS:

_____ _____

Signature Company Name

BRUCE SUTHERLAND ASSOCIATES LIMITED

164 Akerley Boulevard, Dartmouth, NS B3B 1Z5

902-455-2405T | 902-466-7175 F

TO:	Halifax Regional School Board	**DATE**:	July 5, 2018
ATTENTION:	Tyler Bell	**PROJECT NAME:**	Joseph Howe Elementary
CONTRACTOR:	TBD	**ENGINEER/FIRM:**	

THE FOLLOWING FILES ATTACHED FOR SHOP DRAWING REVIEW

- Clearfire model CFC-E-1500 condensing boiler submittal, dimensions and ratings
- Clearfire wiring diagram, Drawing #O14800-1-1
- Electrical Nomenclature
- Kunkle relief valve, model 537
- McDonnell Miller Test 'N Check valves
- McDonnell Miller low water cut-off

CFC-E 1500

ClearFire-CE

Submittal Sheet

Condensing Boiler

1500 MBTU

JOB NAME: Joseph Howe Elementary

REVIEWER NOTES:

CB-8556-1500

PROJECT INFORMATION

CB REPRESENTATIVE Bruce Sutherland Associates Limited

JOB NAME Joseph Howe Elementary School

EQUIPMENT TAGS _____

LOCATION Halifax, NS

CONTRACTOR TBD

ENGINEER _____

MODEL NUMBER CFC-E-1500 QTY 2

FUEL X NATURAL GAS _____ PROPANE

BOILER ROOM GAS SUPPLY PRESSURE 7" WC

VOLTAGE 115/1/60

Description	Units	1500
Input Max.	BTU/Hr.	1,500,000
Natural Gas	FT3/Hr	1500
Propane	FT3/Hr	600
Output at 100/80 F [38/27 C] 100% Firing	BTU/Hr.	1,425,000
Output at 180/140 F [82/60 C] 100% Firing	BTU/Hr.	1,320,000
MAWP	PSI	125
Operating Temp., Max.	°F	210
Dry Weight	Pounds	1861
Shipping Weight	Pounds	1986
Operating Weight	Pounds	2777
Water Volume	Gallons	110
Fan Motor Size	Watts	750
Operating Voltage, Fan	Volts/Ph/Hz	115/1/60
Control Circuit	Volts/Ph/Hz	115/1/60
Current Draw, Fan	Amperes	8.5
Current Draw Cont. Ckt.	Amperes	1.5
Condensate Quantity Firing Nat. Gas & operating @ 100/80 F.	Gal/Hr.	10
Flue Gas Mass Flow @ 100% Firing	lb/hr	1,670
Flue Gas Temp. Oper. 180/140 F	°F	180
Flue Gas Temp. Oper. 100/80 F	°F	130
Effective fireside heating surface	ft^2	387.5

STANDARD FEATURES

- Duplex Stainless Steel ALUFER firetube heat exchanger.
  - True counterflow design
  - Thermal shock proof design
  - Superior effective heating surface area for excellent operational efficiency
  - Dual temperature returns provide 6% efficiency gain
- High water volume and low waterside pressure drop
  - Ideal for Primary Variable Flow pumping
  - Reduced cycling with no buffer tank required
  - Capable of low flow situations with no need for a flow switch
- Low emission premix burner featuring:
  - Self-regulating linkageless control
  - ECM variable speed combustion air blower modulation
  - Whisper quiet operation (<70dBA at high fire)
  - 5:1 turndown [natural gas]
  - <20 ppm NOx standard [natural gas]
  - SCAQMD Rule 1146.2 Certified
- UL certified for natural gas or propane
- Combustion air intake via room air or direct vent connection on boiler
- Spark ignition with UV scanner for flame supervision
- ASME CSD-1 and XL-GAP compliant
- Factory tested prior to shipment

STANDARD EQUIPMENT

- Trim and Controls
  -Manual reset high limit temperature cut-off with adjustable set point
  -Low water cutoff, probe type, manual reset with test switch
  -Thermistor sensors for supply and return water temperature readings
  -Combination temperature/pressure gauge
  -ASME Safety relief valve (ship loose)
  -Combustion air proving switch
  -Blocked flue/condensate safety switch
- Gas Train in Accordance with ASME CSD-1 and Includes:
  -Low and high gas pressure switches
  -Single body gas valve, dual solenoid safety shutoff
  -Leak test cocks
  -Manual shutoff valve

INTELLIGENT, INTEGRATED CONTROLS

- Falcon integrated boiler safety and system control
- Color touch-screen display/interface with trending
- Multiple loop PID set point control - central heat, domestic hot water and lead/lag demand priority
- Configurable Falcon Lead Lag control to match system requirements
- Boiler pump, isolation valve, damper enable/disable
- Modulating pump speed control
- Outdoor temperature reset
- Post shutdown pump or valve delay
- Remote enable and set point capability
- Modbus (RS485) Communications
- Multiple protocol gateway solutions available for other BMS integration requirements
- Built-in annunciator screen with real time graphical trending
- Remote alarm & boiler status contacts standard
- Non-volatile alarm history (last 15 lockouts)

OPERATING EFFICIENCIES

Percent Efficiency

% Firing Rate	Return Water Temperature °F (°C)						
	68 (20)	80 (27)	100 (38)	120 (49)	130 (55)	140 (60)	160 (72)
20%	98.5	97.6	95.2	91.8	90.1	88.8	88.0
50%	97.1	95.9	93.4	90.6	89.3	88.3	87.8
75%	96.0	94.4	91.9	89.6	88.6	87.9	87.5
100%	94.9	93.0	90.4	88.6	87.9	87.5	87.3

Conditions: Natural Gas; ΔT = 40°F

AHRI Certified Efficiency

Combustion Efficiency (%)	Thermal Efficiency (%)
94.4	95.1

FLOW RATES

CFC-E Flow Rates

System Temperature Drop °F					
10	20	30	40	50	60
Flow Rate GPM					
283	141	94	71	57	47

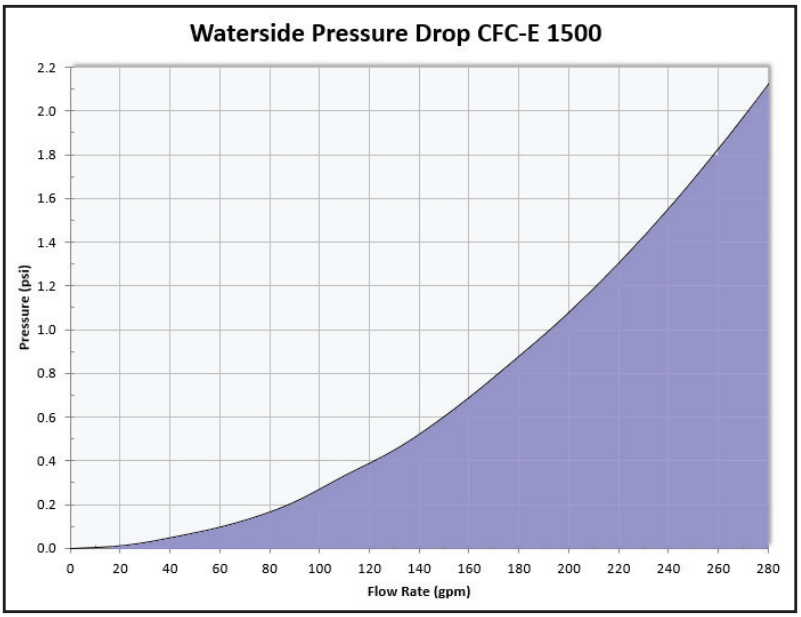
Recommended flow rates relative to temperature drop so as not to exceed boiler output.

Based on 95% nominal efficiency.

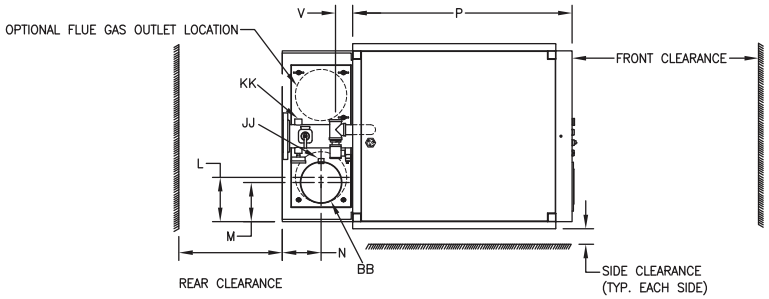
NOTE: Flow rates based on 100% water only. Not applicable to glycol solutions. Contact local C-B representative for assistance with glycol systems.

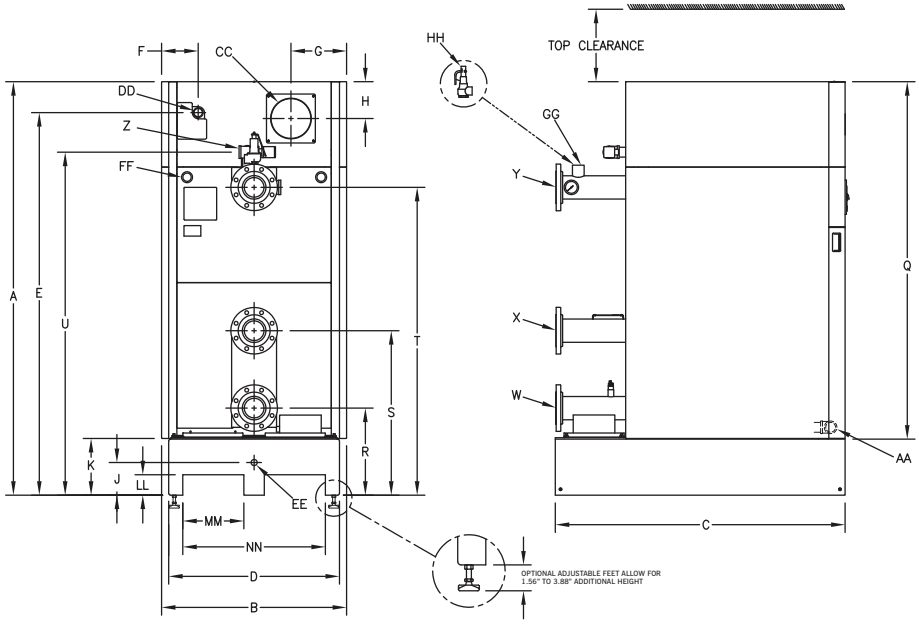
NOTE: The flow rates shown are recommended design flow rates. The CFC-E is capable of handling delta T up to 120 deg F without damage to the heat exchanger.

PRESSURE DROP



DIMENSIONS AND CONNECTION SIZES





DIMENSIONS (inches) CFC-E 1500

A	Overall Height	79.9
B	Overall Width	35.8
C	Overall Depth	56
D	Width Less Casing	33.0
E	Gas Connection to Floor	73.9
F	Side of Casing to Gas Connection	7.1
G	Side of Casing to Air Inlet	10.8
H	Top of Casing to Air Inlet	7.1
J	Floor to Condensate Drain	6.3
K	Floor to Bottom of Casing	11.0
L	Side of Base to Flue Outlet (Centered)	8.5
M	Side of Base to Flue Outlet (Offset)	7.5
N	Rear of Base to Flue Outlet	7.5
P	Casing Depth	42.4
Q	Casing Height	68.9
R	Floor to Lower Return Connection	16.8
S	Floor to Upper Return Connection	31.8
T	Floor to Supply Connection	59.5
U	Floor to Air vent Connection	66.3
V	Air Vent Line Projection From Rear of Casing	3.3

FORK POCKETS (inches)

LL	Pocket Height	3.9
MM	Pocket Width	11.8
NN	Overall Pocket Width	27.6

CONNECTIONS

W	Water Low Temp. Return, CL150 RF Flange	4"
X	Water High Temp. Return, CL150 RF Flange	4"
Y	Water Supply, CL150 RF Flange	4"
Z	Air Vent, NPT	1-1/2"
AA	Vessel Drain, NPT	1-1/2"
BB	Flue Gas Outlet	
	Standard (Offset)	8"
	Option	10"
CC	Combustion Air	8"
DD	Gas, NPT	1-1/2"
EE	Condensate Drain, NPT	1"
FF	Electrical Conduit, Left or Right	1.6"
GG	Safety Relief Valve Vessel Connection, NPT	1-1/4"
HH	Safety Relief Valve	
	30 psig Inlet x Outlet, NPT	1" x 1-1/4"
	50 - 125 psig Inlet x Outlet, NPT	3/4" x 1"
JJ	Flue Coupling, NPT	1/2"
KK	Water Outlet Coupling, NPT	3/4"

CLEARANCES

Top	14"
Side	3"
Rear	20"
Front	36"

Notes:
Boiler rear must be accessible for servicing.
Side clearance to wall or between boilers.
Side clearance typical each side.

WARRANTY

In addition to our Standard Warranty, Cleaver Brooks offers the following Extended Warranty on the ClearFire CFC-E boilers:

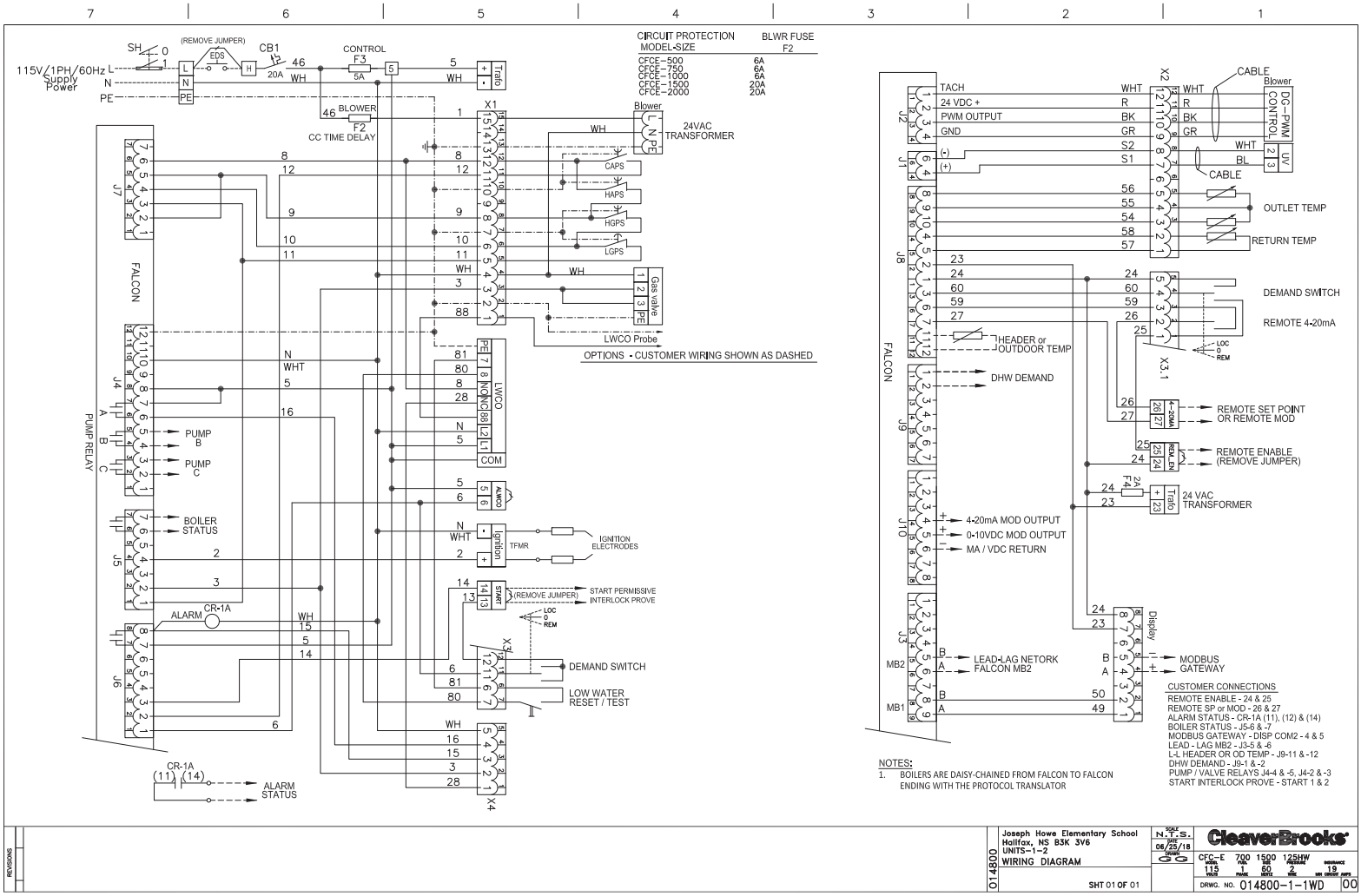
1. The pressure vessel is guaranteed against thermal shock for twenty (20) years when utilized in a closed loop hydronic heating system with a temperature differential of 120°F or less. The boiler pressure vessel is guaranteed accordingly without a minimum flow rate or return water temperature requirement. The boiler shall not require the use of flow switches or other devices to ensure minimum flow.
2. The pressure vessel, tubes, and tube sheets (heat exchanger) are guaranteed against flue gas corrosion and materials/workmanship for a period of ten (10) years.
3. The condensate collection box shall be guaranteed against corrosion for twenty (20) years.
4. The burner cylinder shall be warranted for a period of five (5) years.

All parts not covered by the above warranties are valid for twelve (12) months from the date of initial operation of the Equipment, but in no event shall the Warranty extend more than eighteen (18) months from the date of shipment of the Equipment by Cleaver-Brooks. This includes all electrical and burner components.

The pressure vessel thermal shock warranty covers leaks in the pressure vessel including the furnaces, tubes, tube sheets, and shell (not including failed gaskets), which, from our inspection, are attributed to unequal or rapid expansion, typically referred to as “thermal shock,” or stress cracking. This warranty does not cover damage or failures that are attributed, by our inspection, to corrosion, operation at low water level, accumulation of scale, sludge or dirt in the boiler, or other improper service, operation, or neglect.

Cleaver Brooks' liability hereunder is limited to repairing or furnishing a replacement pressure vessel or component parts thereof, as deemed necessary by our inspection. Cleaver Brooks is not responsible for shipping, handling, installation and other costs, including all costs associated with the removal and disposition of the old pressure vessel or component parts. In no event shall Cleaver Brooks be responsible for any incidental, consequential or other damages, including, without limitation, any damages resulting from loss of use of the boiler.

Refer to official warranty documents for specific warranty information.



REVISIONS

014800

Joseph Howe Elementary School
Halifax, NS B3K 3V6
UNITS-1-2
WIRING DIAGRAM

SHT 01 OF 01

SCALE N.T.S.
DATE 06/25/18
VERSION 00

CFC-E | 700 1500 125HW | INSURANCE 19
KW 115 | KW 60 | BOILERS 2

DRWG. NO. 014800-1-1WD 00

ELECTRICAL NOMENCLATURE

MNEMONIC	DESCRIPTION
A	
A	Amber (Color Of Pilot Light)
AAFL	Atomizing Air Failure Light
AAFR	Atomizing Air Failure Relay
AAPL	Atomizing Air Proven Light
AAPS	Atomizing Air Proving Switch
AAPS-B	Atomizing Air Proving Switch- Burner
AAPS-C	Atomizing Air Proving Switch- Compressor
AASS	Atomizing Air Selector Switch
AB	Alarm Bell
ACCR	Air Compressor Control Relay
ACM	Air Compressor Motor
ACMCB	Air Compressor Motor Circuit Breaker
ACMF	Air Compressor Motor Fuses
ACMRR	Air Compressor Motor Relay Reset
ACMS	Air Compressor Motor Starter
ACMSI	Air Compressor Motor Starter Interlock
AH	Alarm Horn
AI	Analog Input
ALFCO	Assured Low Fire Cutoff
ALFR	Assured Low Fire Relay
ALWCO	Auxiliary Low Water Cutoff
AM	Ammeter
AMS	Atomizing Media Switch
ANLG COM	Analog Common
AO	Analog Output
AOV	Auxiliary Oil Valve
APR	Air Purge Relay
APV	Air Purge Valve
AR	Alarm Relay
AS	Auxiliary Switch (Suffix)
ASR	Alarm Silencing Relay
ASS	Alarm Silencing Switch
ASV	Atomizing Steam Valve
AT	Annunciator Transformer
AWCBDS	Auxiliary Water Column Blowdown Switch
B	
B	Blue (Color of Pilot Light)
BC	Bias Control
BDCS	Breeching Damper Closed Switch
BDOS	Breeching Damper Open Switch
BDRS	Blowdown/Reset Switch
BFPL	Boiler Feed Pump Light
BFPM	Boiler Feed Pump Motor
BFPMCB	Boiler Feed Pump Motor Circuit Breaker
BFPMF	Boiler Feed Pump Motor Fuses
BFPMS	Boiler Feed Pump Motor Starter
BFPS	Boiler Feed Pump Switch
BFTS	Back Flow Temperature Switch
BHS	Boiler - Header Switch
BIOL	Boiler in Operation Light
BIOR	Boiler In Operation Relay
BM	Blower Motor
BMCB	Blower Motor Circuit Breaker
BMCR	Blower Motor Control Relay
BMF	Blower Motor Fuses
BMPR	Blower Motor Power Relay
BMPS	Blower Motor Purge Switch

MNEMONIC	DESCRIPTION
BMR	Blower Motor Relay
BMRR	Blower Motor Relay Reset
BMS	Blower Motor Starter
BMSI	Blower Motor Starter Interlock
BMSS	Boiler Master Selector Switch
BMTB	Blower Motor Terminal Block
BR	BY-Pass Relay
BS	Burner Switch
BSR	Burner Start Switch
BSS	Boiler Selector Switch
BWPM	Booster Water Pump Motor
BWT	Booster Water Thermostat
C	
CAFL	Combustion Air Failure Light
CAFR	Combustion Air Failure Relay
CAP	Capacitor
CAPS	Combustion Air Proving Switch
CBPT	Cleaver Brooks Protocol Translator
CB-WS	Cleaver Brooks Webserver
CCCB	Control Circuit - Circuit Breaker
CCF	Control Circuit Fuse
CCRS	Control Circuit Reset Switch
CCT	Control Circuit Transformer
CFR	Chemical Feed Relay
CIPL	Changeover In Progress Light
CL	Canopy Light
CLS	Canopy Light Switch
COPS	Changeover Pressure Switch
COR	Changeover Relay
COTD	Changeover Time Delay
CPDS	Control Panel Door Switch
CPOL	Control Power on Light
CR	Control Relay
CRV	Condensate Routing Valve
CS	Current Switch
CSR	Current Switch Relay
CSSS	Control System Selector Switch
CWPM	Circulating Water Pump Motor
CWPMCB	Circulating Water Pump Motor Circuit Breaker
CWPMF	Circulating Water Pump Motor Fuses
CWPMS	Circulating Water Pump Motor Starter
CWPMSI	Circulating Water Pump Motor Starter Interlock
CWPR	Circulating Water Pump Relay
CWPS	Circulating Water Pump Switch
CWSV	Cooling Water Solenoid Valve
D	
D	Denotes Digester Gas Equipment (Prefix)
DARR	Deaerator Automatic Recirc Relay
DCVM	Direct Current Voltmeter
DER	Drive Energized Relay
DG	Draft Gauge
DGHPV	Digester Gas Housing Purge Valve
DGR	Digester Gas Relay
DHWC	Deaerator High Water Control
DHWL	Deaerator High Water Light
DHWR	Deaerator High Water Relay
DI	Digital Input

MNEMONIC	DESCRIPTION
DISC	Disconnect (Entrance Switch)
DMT	Damper Motor Transformer
DNS	Day-Night Switch
DO	Digital Output
DODE	Delay on Deenergization (Timer)
DOE	Delay on Energization (Timer)
DSR	Drive status Relay
DPS	Damper Positioning Switch
DS	Door Switch
E	
EDS	Emergency Door Switch
EPSS	Emergency Power Shutdown
ESB	Emergency Stop Button
ESS	Emergency Stop Switch
ETM	Elapsed Time Meter
F	
FADM	Fresh Air Damper Motor
FARC	Fuel Air Ratio Controller
FADR	Fresh Air Damper Relay
FD	Flame Detector
FDJB	Flame Detector Junction Box
FDPS	Flow Differential Pressure Switch
FFA	Flame Failure Alarm
FFL	Flame Failure Light
FFR	Flame Failure Relay
FGR	Flue Gas Recirculation
FGRCDTD	Flue Gas Recirculation Cool Down Time Delay
FGRCPS	Flue Gas Recirculation Cam Position Switch
FGRFM	Flue Gas Recirculation Fan Motor
FGRFMS	Flue Gas Recirculation Fan Motor Starter
FGRFMSI	Flue Gas Recirculation Manual Valve Limit Switch
FGRTD	Flue Gas Recirculation Time Delay
FORS	First Out Reset Switch
FPM	Feed Pump Motor
FPMS	Feed Pump Motor Starter
FPR	Feed Pump Relay
FPS	Feed Pump Switch
FRI	Firing Rate Interface
FRP	Firing Rate Potentiometer (O2 Trim)
FS	Flow Switch
FSG	Flame Safeguard
FSS	Fuel Selector Switch
FSSM	Flame Signal Strength Meter
FVEL	Fuel Valve Energized Light
FVL	Fuel Valve Light
FVR	Fuel Valve Relay
VWC	Feed Water Control
FWVT	Feed Water Valve Transformer
G	
G	Green (Color Of Pilot Light)
GBR	Gas Booster Relay
GGL	Gauge Glass Light
GLFS	Gas Low Fire Switch
GOL	Gas Operation Light
GOR	Gas-Oil Relay
GOS	Gas-Oil Switch
GPS	Gas Pressure Sensor
GPV	Gas Pilot Valve
GPVV	Gas Pilot Vent Valve
GR	Gas Relay
GSL	Green Gas Light
GSSV	Gas Sensor Solenoid Valve
GVEL	Gas Valve Energized Light
GVTS	Gas Valve Test Light

MNEMONIC	DESCRIPTION
H	
HAPS	High Ambient Air Proving Switch
HATS	High Ambient Temperature Switch
HATC	High Ambient Temperature Control
HBWTC	High Boiler Water Temperature Control
HBWTL	High Boiler Water Temperature Light
HFAV	High Fire Air Valve
HFGV	High Fire Gas Valve
HFL	High Fire Light
HFOV	High Fire Oil Valve
HFPS	High Furnace Pressure Switch
HFS	High Fire Switch
HFS-A	High Fire Switch - Air
HGPL	High Gas Pressure Light
HGPR	High Gas Pressure Relay
HGPS	High Gas Pressure Switch
HHFL	Header High Fire Light
H/LWA	High Low Water Alarm
HLC	High Limit Control
HLFC	High-Low Fire Control
HLPC	High Limit Pressure Control
HLTC	High Limit Temperature Control
HMC	Header Modulating Control
HOI	Heavy Oil Isolation
HOPL	High Oil Pressure Light
HOPR	High Oil Pressure Relay
HOPS	High Oil Pressure Switch
HOLC	Header Operating Limit Control
HOTL	High Oil Temperature Light
HOTR	High Oil Temperature Relay
HOTS	High Oil Temperature Switch
HPCO	High Pressure Cutoff
HPV	Head Purge Valve
HSPC	High Steam Pressure Control
HSPL	High Steam Pressure Light
HSPR	High Steam Pressure Relay
HSTC	High Stack Temperature Control
HSTL	High Stack Temperature Light
HSTS	High Stack Temperature Switch
HWA	High Water Alarm
HWAR	High Water Alarm Relay
HWC	High Water Control
HWCO	High Water Cutoff
HWL	High Water Light
HWR	High Water Relay
I	
(I.C.)	Instantaneously Closed
(I.O.)	Instantaneously Open
ICF	Internal Cooling Fan
IL	Ignition Light
INT	Interval (Timer)
I-P	Current to Pressure Positioner
IR	Ignition Relay
IT	Ignition Transformer
IVPR	Isolation Valve Proximity Relay
IVPS	Isolation Valve Proximity Switch
J	
JPP	Jackshaft Position Potentiometer
K	
LAMPS	Low Atomizing Media Pressure Switch
LAPR	Low Air Pressure Relay
LAPS	Low Air Pressure Switch
LASPS	Low Atomizing Steam Pressure Switch
LDL	Load Demand Light
LDPS	Low Differential Pressure Switch

MNEMONIC	DESCRIPTION
LDS	Low Draft Switch
LFAV	Low Fire Air Valve
LFGV	Low Fire Gas Valve
LFHTD	Low Fire Hold Time Delay
LFL	Low Fire Light
LFOV	Low Fire Oil Valve
LFPS	Low Fire Pressure Switch
LFR	Low Fire Relay
LFS	Low Fire Switch
LFS-A	Low Fire Switch - Air
LFS-F	Low Fire Switch -Fuel
LFS-G	Low Fire Switch – Gas
LFS-O	Low Fire Switch - Oil
LFTC	Low Fire Temperature Control
LGPL	Low Gas Pressure Light
LGPR	Low Gas Pressure Relay
LGPS	Low Gas Pressure Switch
LIAPS	Low Instrument Air Pressure
LLPC	Low Limit Pressure Control
LLPR	Low Limit Pressure Relay
LLR	Lead Lag Relay
LLTC	Low Limit Temperature Control
LLTR	Low Limit Temperature Relay
LOPL	Low Oil Pressure Light
LOPR	Low Oil Pressure Relay
LOPS	Low Oil Pressure Switch
LOTL	Low Oil Temperature Light
LOTR	Low Oil Temperature Relay
LOTS	Low Oil Temperature Switch
LPAPS	Low Plant Air Pressure Switch
LPCO	Low Pressure Cutoff
LPS	Low Pressure Switch
LPSR	Limit Proximity Switch Relay
LSPAR	Low Steam Pressure Alarm Relay
LSPC	Low Steam Pressure Control
LSPL	Low Steam Pressure Light
LSPR	Low Steam Pressure Relay
LSPS	Low Steam Pressure Switch
LTS	Lamp Test Switch
LWA	Low Water Alarm
LWAR	Low Water Alarm Relay
LWCO	Low Water Alarm Cutoff
LWFL	Low Water Flow Light
LWL	Low Water Light
LWR	Low Water Relay
LWRR	Low Water Reset Relay
M	
MA	Milli-amp
MAS	Manual - Automatic Switch
MAM	Micrometer
MFC	Manual Flame Control(Potentiometer)
MFR	Main Fuel Relay
MFGRTS	Minimum Flue Gas Recirculation Temperature Switch
MFVL	Main Fuel Valve Light
MFWV	Motorized Feed Water Valve
MGV	Main Gas Valve
MGVAS	Main Gas Valve Auxiliary Switch
MGVEL	Main Gas Valve Energized Light
MGVV	Main Gas Vent Valve
MLC	Modulation Level Control
(MOM)	Momentary
MOP	Main Oil Pump
MOPS	Main Oil Pump Starter
MOV	Main Oil Valve

MNEMONIC	DESCRIPTION
MOVAS	Main Oil Valve Auxiliary Switch
MOVEL	Main Oil Valve Energized Light
MPC	Modulating Pressure Control
MPCB	Main Power Circuit Breaker
MPP	Manual Positioning Potentiometer
(MR)	Manual Reset
MTC	Modulating Temperature Control
MUV	Make-Up Water Valve
MV	Motorized Valve
MVA	Make-Up Valve Actuator
N	
N	Denotes Natural Gas Equipment(Prefix)
NAT	Network address Translator
(N.C.)	Normally Closed
(N.O.)	Normally Open
NFL	No Flow Light
NFR	No Flow Relay
NGHPV	Natural Gas Housing Purge Valve
NGR	Natural Gas Relay
NRLR	Non-recycle Limit Relay
O	
ODA	Outlet Damper Actuator
ODAS	Outlet Damper Auxiliary Switch
ODM	Outlet Damper Motor
ODMAS	Outlet Damper Motor Auxiliary Switch
ODMT	Outlet Damper Motor Transformer
ODS	Oil Drawer Switch
OH	Oil Heater
OHCB	Oil Heater Circuit Breaker
OHF	Oil Heater Fuses
OHR	Oil Heater Relay
OHS	Oil Heater Switch
OHT	Oil Heater Thermostat
OLC	Operating Limit Control
OLFS	Oil Low Fire Switch
OLPC	Operating Limit Pressure Control
OL'S	Thermal Overloads
OLRS	Overload Reset
OLTC	Operating Limit Temperature Control
OMPM	Oil Metering Pump Motor
OMPMF	Oil Metering Pump Motor Fuse
OOL	Oil Operation Light
OPM	Oil Pump Motor
OPMCB	Oil Pump Motor Circuit Breaker
OPMF	Oil Pump Motor Fuse
OPMRR	Oil Pump Motor Relay Reset
OPMS	Oil Pump Motor Starter
OPPM	Oil Purge Pump Motor
OPV	Oil Purge Valve
OR	Oil Relay
ORV	Oil Return Valve
OSOV	Oil Shutoff Valve
OSPS	O2 Set Point Switch
OSS	Oil Selector Switch
OT	Outdoor Thermostat
OTPR	Oil Transfer Pump Relay
OTS	Oil Temperature Sensor
OV	Oil Valve
OVAS	Oil Valve Auxiliary switch
OVEL	Oil Valve Energized Light
P	
P	Denotes Propane Gas Equipment (prefix)
PAASV	Plant Air Atomizing Solenoid Valve
PAFS	Purge Air Flow Switch
PAPS	Purge Air Proving Switch

MNEMONIC	DESCRIPTION
PC	Pump Control
PCL	Purge Complete Light
PCR	Pump Control Relay
PFCC	Power Factor Correction Capacitor
PFFL	Pilot Flame Failure Light
PFFR	Pilot Flame Failure Relay
PFPS	Positive Furnace Pressure Switch
PGHPV	Propane Gas Housing Purge Valve
PHGPS	Pilot High Gas Pressure Switch
PIPL	Purge In Progress Light
PIS	Pilot Ignition Switch
PLC	Programmable Logic Controller
PLGPS	Pilot Low Gas Pressure Switch
POL	Power On Light
POV	Pilot Oil Valve
PPL	Pre-Purging Light
PPR	Post Purge Relay
PPTD	Post Purge Time Delay
PR	Program Relay
PRL	Purge Ready Light
PRPTD	Pre-Purge Time Delay
PS	Power Supply
PSF	Power Supply Fuse
PSS	Pump Selector Switch
PSV	Purge Solenoid Valve
PT	Purge Timer
PTS	Pump Transfer Switch
PUCR	Purge Complete Relay
PUR	Purge Relay
PV	Panelview
R	
R	Red(Color of Pilot Light)
RAR	Remote Alarm Relay
RATD	Remote Alarm Time Delay
RBSR	Remote Boiler Start Relay
REMFSS	Remote Emergency Master Fuel Shutdown
RES	Resistor
RLR	Recycle Limit Relay
RML	Run Mode Light
RMR	Release to Modulate Relay
RS	Range Switch
RSL	Red Stack Light
RSR	Remote Start Relay
RTD	Resistance Temperature Detector
S	
SBFPL	Stand By Feed Pump Light
SBFPM	Stand By Feed Pump Motor
SBFPMCB	Stand By Feed Pump Motor Circuit Breaker
SBFPMF	Stand By Feed Pump Motor Fuses
SBFPMS	Stand by Feed Pump Motor Starter
SBOV	Surface Blow-off Valve
SBPS	Soot Blower Pressure Switch
SBS	Surface Blow-down System
SBR	Soot Blower Relay
SC	Scanner
SCADA	Scalable Control & Data Supply
SCCR	Short Circuit Current Rating
SCTS	Supervisor Cock-Test Switch
SDHPS	Stack Damper High Pressure Switch
SDL	Stack Damper Light
SDOPS	Stack Damper Open Proving Switch
SER	Serial
SHT	Steam Heater Thermostat
SHV	Steam Heater Valve

MNEMONIC	DESCRIPTION
SLCL	Safety Limits Complete Light
SPIR	System Pump Interlock Relay
SPS	Steam Pressure Sensor
SS	Selector Switch
SSC	Sequencing Step Controller
SSL	Safety Shutdown Light
SSOV	Safety Shut-Off Valve
SSR	Solid State Relay
SSV	Span Solenoid Relay
STHWC	Surge Tank High Water Control
STHWL	Surge Tank High Water Light
STHWR	Surge Tank High Water Relay
STLWC	Surge Tank Low Water Control
STLWL	Surge Tank Low Water Light
STLWR	Surge Tank Low Water Relay
STPDPS	Surge Tank Pump Differential Pressure Switch
T	
(T.C.)	Timed Closed
(T.O.)	Timed Open
TB	Terminal Block
T/C	Thermocouple
TC	Time Clock
TCR	Time Clock Relay
TD	Time Delay
TDAS	Time Delay Auxiliary Switch
TFWR	Transistorized Feedwater Relay
TI	Thermocouple Input
TPCR	Transfer Pump Control Relay
TPL	Transfer Pump Light
TPM	Transfer Pump Motor
TPMCB	Transfer Pump Motor Circuit Breaker
TPMF	Transfer Pump Motor Fuses
TPMS	Transfer Pump Motor Starter
TPS	Transfer Pump Switch
TRX	Transformer
U	
UPS	Uninterruptable Power Supply
UVFD	Ultra-Violet Flame Detector
V	
V	Voltmeter
VDR	Voltage Differential Relay
VFD	Variable Frequency Drive
VPS	Valve Proving Switch
VSR	Variable Speed Drive Relay
VSD	Variable Speed Drive
W	
W	White (Color of Pilot Light)
WC	Water Column
WCBDS	Water Column Blow Down Switch
WF	Water Feeder
WFNL	Water Flow Normal Light
WLC	Water Level Control
WO	Denotes Waste Oil Equipment (Prefix)
WTS	Water Temperature Sensor
W	White (Color of Pilot Light)
WC	Water Column
WCBDS	Water Column Blow Down Switch
WF	Water Feeder
WFNL	Water Flow Normal Light
WLC	Water Level Control
WO	Denotes Waste Oil Equipment (Prefix)
WTS	Water Temperature Sensor
X	
XFMR	Transformer
XTMR	Transmitter
Y	
YSL	Yellow Stack Light
Y	Yellow (Color of Pilot Light)

Model 537 ASME Section IV, Low Pressure Hot Water Boilers, 'HV', National Board Certified, Safety Valves

Pressure and Temperature Limits

15 to 160 psig
-20° to 250°F

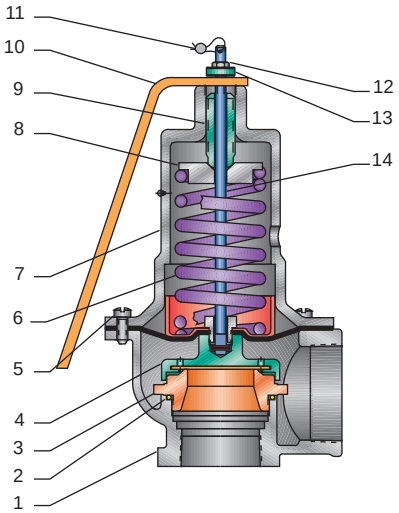
Applications

Hot water boiler, heat exchangers and generators.

Features and Benefits

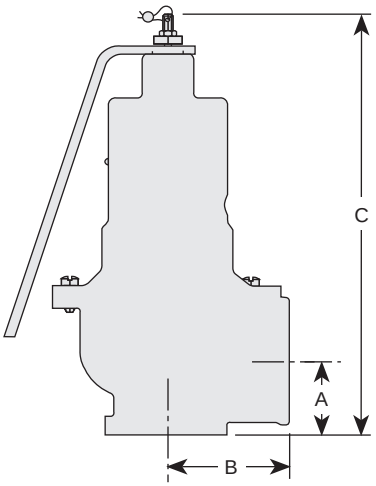
- **Extra heavy construction** provides long life.
- **Top guided disc assembly** incorporates resilient seal in seating area.
- **An isolating diaphragm** protects working parts from corrosion caused by discharged liquid.
- **Pivot between disc and spring** corrects for misalignment and compensates for spring side thrust.
- **These safety relief valves serve the dual purpose** of relieving (1) overpressure created by thermal expansion under normal 'on and off' firing conditions, and (2) overpressure in the form of *water* or *steam* created in over-firing due to failure of electrical or other controls.

Model 537 ASME Section IV, Low Pressure Hot Water Boilers, 'HV', National Board Certified, Safety Valves



Parts and Materials

No.	Part Name	Materials
1	Body	1
2	Seat O-ring	BUNA-N
3	Seat	Bronze, B584 Alloy 84400
4	Disc Holder Insert Diaphragm Guide	Bronze, B584 Alloy 84400 Ethylene Propylene BUNA-N/Nylon Brass, B36 Alloy C26000
5	Screw	SS
6	Spring	SS, A313-631
7	Bonnet	1
8	Spring Step	Brass, B16
9	Compression Screw	Brass, B16
10	Lever	Steel, Zinc Plated
11	Seal and Wire	Lead seal and SS wire
12	Lift Washer Nut	SS
13	Lift Washer	SS
14	Stem Spring Pin Disc Locknut	SS, A479-316 SS Brass



Model 537

Specifications

Size		Dimensions, in			Weight
Inlet	Outlet	A	B	C	(lb)
3/4"	1"	15/16	1 7/8	6 1/8	2
1"	1 1/4"	1 5/16	2 3/8	7 1/8	5
1 1/2"	2"	1 3/4	2 15/16	10 1/8	12
2"	2 1/2"	2 1/8	3 9/16	11 3/4	22

Note

1. 3/4-inch and 1-inch bronze, 1 1/2-inch and 2-inch cast iron.

Model 537 ASME Section IV, Low Pressure Hot Water Boilers, 'HV', National Board Certified, Safety Valves

ASME Section IV Steam (Hot water boiler)

Set Pressure (psig)	Orifice Area, in²							
	3/4" (0.533 in²)		1" (0.833 in²)		1 1/2" (1.767 in²)		2" (3.142 in²)	
	lb/h	BTU/h	lb/h	BTU/h	lb/h	BTU/h	lb/h	BTU/h
15	690	689608	1078	1077755	2286	2286186	4065	4065193
20	811	811173	1268	1267744	2689	2689200	4782	4781814
30	1054	1054304	1648	1647721	3495	3495227	6215	6215055
40	1297	1297435	2028	2027699	4301	4301254	7648	7648296
50	1541	1540566	2408	2407677	5107	5107281	9082	9081537
60	1784	1783697	2788	2787655	5913	5913308	10515	10514779
70	2027	2026828	3168	3167632	6719	6719335	11948	11948020
80	2270	2269959	3548	3547610	7525	7525362	13381	13381261
90	2513	2513090	3928	3927588	8331	8331389	14815	14814502
100	2756	2756221	4308	4307565	9137	9137417	16248	16247744
110	2999	2999352	4688	4687543	9943	9943444	17681	17680985
120	3242	3242483	5068	5067521	10749	10749471	19114	19114226
125	3364	3364049	5258	5257510	11152	11152484	19831	19830847
130	3486	3485614	5447	5447498	11555	11555498	20547	20547467
140	3729	3728745	5827	5827476	12362	12361525	21981	21980708
150	3972	3971876	6207	6207454	13168	13167552	23414	23413950
160	4215	4215007	6587	6587432	13974	13973579	24847	24847191

Model Number/Order Guide

Model Number Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Example	0	5	3	7		D	0	1	—	H	M	0	1	6	0

Model
0537

Inlet Size
D - 3/4-inch
E - 1-inch
G - 1 1/2-inch
H - 2-inch

Variation (01 through 99)
01 - Catalog Standard

Design Revision
Indicates non-interchangeable revision.
Dash (-) if original design.

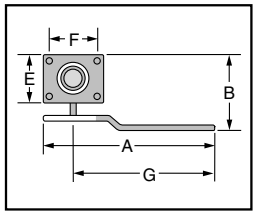
Set Pressure
15 psig (0015)
160 psig (0160)

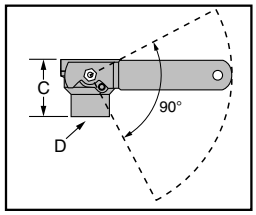
Valves

Series 14-B Ball Type
Blow Down Valve

- For McDonnell & Miller Series 47, 67 and 70B boiler control blow down valve replacement
- Full-ported ball action valve
- Teflon® seats provide bind free, leak tight ball movement
- Easy open handle keeps hands away from hot water and steam
- Gasket and mounting screws included
- Maximum pressure 30 psi (1.8 kg/cm²)
- See page 127 for blow-down information

Series 14-B





Dimensions, in. (mm)

A	B	C	D NPT	E	F	G
6¾ (171.4)	4 (102)	2¼ (57)	¾	2½ (64)	2½ (64)	5¾ (146)

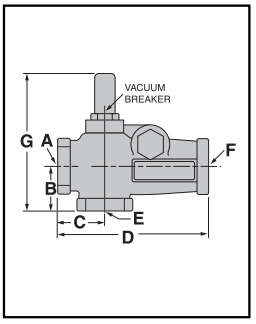
Ordering Information

Model Number	Part Number	Description	Weight lbs. (kg)
14-B	310447	Blow down valve	1 (.5)

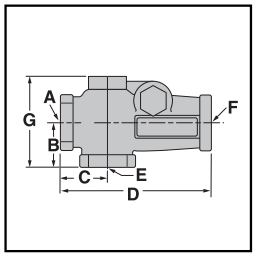
Series TC-4
Test-N-Check® Valves

- For hot water boilers
- Simplifies ASME CSD-1A. code mandated testing of low water cut-offs by eliminating the need to drain the system
- Includes one upper and one lower valve for mounting at crosses in equalizing lines
- Restricts water flow when the low water cut-off's blow down valve is open
- Adjustable built-in vacuum breaker in upper valve provides rapid evacuation of water from the float chamber
- 1" NPT
- Maximum temperature 250°F (121°C)
- Maximum pressure 160 psi (11 kg/cm²)

Series TC-4 Upper Valve



Series TC-4 Lower Valve



Dimensions, in. (mm)

A NPT	B	C	D
1	1½ (38)	1½ (38)	5 (125)

E NPT	F NPT	G	
		Upper	Lower
1	1	5¼ (133)	3 1/16 (78)

Ordering Information

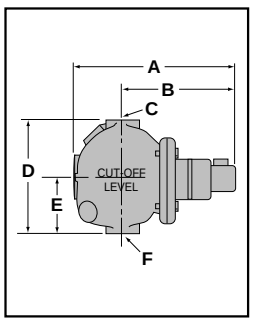
Model Number	Part Number	Description	Weight lbs. (kg)
TC-4	195000	Test-N-Check Valves, set of 2	5.3 (.4)

Low Water Cut-Offs – Mechanical For Steam and Hot Water Boilers

Series 64
Low Water Cut-Offs

- For residential, commercial, and industrial boiler applications of any steaming capacity
- Heavy Duty
- Adjustable BX outlet for easy installation
- Dual precision switches for dependable operation of the low water cut-off and alarm or electric water feeder
- Packless bellows
- Optional manual reset available
- 1" (25mm) NPT equalizing pipes required
- Maximum boiler pressure 50 psi (3.5 kg/cm²)
- Use with TC-4 on hot water systems


SERIES 64



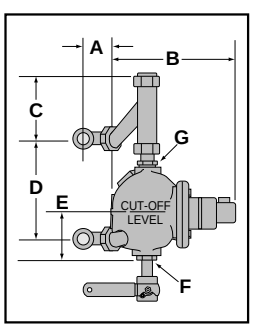
Dimensions, in. (mm)

A	B	C NPT	D	E	F NPT
9 15/16 (252)	7 7/16 (65)	1	6 1/2 (165)	3 1/8 (79)	1

Model 64-A
Low Water Cut-Offs

- Quick hook-up fittings provided for installation directly into gauge glass tappings


Model 64-A



Dimensions, in. (mm)

A	B	C	D		E	F NPT	G NPT
			min.	max.			
2 5/8 (66)	9 15/16 (252)	4 1/2 (113)	6 7/8 (172)	13 3/8 (339)	3 1/8 (79)	1	1

Ordering Information

Model Number	Part Number	Description	Weight lbs. (kg)
64	143600	Low water cut-off	11.3 (5.1)
64-A	143700	64 w/quick hook-up fittings	18.3 (8.3)
64-B	143800	64 w/float block	11.5 (5.2)
64-M	144250	64 w/manual reset	12.5 (5.7)

Electrical Ratings

Voltage	Motor Switch Rating (Amperes)		Pilot Duty
	Full Load	Locked Rotor	
120 VAC	7.4	44.4	125 VA at 120 or 240 VAC
240 VAC	3.7	22.2	

HALIFAX REGIONAL CENTRE FOR EDUCATION

TENDER #3958

Boiler Replacement
Joseph Howe Elementary

Closing Date: **MONDAY, JULY 16TH, 2018**
Closing/Opening Time: ***2:00 P.M.***

Closing Location:
Halifax Regional Centre for Education
33 Spectacle Lake Drive
Dartmouth, N.S. B3B 1X7

Substantial Completion Date:
October 30th, 2018

HRCE Contacts:
Don Walpola, Buyer
Tel: (902) 464-2000 #2223
Fax: (902) 464-0161
Email: dwalpola@hrsb.ca

School Location:
Joseph Howe Elementary
2557 Maynard Street
Halifax
B3K 3V6

Operations Contact:
Tyler Bell, Energy Manager
Tel: (902) 464-2000 Extension #5119
E-mail: tbell@hrsb.ca

A mandatory tenderers' site meeting is scheduled for *THURSDAY JULY 5th 2018 at 10:00 a.m., JOSEPH HOWE ELEMENTARY – Please meet at the front entrance of the school.*

To obtain documents:
Download tender documents in .pdf format from the HRCE's Website:
http://www.hrsb.ca/about-hrsb/financial-services/purchasing/tenders/tender-listing

SECTION 00 00 01 - TABLE OF CONTENTS

SECTION 00 00 01 - TABLE OF CONTENTS

SECTION 00 00 01 - TABLE OF CONTENTS

SECTION 00 00 15 - DESCRIPTION OF WORK & LIST OF DRAWINGS

1. General

1.1 The work of this contract includes the provision of all materials, labour and equipment necessary to complete the **Boiler Replacement** at **Joseph Howe Elementary**, as noted on the drawings and specifications prepared by Dumac Energy Limited.

1.2 It is the HRCE's intent to have all work completed, to point of Substantial Performance, prior to **October 30th, 2018**. It is expected that an early award of this contract will enable the Contractor to facilitate shop drawing review and ordering of materials to allow commencement of work immediately following award of tender.

1.3 The whole of the work shall agree in all particulars with the levels, measurements and details contained in the drawings accompanying this specification and with such other drawings or information as may from time to time be supplied by the HRCE, or may be supplied by the Contractor and reviewed by the HRCE.

2. List Of Drawings

Drawing NO.	Drawing Title
M-1	**Partial Basement Floor Plan, Demolition**
M-2	**Partial Basement Floor Plan, New Work**
M-3	**Details and Schedules**
E-1	**Boiler Room Enlargement - Demo, Legend and Details.**
E-2	**Boiler Room Enlargement - New Work, Details and Schedules**

END OF SECTION 00 00 15

SECTION 00 05 00 - LIST OF CONSULTANTS

Owner: **HALIFAX REGIONAL CENTRE FOR EDUCATION**
33 SPECTACLE LAKE DRIVE, DARTMOUTH NS

Architect: **Tony Meisner**
MCW Maricor
Phone: (902) 876-3182
Email: tmeisner@mcw.com

END OF SECTION 00 05 00

SECTION 00 21 13 – INFORMATION FOR TENDERERS

Invitation:

1. Bid Call

1.1. The HALIFAX REGIONAL CENTRE FOR EDUCATION (HRCE) will receive offers in the form of a bid from Contractors which is signed and received on or before the date and time specified on the cover sheet of this document. The HRCE deems the correct time to be the time indicated on the phone clock on the Receptionist's desk at at 33 Spectacle Lake Drive.

1.2. Offers submitted after the closing time/date shall be returned to the tenderer unopened.

1.3. Submit completed tender documents for above project in sealed envelope marked as follows: ***TENDER #3958, Boiler Replacement –Joseph Howe Elementary.***

1.4. Bids will be opened at the time indicated on the cover sheet of this document. As of April 1, 2014 Public tender openings are no longer held for any tenders relating to goods, services or construction for HRCE. A list of tenderers and bid amounts will be posted on the Procurement Services website (http://novascotia.ca/tenders/tenders/ns-tenders.aspx) shortly following the closing of the tender. All bid submissions are subject to evaluation after opening and before award of contract. The winning tenderer and award amount will be posted on the Procurement Services website (http://novascotia.ca/tenders/tenders/ns-tenders.aspx) after award.

1.5. In the event that the HALIFAX REGIONAL CENTRE FOR EDUCATION office is closed due to inclement weather or any other reason on the date and at the time of closing, the Closing Date and Time will be extended one (1) business day. Proponents should note that closure of Schools does not necessarily mean closure of the HRCE's Regional Office.

1.6. Amendments to the submitted offer will be permitted if received in writing prior to bid closing and if endorsed by the same party or parties who signed and executed the offer.

1.7. Emailed/Faxed Bid Submissions **will not** be accepted.

2. Intent

2.1. The intent of this bid call is to obtain an offer to perform all work associated with ***TENDER #3958, Boiler Replacement,*** at ***Joseph Howe Elementary*** for a Stipulated Price Contract in accordance with the Contract Documents.

3. Scope of work

3.1. Refer to Section 00 00 15 – Description of Work and List of Drawings.

4. Availability

4.1. Bid Documents can be obtained as per the directions on the cover sheet of this document.

4.2. Bid Documents are made available only for the purpose of obtaining offers for this project. Their use does not confer a license or grant for other purposes.

4.3. The HALIFAX REGIONAL CENTRE FOR EDUCATION is not responsible for accuracy of documents and project postings obtained from any other source.

5. Examination

5.1. Bid Documents are on display at the offices of the Nova Scotia Construction Association (CANS), Halifax, NS.

5.2. Upon receipt of Bid Documents verify that documents are complete; notify the HRCE's Buyer by email to dwalpola@hrsb.ca, should the documents be incomplete, or upon finding discrepancies or omissions in the Bid Documents.

5.3. Tenderers shall become fully aware of the content of all tender documents for the preparation of the Tenderer's offer.

5.4. Tenderers will be deemed to have familiarized themselves with the existing site and working conditions and all other conditions which may affect the performance of the work. No plea of ignorance of such conditions as a result of failure to make all necessary examinations will be accepted as a basis for any claims for extra compensation or an extension of time.

6. Clarification and Addenda

6.1. Notify Don Walpola, Buyer, by email to dwalpola@hrsb.ca no less than **five (5)** working days before Tender Closing regarding any questions, omissions, errors or ambiguities found in Contract Documents. If HRCE considers that correction, explanation or interpretation is necessary, a reply will be in the form of an addendum, a copy of which will be posted on the novascotia.ca/tenders and/or HRCE website as applicable, and it is the responsibility of the Tenderer to ensure all addenda are received and acknowledged.

6.2. Addenda will be issued no less than three (3) business days before tender closing date and time, and will form part of the Contract Documents.

6.3. Verbal answers to queries are not binding. Information must be confirmed by written addenda. The HRCE and its representatives shall not be bound by or be liable for any representation or information provided verbally. Information obtained by any other source is not official and will not bind the HALIFAX REGIONAL CENTRE FOR EDUCATION.

6.4. Complete tender form (section 00 41 13) acknowledging that addenda have been received.

7. Product/System Options

7.1. Alternatives to specified products and systems will only be considered during the bidding period in the manner prescribed below.

7.1.1. Where the Bid Documents stipulate a particular product, alternatives may be considered by the Consultant up to five (5) working days before tender closing date and time. Tenderers must forward their written requests by email to: dwalpola@hrsb.ca. The Buyer will relay the requests to the appropriate person(s) for review.

7.2. The submission must provide sufficient information to enable the Consultant to determine acceptability of such products. Request for an alternate must be accompanied with:

7.2.1. information about how the request affects other work in order to accommodate each alternate;

7.2.2. the dollar amount of additions to or reductions from the Bid Price, including revisions to other Work.

A later claim by the tenderer for an addition to the contract price because of changes in work necessitated by use of alternates shall not be considered.

7.3. When a request to substitute a product is made and pursuant to consultation with the Consultant, HRCE may approve or disapprove the substitution. The tenderer making the request will be notified of the HRCE's decision and if the alternate is approved, the HRCE will issue an Addendum.

7.4. Alternates must be submitted in above manner; otherwise, they will not be accepted.

8. Mandatory Tenderers' Site Meeting (Site Assessment)

8.1. Tenderers will be deemed to have familiarized themselves with existing project site and working conditions and all other conditions, which may affect performance of the Contract. No plea of ignorance of such conditions as a result of failure to make all necessary examinations will be accepted as a basis for any claims for extra compensation or an extension of time.

8.1.1. A Mandatory Tenderers' Site Meeting has been scheduled as per the information on the cover sheet of this document. All Tenderers are required to attend. Representatives of HRCE and the Consultant will be in attendance;

9. Tenderers Registration

9.1. The successful Contractor and Sub-contractors must comply with the Nova Scotia Corporations Registration Act or Partnerships and Business Name Registration Act, or equivalent, before a contract is awarded.

10. Qualifications

10.1. Sub-Contractors

10.1.1. HRCE reserves the right to reject a proposed sub-contractor for a reasonable cause.

10.1.2. Refer to Article GC 3.7.3 of CCDC-2 2008.

11. Bid Submission

11.1. Submissions

11.1.1. Tenderers shall be solely responsible for the delivery of their bids in the manner and time prescribed.

11.1.2. Bids must be submitted on the **Bid Form** provided by the HRCE (Section 00 41 13 – Bid Form). These forms are to be completely filled out in ink, with the signature in longhand, and corporate sealed as applicable, and the completed form shall be without interlineations, alterations or erasures. Electronic bid submissions sent by facsimile transmission or email will not be accepted.

11.1.3. Fully complete the Tender Bid Form and enter the contract price in both written words and numerals. Where this bid is requested in both words and numbers, and if the two (2) do not represent the identical amount, words shall prevail.

11.1.4. Submit the executed offer on the Bid Forms together with the required bid security in a closed opaque envelope, clearly identified with tenderer's name, project name and tender number on the outside.

11.1.5. Improperly completed information, irregularities in the bid security, may be cause to declare the bid informal.

12. Accuracy of Referencing

12.1. Indexing and cross-referencing are for convenience only.

13. Conditions of Tendering

13.1. Take full cognizance of content of all Contract Documents in preparation of Tender. Refer to Section 00 41 13 – Tender Form, Subsection 5.0 for a complete list of Contract Documents.

14. Preparation of Tender

14.1. Complete Tender Bid Form (section 00 41 13) provided with Contract Documents in ink. Tender all items and fill in all blanks. Have corrections initialed by person signing Tender. Tenderers' are required to provide all information as detailed.

15. Amendment or Withdrawal of Tender

15.1. Bids may be amended or withdrawn by post, hand or facsimile prior to date and time of closing.

15.2. A Tender Price Amendment Form is provided immediately following the Bid Form (section 00 41 73).

15.2.1.1. The Tender Price Amendment Form provided is the standard Master form for submission of all tender price amendments for this project.

15.2.1.2. Copy and complete form, as directed, for all tender price amendments submitted.

15.3. Amendments shall not disclose either original or revised total price.

15.4. Sign, execute and submit to the HRCE Office or by facsimile to (902) 464-0161 prior to time of Tender Closing.

16. Bid Ineligibility (reason for rejection)

16.1. HRCE may reject a bid which has been received prior to the closing time where:

16.1.1. The bid is not submitted on the required bid form (Section 00 41 13) included herein.

16.1.2. The bid is submitted by electronic transmission.

16.1.3. There are omissions of information that HRCE in its sole discretion deems to be significant.

16.1.4. The bid is not signed as required.

16.1.5. The bid has conditions attached which are not authorized by the invitation to bid.

16.1.6. The bid fails to meet one or more standards specified in the invitation to bid.

16.1.7. All addenda have not been acknowledged.

16.1.8. Any other defect which, in the opinion of the HRCE brings the meaning of the bid into question.

16.1.9. A major irregularity is a deviation from the bid request which affects the price, quality, quantity, or delivery of the project and is material to the award, and is a reason for rejection.

16.1.10. A minor irregularity is a deviation from the bid request which affects form, rather than substance. The effect on price, quality, quantity or delivery is not material to the award, and may be waived by the HRCE.

16.1.11. The required bid security in the required form is not provided.

16.1.12. Tenderer failed to attend Tenderers' Mandatory Site Meeting.

17. Communications Affecting Bids

17.1. Electronic Transmissions, including, but not limited to facsimile transmission:

17.1.1. Bid forms submitted by facsimile and/or e-mail etc. transmission are not acceptable and will be rejected.

17.1.2. Electronic transmissions (facsimile only) modifying tenderer supplied information are acceptable when signed by an authorized signatory of the original bid. Submission and receipt of such electronic transmissions is at the risk of the tenderer. HRCE assumes no liability for the receipt of the electronic transmission or for their proper inclusion with original bid. There is no requirement for HRCE to follow up upon receipt of an electronic transmission. Electronic submissions will be considered binding on both parties. Electronic submissions must be submitted and received prior to closing time and date specified in the bid documents. HRCE Procurement Department Date and Time stamps will prevail. **HRCE Procurement facsimile number is 902-464-0161.**

18. Right to Accept or Reject any Tender

18.1. The HRCE reserves the right to reject any bid in its sole and absolute discretion for any reason whatsoever.

18.2. The HRCE specifically reserves the right to reject all bids if none is considered to be satisfactory in the HRCE's sole and absolute discretion and, in that event, at its option, to call for additional bids.

18.3. Without limiting the generality of any other provision herein, the HRCE reserves the right to accept or reject any bid in accordance with bullet #16 above. (Bid Ineligibility)

18.4. Notwithstanding the above, the HRCE shall be entitled, in its sole and absolute discretion, to waive any irregularity, informality or non-conformance with these instructions in any proposal received by the HRCE. HRCE reserves the right to reject any or all tenders, or to accept any tender, or portion thereof, deemed in its best interest.

18.5. In the event that a number of Tenderers submit bids in substantially the same amount, the HRCE may, at its discretion, call upon those Tenderers to submit further bids or take into consideration any value added services being provide in determination of award.

18.6. No term or condition shall be implied, based upon any industry or trade practice or custom or in a practice or policy of the HRCE or otherwise, which is inconsistent or conflicts with the provisions contained in these Instructions.

19. Construction Contract Guidelines

19.1. The printed policies of the Nova Scotia Construction Guidelines, dated May 18, 2006 (or latest revisions) are applicable to these bid documents.

20. Bid and Security Forms – Signatures

20.1. All bid forms, bid security forms and performance assurance forms **must** bear the Tenderer's original signature and name HRCE as insured.

21. Bid Security

21.1. Submit with Bid one of the following: Bid security in the form of a Certified Cheque, Irrevocable Letter of Credit, or Bid Bond on CCDC Form 220, in the amount of ten percent (10%) of the Bid Price made payable to, or naming HRCE (as obligee), must accompany the tender.

21.2. Where bid bond is provided as bid security:

21.2.1. Provide bond on the standard CCDC Bid Bond Form, latest version, in the amount of not less than ten percent (10%) of the Bid Price.

21.2.2. Bid Bonds, submitted by the general contractor tenderer, signed and sealed by the principal (Contractor) and Surety and shall be with an established Surety Company satisfactory to and approved by HRCE.

21.2.3. Where Bid Bond is used as Bid Security, include the cost of providing the Bid Bond in the Bid Price.

21.3. Where certified cheque or bank draft is provided as bid security:

21.3.1. Provide a certified cheque or bank draft, endorsed in the name of HRCE, for a sum not less than ten percent (10%) of the amount of the Bid Price.

21.3.2. Where certified cheque or bank draft is used as Bid Security, include the cost in the Bid Price.

21.4. Where the Irrevocable Standby Letter of Credit is used as bid security:

21.4.1. Provide an Irrevocable Standby Letter, endorsed in the name of HRCE, for a sum not less than ten percent (10%) of the Bid Price

21.4.2. The Irrevocable Standby Letter of Credit shall be issued by a certified financial institution subject to the Uniform Custom and Practices for Documentary Credit (1993 revision or latest revision) International Chamber of Commerce (Publication No. 500).

21.4.3. Where Irrevocable Standby Letter of Credit is used as bid security, include the cost in the Bid Price.

21.5. Return of Bid Security:

21.5.1. The bid security of the unsuccessful tenderers will be returned to them after the contract has been signed, or previous to such time, at the discretion of HRCE.

21.5.2. The above shall apply provided a contract is awarded within ninety (90) days from the closing date of the bid.

21.5.3. If no contract is awarded, all bid security will be returned.

22. Contract Security (Performance Assurance)

22.1. All bid forms, bid security forms and performance assurance forms must bear the tenderer's original signature and name HRCE as insured.

22.2. Tenderer shall maintain performance assurance in force for a period of not less than twelve (12) months after the issue of the substantial performance certificate certified by HRCE and until completion of the contract.

22.3. Endorse Performance Assurance as specified for bid security.

22.4. Should it become apparent that the final cost of the project will exceed the total amount payable by more than 20%, the tenderer shall arrange to have their bonds reissued based on the projected final cost.

22.5. Refer to Section 00 72 13 – General Conditions GC11.2 and Section 00 73 00 – Supplementary General Conditions for form of Contract Security. Refer to project documents for amount of Contract Security and alternate type of Contract Security if applicable.

22.6. Submit as Performance Assurance one of the following:

22.6.1. Where a Bid Bond was used as bid security:

22.6.1.1. Within ten (10) days after notification of award of the Contract, provide a Performance Bond and a Labour & Material Payment Bond, each in an amount equal to fifty percent (50%) of the amount of the Contract, naming HRCE.

22.6.1.2. Performance Bond and Labour and Material Payment Bonds, submitted by the tenderers, shall be provided at the expense of the tenderer and shall be with an established Surety Company satisfactory to and approved by HRCE.

22.6.1.3. Include the cost of providing the Performance Bond and Labour and Material bond in the Contract price.

22.6.2. Where a Certified Cheque or Bank Draft is used as Contract Security:

22.6.2.1. The Certified Cheque or Bank Draft submitted during the bid period will be cashed and the amount retained by HRCE shall serve as Performance Assurance**,** including the payment of all obligations arising under the Contract.

22.6.2.2. The Certified Cheque or Bank Draft will be held in lieu of the Performance Bond and Labour and Material Bonds, providing that, at Contract award, the successful Tenderer shall supplement their Certified Cheque or Bank Draft to maintain an amount of ten (10%) of the total amount payable (Contract Price plus HST) under the contract.

22.6.2.3. The amount remaining will be returned without interest after a period of not less than twelve (12) months after the issue of the substantial performance certificate certified by HRCE and shall serve as performance assurance and not until completion of the contract.

22.6.2.4. Where certified cheque or bank draft is used as Performance Assurance, include the cost of providing the certified cheque in the Contract price.

22.6.3. Where an Irrevocable Standby Letter or Credit is used as Contract Security:

22.6.3.1. The Irrevocable Standby Letter of Credit submitted during the bid period will be retained by HRCE and shall serve as performance assurance, including the payment of all obligations arising under the contract. The irrevocable standby letter of credit shall be issued by a certified financial intuition subject to the Uniform Customs and Practices for Documentary Credit (1993 revision) International Chamber of Commerce (Publication No. 500).

22.6.3.2. Where irrevocable standby letter of credit is used as Performance Assurance, include the cost of providing and Irrevocable Standby Letter of Credit in the Contract Price. The contractor shall provide to HRCE documentation throughout the duration of the contract that the irrevocable standby letter of credit remains in full effect at all times as specified,

22.6.3.3. Upon expiry of the Irrevocable Standby Letter of Credit, a separate Irrevocable Standby Letter of Credit shall be provided for work requiring extended warranties for such amounts as are required by the contract.

22.6.3.4. The Irrevocable Standby Letter of Credit is to be in effect for a period of not less than twelve (12) months after the issue of the substantial performance certificate certified by HRCE and shall serve as performance assurance and not until completion of the contract.

23. Insurance

23.1. Refer to Section 00 72 13 -General Conditions of Contract, GC 11.1 – Insurance and Section 00 73 00 – Supplementary General Conditions for form of Insurance. Refer to project documents for amount of insurance, duration of coverage and alternate type of Insurance if applicable.

23.2. General Contractor shall secure and maintain at its expense during the term of the Insurance:

23.2.1. Workers' Compensation to meet Statuary requirements and/or Employers Liability.

23.2.2. Wrap Up liability Insurance must insure the general contractor(s) and all sub-contractors on this project:

23.2.2.1. including but not limited to, products liability and completed operations, contractual liability, owners and contractors liability, attached machinery extension endorsement, independent contractor, for a combined single limit of no less than $5,000,000.00 per occurrence.

23.2.3. Commercial Auto Liability insurance covering all owned, non-owned and hired vehicles for a minimum combined single coverage of $2,000,000.00 per occurrence.

23.2.4. Builders Risk – all risks – in the amount of the project contract stipulated bid price.

23.2.5. Deliver a certificate of insurance evidencing the above prior to work being performed. It is also agreed that the above insurance coverage is primary and must be kept in force during the term of this agreement. Furthermore, HRCE must receive, in writing, at least thirty (30) days' notice of cancellation or modification of the above insurances. All insurance policies or certification documents shall specify coverage being applicable to this contract. The Contractor shall not do or omit to do or suffer anything to be done or omitted to be done which will in any way impair or invalidate such policy or policies of insurance.

23.3. Primary Insurance- Supplier agrees that the insurance as required above shall be primary and non-contributory.

23.4. No limitation- Supplier is responsible for determining whether the above minimum insurance coverage's are adequate to protect its interests. The above minimum coverage's do not constitute limitations upon Supplier's Liability.

23.5. Endorsements – For the policies in para 23 above, there shall contain an endorsement naming HRCE and its Affiliates as an Additional Insureds, and eliminating and removing any exclusion of liability for:

23.5.1. injury, including bodily injury and death to an employee of the insured or of HRCE, or

23.5.2. any obligation of the insured to indemnify, hold harmless, defend, or otherwise make contribution to the HRCE because of damage arising out of injury, including bodily injury and death, to an employee of HRCE.

24. Proof of Competency of Tenderer

24.1. Any tenderer may be required to furnish evidence satisfactory to the owner that he and his proposed sub-contractors have sufficient means and experience in the types of work called for to assure completion of the contract in a satisfactory manner.

24.1.1. The successful tenderer **must** be a member in good standing with CRCA, RCANS; and

24.1.2. Nova Scotia Construction Safety Association or approved recognized association or program.

25. Bid Form Requirements

25.1. Bid Submission

25.1.1.1. Tenderers shall be solely responsible for the delivery of their bids in the manner and time prescribed.

25.1.1.2. Bids must be submitted on forms provided by the HRCE. These forms are to be completely filled out in ink or by typewriter, with the signature in longhand, and the completed form shall be without interlineations, alterations or erasures.

25.1.1.3. Submit the executed bid on the bid forms provided, signed and corporate sealed as applicable together with the required security in a closed opaque envelope, clearly identified with Tenderers name, project name on the outside.

25.1.1.4. Improperly completed information, irregularities, in required enclosures may be cause to declare the bid informal.

25.2. Bid Signing

25.2.1. The bid form **Must** be signed and under seal (as applicable) by a duly authorized signing officer(s) in their normal signatures.

25.3. Contract Time

25.3.1. The tenderer, in submitting an offer, agrees to achieve Substantial performance of the work by the date indicated in the contract documents. The Substantial Performance date in the agreement shall be as indicated on the cover sheet.

26. Offer Acceptance / Rejection

26.1. Duration of offer

26.1.1. Bids shall remain open to acceptance and shall be irrevocable for a period of ninety (90) days after the bid closing date.

26.2. Award/Selection/Acceptance of Offer

26.2.1. In the evaluation of a bid, HRCE will consider, but not be limited to, the following criteria:

26.2.1.1. Compliance with Bid requirements.

26.2.1.2. Bid price submitted.

26.2.1.3. The qualifications and experience of the tenderer with similar projects in size and scope.

26.2.1.4. References.

26.2.1.5. Gantt chart (schedule of proposed scope of work for various disciplines).

26.2.1.6. Completion date.

26.2.2. The Owner's evaluation of any and all bid submission(s) will be final.

26.3. HRCE reserves the right to accept or reject any or all offers or to accept any offer deemed most satisfactory, HRCE reserves the right to waive any informality in any or all bids.

26.4. After acceptance HRCE will issue to the successful tenderer, a written bid acceptance.

26.5. After acceptance by HRCE, the successful tenderer shall be notified in writing of acceptance of the bid and will be issued an official purchase order.

27. Agreement

27.1. After acceptance by HRCE and the successful tenderer will enter into a CCDC-2 –2008, standard form of contract for the execution of the work.

28. Post Bid Submissions

28.1. Provide after closing of bid period, but before award of Contract, when requested by HRCE, a copy of the following documents:

28.1.1. Current Certificate of Recognition or Letter of Good Standing:

28.1.1.1. Certificate of Recognition issued jointly by the Nova Scotia Department of Labour and an occupational health and safety organization approved by Nova Scotia Department of Labour, or a valid letter of Good Standing from an occupational health and safety organization approved by HRCE indicating the Contractor is in the process of qualifying for the Certificate of Recognition. Contractor shall remain in good standing for the duration of the contract. In the event that any such certification during

the term of the contract expires, the obligation remains with the contractor to provide the updated required certificates.

28.1.1.2. Worker's Compensation Coverage

28.1.1.2.1. Evidence of an account with the Workers' Compensation Board, coverage under the Workers Compensation Act, R.S.N.S. and a clearance certificate indicating the tenderer is in good standing and shall remain so for the duration of the contract. In the event that any such certification during the term of the contract expires, the obligation remains with the contractor to provide the updated required certificates.

28.1.1.3. Certificates of good standing with CRCA (Canadian Roofing Contractors Association) and RCANS (Roofing Contractors Association of Nova Scotia),

28.1.2. Submit Post-Bid Submissions requested by HRCE within forty-eight (48) hours of request in order to be eligible to receive award of contract.

28.1.3. Submit the following post award documents within ten (10) working days of notice of award:

28.1.3.1. Provide all required contract security and insurance documentation,

28.1.3.2. Schedule of Values,

28.1.3.3. Copy of safety plan,

28.1.3.4. Copy of Hot Work Permit system and procedures,

28.1.3.5. Shop drawings, as applicable, and

28.1.3.6. Applicable documentation as required by the Tender Documents.

28.1.4. All post bid submissions must be received by HRCE in the manner prescribed above, or prior to commencement of work and delivery of materials on-site, whichever occurs first.

29. Taxes

29.1. The General Conditions of the Contract state that the Contractor as of April 1, 1997 and thereafter, the Contractor is to pay all Harmonized Sales Tax.

29.2. HRCE is not exempt for Harmonized Sales Tax (HST) purposes. As a result, the aggregate amount of the bid for contracts is subject to HST, however, **prices submitted shall not include HST.**

29.3. The HST payable by the HRCE will be added as a separate item during the processing of progress payments and therefore **HST will not appear as a cost in the aggregate amount of the tender.**

29.4. Tenderers are advised that they may be eligible to claim an Input Tax Credit (ITC) for a portion of the HST paid in relation to the Contract requirement of the Government of Canada.

29.5. Tenderers are to note that prices indicated on the Bid Form and the appendices to the Bid Form shall not include Provincial Sales Taxes, the Federal Goods and Services Tax or the Harmonized Sales Tax.

29.6. Exclude Harmonized Sales Tax in Tender Contract Price, unless requested to do otherwise.

29.7. Refer to CCDC-2 - 2008 (Section 00 72 13) and Supplementary General Conditions (Section 00 73 00).

END OF SECTION 00 21 13

SECTION 00 41 13 - TENDER FORM

1. Salutation:

To: **HALIFAX REGIONAL CENTRE FOR EDUCATION**
33 SPECTACLE LAKE DRIVE, DARTMOUTH NS
Attn: DON WALPOLA, BUYER

For: ***#3958 Boiler Replacement – Joseph Howe Elementary***
From: _____
Address: _____
_____
E-Mail: _____
Phone: **Fax**: _____
Person Signing for Firm: _____
Position: _____

2. Tenderer Declares:

2.1. That this tender was made without collusion or fraud.
2.2. That the proposed work was carefully examined.
2.3. That the Tenderer was familiar with local conditions.
2.4. That Contract Documents and Addenda were carefully examined.
2.5. That all the above were taken into consideration in preparation of this Tender.

3. Tenderer Agrees:

3.1. To provide all necessary equipment, tools, labour, incidentals and other means of construction to do all the Work and furnish all the materials of the specified requirements which are necessary to complete the Work in accordance with the Contract and agrees to accept, therefore, as payment in full the Lump Sum Price stated in Subsection 6 hereunder.
3.2. Carefully examined the site of the work described herein; become familiar with local conditions and the character and the extent of the work; carefully examined every part of the proposed Contract and thoroughly understands its stipulations, requirements and provisions.
3.3. Determined the quality and quantity of materials required; investigated the location and determined the source of supply of the materials required; investigated labour conditions; and has arranged for the continuous prosecution of the work herein described
3.4. To be bound by the award of the contract and if awarded the contract on this bid to execute the required contract within ten (10) days after notice of award.
3.5. Noted that the Harmonized Sales Tax is excluded from his “Contract Price”.

3.6. School/Work site access control: Contractor's employees shall always report to the main office of a school, indicate who they are and state their purpose on site prior to starting any work in the school. Contractor is not permitted to work on the school site without the HRCE's assigned representative on site unless authorized by the HRCE Operations representative. Typical hours of work are daylight hours. Working in occupied schools will be determined by the Operations representative. No work shall be conducted on weekends or holidays without specific approval of the Operations Representative. Work in an occupied school will be limited to work that is not disruptive to the school. IE: No mechanical removals, no drilling, screwing or torch work during occupied hours without approval from HRCE.

3.7. Hours of work – ~~All work shall be carried out during regular business hours unless otherwise indicated below or in writing by the Manager of Operations or designate.~~ Hours of work shall comply with local ordinances and bylaws for each site. Loud or disruptive work will have to occur outside class hours. All other work can be carried out during regular business hours.

4. Owner Agrees

4.1. To examine this bid and in consideration, therefore, the tenderer hereby agrees not to revoke this bid:

4.1.1. until some other tenderer has entered into the contract with The HRCE for the performance of the work and the supply of the materials specified in the notice inviting bids; or in the Information to Tenderers, or

4.1.2. until ninety (90) days after the time fixed in the Information to Tenderers for receiving bids has expired,

4.1.3. Whichever first occurs; provided, however, that the tenderer may revoke this bid at any time before the time fixed in the Information to Tenderers for receiving bids has expired upon receipt by the HRCE from the tenderer of written notice of such revocation before said time has expired.

4.1.4. The Tenderer declares that he has obtained from the Subcontractors all Bid Security required to be provided by Subcontractors pursuant to the "Instructions to Tenderers".

5. Contract Documents include:

5.1.1. Cover Page
5.1.2. Table of Contents – Section 00 00 01
5.1.3. Description of Work & List of Drawings – Section 00 00 15
5.1.4. List of Consultants – Section 00 05 00
5.1.5. Information for Tenderers – Section 00 21 13
5.1.6. Tender Form – Section 00 41 13
5.1.7. Tender Price Amendment Form (if applicable) – Section 00 41 73
5.1.8. Agreement Between Owner and Contractor (CCDC 2 – 2008) – Section 00 52 00
5.1.9. Definitions (CCDC 2 – 2008) – Section 00 52 13
5.1.10. General Conditions of the Stipulated Contract Price (CCDC 2 -2008) – Section 00 72 13
5.1.11. Supplementary General Conditions – Section 00 73 00
5.1.12. HRCE General Terms & Conditions – Section 00 73 10
5.1.13. Specifications of Work (all applicable sections)
5.1.14. Drawing(s) – as applicable
5.1.15. Addendum/Addenda issued by HRCE.
5.1.16. Contract Sets (2)

6. Fee Submission - Contract Price:

6.1. The undersigned Tenderer, having carefully read and examined the aforementioned Contract Documents prepared by the Consultant, for the Halifax Regional Centre for Education, hereby accepts the same as part and parcel of the Contract herein referred to, and having carefully examined the locality and Site of Works and having full knowledge of the work required and of the materials to be furnished and used, does hereby Tender and offer to enter into a contract to perform and complete, the whole of the said works and provide all necessary labour, plant, tools, materials and equipment and pay all applicable taxes, as set forth and in strict accordance with the Specifications, Drawings and other Contract Documents and to do all therein called for on the terms and conditions and under the provisions therein set forth for the following:

6.2 LUMP SUM BID PRICE

_____ /100 Dollars ($_____) (HST Excluded)

Contract Price to be completed in written form on the lines provided above, with cents expressed as numerical fraction of a dollar. Contract price to be completed in numerical form on the line bounded by parenthesis above, with cents expressed as a decimal of a dollar. WHERE THERE IS A CONFLICT, WRITTEN WORD WILL GOVERN.

6.3 Breakout Prices: Breakout prices requested in the Tender Document, as detailed below, **SHALL BE INCLUDED IN THE LUMP SUM TENDER PRICE** above (6.1 - Contract Price) and deleted only on the instruction at the sole discretion of the Owner, for which a credit will be offered by the Contractor, equal to the breakout pricing detailed below (price excludes HST):

Item No.	Description	Unit of Measurement	Credit Amount
1.	_____n/a_____	_____	$_____
2.	_____	_____	$_____
3.	_____	_____	$_____
4.	_____	_____	$_____
5.	_____	_____	$_____

Total Credit Amount for ALL Breakout Items:

_____ /100 Dollars ($_____) (HST Excluded)

6.4 Separate Prices: Separate prices requested in the Tender Document, as detailed below **SHALL NOT BE INCLUDED IN THE LUMP SUM TENDER PRICE** above (6.1 - Contract Price) and added only on the instruction and at the sole discretion of the Owner, for which the contract will be adjusted, equal to the separate pricing detailed below (price excludes HST):

Listing of Separate Price Details Requested by HRCE:

Item No.	Description	Unit of Measurement	Unit Price
6.	_____n/a_____	_____	$_____
7.	_____	_____	$_____
8.	_____	_____	$_____
9.	_____	_____	$_____
10.	_____	_____	$_____

7. Completion Time:

7.1. Tenderer agrees to be substantially complete as follows:

7.1.1.1. ***October 30th,2018***

7.1.1.2. The undersigned Tenderer agrees if awarded the Contract on this Bid to achieve the Substantial Completion Date providing the contract is awarded within ten (10) business days of tender closing time.

7.2. Detailed breakdown of overall project specific phases (schedule of proposed scope of work for various disciplines) written and/or Gantt Chart to be provided with bid documents or within five (5) business days of tender award.

8. Addenda Acknowledgement

I/We have received and noted the following addenda ***for Tender #3958 Boiler Replacement – Joseph Howe Elementary***

Addendum #	**Dated**	**# of Pages**
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

9. Supporting Information

9.1. References: (Minimum of three)

Tenderer to furnish particulars of at least three (3) similar contracts successfully completed or currently being carried to completion. The projects quoted should preferably be approximate in nature to the work now tendered for and be of comparable or greater size. References are to be submitted with the bid prior to closing date and time.

Contact Name & Phone #	**Date**	**Contract Value**
_____	**From** _____ **to** _____	**$** _____
_____	**From** _____ **to** _____	**$** _____
_____	**From** _____ **to** _____	**$** _____
_____	**From** _____ **to** _____	**$** _____

9.2. Bid submission to include a minimum of two letters of endorsement from clients commenting upon the contractor's ability to deliver quality projects, similar in scope and size, which met schedule and budget.

10. Proof Of Competency Of Tenderer

10.1. Any tenderer may be required to furnish evidence satisfactory to the Owner that he and his proposed sub-contractors have sufficient means and experience in the types of work called for to assure completion of the Contract in a satisfactory manner.

10.1.1. The Tenderer acknowledges, as part of their bid submission, their responsibility and contract obligations to ensure that the proposed sub-contractors will fully perform the project requirements and meet the timings as detailed in this tender call.

10.2. Sub-Contractors: The Tenderer to provide the name and address of each major sub-contractor used in making up this tender. This list of sub-contractors is to be submitted with the bid prior to closing date and time. Only one sub-contractor shall be named for each part of the work to be sublet.

Subcontractor/Suppliers/Manufacturers	**Service/Material**
Site Works	
Electrical	
Mechanical	
Roof	

10.2.1. Project Personnel: The Tenderer to include below, the names, qualifications and previous experience of those people who will be directly involved with the project. The names shall, for example, include foremen, superintendent, project engineer and/or project manager, labourers and trade staff. This list of personnel is to be submitted with the bid prior to closing date and time.

Name	**Position**	**Qualifications/Experience**

Signature * The undersigned Tenderer declares that this bid is made without connection with any other person(s) submitting bids for the same work and is in all respects fair and without collusion or fraud.

SIGNATURE:

SIGNED AND DELIVERED
in the presence of:

_____
Witness

CONTRACTOR

_____
Company name

_____
Signature of Signing Officer

_____
Name and Title (printed)

_____
Date

HRCE is directly responsible for the safety of its students and staff. Should contractors be required to work in or on school property while children are present, it is a MANDATORY HRCE REQUIREMENT that contractors assign the work to employees and/or sub-contractors who DO NOT have a CRIMINAL RECORD and who ARE NOT LISTED ON THE CHILD ABUSE REGISTRY. Failure to comply with this requirement may result in immediate contract termination.

By checking the "Agreed" box you are confirming that you understand and will abide by this mandatory HRCE requirement.

Agreed □

Note: *Bids submitted **Must** be signed by a duly authorized officer or agent.*

END OF SECTION 00 41 13

SECTION 00 41 73 - TENDER AMENDMENT FORM

#3958 Boiler Replacement - Joseph Howe Elementary

Note: to be completed and forwarded for each Bid Price adjustment prior to bid closing time and date as detailed on the Cover Sheet of the tender document and related Addendum.

Lump Sum Price Adjustment – Section 00 41 13 Tender form, Article 6.1.1 Contract Price

Increase Bid by		**Decrease Bid By**	
Amount (excluding HST)	**$**	**Amount** (excluding HST)	**$**
HST	**$**	**HST**	**$**
Total Amount (including HST)	**$**	**Total Amount** (including HST)	**$**

It is the Tenderer's responsibility to ensure the table above is legible

Attachments included: **no** ☐ **yes** ☐ (✓ one)

If yes above, check ✓ and complete information regarding attachments

☐ **Revised Bid Form**: Dated _____ # of pages _____

☐ **Other, Specify** _____

Dated _____ # of pages _____

Total number of pages (including this form) _____

Submitted by:

_____

Company Name (please print as it appears on original tender envelope)

_____

Authorized Tenderer's Name (please print as it appears on Bid Form)

_____

Authorized Tenderer's Signature

END OF SECTION 00 41 73

SECTION 00 52 00 - AGREEMENT BETWEEN OWNER AND CONTRACTOR

CCDC 2 – 2008

(a copy of Section 00 52 00, Standard Construction Contract CCDC 2 – 2008 (5 pages) is available upon request, otherwise, will form part of the contract sets to the successful tenderer)

END OF SECTION 00 52 00

SECTION 00 52 13 - DEFINITIONS

CCDC 2 - 2008

(A copy of section 00 52 13, Standard Construction Contract CCDC 2 – 2008 (2 pages) is available upon request, otherwise, will form part of the contract sets to the successful tenderer)

END OF SECTION 00 52 13

SECTION 00 72 13 - GENERAL CONDITIONS
OF THE STIPULATED PRICE CONTRACT
CCDC 2 - 2008

(A copy of section 00 72 13, Standard Construction Contract CCDC 2 – 2008 (23 pages) is available upon request, otherwise, will form part of the contract sets to the successful tenderer)

END OF SECTION 00 72 13

SECTION 00 73 00 - SUPPLEMENTARY GENERAL CONDITIONS CCDC2 – 2008

The Canadian Standard Construction Document for Stipulated Price Contract (CCDC 2, 2008 version), Definitions and General Conditions governing same, shall be used by the project. The following Supplementary General Conditions are intended to supplement or amend the General Conditions, and where conflicts occur, the Supplementary Conditions shall take precedence.

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

ARTICLE A-5 PAYMENT

Delete paragraph 5.1 in its entirety and insert:

5.1 "Subject to applicable legislation and the provisions of the Contract Documents, and in accordance with legislation and statutory regulations respecting holdback percentages and, where such legislation or regulations do not exist or apply, subject to a holdback of ten percent (10%) including the HST (Harmonized Sales Tax), the Owner shall:"

.1 Make progress payments to the Contractor on account of the Contract Price (work performed) when due in the amount certified by the Consultant together with Value Added Taxes as may be applicable to such payments, and
.2 Upon Substantial Performance of the Work as certified by the Consultant, pay to the Contractor the unpaid balance of monies then due, excepting that amounts as certified by the Consultant to rectify deficiency items, or incomplete portions of individual work items may be retained by the Owner pending Total Performance of the work or other authorization for the release by the Consultant, and
.3 Upon Total performance of the Work as certified by the Consultant pay to the contractor the unpaid balance of monies due together with such Value Added Taxes as may be applicable to such payment.

Change 5.3.1 (1) to read: "1% per annum above the prime rate."

Delete 5.3.2 (2) in its entirety.

DEFINITIONS

Add subparagraph 19a to definitions:

19a. Submittals

Submittals are documents or items required by the Contract Documents to be provided by the Contractor, such as:

1 Shop Drawings, samples, models, mock-ups to include details or characteristics, before the portion of the Work that they represent can be incorporated into the Work; and
2 As-built drawings and manuals to provide instructions to the operation and maintenance of the Work.

GC 1.1 CONTRACT DOCUMENTS

Add to the end of subparagraph 1.1.2.2:

1.1.2.2 Except where the Consultant shall be indemnified as a third party beneficiary as provided in subparagraphs 9.2.7.4, 9.5.3.4 and in 12.1.3.

Add subparagraph 1.1.7.5:

1.1.7.5 Should conflicts occur between Contract Documents and any work is done without consulting the Consultant for his decision, the Contractor shall assume full responsibility.

Add subparagraph to 1.1.7.6:

1.1.7.6 In case of discrepancies, noted materials and annotations shall take precedence over graphic indications in the Contract Documents.

Delete paragraph 1.18 in its entirety and insert:

1.18 "The Contractor will be provided with up to a maximum of ten (10) copies, without charge, of the Contract Documents or parts thereof for the performance of the work. Extra copies may be obtained for cost of printing and mailing."

GC 2.4 DEFECTIVE WORK

Add new subparagraphs 2.4.1.1 and 2.4.1.2:

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

2.4.1.2 The Contractor shall prioritize the correction of any defective work which, in the sole discretion of the Owner, adversely affects the day to day operation of the Owner.

GC 3.1 CONTROL OF THE WORK

Add new paragraph 3.1.3:

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

GC 3.4 DOCUMENT REVIEW

Delete paragraph 3.4.1 in its entirety and substitute new paragraph:

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

GC 3.7 SUBCONTRACTORS AND SUPPLIERS

Add the following paragraph 3.7.7:

3.7.7 A copy of the agreement between Contractor and any subcontractor(s) shall be provided to the Consultant if so requested.

GC 3.8 LABOUR AND PRODUCTS

Add the following paragraph 3.8.4:

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

GC 3.10 SHOP DRAWINGS

Add the words "AND OTHER SUBMITTALS" to the Title after SHOP DRAWINGS in GC 3.10.

Add "and submittals" after the words "Shop Drawings" in paragraphs 3.10.1, 3.10.2, 3.10.4, 3.10.7, 3.10.8, 3.10.8.2, 3.10.9, 3.10.10, 3.10.11 and 3.10.12.

Delete 3.10.3 in its entirety and substitute new paragraph:

3.10.3 Prior to the first application for payment, the Contractor and the Consultant shall jointly prepare a schedule of the dates for submission and return of Shop Drawings and any Submittals.

Add the following subparagraph 3.10.6.1:

3.10.6.1 The following paragraph shall apply to each shop drawing and submittals reviewed in connection with the project. This review shall not mean that the Consultant approved the detailed design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same. The Contractor is responsible for information that pertains solely to fabricated processes or to techniques of construction and installation, and for coordination of the work of all sub trades.

Delete and insert the words in paragraph 3.10.12

3.10.12 "with reasonable promptness so as to cause no delay in the performance of the Work" and replace with "within ten (10) working days or such longer period as may be reasonably required"

PART 3 EXECUTION OF THE WORK

Add new GC 3.14 as follows:

GC 3.14 CONTRACTOR RESPONSIBILITY FOR WATER TIGHTNESS

GC 3.14.1 The drawings and specifications are not intended to depict each and every condition or detail of construction. As the knowledgeable party in the field, the contractor is in the best position to verify that all construction is completed in a manner which will provide a watertight structure. The contractor has the sole responsibility for ensuring the watertight integrity of the structure.

Add new GC 3.15 as follows:

GC 3.15 PERFORMANCE BY CONTRACTOR

GC 3.15.1 In performing its services and obligations under the Contract, the Contractor shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The Contractor acknowledges and agrees that throughout the Contract, the Contractor's obligations, duties and responsibilities shall be interpreted in accordance with this standard. The Contractor shall exercise the same standard of due care and diligence in respect of any products, personnel, or procedures which it may recommend to the Owner.

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

1. The personnel it assigns to the Project are appropriately experienced;
2. It has sufficient staff of qualified and competent personnel to replace its designated supervisor and project manager, subject to the Owner's approval, in the event of death, incapacity, removal or resignation.

GC 4.1 CASH ALLOWANCES

Delete paragraph 4.1.4 in its entirety and substitute:

4.1.4 Where cost under a cash allowance exceed the amount of the allowances, unexpended amounts from other cash allowances shall be reallocated at the *Consultant's* direction to cover the shortfall.

Delete paragraph 4.1.5 in its entirety and substitute:

4.1.5 The net amount of any 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.

Delete paragraph 4.1.7 in its entirety and substitute:

4.1.7 At the commencement of the work, the Contractor shall prepare for the review and acceptance of the Owner and the Consultant, a schedule indicating the times, within the construction schedule referred to in GC 3.5, that items call for under cash allowances and items that are specified to be Owner purchased and Contractor installed or hooked up are required at the site to avoid delaying the progress of the Work.

Add new paragraph 4.1.8:

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

GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

Delete section GC 5.1 in its entirety.

GC 5.2 APPLICATION FOR PROGRESS PAYMENT

Add the following at the end of paragraph 5.2.2:

5.2.2 Such applications shall be accompanied by one or more of the following documents: a Statutory Declaration Waiver of Lien or receipt stating that the holdback monies claimed have been paid to the particular party or parties so named or referred to in the Declaration. Form of Statutory Declaration shall meet the approval of the Consultant.

Add the following paragraph 5.2.8:

5.2.8 The reference to payment for products delivered to the place of work in Article 5.2.7 shall not be construed as covering day-to-day financing of the project. Products delivered to the place of work shall be construed to mean major items of equipment or quantities of items that are essential for the expedient conduct of the work.

GC 5.3 PROGRESS PAYMENT

Supplement paragraph 5.3.1 by adding the following:

5.3.1 A holdback percentage of ten (10) percent (%) shall apply to progress payments. The sworn statement by the Contractor for release of holdback monies shall be in the form of a Statutory Declaration meeting the approval of the Consultant. Amounts as certified by the Consultant to rectify deficiency items, or incomplete portions of individual work items, may be retained by the Owner after Substantial Performance has been obtained, pending Total Performance of the work or other authorization for release by the Consultant.

Amend subparagraph 5.3.1.3 as follows:

5.3.1.3 Delete "20" and replace with "30."

GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK

Add the following paragraph 5.4.4:

5.4.4 Before the Contractor submits his application for Substantial Performance of the Work, all Operations and Maintenance Manual materials shall be submitted in accordance with the Contract Documents. The Certificate of Substantial Performance will not be issued until this requirement is met.

GC 5.5 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF WORK

Add the following subparagraphs 5.5.1.3 and 5.5.1.4:

5.5.1.3 Submit a certificate from barrister stating that there are no Builders' Liens filed relating to the Contract Works.
5.5.1.4 Submit a clearance letter from the Workers' Compensation Board.

GC 5.7 FINAL PAYMENT

Add the following subparagraphs 5.7.1.1, 5.7.1.2, 5.7.1.3, 5.7.1.4 and 5.7.1.5:

5.7.1.1 Contractor's application for final payment is considered to be valid when the following have been performed:

1. Work has been completed and inspected for compliance with Contract Documents, and the Consultant is satisfied that all the requirements of the Contract have been fulfilled by the Contractor.
2. Defects have been corrected and deficiencies have been completed.
3. Equipment and systems have been tested, adjusted and balanced and are fully operational, and written reports as outlined in the Contract Documents have been provided to the Consultant.
4. Certificates required by Utility companies, manufacturer's representative and inspectors have been submitted.
5. Spare parts, maintenance materials, warranties and bonds have been provided.

5.7.1.2 If Work is deemed incomplete by Consultant, complete outstanding items and request re-inspection.

5.7.1.3 If in opinion of the Consultant, it is not expedient to correct defective work or Work is not performed in accordance with the requirements of the Contract, the Owner may deduct from Contract Price difference in value between work performed and that called for by Contract Documents, amount of which shall be determined by the Consultant.

5.7.1.4 If, within sixty (60) days after the issue by the Consultant of the Certificate of the Substantial Performance, the Contractor has not corrected all the deficiencies, the Owner will retain sufficient money to cover the cost of completing said deficiencies, as determined by the Consultant, in addition to holding monies retained in accordance with the Contract and subject to the provisions of the Builders' lien legislation of Nova Scotia.

5.7.1.5 Neither the final certificate nor the payment thereunder, nor any provision in the Contract Documents shall relieve the Contractor from responsibility for faulty material or workmanship which shall appear within a period of one (1) year from the date of Substantial Performance of the Work and he shall remedy any defects due thereto and pay for any damage to other Work resulting therefrom which shall appear within such period of one year. The Owner shall give notice of observed defects promptly. This article shall not be deemed to restrict any liability of the Contractor arising out of any law in force in the Province of Nova Scotia.

GC 6.2 CHANGE ORDER

Add the following paragraphs 6.2.3, 6.2.4, 6.2.5, 6.2.5, 6.2.6 and 6.2.7:

6.2.3 All contemplated changes in the work shall be issued by the Consultant on a "Contemplated Change Order" form.

6.2.4 For lump sum pricing, the Contractor shall, upon receipt of the Contemplated Change Order, submit to the Consultant for approval within seven (7) days, a quotation for changes in the work.

6.2.5 Quotation for changes shall be priced in sufficient detail (GC6.6 applies).

6.2.6 Consultant shall, within five (5) working days, notify the Contractor whether estimates are accepted by Owner or further information required. Acceptance of Owner shall be indicated by writing, and a signed copy of form (Change Order) returned to Contractor.

6.2.7 Contractor shall take reasonable measures to stop work or minimize the work in areas affected by or related to the contemplated changes.

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

Add new paragraph 6.4.5:

6.4.5 The *Contractor* confirms that, prior to bidding the *Project,* it carefully investigated the Place of the Work and applied to that investigation the degree of care and skill described in paragraph 3.15.1, given the amount of time provided between the issue of the bid documents and the actual closing of bids, the degree of access provided to the Contractor prior to submission of bid, and the sufficiency and completeness of the information provided by the Owner. The Contractor is not entitled to compensation or to an extension of the Contract Time for which could reasonably have been ascertained by the Contractor by such careful investigation undertaken prior to the submission of the bid.

GC 6.5 DELAYS

Delete the period at the end of paragraph 6.5.1 and substitute the following words:

6.5.1 ", but excluding any consequential, indirect or special damages."

Add new paragraph 6.5.6:

6.5.6 If the Contractor is delayed in the performance of the Work by any act or omission of the Contractor or anyone employed or engaged by the Contractor directly or indirectly, or by any

cause within the Contractor's control, then the Contract Time shall be extended for such reasonable time as the Consultant may decide in consultation with the Contractor. The Owner shall be reimbursed by the Contractor for all reasonable costs incurred by the Owner as the result of such delay, including all services required by the Owner from the Consultant as a result of such delay by the Contractor and, in particular, the cost of the Consultant's services during the period between the date of Substantial Performance of the Work stated in Article A-1 herein as the same may be extended through the provisions of these General Conditions and any later, actual date of Substantial Performance of the Work achieved by the Contractor.

Add new paragraph 6.5.7:

6.5.7 If the Contractor is delayed in the completion of the Work by any act or neglect of: The HRCE, any employee or either any other Contractor employed by The HRCE, changes ordered in the Work, strikes, lockouts, fire, unusual delay by common carriers, unavoidable casualties, any other cause of any kind whatsoever beyond the Contractor's control or by any cause within the Contractor's control which the Consultant shall decide as justifying the delay, then the time of completion shall be extended for such reasonable time as the Consultant may decide.

Add new paragraph 6.5.8:

6.5.8 No such extension shall be made for delay occurring more than seven (7) days before claim therefore is made in writing to the Consultant, provided however that in the case of a continuing cause of delay, only one (1) claim shall be necessary.

Add new paragraph 6.5.9:

6.5.9 If no schedule is made, no claim for delay shall be allowed on account of failure to furnish such schedule until two (2) weeks after demand for such schedule and not then unless such claim be reasonable.

Add new paragraph 6.5.10:

6.5.10 The Consultant shall not, except by written notice to the Contractor, stop or delay any part of the main Contract Work pending decisions or proposed changes.

GC6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

Amend paragraph 6.6.5 as follows:

6.6.5 Add the words "as noted in paragraph 6.6.3" after the words "of the claim" and add the words "and the consultant", at the end.

GC 6.7 VALUATION OF CHANGES

Add the following Header and paragraphs 6.7.1, 6.7.2, 6.7.3 and 6.7.4 in their entirety:

GC 6.7 VALUATION OF CHANGES

6.7.1 The value of any change shall be determined in one or more of the following way as determined by the Consultant:

(a) By estimate and acceptance in a lump sum, submitted with sub-contractors' and suppliers' signed quotations and breakdown estimates including itemized material and labour lists.
For changes where the individual trade cost is anticipated to be less than $1000, the requirement for the detailed cost breakdown may be waived, but individual trade quotation must be supplied.

(b) By unit prices agreed upon or as listed in the contract.

(c) Cost of work and percentage or by cost and fixed fee.

6.7.2 In cases of additional work to be paid for under method "c", the Contractor shall keep and present in such form as the Consultant may direct, a correct account of the net cost of labour and materials, together with vouchers. In any case, the Consultant shall certify to the amount due to the Contractor including the profit and overhead. Pending final determination of value, payments on account of changes shall be made on the Consultant's certificate.

6.7.3 In determination of method ".1(a) or ".1(c) above, the labour costs to be calculated by the actual estimated hours at an hourly rate determined as follows:

The hourly labour rate to be total payroll costs including hourly wage, statutory contributions to UIC, WCB, CPP, Training Funds, Health Benefits and other applicable labour burdens paid directly by the employer such as vacation pay, holiday pay, pension plan etc.

The HRCE reserves the right to verify the payroll cost by independent audit.

To the total payroll cost the following percentage factors will be recognized.

- small tools/expenditures 5% (on payroll costs)
- site supervision 5% (on payroll costs)

(d) In determination of methods ".1(a)" and ".1(c)" above, the material costs to be calculated as follows:

Contractors net costs, including contractor discounts from suppliers, FOB the project site plus applicable taxes.

(e) In determination of methods ".1(a)" and ".1(c)" above, equipment rental costs for major pieces of equipment required will be at local industry rates.

(f) In determination of methods ".1(a)" and ".1(c)" above, overhead and fees shall be calculated as follows:

The cost of any authorized change shall be determined by the net total of labour and material or equipment as outlined in ".3(a)", ".3(b)" and ".3(c)" above on which the percentage markup shall be determined as follows:

<u>For Extras Up to $5,000:</u>

Sub- Contractors Own Work	- Overhead & Fee – 15% total
General Contractors Own Work	- Overhead & Fee – 15% total
General Contractors on Sub Contractors work	- 10% total
(no percentage markup shall be applied to deductions)	

<u>For Extras Above $5,000:</u>

Sub-Contractors Own Work	- Overhead & Fee – 10% total
General Contractors Own Work	- Overhead & Fee – 10% total
General Contractors on sub contractor's work	– 8% total
(no percentage markup shall be applied to deductions)	

6.7.4 Submit to the Consultant and The HRCE's representative detailed breakdown of the hourly labour rate as defined in paragraph ".3(a)".

GC 8.2 NEGOTIATION, MEDIATION, AND ARBITRATION

<u>Add</u> the following paragraphs 8.2.9, 8.2.10, 8.2.11, 8.2.12, 8.2.13, 8.2.14, and 8.3:

8.2.9 Within five days of receipt of the notice of arbitration by the responding party under paragraph 8.2.6, the Owner and the Contractor shall give the Consultant a written notice containing:

a) a copy of the notice of arbitration;
b) a copy of supplementary conditions 8.2.9 to 8.2.14 of this contract, and;
c) any claims or issues which the Contractor or the Owner, as the case may be, wishes to raise in relation to the Consultant arising out of the issues in dispute in the arbitration.

8.2.10 The Owner and the Contractor agree that the Consultant may elect, within ten days of receipt of the notice under paragraph 8.2.9, to become a full party to the arbitration under paragraph 8.2.6 if the Consultant:

a) has a vested or contingent financial interest in the outcome of the arbitration;

b) gives the notice of election to the Owner and the Contractor before the arbitrator is appointed;

c) agrees to be a party to the arbitration within the meaning of the rules referred to in paragraph 8.2.6, and;

d) agrees to be bound by the arbitral award made in the arbitration.

8.2.11 If an election is made under paragraph 8.2.10, the Consultant may participate in the appointment of the arbitrator and, notwithstanding the rules referred to in paragraph 8.2.6, the time period for reaching agreement on the appointment of the arbitrator shall begin to run from the date the respondent receives a copy of the notice of arbitration.

8.2.12 The arbitrator in the arbitration in which the Consultant has elected under paragraph 8.2.10 to become a full party may:

a) on application of the Owner or the Contractor, determine whether the Consultant has satisfied the requirements of paragraph 8.2.10, and;

b) make any procedural order considered necessary to facilitate the addition of the Consultant as a party to the arbitration.

8.2.13 The provisions of paragraph 8.2.9 shall apply mutatis mutandis to written notice to be given by the Consultant to any sub-consultant.

8.2.14 In the event of notice of arbitration given by the Consultant to a sub-consultant, the sub-consultant is not entitled to any election with respect to the proceeding as outlined in 8.2.10, and is deemed to be bound by the arbitration proceeding.

8.3 An application for arbitration shall be accompanied by security in the amount of $1000 to apply to the cost of arbitration. Any claims of excess costs must be submitted in writing to the Consultant within two weeks of completion or alleged completion of the work. No claims shall be accepted after this date and, also, no claims shall be accepted for disputed work unless the Consultant has been notified as specified.

GC 9.1 PROTECTION OF WORK AND PROPERTY

Delete subparagraph 9.1.1.1 in its entirety and substitute the following new paragraph 9.1.1.1:

9.1.1.1 errors in the Contract Documents which the Contractor could not have discovered applying the standard of care described in paragraph 3.15.1.

Delete paragraph 9.1.2 in its entirety and substitute the following new paragraph 9.1.2:

9.12 Before commencing any Work, the Contractor shall determine the locations of all underground utilities and structures indicated in the Contract Documents, or that are discoverable by applying to an Inspection of the Place of Work exercising the degree of care and skill described in paragraph 3.15.1.

GC 9.2 TOXIC AND HAXARDOUS SUBSTANCES

Add in paragraph 9.2.6 after the word “responsible”, the following new words:

9.2.6 Or whether any toxic or hazardous substances or materials already at the Place of Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the Owner and others,

Add in subparagraph 9.2.7.4:

9.2.7.4 “and the Consultant” after “Contractor”:

Add in paragraph 9.2.8 after the word “responsible”, the following new words:

9.2.8 or that any toxic or hazardous substances or materials already at the Place of the Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirement, or which threatens, humane health and safety or the environment, or material damage to the property of the Owner or others.

GC 9.5 MOULD

Add in subparagraph 9.5.3.4:

9.5.3.4 "and the Consultant" after "Contractor"

GC 10.1 TAXES AND DUTIES

Add the following paragraph 10.1.3:

10.1.3 The Contractor shall indicate on each application for payment as a separate amount, the appropriate Harmonized Sales Tax the Owner is legally obliged to pay. This amount will be paid to the Contractor in addition to the amount certified for payment under the Contract.

GC 10.2 LAWS, NOTICES, PERMITS AND FEES

Delete from the first line of paragraph 10.2.5 the word, "The" and substitute the words:

10.2.5 "Subject to paragraph 3.15.1, the"

GC 10.4 WORKERS' COMPENSATION

Add the following paragraphs 10.4.3, 10.4.4, and 10.4.5:

10.4.3 The contractor is referred to regulations, as applicable, under the Worker's Compensation Act of Nova Scotia.

10.4.4 Registration with Worker's Compensation Board shall be continuous during the contract. Should registrations be scheduled to expire during the contract period, the Contractor shall submit a copy of registration renewal one month prior to the expiration of the current certificate.

10.4.5 The Contractor shall furnish evidence of coverage under the Worker's Compensation Act, R.S.N.S. and a clearance Certificate providing proof of registration with Worker's Compensation Board prior to commencement of work. (A photocopy of the Contractors registration certificate is acceptable proof). On-going proof of good standing with the Worker's Compensation Board during the term of the contract is required.

GC 11.1 INSURANCE

Delete sentences and replace with the following in subparagraph 11.1.1.1:

11.1.1.1 "General liability insurance shall be maintained from the commencement of the work until one year from the date of Substantial Performance of the Work. Liability coverage shall be provided for completed operations hazards from the date of Substantial Performance of the Work, as set out in the certificate of Substantial Performance of the Work, on an ongoing basis for a period of 6 years following the Substantial Performance of the Work**" and replace with:** " General Liability Insurance or Wrap- Up Liability Insurance, (as detailed in the Information to Tenders section under "Insurance Requirements"), shall be maintained from the commencement of the work until final completion and acceptance of the work including the making good of faulty work or materials, except that coverage of completed operations liability shall in any event be maintained for twelve (12) months from date of Substantial Performance of the work as certified from the Consultant, and approved by the Owner".

Add the following subparagraphs 11.1.1.1.1, 11.1.1.1.2, and 11.1.1.2.1:

11.1.1.1.1 The general liability insurance to be maintained by the Contractor shall include Commercial General Liability Insurance covering Premises and Operations Liability, elevators, board form property damage, board from automobile, owners and contractors protective, blanket contractual, personal injury, completed operations liability contingent employers liability, cross liability clause, non-owned automobile liability, and a 30 day notice of cancellation clause.

11.1.1.1.2 All liability insurance policies shall be written in such terms as will fully protect the Contractor and
The Halifax Regional Centre for Education as an additional named insured.

11.1.1.2.1 Liability coverage of not less than two million dollars ($2,000,000) is required with regard to operations of owned automobiles.

Delete subparagraph 11.1.1.4 in its entirety and insert the following subparagraphs:

11.1.1.4 Broad Form (All Risks) Builders Risk Coverage - Prior to the commencement of any Work the Contractor shall maintain and pay for Broad Form (All Risks) Builders Risk Coverage in the joint names of The HRCE and the Contractor totaling not less than one hundred percent (100%) of the total value of the Work done and materials delivered on the site (contract value), so that any loss under such policies of insurance will be payable to The HRCE and the Contractor as their respective interests appear. The Builders Risk Insurance shall include all materials related to the work while in transit or at other locations.

11.1.1.4.1 Should a loss be sustained under the Builders Risk Coverage, the Contractor shall act on behalf of The HRCE and Contractor for the purpose of adjusting the amount of such loss with the insurance companies. As soon as such adjustment has been satisfactorily completed, the Contractor shall proceed to repair the damage and complete the Work and shall be entitled to receive from The HRCE in addition to any sum due under the Contract, the amount at which The HRCE interest has been appraised in the adjustment made with the insurance companies as referred to above, said amount to be paid to the Contractor as the Work of restoration proceeds. Any loss or damage which may occur shall not affect the rights and obligations of either party under the Contract except as aforesaid and except that the Contractor shall be entitled to a reasonable extension of time for the performance of the Work, as The HRCE may decide.

11.1.1.4.2 Upon approval by The HRCE of the Substantial Performance certificate issued by the Consultant, the Contractor's obligation to maintain Builder Risk Insurance shall cease and The HRCE shall assume full responsibility for insuring the whole of the Work against loss or damage.

11.1.1.4.3 "Broad form" property insurance in the joint names of the *Contractor,* the *Owner* and the *Consultant.* The policy shall include as insureds all *Subcontractors* The Broad form" property insurance shall be provided from the date of commencement of the *Work* until the earliest of:

11.1.4.3.1 Ten (10) Calendar days after the date of *Substantial Performance of the Work;*

11.1.4.3.2 on the commencement of use or occupancy of any part or section of the *Work* unless such use or occupancy is for construction purposes, habitational, office, banking, convenience store under 465 square meter in area, or parking purposes, or for the installation, testing and commissioning or equipment forming part of the *Work*; and

11.1.4.3.3 when left unattended for more than thirty (30) consecutive calendar days or when construction activity has ceased for more than thirty (30) consecutive calendar days.

Paragraph 11.1.2 is clarified as follows:

11.1.2 Submit certified true copies of each insurance policy to the Owner's Contract Authority within seven (7) working days after notification of award or in any event prior to payment of the first progress claim. Such copies shall be exclusive of information pertaining to premium or premium bases used by the insurer to determine the cost of the insurance. Prior to the commencement of any work, the Contractor shall file with the Owner a certified copy of each insurance policy and certificate required.

Delete 11.1.5 in its entirety and replace with the following:

11.1.5 Insurance contracts shall be procured from and the premiums paid to a resident agent of an insurance Company licensed to underwrite insurance in the Province of Nova Scotia.

Add the following paragraph 11.1.9:

11.1.9 All of the insurance policies shall contain a clause stating that no change in terms and conditions or cancellation may at any time be made without the full knowledge and consent of the owner.

GC 11.2 CONTRACT SECURITY

Add the following subparagraph 11.2.2.1:

11.2.2.1 "Bonds shall be procured from a Nova Scotia resident agent of an insurance company licensed to do business in Nova Scotia and shall be maintained in good standing and held by the Owner until one (1) year after Substantial Performance of the Work.

Add the following paragraph 11.2.3:

11.2.3 If a Certified Cheque is held as contract security it shall be in an amount equal to ten (10) percent (%) of the Contract Price. Supplement the Certified Cheque as necessary to maintain the amount equal to ten (10) percent (%) of the total amount payable (Contract Price plus HST).

.1 The Certified Cheque will be deposited at the chartered bank holding The HRCE deposits.
.2 The HRCE will return the cheque amount to the Contractor upon satisfactory completion of the contract and duration as specified in the Tender documents.
.3 Should Contractor default, total amount payable under the Certified Cheque will be the face value of the cheque plus all accrued interest.
.4 Payment for completion of work, due to failure of performance of the Contractor, shall include all reasonable obligations under the Contract, including architectural and engineering costs arising because of the default of the Contractor.
.5 Payment for labour and materials shall be limited to those who have a direct contract with the Contractor for the provision of labour and/or material (which includes equipment rental).

GC 12.3 INDEMNIFICATION

Add the following paragraph 12.1.1.3:

12.1.1.3 The Contractor shall indemnify and hold harmless the Consultant, its agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceeding by third parties that arise out of, or are attributable to, the Contractor's performance of the Contract, provided such claims are attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property, and caused by negligent acts or omissions of the Contractor or anyone for whose acts the Contractor may be liable, and made in writing within a period of six (6) years from the date of Substantial Performance of the Work, or within such shorter such period as may be prescribed by any limitation statute or the province or territory of the Place of Work.

GC 12.3 WARRANTY

Delete from the first line the word, "The" and substitute the words in paragraph 12.3.2:

12.3.2 "Subject to paragraph 3.15.1, the…"

Add the following paragraph 12.3.7:

12.3.7 Warranty repairs or replacements which arise during warranty period which affect the operation of the system shall be attended to immediately upon notification from the Consultant.

END OF SECTION 00 73 00

SECTION 00 73 10 - HRCE GENERAL TERMS & CONDITIONS

1. General

1.1. These Terms and Conditions, shall apply only to those documents (Quotations, Request for Proposals and Tenders, herein referred to as Public RFX or RFX) that reference them specifically. In the event of any conflict or disagreement between these Terms and Conditions and the RFX documents, the RFX documents have precedence and will be assumed to be correct.

1.2. These Terms and Conditions are intended to cover a wide range of procurements, including goods and services. As such, not all clauses will be applicable in all situations. If Suppliers have questions regarding any of these Terms and Conditions, they should contact the Halifax Regional Centre for Education (HRCE) Procurement Division. To satisfy special requirements, supplementary Terms and Conditions may also apply to some acquisitions. If this is the case, the RFX documents will reference any such documents, in addition to these Terms and Conditions.

1.3. For the purpose of these Terms and Conditions HRCE intends to only contract with responsible Suppliers who are in the business of providing the goods and/or services submitted upon, and can provide proof that they can furnish satisfactory performance based on past work experience with HRCE, other companies, or government agencies and have the financial managerial, and resource capabilities for the size of project bid upon. Satisfactory performance includes meeting all of the requirements of the various federal and provincial regulations and agencies for the completion of work and making payment to sub-contractors in a timely basis.

1.4. All of the terms, conditions and/or specifications stated or referenced in the Solicitation are assumed to be accepted by the Tenderer and incorporated in the Bid.

2. RFX Documents

2.1. RFX Documents should be obtained as indicated on the Cover Sheet of the tender document.

2.2. While HRCE has tried to ensure accuracy in the RFX documents, it is not guaranteed or warranted by HRCE to be accurate, nor is it necessarily comprehensive or exhaustive.

2.3. HRCE cannot ensure the accuracy of RFX documents obtained from any other source. (i.e. Construction Association of Nova Scotia (CANS), Nova Scotia Electronic Tendering Bulletin Board, Project Consultants, etc.).

2.4. All inquiries to this RFX are to be directed, in writing, to HRCE Procurement Division representative indicated in the RFX documents. Information obtained from any other source is not official and will not bind HRCE.

2.5. HRCE will assume that all Suppliers have resolved any questions they might have about the RFX and have informed themselves as to existing conditions and limitations, site restrictions, etc. before providing a RFX submission.

2.6. Nothing in the RFX is intended to relieve Suppliers from forming their own opinions and conclusions with respect to the matters addressed in the RFX or its associated documents.

2.7. In the event that HRCE Regional Office (33 Spectacle Lake Drive, Dartmouth) is closed (this includes partial day closures) due to inclement weather on the date and time of the RFX closing, the closing date and time will be extended one (1) business day. Tenderers should note that closure of Schools does not necessarily mean the closure of the HRCE's Regional Office. Closures are detailed on HRCE website.

3. Verbal instructions: Any changes to RFX call, specifications, terms and conditions shall be stated in writing. Verbal statements made by employees or representatives of HRCE, whether or not they appear to have the proper authority, shall not be binding on HRCE.

4. Addenda: HRCE reserves the right to modify the terms of the RFX documents prior to closing, at its sole discretion by addenda.

4.1. HRCE Procurement Division will make every effort to ensure the information provided on hrsb.ca is complete and accurate, please report any omissions or discrepancies to the Procurement Division immediately. **Any questions or requests for clarification arising from omissions, discrepancies, or ambiguities, must be made in writing no later than five(5) working days prior to the closing date, not including the closing date**. Replies to requests for clarification, if required, will be made in the form of written addenda, copies of which will be

posted on www.hrsb.ca/tender no later than three (3) working days prior to the date of closing, not including the closing date.

4.2. By downloading files from the www.hrsb.ca, you will automatically become registered for the applicable RFX. HRCE Procurement Division will make reasonable efforts, strictly as a courtesy, to directly inform registered Suppliers of any addenda, **however it is the sole responsibility of each registered Supplier to ensure that they have all the documents associated with any RFX and, to this end, every registered Supplier should review HRCE Tender Web Site daily**. These documents must be downloaded from the www.hrsb.ca/tender or obtained from HRCE Procurement Division, as applicable. Suppliers must acknowledge receipt of all addenda(s) with their RFX Submission.

5. Suppliers Responsibility: Suppliers are solely responsible for their own expenses in preparing, delivering or presenting a RFX and for subsequent negotiations, if any, with HRCE. It will be the responsibility of the Supplier to acquire at the Suppliers cost, any RFX documents as indicated on the Cover Sheet of the tender document.

6. Existing Conditions: Suppliers will be deemed to have familiarized themselves with the existing conditions which may affect the performance of required goods, services and construction. No plea of ignorance of such conditions as a result of failure to make all necessary examinations will be accepted as a basis for any claims for extra compensation or an extension of time. Suppliers are to ensure that they understand the expected use for the requested goods, service and construction and submit their RFX submission accordingly.

7. RFX Submissions

7.1. RFX will close at the time, date and location specified in the RFX documents (Atlantic Time Zone).

7.2. All RFX submissions must be received in their entirety on or before the closing time specified. Suppliers are responsible for ensuring that their RFX submission, however submitted, is received on time and at the location specified.

7.3. RFX Submissions must be submitted on the forms provided or in such format as directed in the RFX documents. These forms must be legible, complete, filled out in ink, or by typewriter, with the signature in longhand and the completed form shall be without interlineations, alterations or erasures.

7.4. If an electronic transmission (i.e. Facsimile, e-mail or hrsb.ca upload) can be accepted, as detailed in the applicable RFX documents, it is the responsibility of the Supplier:

7.4.1. to ensure that the submissions are delivered on or before the closing time and date shown on the RFX documents;

7.4.2. that the correspondence is legible and properly transmitted; and

7.4.3. that the name and number of the RFX is clearly displayed.

7.5. Electronic transmission of a RFX submission cannot be used where original documents are required, e.g. bid bonds, certified cheques, samples, etc., or as may be otherwise stated in the RFX documents.

7.6. **Sealed RFX submissions** must be delivered to HRCE Receptionist, 1st floor, 33 Spectacle Lake Drive, Dartmouth, Nova Scotia, on or before the closing time and date shown on the RFX documents. The RFX Submission is to be submitted on the provided forms, signed (together with the required RFX security as applicable) in a sealed opaque envelope, clearly identified with Suppliers name, RFX identification number and name, and closing date on the outside of the envelope. RFX Submissions are date and time stamped upon receipt at the Procurement Division (not at any other location) by the Procurement date time stamp. Any submission received after the closing date and time shown on the RFX documents will not be accepted and will be returned to the Supplier unopened and deemed non-compliant.

7.7. **Facsimile submissions** received are date and time stamped by the Procurement Division Facsimile, no other time stamp will be considered. A facsimile submission received after the closing date and time shown on the RFX documents will not be accepted and shall be deemed non-compliant. **The facsimile number for the Procurement Department of HRCE is (902) 464-0161. Do not send RFX correspondence to any other fax number.**

7.7.1. Where specified, facsimile submissions are accepted for the convenience of the Supplier; HRCE cannot ensure the confidentiality or error-free receipt of facsimile submissions.

7.8. Amendments/Withdrawn Submissions

7.8.1. Submissions may be withdrawn or amended by written request (on company letterhead or equivalent), prior to RFX closing date and time, but cannot be altered or changed in any way after the RFX closing.

7.8.2. Facsimile transmissions modifying supplier provided information are acceptable when signed by a duly authorized officer or agent. Submission of such electronic transmissions is at the risk of the Supplier. HRCE assumes no liability for the receipt of the electronic transmissions or their proper inclusion with original RFX submission. An electronic submission must be submitted prior to closing time and date specified in the RFX documents.

7.8.3. An amendment to a RFX submission replaces any other RFX submission amendment previously submitted by the supplier; only the last of any RFX submission amendment received will be accepted.

7.9. All RFX submissions must be signed by an authorized representative of the entity.

7.10. HRCE's time clocks will be assumed to be correct in the event of dispute.

7.11. HRCE reserves the right in its sole discretion to clarify any RFX submission after closing by seeking further information from that Supplier, without becoming obligated to clarify or seek further information from any or all other Supplier. However, Suppliers are cautioned that any clarifications sought will not be an opportunity either to correct errors or change their Bids in any substantive manner.

8. Brand Name: Some terminology may be used that would imply or denote a particular supplier. Brand names may be utilized to designate the type and quality of the product requested. Such usage shall not to be construed as restrictive in any way. Suppliers must be prepared to provide samples if required.

9. Substitute

9.1. If the Supplier is offering an equivalent (similar) substitute product to those specified, unless a specific product is requested, the supplier must clearly identify this substitution and supply the manufacturer's name, product number and provide any technical information required so that HRCE can determine the acceptability of the substitute.

9.2. HRCE reserves the right to inspect or test any product bid to determine equivalency, and may require demonstrator or sample items in order to be able to evaluate the items proposed.

9.3. HRCE shall be the sole judge of the acceptability of any substitute or proposed equivalent.

9.4. Specifications may, for technical or logistical reasons, require that the items specified be supplied without substitution.

10. Warranty

10.1. The supplier must describe the duration, type (e.g. on-site, depot, ship-in or carry-in) and terms of the manufacturer's warranty on all goods. If the supplier provides any additional/supplementary warranty coverage, describe this as well.

10.2. If warranties can be upgraded or extended, identify the upgrade costs separately. Do not include warranty upgrade or extension costs in the price unless the RFX documents specifically states that the upgrade is a mandatory requirement.

11. Pricing

11.1. All prices must be extended and totaled, where practical to do so. RFX Submission may be rejected as incomplete if total figures are not provided. In the case of an error in the extension of prices, the unit prices shall prevail.

11.2. Prices must be in Canadian funds, and shall include all shipping, handling, freight, offloading, duty, insurance and any other charges, which are applicable at time RFX is awarded (FOB – Destination). HRCE will not assume responsibility for any goods or services until they have been delivered to the destination(s) specified in the Solicitation. It is the responsibility of the Supplier to find out from the appropriate authorities what rates and charges are applicable to this RFX. No extra charges will be paid by HRCE.

11.3. In the event that a number of Suppliers provide submission in substantially the same amount, HRCE may, at its discretion, call upon those Suppliers to submit further bids.

12. **Permits and Taxes:** It is the responsibility of the Supplier to ensure that quotations include all taxes, permits, and other charges required to supply the goods, services and construction. The successful Supplier is to comply with all codes, regulations, and by-laws and all government and applicable standards pertaining to the work and job-site including, and not limited to, the Nova Scotia Occupational Health and Safety Act and Regulations. HRCE is required to pay a Harmonized Sales Tax (HST) at a rate specified by the Province of Nova Scotia. This tax is to be shown as a separate line item.

13. **Standards**
    - **13.1.** All goods, services and construction supplied to HRCE shall, when standards are available, be certified in accordance with the applicable code(s), but not limited to:
      - 13.1.1. Canadian Standards Association;
      - 13.1.2. Canadian Government Standards Board;
      - 13.1.3. Underwriters Laboratories of Canada; and
      - 13.1.4. And all applicable Federal, Provincial and Municipal regulations and acts.
    - **13.2.** HRCE reserves the right to discontinue the purchase of any product/service that does not continue to meet the applicable standard(s).

14. **Inspection:** HRCE reserves the right to inspect any goods, services or construction supplied either during or after manufacture and delivery, and shall be the sole judge as to the acceptability of goods, services and construction to meet the needs of HRCE and fulfills the requirements as specified.

15. **Rejection of RFX Submissions/Compliance:**
    - **15.1.** Failure to comply with any of the mandatory terms or conditions contained or referenced in the RFX documents shall result in the rejection of the RFX submission.
    - **15.2.** HRCE specifically reserves the right to accept or reject any or all RFX submission and implies no obligation on HRCE to accept any RFX submission, a portion of any RFX submission or any RFX submission. HRCE reserves the right to cancel any RFX in its entirety and shall not be responsible, in any manner, for expenses incurred by the Supplier for preparing a RFX submission. HRCE may award all or a portion of the work to one or more Suppliers. Without limiting the generality or any other provision hereof, HRCE reserves the right to reject or accept any RFX submission:
      - 15.2.1. that contains any irregularity or informality;
      - 15.2.2. that is not accompanied by the security documents required;
      - 15.2.3. that contains an alteration in the quoted price that is not initialed by the or on behalf of the Supplier;
      - 15.2.4. that is incomplete or ambiguous;
      - 15.2.5. contains clauses additional to the RFX that are "qualified" or "conditional"; and/or
      - 15.2.6. that does not strictly comply with the requirements contained in these instructions.
    - **15.3.** HRCE reserves the right to waive minor non-compliance where such non- compliance is not of a material nature in its sole and absolute discretion, or to accept or reject in whole or in part any or all RFX submissions, with or without giving notice. Such minor non-compliance will be deemed substantial compliance and capable of acceptance. HRCE will be the sole judge of whether a RFX submission is accepted or rejected.
    - **15.4.** HRCE reserves the right to accept or reject any or all RFX submission, not necessarily accept the lowest priced RFX submission, or to accept any RFX submission which it may consider to be in its best interest.

16. **Evaluation criteria:** If applicable, award of the RFX will be based on “Best Value” (which includes, but not limited to; price, discounts, product specifications, warranty, delivery, reference checks, etc.

17. **Cancellation/no award**
    - **17.1.** Issuing a RFX implies no obligation on HRCE to accept any submission, or a portion of any submission. The lowest or any RFX submission will not necessarily be accepted.
    - **17.2.** RFX’s may be cancelled in whole or in part by HRCE in its sole discretion when:
      - 17.2.1. the RFX submission price exceeds the funds allocated for the purchase;

17.2.2. there has been a substantial change in the requirements after the RFX has been issued;
17.2.3. information has been received by the RFX after the RFX has been issued that the RFX believes has substantially altered the procurement;
17.2.4. there was insufficient competition in order to provide the level of service, quality of goods or pricing required.

17.3. If no compliant RFX submission is received in response to a RFX, the HRCE reserves the right to enter into negotiations with one or more suppliers in order to complete the procurement.

17.4. HRCE will be the sole judge of whether there is sufficient justification to cancel any RFX.

17.5. No action or liability will lie or reside against HRCE in its exercise of its rights under this section.

18. Eligibility and Conflict of Interest

18.1. A RFX Submission may not be eligible for acceptance if current or past corporate or other interests of the Tenderer may, in HRCE's opinion, give rise to a conflict of interest in connection with a project.

18.2. Suppliers are cautioned that acceptance of their RFX submission may preclude them from submitting a response on subsequent phases where a conflict of interest may arise. Suppliers should study the project implementation strategy to determine whether or not they plan to submit response on subsequent phases.

18.3. If the RFX submission covers the first phase of what may prove to be a multi-phased project, the successful Supplier on the initial phase may be permitted to respond on subsequent phases as long as, in HRCE's opinion, no conflict of interest would be created in performance of the work by that Supplier.

18.4. Sub-contracting to any firm or individual whose current or past corporate or other interests may, in HRCE's opinion, give rise to a conflict of interest in connection with this bid will not be permitted. This includes, but is not limited to, any firm or individual involved in the preparation of the RFX documents.

19. Disputes: In case of dispute as to whether or not an item or service quoted or delivered meets RFX requirements, the decision of HRCE, or its authorized representative, shall be final and binding on all parties.

20. Exceptions: A RFX submission shall be considered an agreement to all terms and conditions provided herein and in various RFX documents, unless specifically noted otherwise in the RFX documents.

21. Irrevocable Offer: A RFX submission represents an irrevocable offer, unless otherwise stated in the RFX documents and shall be valid for a period of ninety (90) days following the closing date for RFX submissions.

22. Patent right and royalties: The successful Supplier shall pay all royalties and patent license fees required for the performance of the work. The successful Supplier shall hold HRCE harmless from and against claims, demands, losses, costs, damages, action suits or proceedings arising out of the successful Supplier's performance of the Contract which are attributable to an infringement or an alleged infringement of a patent of invention by the successful Supplier or anyone for whose acts the successful Supplier may be liable.

23. Assignment: The successful Supplier shall not assign the Contract (or portion thereof) nor sub-contract without the prior written consent of HRCE, consent shall not be unreasonably withheld.

24. Purchase Order: Work by the Supplier will begin only with the issuance of HRCE's official purchase order and/or any Contract Documents as applicable. The purchase order number must appear on any/all invoices covering same. No work is authorized until the successful Supplier has received an official HRCE purchase order and/or required Contract Documents. HRCE accepts no responsibility for any work performed prior to the issuance of a purchase order and/or required Contract Documents.

25. Delivery

25.1. Where the RFX Document includes a mandatory delivery schedule, HRCE will assume that the Supplier can meet the requested schedule and is satisfied that the goods or services required will be available for delivery on the requested date(s).

25.2. If Suppliers wish to specify a delivery schedule different from that requested in the RFX document, they must provide specific delivery dates or a schedule in calendar days from the date a Purchase Order is issued. RFX Submission that do not meet the delivery schedule as requested in the RFX documents may be rejected.

25.3. Time is of the essence, and supplier's delivery schedule is legally binding. HRCE reserves the right to assess penalties or cancel awards to Suppliers who fail to meet their stated delivery or completion dates.

26. Invoices

26.1. All invoices are to be submitted quoting the Purchase Order number (as applicable). The H.S.T. number must be shown on each invoice. Invoices must include a description of the goods, services and construction provided with HRCE Work Order Numbers (where applicable). Invoices must also clearly indicate list price, discounts offered and net price, if applicable. All invoices are to be forwarded to:

Halifax Regional Centre for Education
33 Spectacle Lake Drive
Dartmouth, NS, B3B 1X7
Attn: Accounts Payable

26.2. All Suppliers are required to maintain their tax status in good standing. In this regard, Suppliers are advised that verification of good standing with the Nova Scotia Minister of Finance and Revenue Canada (GST/HST) may be carried out prior to the award of a contract to a successful Supplier.

26.3. In order to maximize efficiencies, as well as to be more environmentally friendly, vendor payments are now being paid via EFT (Electronic Funds Transfer) direct deposit to vendor bank accounts. A vendor direct deposit form must be filled out with banking information for EFT payments.

27. Payment:

27.1. HRCE's normal payment terms are thirty (30) days from acceptance that the goods, services and construction meet the specifications. Alternative payment schedules may be proposed and are to be shown as an option and list any additional discounts to HRCE. Early payment discount terms (minimum period ten (10) days) may be considered in the evaluation of the RFX response. Payment of term discount invoices will be calculated from the date of the invoice or goods have been received, whichever is later. Discount terms must appear on the invoice.

27.2. The Supplier shall make application for payment at least monthly with the application based on progress or services provided during that month. HRCE will hold back ten percent (10%) of any payment until the lien periods have expired and the Supplier has provided HRCE with a complete release of any lien registered as a result of any work carried out by the Supplier, or any sub-contractor or supplier to the Supplier.

28. Right to offset: The successful Supplier agrees that HRCE may apply payments for goods, services and construction to any amount owing to HRCE by the Supplier or supplier including any related administration fees.

29. Confidentiality: The Supplier shall keep private, treat as being confidential, and not make public or divulge during, as well as after, the term on this Agreement, any information or material to which the Supplier or staff becomes privy as a result of acting under this Agreement without having first obtained HRCE's consent in writing.

30. Freedom of Information and Protection of Privacy (FOIPOP) Act and Personal Information International Disclosure Protection Act (PIIDPA)

30.1. As a public body, HRCE is subject to provincial legislation, Freedom of Information and Protection of Privacy (FOIPOP) Act. RFX submissions and associated documents are subject to disclosure and protection under this legislation. In the event an application for disclosure of information is made under FOIPOP, HRCE is subject to the disclosure and protection of information in accordance with that legislation. Suppliers are recommended to visit the following websites for more information on the Act: http://www.gov.ns.ca/just/IAP/default.asp and http://www.foipop.ns.ca/

30.2. The Province of Nova Scotia is required to comply with the Personal Information International Disclosure Protection Act (PIIDPA) (S.N.S 2006, c.3). The act creates obligations for the Province of Nova Scotia and its service providers when personal information is collected, used or disclosed. Requirements include limiting storage, access and disclosure of personal information to Canada, except as necessary or otherwise required by law. Suppliers are recommended to visit the following PIIDPA websites for more information on the Act: http://nslegislature.ca/legc/bills/60th_1st/3rd_read/b019.htm and http://www.gov.ns.ca/just/IAP/PIIDPAquest.asp#p01

30.3. The Supplier acknowledges and confirms that it is a "service provider" as defined in the Personal Information International Disclosure Protection Act, SNS 2006 c. 3 ("PIIDPA"), that the Supplier has read and understands its obligations as a service provider thereunder and that as a service provider It is legally bound by the obligations imposed on it by PIIDPA. It is a condition precedent to HRCE entering into the Agreement with the Supplier that the Supplier irrevocably undertakes covenants and agrees to be bound by and comply with the obligations imposed on it as a service provider under PIIDPA.

30.4. The Supplier further covenants, warranty and represents to HRCE that it will not at any time provide or allow the release of personal information to which it has access in its capacity as a service provider to HRCE in response to any "foreign demand for disclosure" or permit or allow the "unauthorized disclosure of personal information" as each of those terms are defined in PIIDPA.

30.5. The Supplier shall implement and strictly enforce security arrangements that will ensure that all personal information that it collects or uses on behalf of HRCE is protected at all times from unauthorized access or disclosure and shall confirm in writhing to HRCE, upon request, the details of such security arrangement. The Supplier also agrees to implement and enforce any additional security procedures as may be required by HRCE from time to time to protect the personal information that the Supplier collects on behalf of HRCE. HRCE shall be authorized, upon giving prior written notice to the Supplier, to enter the premises of the Supplier during normal business hours for the purpose of conducting an audit of the security arrangement referenced herein.

30.6. All personal information that the Supplier obtains or becomes aware of while providing services to HRCE is not and shall not be or be deemed to be the property of the Supplier. The Supplier acknowledges and agrees that it will not, either directly or indirectly, acquire any rights to use or own any such information other than the right to use it for the sole purpose of fulfilling its obligations to HRCE under the Agreement.

30.7. All RFX submissions become the property of HRCE. By providing a RFX submission, the supplier hereby grants HRCE a license to distribute, copy, print or translate the RFX submission for the purposes of the RFX. Any attempt to limit HRCE's right in this area may result in rejection of the RFX submission.

30.8. Suppliers RFX submission may be subject to disclosure under the Province's "freedom of information" legislation. By submitting a RFX submission, the Supplier agrees to the appropriate disclosure of the information supplied, subject to the provisions of the governing law. HRCE cannot guarantee the confidentiality of the complete content of any RFX submissions after the procurement has been awarded to the successful supplier.

30.9. During the delivery and installation of goods and/or services, the supplier or supplier's staff may have access to confidential information belonging to HRCE. Should this occur, the supplier must ensure that such information is not released to any third parties or unauthorized individuals; failure to comply may result in legal action being taken and/or the supplier's disqualification from any further RFX's issued by HRCE.

31. Indemnification: The Supplier shall indemnify and hold harmless HRCE, their agents, representatives and employees from and against all claims, demands, losses, costs, damages, actions, suits or proceedings arising out of, or resulting from the performance of this work, provided that any such claim is caused in whole or in part by the negligent act or omission of the Supplier, and sub-contractor, supplier, licensee, anyone directly or indirectly employed by any one of them or anyone for whose act any of them is liable, regardless of whether or not it is cause in part by a party indemnified hereunder.

32. Insurance: Unless otherwise stated, Commercial General Liability Insurance with policy limits of not less than five (5) million dollars ($5,000,000.00) must be filed with the Procurement Department of HRCE; such insurance shall be in the name of the Supplier and HRCE. The insurance must include non-owned automobile liability with policy limits of not less than two (2) million dollars ($2,000,000.00). All insurances are to be maintained in good standing for the duration of the Contract.

33. **Termination for convenience:** HRCE may terminate a contract, in whole or part, whenever HRCE determined that such termination is in the best interest of HRCE, without just cause giving sixty (60) days written notice to the proponent. However, in no event shall the proponent be paid an amount that exceeds the submitted price for the work performed.

34. **Termination for default:** When the proponent has not performed or has unsatisfactorily performed the contract, HRCE may terminate the contract for default. Upon termination for default, outstanding payment will be withheld at the discretion of HRCE. Failure on the part of the proponent to fulfill the contract obligations shall be considered just cause for termination of the contract. The proponent will be paid for work satisfactorily performed prior to termination, less any excess costs incurred by HRCE in re-procuring and completing the work.

35. **Workers Compensation:** Prior to commencing the work, the Supplier shall provide a current clearance letter from the Workmen's Compensation Board (WCB) and must maintain this coverage during the whole term of the Contract.

36. **WHMIS:** All controlled products supplies to HRCE must have approved Workplace Hazardous Materials Information System (WHMIS) supplier labels; Material Safety Data Sheets must also be supplied. Failure to comply with this requirement may result in rejection of any shipment, and may result in cancellation of the order and the return of goods to the supplier at the supplier's expense.

37. **Health and Safety Act:** The Supplier shall take every precaution to ensure that every employee, self-employed person and employer performing work in respect of the project complies with the latest revisions of the Nova Scotia Occupational Health and Safety Act and the Regulations, HRCE Occupational Health and Safety Policy BP 303.1, and all other safety measures as required by authorities having jurisdiction.

38. **Site Safety Plan:** Before being permitted access to the site to commence construction the Supplier may be requested provide HRCE with a written Project Specific Site Safety Plan. The Site Safety Plan provided shall be a written course of action that, through a pre-job evaluation, identifies and sets out specific actions to be taken to eliminate or control hazards associated with the work to be performed and to also deal with concerns or hazards that may develop during the course of the project. This Plan shall include, but not be limited to, identification of safety hazards anticipated during the project, solutions to those hazards, safety procedures, identification of designated safety officers and provision for safe access to the site for HRCE staff and or Consultants. Receipt and acceptance of the safety plan shall be mandatory prior to commencement of work.

39. **Extension to the Broader Public Sector**
    - **39.1.** HRCE may choose to allow the Broader Public Sector to purchase goods or services from some RFX's. The Broader Public Sector are generally permitted to purchase from "Standing Offers", which are contracts resulting from a RFX. Other RFXs may also be available to the Broader Public Sector; if so, the Solicitation documents will state this.
    - **39.2.** By submitting a response to a RFX, the Supplier agrees to extend the same pricing to other eligible Broader Public Sector institutions as per the terms and specifications in the Solicitation

40. **Governing Laws and Trade Agreements**
    - **40.1.** Unless the RFX documents specifically state otherwise, the RFX, all submissions, and any subsequent contracts will be construed and interpreted in accordance with the laws of the Province in which the Solicitation was issued.
    - **40.2.** RFX's subject to the Atlantic Procurement Agreement, the Agreement on Internal Trade, any other inter-provincial trade agreements, or any international trade agreements, will be specifically identified as such in the public notice and/or the Solicitation documents.
    - **40.3.** Information of any applicable trade or procurement agreements and/or legislation can be obtained by contacting HRCE Procurement Department.
    - **40.4.** Suppliers agree to comply with all applicable laws, regulations and standards, including all labour, occupational health & safety, and worker compensation requirements of the Province.

40.5. HRCE may consider and evaluate any RFX submission from other jurisdictions on the same basis that the purchasing authorities in those jurisdictions would treat a similar RFX submission from a supplier located in this Province. HRCE will be the sole judge of whether these conditions will be used and the extent to which they will be applied.

40.6. Suppliers registered to do business in any Atlantic Province can bid on RFX issued by any other Atlantic Province without having to satisfy any local registration or residency requirements.

40.7. Under Canadian law (and international agreements), your RFX submission must be arrived at separately and independently, without conspiracy, collusion or fraud; see: http://www.competitionbureau.gc.ca/internet/index.cfm?itemid=1243&lg=e for further information.

41. Other General Conditions

41.1. No RFX submissions shall be accepted from any person or corporation who, or which, has a claim or has instituted a legal proceeding against HRCE or against whom HRCE has a claim or has instituted a legal proceeding with respect to a previous contract, without prior approval of HRCE.

41.2. The Supplier shall perform the obligations of this Contract in a good and workmanlike manner in compliance with all applicable legislation in effect in Nova Scotia, and in accordance with industry standards and practice.

41.3. The Supplier shall be solely responsible for all means, methods, techniques and procedures necessary for performing the work required under this Contract.

41.4. All Suppliers must comply with the Nova Scotia Corporations Registration Act (CRA) or the Partnerships and Business Names Registration Act (PBNRA) as one of the conditions of doing business with the Province of Nova Scotia. In this regard, Suppliers are advised that verification of registration and good standing may be carried out prior to the final award of a contract to a successful Supplier. Suppliers residing outside Nova Scotia (which are not otherwise carrying on business in Nova Scotia) are expected to be registered in an equivalent manner in their respective jurisdictions.

41.5. Unless otherwise specified, all materials installed by the Supplier as part of this Contract shall be new and shall comply with the specifications and any applicable building codes. The Supplier is, at all times, responsible for correcting any defective work or materials at the Supplier's cost, and payment by HRCE to the Supplier does not relieve the Supplier of that responsibility.

41.6. Where applicable, the end user must be provided with complete operation manuals, warranty registration forms, user licenses/ authentications and/or other associated documentation normally provided by the manufacturer, reseller, installer and/or consultant.

41.7. The Supplier shall, at all times, keep HRCE premises free from accumulations of waste and rubbish. Disposal of all waste and rubbish shall be at approved waste disposal sites.

41.8. If the Supplier files for bankruptcy, becomes insolvent or fails to perform the Supplier's obligations under this Contract in a timely and workmanlike manner, HRCE may, by written notice, immediately terminate the employment of the Supplier and the Supplier shall be entitled only to the value of work performed and materials supplied up to the date of the termination.

41.9. The Supplier shall not permit smoking by any of its employees or sub-contractors on HRCE property and will act in accordance to the HRCE policy BP101.3 Tobacco-Free Schools and Workplaces.

41.10. The Supplier warrants its work and materials for a minimum of twelve (12) months after the date of substantial completion.

41.11. The Supplier, if performing work on HRCE property may be required to provide a safety program certified with the Nova Scotia Construction Safety Association or with an approved alternate safety association and/or program.

41.12. HRCE reserves the right to split an award amongst Suppliers as deemed in the best interests of HRCE.

END OF SECTION 00 73 10

SECTION 01 11 00 - HRCE SUMMARY OF WORK

1. Project Location & General Scope

1.1. Joseph Howe Elementary,
2557 Maynard Street, Halifax, NS B3K 3V6

1.2. Scope: Refer to Section 00 00 15 for scope and schedule information.

2. Contract Documents

2.1. Work will be performed under CCDC-2, 2008 contract.

3. General Conditions

3.1. Halifax Regional Centre for Education and CCDC-2, 2008, form an integral part of this Project Manual, a copy of which is bound herein.

4. Project Manual

4.1. Sections of the Project Manual are numbered in conformance with the Master List of Section Titles and Numbers, CSC Document 004E, published jointly by Construction Specifications Canada and The Construction Specifications Institute (USA). Sections are arranged in their standard format.

4.2. Sections are written as units of the Work which have been assigned numbers in conformance with the CSC/CSI system. They are arranged in sequence for this Manual. Gaps in the order of numerical sequence do not indicate that a section has been inadvertently omitted from this Manual, but, rather that a Section is not required for completion of the Work.

4.3. Wherever the project location building name occurs in the Contract Documents it shall be taken to mean all work included in the Contract.

4.4. Wherever in the Contract Documents the words "approval", "approved", "direction", "directed", "selection", "selected", "request", "requested", "report", and similar words are used, such approvals, directions, selections, requests and reports shall be given by the HRCE unless specifically stated otherwise.

4.5. Wherever in the Contract Documents the word "provide" is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.

4.6. Wherever in this Project Manual it is specified that Work is to proceed or to meet approval, direction, selection or request of jurisdictional authorities or others, such approval, direction,

selection or request shall be in writing.

5. Errors & Omissions

5.1. If errors or omissions are observed in the Contract Documents, immediately notify the HRCE Procurement in writing of all such errors or omissions. In the event no such notice is given, the Contractor will be held responsible for the results of any such error or omission and the cost of rectifying the same.

6. Division 1

6.1. The provisions of all Sections of **Division 1** shall apply to each Section of this Specification**.**

7. Wage Rates

7.1. Pay all employees engaged on the Work a wage not less than the minimum wage per hour as set out by the Province of Nova Scotia. For overtime work beyond 48 hours in any one week, pay no employee at a rate of less than one and one-half times the minimum wage per hour noted above. Provide for these wage rates in tendered contract amount.

8. Work Performed Under Separate Contracts

8.1. Work not to be included in the Contract, as noted "NIC" on the Drawings, shall be governed by Article 37, Separate Contracts, of General Conditions of Contract.

8.2. Furniture installation will be carried out by others.

8.3. Computer installation will be carried out by others.

9. Project Schedule

9.1. Refer to Section 00 00 15 Description of Work.

9.2. Existing services (mechanical & electrical) will need to be maintained through the renovations.

9.3. During construction, all life safety systems as well as mechanical and electrical systems must be in active, usable condition to permit the school to operate or alternate methods used to ensure the safe operation of the school as directed by HRCE project representative.

9.4. As construction progresses revise the schedule to compensate for any delays or unforeseen activities so as to maintain the contract completion date. Each schedule submission is to be complete with a statement indicating the changes made, the reason they were changed and confirmation that the project completion date will not change. The above schedule information is to be submitted monthly or more often if necessary.

10. Site Progress Records

10.1. Maintain at site a permanent written record of progress of Work. Make the record available at all times with copies provided when requested. Include in record each day:

10.1.1. Commencement and completion dates of the Work of each trade in each area of Project.

10.1.2. Attendance of Contractor's and Subcontractor's Work forces at Project and a record of the work they perform.

10.1.3. Visits to site by representatives of the Owner, Engineer, jurisdictional authorities, Contractor, Subcontractors, and suppliers.

10.2. Maintain a progress chart in approved format. Show on chart proposed Work schedule and progress of Work by Contractor and Subcontractor.

11. Examination

11.1. Site:

11.1.1. Examine site, and ensure that site conditions have been examined, that all are fully informed on all particulars which affect Work thereon and at the place of construction, and in order that construction proceeds competently and expeditiously.

11.1.2. Ensure by examination that all physical features, and working restrictions and limitations which exist are known.

11.2. Previously Completed Work:

11.2.1. Verify dimensions of existing Work in place before construction of Work to be incorporated with it.

11.2.2. Verify that previously executed Work and surfaces are satisfactory for construction, and that performance of subsequent Work will not be adversely affected.

11.2.3. Commencement of Work will constitute acceptance of site conditions and previously executed Work as satisfactory.

11.2.4. Report to Engineer defects in prior Work which will affect quality of subsequent Work, or construction schedule.

11.3. Construction Measurements:

11.3.1. Before commencing installation of Work, verify that its layout is accurate in accordance with intent of Drawings, and that locations, elevations, and clearances to adjacent infrastructure are maintained.

11.3.2. If Work is installed in wrong location, rectify it before other Work concerned proceeds.

12. PROTECTION OF WORK, PROPERTY & PERSONS

12.1. Include in Work necessary methods, materials, and construction to ensure that no damage or harm to Work, materials, property and persons results from the Work of this Contract. Temporary facilities relating to protection are specified in Section 01 52 00.

12.2. Protect, and if damaged make good, adjacent private and public property.

12.3. Keep surfaces, on which finish materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.

12.4. Protect finished surfaces of completed Work from damage by restriction of access or by use of physical means suitable to the material and surface location. Establish with each Subcontractor the suitability of such protection in each case.

12.5. Protect existing underground infrastructure, mechanical, electrical, telephone and similar services from damage. If necessary, relocate active services to ensure that they function continuously in safety and without risk of damage.

12.6. Cap off and remove unused utility services encountered during Work after approval is given by the utilities concerned or jurisdictional authorities, whichever may apply. Relocation, removal, protection and capping of existing utility services shall be performed only by the applicable utility and of other services by licensed mechanics.

12.7. To prevent soiling or damage to finish flooring where pedestrian traffic occurs after the flooring has been installed, install and maintain 6 mil. polyethylene membrane or reinforced kraft paper temporary protection, secured in place and with joints sealed by reinforced pressure sensitive tape.

12.8. Install plywood panels of minimum ¼" thickness over completed finish flooring materials, on which further construction Work is performed by other trades or delivery of products is made, or both. Seal joints between panels with reinforced pressure sensitive tape.

12.9. Prevent spread of dust beyond the construction zone by wetting, or by other approved means, as it accumulates.

12.10. The outside work area shall be appropriately demarked and/or surrounded by rigid chain link panels or fencing to prevent unauthorized entry to the work area. Any area of roof having work completed is to be covered below with this fencing approximately 10' from the edge of the building. It is to be maintained at all times throughout the project. All waste disposal bins are to be fenced in using the same type of fencing as indicated above during working hours. After working hours, all waste disposal bins shall be located a minimum of 25 feet from any structure. Any windows where the debris chute is located are to be covered. All entrances below the roof area are to have covered scaffolding erected to ensure a safe travel path to a distance of ten feet from edge of building. All workers shall contain their activity to the work site area. Access to the school shall only be allowed as planned in coordination with HRCE Operations and the

school administration.

12.11. The contractor is responsible for security of all project materials and access to the project site and/or the school through the project site at all times until completion of work and acceptance of the finished project by HRCE. Such additional security costs for security personnel or other means of security as deemed necessary by the contractor will be the sole responsibility of the contractor. The HRCE will provide security personnel up to and including the Substantial Completion date as noted on the bid submission documents.

12.12. The contractor shall keep the work site free from accumulated debris caused by the employees or work and shall remove all debris at the end of each work shift. Debris shall not be deposited in HRCE controlled garbage and/or recycling containers.

12.13. All waste materials and debris created during demolition and/or construction shall be disposed of in a dumpster provided by the contractor, to be removed at the end of the construction project, using a methodology that is in compliance with the applicable HRM solid waste by laws. Otherwise, the material must be removed and disposed of off site at the end of each working day. The waste materials may not be stored on site unless they are held in an approved project dumpster no closer than twenty five (25) feet from any structure.

12.14. All temporary structures such as portable washroom facilities, materials storage trailer, work trailer, debris dumpster, vehicles, etc., shall be located a minimum of (25) twenty-five feet from the school building.

12.15. Where applicable, a hot work permit will be required to be completed prior to commencement of work and all conditions of the permit must be maintained until completion of hot work. A copy of the hot work permit signed by the contractor representative shall be provided to HRCE upon completion of each hot work session. Contractor must assign a designated fire watch as noted on the permit document who shall remain on site for three hours after completion of each hot work session.

12.16. A school washroom will be designated for use where appropriate. However, protection of the surfaces as indicated above must be maintained. It should also be noted that access to the building during summer months will be limited for security reasons. Contractor is responsible to provide temporary portable washroom facilities for general use of contractor staff.

12.17. Access to Interior of School - All interior access is to be scheduled with the PM. This will allow for notice to the school admin., custodial and possible scheduling of a security guard for after hour access.

12.18. Adhesives / Torch Work - All adhesive use and torch work must be completed after school hours.

13. Cleaning

13.1. Ensure that during and after construction the public streets and existing asphalt parking lot are cleaned as required.

14. Salvage

14.1. Unless otherwise specified, salvaged material resulting from construction, and surplus materials and construction debris shall become property of Contractor, who must dispose of it away from Site.

15. Site Limitations

15.1. Since the existing building will be occupied during the Work (in accordance with the Phasing Schedule) the Architect will designate the precise areas on the site which may be utilized for work and storage, and where personnel will be permitted to be present. Refer also to Drawings. Allow for hoarding to secure construction areas from occupied portions of the Building and Site.

15.2. All access to the construction site is to be coordinated with the Project Manager for HRCE and communicated at the pre-construction meeting.

15.3. Any Work carried out in the building is to be carried out during hours approved by the School Administration.

15.4. Any disruption to services within the building must occur during hours approved by School Administration.

15.5. Any Work which may have an adverse affect on the occupancy functions, must have prior approval of the School Administration and **may** require scheduling during off-hours.

16. Security Regulations

16.1. Perform Work in conformance to the security regulations of the building as directed by the Project Manager for HRCE.

17. Project Identification

17.1. No project sign is required on this Project.

18. Owner's Occupancy

18.1. The Owner reserves the right to occupy and use portions of the Project, whether partially or entirely completed, or whether completed on schedule or not, provided such occupancy does not interfere with the Contractor's continuing Work.

18.2. Partial occupancy or installation by the Owner of his equipment shall not imply acceptance of the Project in whole, or in part, nor shall it imply acknowledgement that terms of the Agreement are fulfilled.

END OF SECTION 01 11 00

SECTION 01 11 25 - PRICES

1. General

1.1. Prices included in the Contract shall be complete for the applicable Work, and shall include for each price:

1.1.1. Expenditures for wages and for salaries of workmen, engineers, superintendents, draftsmen, foremen, timekeepers, accountants, expeditors, clerks, watchmen and such other personnel as may be approved, employed directly under the Contractor and while engaged on the applicable Work at the site and expenditures for travelling and HRCE allowances of such employees when required by location of the applicable Work or when covered by trade agreements and when approved; provided, however, that nothing shall be included for wages or salary of the Contractor if an individual, or of any member of the Contractor's firm if the Contractor is a firm or the salary of any officer of the Corporation if the Contractor is a corporation, unless otherwise agreed to in writing.

1.1.2. Expenditures for material used in or required in connection with the construction of the applicable Work including material tests and required by the laws or ordinances of any authority having jurisdiction and not included under Subparagraph .9.

1.1.3. Expenditures for preparation, inspection, delivery, installation and removal of materials, equipment, tools and supplies.

1.1.4. Temporary facilities as required for the applicable Work.

1.1.5. Travelling expenses properly incurred by the Contractor in connection with the inspection and supervision of the applicable Work or in connection with the inspection of materials prepared or in course of preparation for the applicable Work and in expediting their delivery.

1.1.6. Rentals of all equipment whether rented from the Contractor or others, in accordance with approved rental agreements including any approved applicable insurance premiums thereon and expenditures for transportation to and from the site of such equipment, costs of loading and unloading, cost of installation, dismantling and removal thereof and repairs or replacements during its use on the applicable Work, exclusive of any repairs which may be necessary because of defects in the equipment when brought to the Work or appearing within thirty (30) days thereafter.

1.1.7. The cost of all expendable materials, supplies, light, power, heat, water and tools (other than tools customarily provided by tradesmen) less the salvage value thereof at the completion of the applicable Work.

1.1.8. Assessments under the Workmen's Compensation Act, the Unemployment Insurance Act, Canada Pension Act, statutes providing for government hospitalization, vacations with pay or any similar statutes; or payments on account of usual vacations made by the Contractor to his employees engaged on the applicable Work at the site, to the extent to which such assessments or payments for vacations with pay relate to the Work covered by the specified price; and all sales taxes or other taxes where applicable.

1.1.9. The amounts of all Subcontracts related to the specified price.

1.1.10. Premiums on all insurance policies and bonds called for under this Contract as related to the specified price.

1.1.11. Royalties for the use of any patented invention on the applicable Work.

1.1.12. Fees for licenses and permits in connection with the applicable Work. No Building Permit is required for the project.

1.1.13. Duties and taxes imposed on the applicable Work.

1.1.14. Such other expenditures in connection with the applicable Work as may be approved.

1.1.15. Provided always that except with the consent of the Owner, the above items of cost shall be at rates comparable with those prevailing in the locality of the Work.

END OF SECTION 01 11 25

SECTION 01 11 41 - PROJECT COORDINATION

1. Requirements Included

1.1. Each Trade Contractor's responsibilities include the coordination of Work within his own Contract and with the Work of other Contracts.

2. Related Requirements

2.1. Project Meetings: Section 01 31 19

2.2. Submittals: Section 01 33 00

3. Description

3.1. Coordinate Work on which subsequent Work depends to facilitate mutual progress, and to prevent conflict between parts of the work.

3.2. Ensure that each Section makes known for the information of the Construction Manager and other Sections, the environmental and surface conditions required for the execution of its Work, and the sequence of others Work required installation of its Work.

3.3. Ensure that each Section, commencing Work, and that each Section is assisted in the execution of its preparatory Work by Sections depending upon its preparation.

3.4. Deliver materials supplied by one Section to be installed by another well before the installation begins.

3.5. Sections giving installation information in error, or too late to incorporate in the Work, shall be responsible for having Work done which was thereby additionally made necessary.

3.6. Coordinate warranty conditions of interconnected Work to ensure that full coverage is obtained.

3.7. Remove work installed in error which is unsatisfactory for subsequent Work.

4. Cutting And Patching

4.1. Include under Work of this Section all cutting and patching of asphalt required by the Work.

4.2. Finish new surfaces flush with existing surfaces.

4.3. Cut and patch as required making work fit.

4.4. Make cuts with clean, true, smooth edges.

4.5. Patching of existing or new asphalt shall be performed only by workmen with expertise in that particular trade and who normally perform that Trade.

4.6. Replace, and otherwise make good, damaged or defective Work. If required by the Construction Manager.

4.7. Do not endanger Work or property by cutting, digging, or similar activities. No Section shall cut or alter the Work of another Section unless approved by the Section which has installed it.

4.8. Cut and drill with true smooth edges and to minimum suitable tolerances.

4.9. If required, before cutting, drilling, or sleeving structural load bearing elements, obtain approval of location and methods.

4.10. Cutting, drilling and sleeving of Work shall be done only by the Section which has installed it. The Section requiring drilling and sleeving shall inform the Section performing the Work of the location and other requirements for drilling and sleeving. The Contractor shall directly supervise performance of cutting and patching.

4.11. Cutting and Patching for Holes Required by Mechanical & Electrical Work:

4.11.1. Include under Work of Mechanical Divisions cutting or provision of holes up to 8" in diameter and related patching.

4.11.2. Include under Work of this Section holes and other openings required by the work of Mechanical Divisions which are larger than 8" in diameter or least dimension, and chases, bulkheads, furring and required patching. This Section shall be responsible for determination of Work required for holes in excess of 8" diameter or least dimension.

4.11.3. Include under the Work of Electrical Divisions all cutting or provision of holes and related patching for the Work of that Division.

4.12. Include under Work of this Section all other cutting and patching required by the Work except as described in Clause .11 above.

4.13. Patching or replacement of damaged Work shall be done by the Subcontractor under whose Work it was originally executed, and at the expense of the Subcontractor who caused the damage.

4.14. Make patches invisible in final assembly.

5. Quality Assurance

5.1. Requirements of Regulatory Agencies:

5.1.1. Make known and coordinate the requirements of jurisdictional authorities, as made explicit by the Contract Documents, and by representatives of such authorities

5.2. Source Quality Control:

5.2.1. Ensure that Work meets specified requirements

5.2.2. Schedule, supervise and administer inspection and testing as specified in Section 01 45 00.

5.3. Job Records:

5.3.1. Maintain job records and ensure that such records are maintained by subcontractors.

Submittals

5.4. Prepare a Project schedule in accordance with Section 01 33 00, and ensure that all subcontractors and suppliers are aware of the details of this schedule, and progressively of their general compliance with the schedule.

5.5. Become aware of the required submittals specified in each Section, and expedite submission of such submittals so as not to hinder the Project Schedule.

5.6. Review submittals and make comments as specified in Section 01 33 00.

6. Job Conditions

6.1. Ensure that Work proceeds under conditions meeting specified environment and job safety requirements

6.2. Ensure that protection of adjacent property and the Work is adequately provided and maintained to meet specified requirements.

7. Product Delivery, Storage And Handling

7.1. Site has limited spaces for storage, only delivery of materials agreed upon by the Construction Manager will be allowed. Comply with Construction Manager's allocations. Any requirement for modifications to the building in order to allow delivery and storage of the materials to complete this work is the responsibility of the contractor.

7.2. Schedule delivery of products & removal of material with Construction Manager.

7.3. Make available areas for storage of products and construction equipment to meet specified requirements, and to ensure a minimum of interference with progress of the Work and relocations.

7.4. Trade Contractor to provide flag persons, traffic signals, barricades and Flares/lights/lanterns as required to perform the Work and to protect the public.

7.5. Material and Waste - Deliveries and Removals - Must be coordinated to be completed 30 minutes after school dismissal where applicable.

END OF SECTION 01 11 41

SECTION 01 31 19 – PROJECT MEETINGS

1. Pre-Award Meeting

1.1. A Pre-award meeting will be held at which time the following will be addressed:

- **1.1.1.** Owner and HRCE's functions.
- **1.1.2.** The Consultant and the Consultant's functions.
- **1.1.3.** The General Contractor and the General Contractor's functions.
- **1.1.4.** Documentation requirements from the General Contractor.
- **1.1.5.** Obligee for Performance and Payment Bonds from Sub-contractors.
- **1.1.6.** Progress Claims.
- **1.1.7.** CO's & CCO's.
- **1.1.8.** Construction Schedule.
- **1.1.9.** Project Start-up.
- **1.1.10.** Job Meetings.
- **1.1.11.** Superintendent – General Contractor's Representative.
- **1.1.12.** Design / Administration authority.
- **1.1.13.** Owner's Representative.
- **1.1.14.** Special Consultants.
- **1.1.15.** Quality of Workmanship.
- **1.1.16.** Accountability.
- **1.1.17.** Harmonized Sales Tax.
- **1.1.18.** Contract Close-out Documentation.

2. Preconstruction Meeting

2.1. Within fifteen (15) days after award of Contract, arrange a meeting between the, Consultant, Subcontractors, Project Superintendents, Inspection and Testing Company Representatives, and representatives of others whose coordination is required during construction.

2.2. Discuss at the meeting the means by which full cooperation and coordination of the participants during construction can be achieved.

2.3. Document the responsibilities and necessary activities of the participants during construction as discussed, and distribute to each participant.

2.4. Establish procedures for maintenance and completion of Project record drawings specified in Section 01 77 00.

2.5. Review and establish methods of maintaining life safety and egress for the school occupants. Communicate these methods thoroughly with the School Principal.

3. Progress Meeting

3.1. Invite representatives of HRCE, to attend twice monthly site meetings called by the Contractor during the progress of the Work.

3.2. Inform HRCE of each meeting and of proposed agenda a minimum of five (5) days before meeting.
3.3. Submit proposed schedule of site meetings to Engineer and Owner.
3.4. Record, prepare and distribute minutes of each meeting to HRCE and to each other participant within 72 hours of meeting.
3.5. Ensure that all representatives who attend meetings have the authority to conduct business on behalf of firms they represent.
3.6. Details of Progress Meetings to be discussed at the project start-up meeting.

4. Suggested Agendum (Preconstruction Meeting)

4.1. Distribution and discussion of:
4.1.1. List of major subcontractors and suppliers.
4.1.2. Projected Construction Schedules.
4.2. Critical work sequencing.
4.3. Major equipment deliveries and priorities.
4.4. Project Coordination:
4.4.1. Designation of responsible personnel.
4.5. Procedures and Processing of:
4.5.1. Field decisions
4.5.2. Proposal requests
4.5.3. Submittals
4.5.4. Change orders
4.5.5. Applications for Payment.
4.6. Adequacy of distribution of Contract Documents.
4.7. Procedures for maintaining Record Documents.
4.8. Use of premises:
4.8.1. Office, work and storage areas.
4.8.2. Owner's requirements.
4.9. Construction facilities, controls and construction aids.
4.10. Safety/Tool Box Meetings.
4.11. Security procedures.
4.12. Housekeeping procedures.
4.13. Egress/life safety procedures

5. Suggested Agendum (Progress Meetings)

5.1. Review and approval of minutes of previous meeting.
5.2. Safety meeting minutes.
5.3. Review of work progress since previous meeting.
5.4. Field observations, problems, conflicts.
5.5. Problems which impede Construction Schedule.
5.6. Review of off-site fabrication, delivery Schedules.

5.7. Corrective measures and procedures to regain projected schedules.
5.8. Revisions to Construction Schedules.
5.9. Maintenance of quality standards.
5.10. Pending changes and substitutions and effect on Construction Schedule.
5.11. Other Business.

6. Attend, with representatives of HRCE weekly meetings with the School Administration to review construction activities and concerns of Building Occupants.
7. Quarterly meetings with Contractor and the HRCE / User during Warranty Period including major sub-trade contractors.
8. Dates for meetings will be set at time of completion.

END OF SECTION 01 31 19

SECTION 01 33 00 – SUBMITTAL PROCEDURES

1. General Requirements

1.1. Make submittals specified in this Section to Consultant unless otherwise specified, with additional submissions made, in manner he directs, to other parties involved with construction of the Project as their interests are concerned. These parties are, but shall not be restricted to, consultants, jurisdictional authorities, and Subcontractors whose Work must be coordinated with Work related to Submittals.

1.2. Ensure that submissions are made to allow sufficient time for review without the construction schedule being delayed.

2. Document Submissions Required

2.1. At Commencement of Contract:

2.1.1. Performance and Payment Bonds.

2.1.2. Public Liability and Property Damage Insurance Certificates.

2.1.3. List of Subcontractors by firm name.

2.1.4. Construction Schedule and other required schedules and estimates.

2.1.5. Site Specific Safety Plan/Safety Policy.

2.1.6. Workers' Compensation Board status.

2.2. During Construction:

2.2.1. Weekly progress reports.

2.2.2. Job meeting reports and minutes.

2.2.3. Updated construction schedules.

2.2.4. Shop drawings as required.

2.2.5. Inspection and test reports.

2.2.6. Daily communication of Hot Work Permits as needed.

2.3. Submissions at completion of Work are specified in Section 01 77 00, Contract Closeout.

3. Administrative

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

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

3.3. Present shop drawings, product data, samples and in Imperial units.

3.4. Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has

been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.

3.5. Notify Consultant in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

3.6. Verify field measurements and affirm that affected adjacent work is coordinated.

3.7. Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.

3.8. Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant's review.

3.9. Keep one review copy of each submission on site.

4. Construction Schedules

4.1. Submit proposed construction schedule at beginning of Project, as specified in Project Documents.

4.2. As construction progresses, submit up-dated construction schedules as specified in Project documents.

5. Shop Drawings And Product Data

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

5.2. Submit drawings stamped and signed by professional consultant registered or licensed in Province of Nova Scotia of Canada.

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

5.4. Allow seven (7) days for Consultant's review of each submission. Do not proceed with work involving relevant products until completion of shop drawing review.

5.5. Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of work, state such in writing to Consultant prior to proceeding with work.

5.6. Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.

Accompany submission with transmittal letter, in duplicate, containing:

5.6.1. Date

5.6.2. Project title and number

5.6.3. Contractor's name and address

5.6.4. Identification and quantity of each shop drawing, product data and sample.

5.6.5. Other pertinent data.

5.7. Submission to include:

5.7.1. Date and revision dates.

5.7.2. Project title and number.

5.7.3. Name and address of:

5.7.3.1. Subcontractor.

5.7.3.2. Supplier.

5.7.3.3. Manufacturer.

5.7.4. Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

5.7.5. Details of appropriate portions of Work as applicable:

5.7.5.1. Fabrication.

5.7.5.2. Layout, showing dimensions, including identified field dimensions, and clearances.

5.7.5.3. Setting or erection details.

5.7.5.4. Capacities.

5.7.5.5. Performance characteristics.

5.7.5.6. Standards.

5.7.5.7. Relationship to adjacent work.

5.8. After Consultant's review, distribute copies.

5.9. Submit for review one electronic copy in PDF file format of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

5.10. Submit electronic copies of product data sheets for brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

5.11. Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant.

5.11.1. Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

5.11.2. Testing must have been within three (3) years of date of contract award for project.

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

5.13. Delete information not applicable to project.

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

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

5.14.2. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of work of sub-trades.

5.15. Shop Drawings are specified for submission under the following:

Section 03 20 00 Concrete Reinforcement
Section 05 12 23 Structural Steel
Section 05 31 00 Steel Deck
Section 05 50 00 Metal Fabrications
Section 06 10 11 Rough Carpentry
Section 06 40 00 Architectural Woodwork
Section 07 41 43 Aluminum Composite Panels
Section 07 46 13 Preformed Metal Siding
Section 07 55 00 Modified Bitumen Roofing System & Flashing
Section 07 84 00 Fire Stopping and Smoke Seals
Section 08 11 14 Steel Doors & Frames
Section 08 11 16 Aluminum Doors & Frames
Section 08 14 10 Wood Doors
Section 08 50 50 Aluminum Windows
Section 08 62 11 Vinyl Windows
Section 08 71 10 Door Hardware
Section 09 22 16 Non-Load Bearing Wall Framing
Section 09 30 13 Ceramic Tile
Section 10 11 13 Communication Boards
Section 10 11 23 Tackboards
Section 10 14 53 Traffic Signs
Section 10 28 10 Toilet & Bath Accessories
Section 10 50 00 Miscellaneous Specialties
Section 11 40 11 Food Services Catalogued & Custom Equipment
Section 12 21 13 Horizontal Blinds
Section 12 21 16 Roller Shades

Section 14 42 13 Wheelchair Platform Lift

All pre-manufactured Mechanical & Electrical items as noted in Mechanical & Electrical Divisions.

6. SAMPLES

6.1. Submit for review samples in duplicate as requested in respective specification Sections, as requested by the Consultant. Label samples with origin and intended use.

6.2. Deliver samples prepaid to Consultant's business address.

6.3. Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.

6.4. Adjustments made on samples by Consultant are not intended to change.

6.5. Make changes in samples which Consultant may require, consistent with Contract Documents.

6.6. Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

6.7. Samples are specified for submission under the following Sections:

Section 07 41 43 Aluminum Composite Panels
Section 07 46 13 Preformed Metal Siding
Section 08 14 10 Wood Doors
Section 08 50 50 Aluminum Windows
Section 09 30 13 Ceramic Tile
Section 09 51 13 Acoustical Ceiling Units
Section 09 65 19 Resilient Tile Flooring
Section 12 21 13 Horizontal Blinds
Section 12 21 16 Roller Shades
Refer to Mechanical & Electrical Divisions for sample requirements in those Trades.

7. Record Drawings

7.1. Record, as the Work progresses, changes and deviations in the location of Work concealed by the finished Work, and such other approved changes that occur during progress of Work, to ensure that an accurate record is provided for future maintenance and alterations.

7.2. White prints will be provided by the HRCE for use in preparing record drawings. Record changes in the Work on these prints in red ink.

7.3. Dimension location of concealed Work in reference to building walls, and elevation in reference to floor elevation. Indicate at which point dimension is taken to conceal Work. Dimension all terminations and offsets of runs of concealed work.

7.4. Record work constructed differently than shown on Contract Documents, changes in the work caused by site conditions, by Owner, Consultant, Contractor and Subcontractor

originated changes, and by site instructions, supplementary instructions, field orders, change orders, addenda, correspondence and directions of jurisdictional authorities.

7.5. Record location of mechanical and electrical services, piping, valves, conduits, pull boxes, junction boxes and similar work not clearly in view, and position of which is required for maintenance, alteration work and future additions. Do not conceal critical work until its location has been recorded.

7.6. Identify record drawings as a "Project Record Copy". Maintain in good condition, do not use for construction purposes and make available to Consultant at all times.

7.7. Submit record drawings at completion of Work. Final acceptance of the Work will be predicated on receipt and approval of record drawings.

8. Extra Stock

8.1. Supply extra stock at completion of Project as specified in other Sections of the Project Manual.

8.2. Deliver extra stock as directed by the Architect to location he designates.

8.3. Extra stock is specified to be supplied in the following Sections:

Section 09 30 13 Ceramic Tile
Section 09 51 13 Acoustical Ceiling Units
Section 09 65 19 Resilient Tile Flooring
Section 09 91 23 Painting
Refer to Mechanical & Electrical Divisions for Extra Stock requirements in those Trades.

9. Maintenance Manual & Operating Instructions

9.1. Submit three (3) copies of Maintenance Manual with application for completion certificate.

9.2. Include in Maintenance Manual one (1) copy of each final approved shop drawing issued for Project on which have been recorded changes made during fabrication and installation caused by unforeseen conditions.

9.3. Submit extended guarantees together in one (1) report binder.

9.4. The Manuals shall:

9.4.1. Consist of a hard-cover, black, vinyl-covered, loose-leaf, letter-size binder.

9.4.2. Have a title sheet, or sheets preceding data on which shall be recorded Project name, Project number, date, list of contents, and Contractor's and Subcontractors' names.

9.4.3. Be organized into applicable Sections of Work with each Section separated by hard paper dividers with plastic covered tabs marked by Section.

9.4.4. Contain only typed or printed information and notes, and neatly drafted drawings.

9.4.5. Contain maintenance and operating instructions on all building, and mechanical and electrical equipment.

9.4.6. Contain maintenance instructions as specified in various Sections.

9.4.7. Contain brochures and parts lists on all equipment.

9.4.8. Contain sources of supply for all proprietary products used in the Work.

9.4.9. Contain lists of supply sources for maintenance of all equipment in Project of which more detailed information is not included above.

9.4.10. Contain finished hardware schedule.

9.4.11. Contain charts, diagrams and reports specified in Mechanical & Electrical Divisions.

10. Extended Warranties

10.1. Submit the extended warranties listed in this Article and as specified in each applicable Section of this Project Manual.

10.2. Extended warranties shall commence on termination of the standard one-year warranty granted in this Contract.

10.3. Submit each extended warranty on a standard Form of Warranty, a sample of which is included in this Section.

10.4. Secure each extended Warranty by a Maintenance Bond in an amount indicated.

10.5. Submit extended warranties for:

Section 06 40 00 Architectural Woodwork – extended 4 years
Section 07 41 43 Aluminum Composite Panels – extended 10 years (panel finish)
Section 07 55 00 Modified Bitumen Roofing System & Flashing:

- 2 year CRCA materials and workmanship against leaks and blow off
- 10 year material warranty the membrane will perform as a roofing material
- 1 year CRCA warranty against defects of materials and workmanship for the sheet metal work.

Section 07 92 10 Joint Sealants – extended 5 years
Section 08 11 16 Aluminum Doors & Frames – extended 4 years
Section 08 14 10 Wood Doors – extended 4 years
Section 08 50 50 Aluminum Windows – extended 4 years
Section 08 62 11 Vinyl Windows – extended 5 years
Section 08 71 10 Door Hardware – various, refer to that Section
Section 09 30 13 Ceramic Tile – extended 4 years
Section 09 51 13 Acoustical Ceiling Units – extended 4 years
Section 09 65 19 Resilient Tile Flooring – extended 4 years
Section 10 11 13 Communication Boards – extended 24 years
Section 10 11 23 Tackboards – extended 9 years
Section 12 21 13 Horizontal Blinds – extended 5 years
Section 12 21 16 Rollers Shades – extended 5 years

Section 14 42 13 Platform Lift – extended 5 years
Refer to Mechanical & Electrical Divisions for extended Warranty requirements in those trades.

11. Inspection Laboratory Reports

11.1. Submit copies of inspection and test reports obtained by the Contractor and Subcontractors for their Work or for Jurisdictional Authorities, if requested by Consultant.

11.2. Submit reports in accordance with requirements specified in Section 01 41 00.

12. Documentation On Suppliers & Manufacturers

12.1. Provide information under headings identifying the following: Associated Technical Section, Manufacturer, Supplier, Contact Name, and Phone Numbers.

SAMPLE FORM OF WARRANTY FOLLOWS THIS PAGE

Sample Form for Warranty

Date .....

Client .....

Project .....

.....

Warranty .....
(title of work)

We hereby undertake to warrant all materials supplied and installed under our Contracts and include the providing of necessary materials and labour to cover the result of faulty materials or workmanship. Upon written notification from Client or the Architect that the above work is defective any repair or replacement work required shall be to the Architect's satisfaction at no cost to the Client. This Warranty shall not apply to defects caused by the work of others, maltreatment of materials, negligence or Acts of God. This Warranty shall remain in effect for the total period from the acceptance of the Work to (....date....), irrespective of the date of completion or the beneficial use by the Owner.

Signature .....

Authorized Signing Officer .....

Name of Firm .....

Address .....

END OF SECTION 01 33 00

SECTION 01 35 13 – APPENDIX A - SPECIAL PROJECT PROCEDURES

1. Introduction

1.1. School construction, renovation and maintenance projects are scheduled every year as a normal and necessary course of business by operations departments in each Nova Scotia Centre for Education. Building modifications, repairs and additions/demolitions to buildings may impact the school environment without appropriate controls. With increased controls based primarily on the CSA standards implementation, proper scheduling and clear communication on adequate controls can be put into place to eliminate/minimize the impact to all occupants.

1.2. Projects of this nature may generate varying levels of dusts, noises and odors. It is possible, unknown/unforeseeable environmental contaminants, such as spills, mould, fumes, lead or asbestos exposure maybe identified.

1.3. To successfully complete work within the school environment, it is necessary to plan and implement appropriate containment and control strategies. This document is developed to provide a minimum standard for contaminant controls for various types of projects in schools. These standards are in addition to and should complement all legislated protocols for working with regulated materials such as asbestos, lead paints, PCB's etc.

1.4. Executing a successful project will depend primarily on clear, concise communication. This may involve a number of parties (Project Manager, Operations staff, School Administration and Health & Safety staff and Joint Occupational Health & Safety Committee).

2. Communication Plan

2.1. The most critical element of any project management plan is effective communication between all stakeholders. Communication between the Operations project manager/supervisor, the contractor and school administrators before the start of a project is very important. This meeting is meant to explain the scope, schedule and risk assessment for the project. The meeting will also help establish clear expectations when managing planned and unplanned exposure risks associated with contaminant controls.

2.2. The communication plan shall include:

2.2.1. A description of potential contaminants, which may include but is not limited to:

2.2.1.1. Particulates (dirt, concrete/silica, steel, fiberglass, wood dust, ash, cellulose, etc.)

2.2.1.2. Moisture: external water infiltration, internal system leaks (domestic water, sanitary, storm, sprinkler)

2.2.1.3. Noise from equipment/tool operation,

2.2.1.4. Fumes/odors from equipment exhaust, boiler exhaust, septic waste, chemical/adhesives, etc.

2.2.1.5. Hazardous materials including, asbestos, PCB, mercury, lead, fuel oil, fungi/mould, etc.

2.2.1.6. Excessive heat/cold

2.2.2. A description of the control measure which may include but not be limited to:

2.2.2.1. Isolation within an enclosure (water, noise, hazardous materials)

2.2.2.2. Ventilation and filtration

2.2.2.3. Dehumidifiers/blowers (moisture)

2.2.2.4. Personal protective equipment

2.2.2.5. Schedule outside or inside school hours

2.2.2.6. Sound dampeners

2.2.2.7. Monitoring

2.2.2.8. Security

2.2.3. Other Hazards created by the work, including but not limited to fire safety and the need to alter fire safety plans.

2.3. For small routine work orders the communication plan may only involve one tradesperson and the school principal or designate. This communication is equally as important for management of contaminant controls.

3. Contaminant Control Management

3.1. Regardless of the contaminant or control measure used, the following procedures shall apply for every project:

3.1.1. Every project, including all routine work requests, shall be assessed, as per this document, by appropriate personnel for potential contaminant risk.

3.1.2. Clear lines of communication must be established between project personnel, site supervisor or project manager and the school administration.

3.1.3. Control strategies as per this document, shall be, communicated to workers as well as the site JOHSC and implemented prior to starting the work.

3.1.4. Where isolation is used as a control, all entry points must be clearly posted to describe the purpose of the enclosure and limitations of access.

3.1.5. During the execution of the project, the control measures must be regularly inspected and maintained before the start of each work shift, and throughout the shift as required.

3.1.6. A process for stop work and remediation orders must be established to ensure the project manager; site supervisor and school administrator have a means to cease project operations when a contaminant control breach may impact the school environment. Breached control measures must be reported immediately to HRCE project manager upon discovery. He/she will be responsible to communicate to the school principal or designate. Work shall be stopped immediately until the control measures are re-established.

3.1.7. Access to the controlled work site is only permitted by authorized personnel. The project supervisor or designate shall determine appropriate personal protective equipment (PPE) and necessary worker orientation.

4. Particulate Control

4.1. Exposure to minimal levels of dust is a normal condition in most outdoor and indoor environments and is typically controlled inside a building through building ventilation, filtration and routine housekeeping measures. However, as noted, construction projects generally create elevated dust levels in work areas, whether inside or outside of a building.

4.2. Operational Services Managers must ensure maintenance staff and contracted service providers implement dust control measures appropriate for the type and scope of work being performed. This will include assessing the type and amount of dust being created as well as the location of the work being conducted.

4.2.1. Interior Construction Projects:

4.2.2. Construction projects may be described as projects that may include window replacement, wall creation/demolition, etc.

4.3. As a minimum for these types of construction projects, all interior entry points into a construction zone must be effectively sealed. The barrier must prevent contaminants from the work area to be distributed to other areas of the school. Appropriate signage must be posted to indicate only authorized persons are permitted access.

4.4. Entrance design could range from a two flap plastic tarp door to a fully constructed sealed entry door with negative hepa-filtered ventilation on the construction side of the barrier.

4.5. Exterior Construction Projects:

4.5.1. Exterior work shall be performed so as not to affect the safety of building occupants. It will also provide controls to avoid impact to adjacent properties. Depending up on the results identified in the risk assessment, at a minimum consideration must be given to prevent dust from entering into the school environment. This may be controlled through isolation, dampening application, closing building AHU and window/door openings.

5. Noise Control

5.1. Hearing plays an essential role in communication, speech and language development and learning within a school environment. During construction the contractor is responsible for ensuring acceptable noise levels will be adhered to for the HRCE staff and students within the building. Noise related to a project may prove to be very distracting for staff and students. To minimize distractions and interruptions in student learning the following are important to consider:

5.1.1. Contractors are responsible to ensure appropriate noise control measures are taken

5.1.2. "No work" periods may need to be incorporated into construction schedules

5.1.3. Work causing a noise disruption may need to take place during unoccupied times and/or during pre-determined acceptable times of the day (i.e. before and after class times)

5.1.4. It may be necessary for the School Administrator to make a request to the HRCE Project Manager or the Contractor to exclude undertaking certain noisy activities during particular periods and/or activities.

6. Moisture Control

6.1. Moisture levels are to be controlled during construction and maintenance activities. Moisture levels above normal may impact the air in the room and/or building and may also penetrate building materials giving the potential to lead to mould growth.

6.2. Certain activities (i.e. tape and mud of drywall, painting, pressure washing, concrete cutting with water or other water based dust-suppression) introduce high amounts of moisture into the room environment and ventilation and or drying is required to control local moisture.

6.3. An enclosure properly set-up to contain other contaminants will similarly contain/control high levels of airborne moisture. A wet-vac should be available on-site for activities which have a risk of water spillage of more than 5 gallons at any instance.

6.4. Standing and or stagnate water must be avoided on construction sites, for a number of reasons, including, but not limited to; insects breed in these bodies of water, the water may give off odours, it is a nuisance to walk through, and it may be an ice hazard in cold weather.

6.5. It is important that all water leaks and flooding are reported immediately to the HRCE's project manager and building supervisor. Where works to existing "plumbing" is to occur the water lines (potable, heating, fire suppression) must be isolated and drained (de-energized/de-pressurized) following Lock Out - Tag Out procedure. Adequate supplies such as buckets and absorbents should be present when drains are not available to drain a line.

6.6. When an interruption to the water supply, potable or service, is to occur then the "owner's representative" and building supervisor should be notified 24 hours in advance. Bottled water provision may be required.

6.7. Materials used in the construction and or maintenance activities are to be stored in dry areas. The introduction of materials to the activities with moisture levels above the acceptable (XXX%)CNBC states for wood, on dry weight basis, a max of 19%, I can't find info on drywall but assume it is much lower range is prohibited as these materials are highly susceptible to colonization by mould spores.

7. Fumes

7.1. Fumes may be produced on a project site for a variety of reasons such as use of motorized equipment, off gassing of sealants, adhesives and finish products, cutting/torching processes, exposure of sanitary systems, process ignition gases such as propane and acetylene, proximity of project temporary washrooms, radon, etc.

7.2. The impact of fumes on occupants may range from discomfort to health risk, to life safety risk.

7.3. The project manager or supervisor must ensure that all potential fume sources are identified and remedial or control measures included in the scope of work by the contractor.

7.4. Monitoring equipment may be required to determine for example radon exposure or safety of confined space access.

8. Activity Assessment

8.1. Activities that may produce contaminants which require control may be considered as low, medium and high impact.

8.2. Low impact activities include routine maintenance and repairs that may create localized dust or odors or brief periods of noise which are not considered harmful to occupants but may be a nuisance which requires minimal control. These may include activities such as opening ceiling tiles or gyproc walls, replacing a plumbing fixture, paint touch ups, drilling through a wall, etc.

8.3. Medium impact activities include larger repair jobs or longer duration projects that will create more wide spread levels of contaminant which must be controlled to prevent exposure to building occupants. Boiler cleaning, ceiling replacement, long periods of hammer drilling, etc.

8.4. High impact activities include large demolition and construction projects, or jobs with exposure to contaminants that are a risk to health or life safety such as asbestos remediation, mould abatement, lead paint clean up, etc.

9. Hazard Assessment

9.1. A hazardous assessment is required to be completed for each job to ensure hazards are identified and corresponding controls are implemented. Depending upon the circumstances at the site it may be necessary to upgrade and/or add other precautions.

9.2. Determine the most appropriate hazard classification and apply the corresponding protocols. The attached hazard assessment identifies the minimum controls that must be in place during the corresponding activities. Depending on the specific circumstances at a site further controls may be required. When the hazards are deemed to be in the C or F category the form including specific controls must be submitted to the HRCE for review, prior to commencing work. The contractor may still be required to complete their own hazard assessment of the job/work.

10. Contaminant Controls Procedure for initiating work for all Contaminant Controls:

10.1. Contaminant Control I

10.1.1. The tradesperson or project manager for the HRCE will discuss the details, including the scope and any impacts of the job/project with the principal.

10.1.2. Ensure fire exiting requirements and life safety systems are addressed or adequate mitigating plans are implemented for the building, construction staff and building occupants.

10.1.3. Presence of lead paint or ACM's (Asbestos Containing Materials) must be determined prior to the start of any job. Specific protocols or Codes of Practice may apply.

10.1.4. Consideration will be given for work that is anticipated to generate significant noise, odours or VOC's (Volatile Organic Compounds) and this will be scheduled outside of school hours or during times when the noise will not disrupt occupant activities. This will require coordination with the Principal.

10.1.5. The work area shall be isolated where possible. This may be achieved at varying levels, by closing doors and opening outside windows for ventilation or by installing appropriate hoarding and negative pressure units to ensure contaminants are not circulated throughout the school causing further health and safety concerns.

10.1.6. Dust shall be minimized during the activity. When drilling, sanding or cutting is taking place, wetting the area may be necessary to reduce dust.

10.1.7. Good housekeeping practices shall be maintained at all times on the work site. Bag and remove dust and debris from the building as soon as possible.

10.1.8. Possible environmental impacts shall be managed and minimized. If work uncovers environmental contaminants or suspected contaminants such as oil spills (current or historic) or potentially friable asbestos materials (check the school asbestos audit) that may be disturbed, this information shall be brought to the attention of the HRCE's employee responsible for the project so that appropriate actions can be taken.

10.1.9. When the activity is completed the work area shall be inspected and cleaned. Dust and debris shall be removed from the area and all efforts will be made to return items to their pre-maintenance activity location.

10.1.10. The Principal shall be notified that the work is completed.

10.2. Contaminant Control II - All Contaminant Control I measures shall apply, as well as;

10.2.1. Cover furniture, bookshelves and teaching materials with plastic sheets.

10.2.2. Water misting while performing dust generating activities may be required.

10.2.3. Seal un-used doors. Seal wall penetrations, electrical outlets, or any other source of air leaks in the construction area.

10.2.4. Seal exhaust air vents in construction area and open the windows. If possible shut down air handling system in the area for duration of project.

10.2.5. A walk out mat at exterior of exit door to trap dust may be required.

10.3. Contaminant Control III - All Contaminant Control I and II measures shall apply, as well as;

10.3.1. Install an impermeable dust barrier from the true ceiling to the floor consisting of two layers of 6 mil fire retardant polyethylene or solid wall and sealed door. The wall shall remain in place until the job is finished and the clean-up is completed.

10.3.2. Seal all wall penetrations

10.3.3. Seal off all return and supply air handling ducts and close all windows.

10.3.4. Turn off the air handling system in the area of construction.

10.3.5. Maintain negative air pressure in the construction area using HEPA filter equipped exhaust ventilation. The pressure differential between the project area of contamination and the building's occupied areas shall be demonstrable by a means approved by the HRCE employee responsible for the project.

10.3.6. Ensure that the air is exhausted directly outside and away from intake vents.

10.3.7. Vacuum all horizontal surfaces including drop cloths with a hepa vacuum.

10.3.8. Remove drop clothes

10.3.9. Vacuum again all horizontal surfaces with HEPA Vacuum.

10.3.10. Restore ventilation.

10.3.11. Remove enclosure and equipment.

10.4. Control IV: (External Work)

10.4.1. External work may impact building interior or occupants.

10.4.2. To reduce the impact to building interior or occupants, it may be necessary to contain the work area from impacting building interior. This may include closing or opening windows, tarping ceilings to capture debris or water, temporary relocation of occupants or ventilation controls.

10.4.3. The job supervisor shall consider weather conditions and forecast to reduce the effect of any weather impacts to the building materials or building occupants.

10.4.4. It may be necessary to use protective tarps and ground cover sheets below equipment and work areas to contain building debris such as paint chips, materials, dust or oil from equipment.

10.4.5. When the job is completed and the tarps have been lifted, inspect the ground around the job for debris and clean as necessary.

Fire Protection

10.5. Type V: General Fire Protection

10.5.1. Ensure fire exiting requirements and life safety systems are addressed or adequate mitigating plans are implemented for the building, construction staff and building occupants. Staff must be aware of temporary modifications to fire safety plans.

10.5.2. MSDSs for all materials to be used must be reviewed and available on site.

10.5.3. Construction materials stored outside must be a minimum distance of ten feet from the building and be in a secured area.

10.5.4. Flammable or Combustible liquids must be stored as per Fire Code requirements. All flammable and combustible liquids or materials must be kept in a secure area at all times.

10.6. Control VI: Fire Protection (minor hot work) - All Contaminant Control V shall apply as well as;

10.6.1. Notify the Principal that a risk of fire has increased and the area in which the hot work will occur.

10.6.2. Refer and implement the HRCE's hot work permit process. At a minimum the following should be considered;

10.6.2.1. Sweep the work area and remove all unnecessary materials in the vicinity; particularly all combustible and flammable materials and liquids shall be removed from the area (35 feet).

10.6.2.2. Have an appropriate size fire extinguisher available.

10.6.2.3. Inspect the work location for areas (such as a hole in the wall) where hot material or sparks could fall and smolder and close them off so that any hot debris can only fall within your field of view.

10.6.2.4. If it is possible that the flame will go past the object being welded or soldered and excessively heat a flammable or combustible material then either protect that material with a non-flammable material or wet the material and keep it wetted during the use of heat or grinding.

10.6.2.5. Remain in the area while the joint and/or heated materials cool to room temperature (ambient) while checking for the smell or appearance of smoke in the area.

10.6.2.6. Stay in the area for at least Y2 hour and then re-inspect for any smell or appearance of smoke.

10.6.2.7. Ask another staff person to inspect the area for the smell or appearance of smoke. Record who you asked to do the final inspection.

10.6.3. Type VII: Fire Protection (hot work w fire watch) - All Contaminant Control V and VI shall apply as well as;

10.6.4. Notify the Principal that a risk of fire has increased and the area in which the hot work will occur. If any life safety system components (sprinkler, detectors, fire alarms) are not function, hot work should not proceed until these systems are functioning unless fire watch procedures for life systems are followed. See Activation of Fire Watch for Life Safety Systems checklist. Appendix…XX

10.6.5. Refer and implement the HRCE's hot work permit process. At a minimum the following should be considered;

10.6.5.1. Cover all floor openings with fire stop material. Seal duct work openings with metal covers or blankets and close all doors.

10.6.5.2. Ensure that there are no potentially explosive atmospheres in the area.

10.6.5.3. Hot work on vessels, pressure tanks or boilers, use only contractors who are qualified by nationally or internationally recognized boiler and pressure vessel code.

10.6.5.4. Notify the local fire department of the type of work and the work schedule.

10.6.5.5. Before hot work is started, designate one employee responsible to complete the fire watch: while work is in progress, during lunch breaks and other breaks and for one hour after all flames are extinguished for the day and monitor the area for an additional two hours. After three hours after the last flame has been extinguished, have a second employee do a final survey of the area for smells or evidence of smoldering or fire and record the inspection.

APPENDIX
Fire Watch Activation Checklist

1. Documentation (identify locations to be checked on an hourly basis, provide contact information for relevant HRCE staff and outside agencies} HRCE provided template to be used for documentation.
2. Procedure reviewed with Custodian or individual responsible for fire watch. Any high risk areas shall be identified to be highlighted on the documentation page and checked during the rounds.
3. Staff working in the building have been notified of the Fire Watch and that they are responsible to monitor areas for signs of fire or smoke and have been reminded of required actions to take according to the school fire safety plan.
4. Staff responsible for fire watch have been trained in how to use a fire extinguisher. (PASS)
5. Staff responsible for the fire watch have a means of communication (cell phone or walkie-talkies)
6. Staff responsible for the fire watch are aware of the procedure for initiating fire alarm and what systems are functioning. i.e. systems (sprinklers, alarm panel or if school has monitoring company or if calling 911 is required)
7. The School Insurance Program (SIP) Emergency Information Line has been notified 1-902-448-2840
8. All relevant information has been documented in the school's fire books. Including date, time and reason for fire watch.

Fire Watch De-Activation Checklist

1. Document the date, time and actions taken to remedy the deficiency requiring the fire watch.
2. School Insurance Program (SIP) has been notified
3. Copy of the Fire Watch documentation is kept in the fire book and the original is sent to the HRCE Project Representative.

END OF SECTION 01 35 13

SECTION 01 35 29 - OCCUPATIONAL HEALTH & SAFETY REQUIREMENTS

1. References

1.1. CSA S269.1-1975 Falsework for Construction Purposes.

2. CONSTRUCTION SAFETY MEASURES

2.1. Observe construction safety measures of:

2.1.1. National Building Code 2010, Part 8

2.1.2. National Fire Code of Canada

2.1.3. Provincial Government, including but not limited to the:

2.1.3.1. Occupational Health & Safety Act revised Statutes of Nova Scotia 1996, Chapter 7 and regulations.

2.1.3.2. Workers' Compensation Act

2.1.3.3. Fire Protection Act

2.1.3.4. Dangerous Goods Transportation Act

2.2. In case of conflict or discrepancy the more stringent requirement shall apply.

2.3. Ensure that employees working on this specific project have met training requirements as legislated by the Nova Scotia Occupational Health & Safety Act and its regulations.

2.4. Where reference is made to jurisdictional authorities, it shall mean all authorities who have within their constituted powers the right to enforce the laws of the place of the building.

3. Equipment & Tools

3.1. Each user of equipment or tools shall be responsible to examine for sufficiency before use. Make equipment and tools safe if necessary.

4. WHMIS

4.1. Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets.

4.2. Have a copy of WHMIS data sheets available at the workplace on delivery of materials.

5. Hazardous Material

5.1. Should material resembling hazardous materials other than those identified with the Contract Documents, including but not limited to spray or trowel applied asbestos, be encountered in course of work; stop work immediately. Do not proceed until written instructions have been received from Consultant.

5.2. Where work entails use, storage, or disposal of toxic or hazardous materials, chemicals and or explosives, or otherwise creates a hazard to life, safety, health, or the environment; work shall be in accordance with the Jurisdictional Authority.

6. Site Cleaning

6.1. Except where special permission is obtained, maintain clear access on public sidewalks and roads.

6.2. Maintain walks and roads clear of construction materials and debris, including excavated material. Clean walks and roads as frequently as required to ensure that they are cleared of materials, debris and excavated material.

7. Fire Safety Requirements

7.1. Enforce fire protection methods, good housekeeping and adherence to local and Underwriter's fire regulations including, but not limited to, Fire Protection Act and the Provincial Building Code Act. Provide UL approved fire extinguishers, and other fire- fighting services and equipment, except where more explicit requirements are specified as the responsibility of individual Sections.

7.2. Smoking is not permitted on school property.

7.3. Advise Fire Chief in the area of Work of any work that would impede fire apparatus response, including but not limited to violation of minimum overhead clearance prescribed by the fire chief, erecting of barricades and digging of trenches and in areas where work is being done.

7.4. Ensure nothing subverts the integrity of fire protection provided for the building structure.

8. Reporting Fires

8.1. Know the location of the nearest fire alarm box and telephone, including the emergency phone number.

8.2. Report immediately all fire incidents to the fire department as follows:

8.2.1. Activate nearest fire alarm box, or

8.2.2. Telephone local fire department

8.2.3. Where fire alarm box is exterior to building, the person activating the fire alarm box shall remain at the box to direct Fire Department to scene of the fire.

8.2.4. When reporting a fire by telephone, give location of fire, name or number of building and be prepared to verify the location.

9. Safety Document Submission

9.1. Ensure Safety Document Submission applies to Work of this specific project and site.

9.2. Submit two (2) copies of Project Safety Document at the Pre-Construction Meeting. Do not commence Work nor deliver material on-site prior to submission.

9.3. Include in Safety Document submission specific information detailing the methods and procedures to be implemented ensuring adherence to the acts, regulations, codes and policies specified in this section and to:

9.3.1. Ensure the Health & Safety of persons at or near the Work; including, but not limited to, the Public.

9.3.2. Ensure the measures and procedures of the regulatory agencies specified are carried out.

9.3.3. Ensure every employee, self-employed person and employer performing Work under this contract complies with the regulatory agencies specified.

9.3.4. Where changes to the methods and procedures in the execution of work change submitted safety methods and procedures, modify submitted Safety Documentation and submit modifications, in writing to the Consultant and Owner prior to implementation.

10. Safety Document Organization

10.1. Organize information in the form of an instructional manual as follows:

10.1.1. Place in binders of commercial quality, accommodating 8½" x 11" paper size.

10.1.2. Cover: Identify binder with typed or printed title ‘Project Safety Document’ and list the title of project.

10.1.3. Provide tabbed fly leaf for each separate heading, with typed heading on tab.

10.1.4. Where drawings are within the safety document, provide with reinforced punched binder tab. Bind in with text; fold in larger drawings to size of text pages.

10.1.5. Arrange content under Safety Document headings specified herein.

11. Safety Document Headings

11.1. Employee Safety Training

11.1.1. Place, under this heading, a statement indicating employees working on this specific project have met specified training requirements, if required.

11.2. Company Safety Policy

11.2.1. Place, under this heading, information pertaining to the company's policy and commitment to Occupational Health & Safety, including the responsibilities of management, supervisors and workers.

11.3. Company Safety Rules in General Terms

11.3.1. Place, under this heading, information of a general, global nature, applying to every work environment where the company has staff and pertaining to rules directing compliance to policy. For example state company safety rules with respect to use of hard hats, safety glasses, safety foot ware, CSA approval on such items, and use of alcohol or non-prescription drugs.

11.4. Hazard Assessment

11.4.1. Place, under this heading, information identifying possible hazards specific to this project and identify safe methods and procedures for the execution of work to ensure safety in the work place.

11.4.2. Arrange contents of this heading by technical section number of the project manual.

11.5. Emergency Action Plan

11.5.1. Place, under this heading, information detailing action to be taken in the event of various emergencies.

11.5.2. Arrange content under the following sub-headings:

11.5.2.1. First Aid

11.5.2.1.1. Include information concerning establishment of a First Aid Station, related supplies, staff awareness of location and staff training in First Aid Care of Casualties.

11.5.2.2. Contact of Emergency Support Groups:

11.5.2.2.1. Include relative information including phone location for emergency use, the emergency telephone numbers and their location for the various organizations which must be contacted in case of an emergency, and staff training in procedures.

Cessation of Work:

11.5.2.2.2. Include relative information how work cessation during emergencies is handled and communicated to persons present on site.

11.6. Joint Occupational Health & Safety Committee/Representative:

11.6.1. Place under this heading information detailing membership and terms of reference.

OCCUPATIONAL HEALTH & SAFETY SUMMARY FOLLOWS THIS PAGE

Occupational Health & Safety Summary (to be submitted with each monthly Progress estimate)

The following information summarizes Occupational Health & Safety activities on the project conducted by the Contractor during the month and includes activities of Subcontractors. Activities include all matters prescribed by the Occupational Health & Safety Act and Regulations and the submitted Occupational Health & Safety Document for the Project.

Indicate the applicable # number below:

#_____new contractors on site,
#_____orientations
#_____toolbox talks
#_____safety meetings
#_____Joint Occupational Health and Safety Committee meetings
#_____hazard assessments
#_____formal written inspections
#_____warnings issued to employees or subcontractors
#_____other, explain_____

List new Contractors on Site below:

_____
_____
_____
_____
_____
_____

The Contractor certifies that the above noted activity list is accurate and that during the month:

Check

☐ All activities on the Project were found to be in compliance with the Occupational Health & Safety Act and Regulations

☐ Some activities on the Project were not found to be in compliance with the Occupational Health & Safety Act and Regulations but were adequately corrected in an appropriate time frame. Explain _____
_____

Prepared by

_____
(Contractor Project Manager)

Certified by

_____
(Contractor Senior Management)

END OF SECTION 01 35 29

SECTION 01 37 00 - SCHEDULE OF VALUES

1. Related Documents

1.1. General Conditions of Contract.

2. General

2.1. Submit to the Architect, and Owner, Schedule of Values, within twenty (20) days after signing Agreement.

2.2. Use Schedule of Values as basis for Contractor's Progress Claim.

3. Form Of Submittal

3.1. Form included at end of this Section.

3.2. **The form included below is a suggested guide but might not be appropriate for all projects. Contractors may submit their own template to the Owner for review/approval.**

4. Preparing Schedule Of Values

4.1. Itemize separate line item cost for work required.

4.2. Round off figures to nearest ten (10) dollars.

4.3. The sum of all values listed in the schedule shall equal the total contract sum.

5. Review And Submittal

5.1. After review by Architect and Owner, revise and resubmit Schedule as directed.

5.2. The form shall be completed and supported by such evidence as to its correctness as the Architect may reasonably direct.

Schedule of Values

Project Name ***#3958-Boiler Replacement – Joseph Howe Elementary***

Contract Number .....

Architect .....

Contractor .....

Date .....

Item	Description	Item Amount

1. **General Requirements**
   - **1.1.** Mobilization & Initial Expenses
   - **1.2.** Site Overhead & Fee
   - **1.3.** Bonds
   - **1.4.** Certificates
   - **1.5.** Testing
   - **1.6.** Construction Facilities & Temporary Controls
   - **1.7.** Other (Specify)

Total (Items 1.1 to 1.7) _____

2. **Excavation, Backfill, Sitework**

Total (Item 2.) _____

3. **Concrete**

Total (Item 3.) _____

4. **Masonry**

Total (Item 4.) _____

5. **Metals**

Total (Item 5.) _____

6. **Wood & Plastics**
   - **6.1.** Rough Carpentry
   - **6.2.** Finish Carpentry
   - **6.3.** Architectural Woodwork

Total (Items 6.1 to 6.3) _____

7. **Thermal & Moisture Protection**
   - **7.1.** Insulation
   - **7.2.** Air Vapour Barrier
   - **7.3.** Aluminum Composite Panels
   - **7.4.** Preformed Metal Siding
   - **7.5.** Fire Stopping
   - **7.6.** Roofing

Total (Item 7.1 to 7.6) _____

8. Doors And Windows

8.1. Metal Doors & Frames
8.2. Wood Doors
8.3. Hardware
8.4. Windows

Total (Items 8.1 to 8.4) _____

9. Finishes

9.1. Acoustic Ceiling Systems
9.2. Gypsum Board and Support Systems
9.3. Hard Tile
9.4. Resilient Tile
9.5. Painting

Total (Items 9.1 to 9.5) _____

10. Specialties

10.1. Tackboards, Communication Boards
10.2. Toilet & Bath Accessories
10.3. Manufactured Specialties
10.4. Food Service Equipment

Total (Items 10.1 to 10.4) _____

11. Mechanical

11.1. As per Sections — Total (Item 11.) _____

12. Electrical

12.1. As per Sections — Total (Item 12.) _____

TOTAL (Items 1 - 12) _____

END OF SECTION 01 37 00

SECTION 01 41 00 - REGULATORY AGENCIES

1. Jurisdictional Authorities

1.1. Where reference is made to jurisdictional authorities, it shall mean all authorities who have within their constituted powers the right to enforce the laws of the place of building.

2. Definitions

2.1. The "Constructor" named in the Construction Safety Act, Chapter 52, Revised Statutes of Nova Scotia, as amended by 1972, Chapter 25; and Construction Safety Regulations, pursuant to Chapter 52 R.S.N.S., including any amendments, shall mean the "Contractor" for the Work performed under this Specification.

3. Fire Prevention, Safety & Protection

3.1. General Construction Safety Measures:

3.1.1. Observe safety measures of the

3.1.1.1. National Building Code 2010, Part 8.

3.1.1.2. National Fire Code of Canada.

3.1.1.3. Provincial Government, including but not limited to the Occupational Health & Safety Act Revised Statutes of Nova Scotia 1996, Chapter 320, and the Construction Safety & Industrial Safety Regulations made pursuant to the Occupational Health and Safety Act, 1996.

3.1.1.4. Workers'/Workmen's Compensation Board.

3.1.2. In case of conflict or discrepancy the more stringent requirement shall apply.

3.1.3. Maintain clear emergency exit paths for personnel.

3.2. Except where special permission is obtained, maintain clear access on public sidewalks and roads.

3.3. Maintain walks and roads clear of construction materials and debris, including excavated materials. Clean walks and roads as frequently as required to ensure that they are cleared of materials, debris and excavated materials.

3.4. WHMIS:

3.4.1. Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Labour Canada and Health & Welfare Canada.

3.4.2. Have a copy of WHMIS data sheets available at the workplace on delivery of materials.

Blockage of Roadways

3.5. Advise Fire Chief of any work that would impede fire apparatus response. This includes violation of minimum overhead clearance, as prescribed by fire chief, erecting of barricades and the digging of trenches.

4. Smoking Precautions

4.1. Observe, at all times, smoking regulations.

5. Rubbish And Waste Materials

5.1. Rubbish and waste materials are to be kept to a minimum.

5.2. The burning of rubbish is prohibited.

6. Flammable And Combustible Liquids

6.1. The handling, storage and use of flammable and combustible liquids are to be governed by the current National Fire Code of Canada.

6.2. Flammable and combustible liquids such as gasoline, kerosene and naphtha will be kept for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes, requires the permission of the Fire Chief.

6.3. Transfer of flammable and combustible liquids is prohibited within buildings or jetties.

6.4. Transfer of flammable and combustible liquids will not be carried out in the vicinity of open flames or any type of heat-producing devices.

6.5. Flammable liquids having a flash point below 38°C such as naphtha or gasoline will not be used as solvents or cleaning agents.

6.6. Flammable and combustible waste liquids, for disposal, will be stored in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum and the Fire Department is to be notified when disposal is required.

7. Hazardous Substances

7.1. Work entailing the use of toxic or hazardous materials, chemicals and/or explosives, otherwise creates a hazard to life, safety or health, will be in accordance with the National Fire Code of Canada.

7.2. Where flammable liquids, such as lacquers or urethanes are to be used, proper ventilation will be assured and all sources of ignition are to be eliminated. The Fire Chief is to be informed prior to and at the cessation of such work.

8. Questions and/or Clarification

8.1. Direct any questions or clarification on Fire Safety in addition to above requirements to Fire Chief.

9. Fire Inspection

9.1. Site inspections by Fire Chief will be coordinated through HRCE Project Manager.

9.2. Allow Fire Chief unrestricted access to the work site.

9.3. Co-operate with the Fire Chief during routine fire safety inspection of the Work site.

9.4. Immediately remedy all unsafe fire situations observed by the Fire Chief.

10. Reference Standards

10.1. Where edition date is not specified, consider that references to manufacturer's and, published codes, standards and specifications are made to the latest edition, (revision) approved by the issuing organization, current at the date of this Specification.

10.2. Reference standards and specifications are quoted in this Specification to establish minimum standards. Work which in quality exceeds these minimum standards shall be considered to conform.

10.3. Should the Contract Documents conflict with specified reference standards or specifications the General Conditions of the Contract shall govern.

10.4. Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.

10.5. Have a copy of each code, standard and specification, and manufacturer's directions, instructions and specifications, to which reference is made in this Specification, always available at construction site.

10.6. Standards, specifications, associations, and regulatory bodies are generally referred to throughout the specifications by their abbreviated designations:

AA	The Aluminum Association
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ARI	Air Conditioning & Refrigeration Institute
ASTM	American Society for Testing & Materials
CCA	Canadian Construction Association
CGSB	Canadian General Standards Board
CSA	Canadian Standards Association
NSDTIR	Department of Transportation & Infrastructure Renewal, Province of Nova Scotia
IAO	Insurers Advisory Organization
NBC	National Building Code
NFPA	National Fire Protection Association
CANS	Construction Association of Nova Scotia
ULC	Underwriters Laboratories of Canada
WHMIS	Workplace Hazardous Materials Information System

END OF SECTION 01 41 00

SECTION 01 45 00 - QUALITY CONTROL

1. Section Includes

1.1. Inspection and testing, administrative and enforcement requirements

1.2. Tests and mix designs.

1.3. Mock-ups.

1.4. Mill tests.

1.5. Equipment and system adjust and balance.

1.6. Verification by affidavits and certificates that specified products meet requirements of reference standards: In applicable Sections of the Specification.

1.7. Testing, balancing and adjusting of equipment: In applicable Mechanical and Electrical Sections of the Specification.

1.8. Cutting & Patching: Section 01 11 41.

2. Related Sections

2.1. Section 01 33 00 Submittal Procedures: Submission of samples to confirm product quality.

2.2. Section 01 61 00 Material & Equipment: Material and workmanship quality – reference standards.

2.3. Section 01 77 00 Contract Closeout.

3. REVIEW OF WORK

3.1. The Owner shall have access to the Work. If part of the Work is in preparation at locations other than the Place of the Work, access shall be given to such work whenever it is in progress.

3.2. Give timely notice to the Owner's Representative, requesting review of the Work as indicated in the Contract Documents.

3.3. If the Contractor covers or permits to be covered Work that has been designated for review by the Owner before such is made, uncover such Work, have the review satisfactorily completed and make good such Work at no extra cost to Owner.

4. Inspection, Special Tests, Approvals

4.1. Engage the services of appropriate inspection testing agencies ensuring the Work meets codes, acts and regulations, and lows in force at the place of Work. Include such costs in the Contract Price.

4.2. Give timely notice requesting inspection to those required to provide inspections, special tests, or approvals, where Work is designated, by the Owner's instructions or the law of the place of Work, for special tests.

4.3. If the Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have the inspections or tests satisfactorily completed and make good such Work at no extra cost to the Owner.

4.4. The Owner may order any part of the Work to be examined if the Work is suspected to be not in accordance with the Contract Documents. If, upon examination such Work is found not in accordance with the Contract Documents, correct such Work and pay the cost of examination and correction. If such Work is found in accordance with the Contractor Documents, the Owner shall pay the cost of examination and replacement.

5. Independent Inspection Agencies

5.1. Independent Inspection/Testing Agencies may be engaged by the Owner for the purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Owner.

5.2. Provide access to the Work, and equipment required for executing inspection and testing by the appointed agencies.

5.3. Employment of inspection/testing agencies does not relax the Contractor's responsibility to perform Work, or carry out his own inspections and testing in accordance with the Contract Documents.

5.4. If defects are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Owner at no cost to the Owner. Pay costs for retesting and reinspection.

6. Access To Work

6.1. Allow inspection/testing agencies access to the Work, off site manufacturing and fabrication plants.

6.2. Co-operate to provide reasonable facilities for such access.

7. Procedures

7.1. Notify the appropriate agency and Owner in advance of the requirement for tests, in order that attendance arrangements can be made.

7.2. Submit samples and/or materials required for testing, at specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work.

7.3. Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

8. Rejected Work

8.1. Remove defective Work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in the Work or not, which has been rejected, including (but not limited to) defective Work rejected by the Owner as failing to conform to the Contract Documents. Replace or re-execute in accordance with the Contract Documents.

8.2. Make good other Contractor's work damaged by such removals or replacements promptly.

8.3. If in the opinion of the Owner, it is not expedient to correct defective Work or Work not performed in accordance with the Contract Documents, the Owner may deduct from the Contract Price the difference in value between the Work performed and that called for by the Contract Documents, the amount of which shall be determined by the Owner.

9. Reports

9.1. Submit four (4) copies of inspection and test reports to the Owner.

9.2. Provide copies to Contractor's Consultant and Subcontractor of Work being inspected or tested.

10. Tests and Mix Designs

10.1. Furnish test results and mix designs as may be requested.

10.2. The cost of tests and mix designs beyond those called for in the Contract Documents or beyond those required by law of the Place of Work shall be appraised by the Owner and may be authorized as recoverable.

11. Mock-Up

11.1. Prepare mock-up for Work for each finish in the Work and other work specifically requested in the specifications. Include for Work of all Sections required to provide mock-ups.

11.2. Construct in all locations as specified in specific Section.

11.3. Prepare mock-up for Owner's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in the Work.

11.4. Failure to prepare mock-up in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

11.5. If requested the Owner will assist in preparing a schedule fixing the dates for preparation.

11.6. Mock-ups may remain as part of the Work, unless specified otherwise in the Contract Documents.

12. Mill Tests

12.1. Submit mill test certificates as may be requested.

13. Equipment And Systems

13.1. Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

13.2. Refer to Contract Documents for definitive requirements.

END OF SECTION 01 45 00

SECTION 01 52 00 – CONSTRUCTION & TEMPORARY FACILITIES

1. General

1.1. Include in the Work construction and temporary facilities required as construction aids or by jurisdictional authorities or as otherwise specified. Install to meet needs of construction as Work progresses. Maintain construction and temporary facilities during use, relocate them as required by the Work, remove them at completion of need and make good adjacent Work and property affected by their installation.

1.2. Include in the Work construction and temporary facilities to provide for construction safety such as: fences, barricades, bracing, supports, storage, sanitation and first aid facilities, fire protection, stand pipes, electrical supply, construction equipment with its supports and guards, stairs, ramps, platforms, runways, ladders, scaffolds, guardrails, temporary flooring, rubbish chutes, and walkway, morality and guard lights, and as otherwise required of the Constructor by the Construction Safety Act, of the Province of Nova Scotia, as well as all other applicable regulations or jurisdictional authorities.

1.3. Construct temporary Work of new materials unless use of second-hand materials is approved.

1.4. Ensure that structural, mechanical, and electrical characteristics of temporary facilities are suitable and adequate for use intended. Be responsible that no harm is caused to persons and property by failure of temporary facilities because of placing, location, stability, protection, structural sufficiency, removal, or any other cause.

1.5. Locate temporary facilities as directed and coordinated with School Administration and HRCE.

1.6. Relocate construction and temporary facilities as required by the Progress of the Work, and remove at completion of Work.

1.7. Do not permit construction personnel to use new washroom and toilet facilities.

1.8. Interior work zones to be complete with temporary negative air ventilation units to be functioning at all times to control dust migration to occupied areas.

1.9. Refer also to HRCE Policies & Guidelines contained in Appendix A of Section 01 35 13.

2. Services

2.1. Temporary Electric Power:

2.1.1. The Contractor will provide a source of electric power for all construction purposes.

2.1.2. Coordinate with the Building Operator locations of power sources and arrange to connect under his direction.

2.1.3. Install electric service distribution conductors and necessary components. Determine anticipated demand which will be placed on service during normal peak

periods and obtain approval on this basis before making installation. Supply power of characteristics required by the Work. Install a power centre for miscellaneous tools and equipment for each major building floor area with distribution box, a minimum of four 20 amp grounded outlets, and circuit breaker protection for each outlet. Make connections available to any part of the Work within distance of a 100'-0" extension.

2.2. Temporary Lighting:

2.2.1. Install lighting for

2.2.1.1. emergency evacuation, safety and security throughout the Project at intensity levels required by jurisdictional authorities.

2.2.1.2. performance of Work throughout Work areas as required, evenly distributed, and at intensities to ensure that proper installations and applications are achieved.

2.2.1.3. performance of finishing Work in areas as required, evenly distributed and of an intensity of at least 15 foot candles.

2.2.2. Permanent fluorescent lighting may be used during construction, provided that fixtures, lamps and lenses are completely cleaned. Incandescent sources may be used during construction to the extent of 20% of the total. Electrical Division Contractor to provide 20% spare lamps to the Owner for replacement purposes.

2.3. Temporary Sanitary Facilities:

2.3.1. Provide sanitary facilities for persons on the Work site. Facilities in areas of the building are only to be used under extraordinary circumstances and with prior approval.

2.4. Maintain fire protection as required by jurisdictional authorities. The Contractor is responsible for de-activating and re-activating Fire Alarm zones as required by the Work of the Contract and to maintain protection in the existing building.

3. Construction Aids

3.1. Hoists & Cranes:

3.1.1. Select, operate and maintain hoisting equipment and cranes as may be required. Operate such equipment only by qualified hoist or crane operators. Make hoist available for Work of each Section.

3.2. Building Enclosure:

3.2.1. Include in Work temporary enclosure for building as required to protect it, in its entirety or in its parts, against the elements, to maintain environmental conditions required for Work. Design enclosures to withstand wind pressures required for the building by jurisdictional authorities. Erect enclosures to allow complete accessibility for installation of materials during the time enclosures remain in place.

3.3. Scaffolding:

3.3.1. Each user of scaffolding shall be responsible for its examination and testing for sufficiency before using it. He shall make it secure if necessary, or shall notify the Contractor in writing that he will not commence work until it is made secure; otherwise he will be held responsible for accidents due to its insufficiency.

4. Barriers

4.1. Install barricades for traffic control, and to prevent damaging traffic over exterior and interior finished areas, as well as safety barricades and otherwise, as may be required.

4.2. Construct hoardings and walkways as required by HRCE or jurisdictional authorities.

5. Protection

5.1. Protect roofs and podiums by substantial temporary construction to ensure that no damage occurs. Provide protection by materials of sufficient thickness to prevent all damage to structure and finish, and to waterproofing qualities of membranes, whenever each of these individual components are exposed. Damage shall include harm resulting from all construction work, such as falling objects, wheel and foot traffic, failure to remove debris, operation of machinery and equipment, and scaffolding and hoisting operations. Positively secure protection to prevent displacement from any cause.

5.2. Box with wood or otherwise protect from damage, by continuing construction, finished sills, jambs, corners, and the like.

END OF SECTION 01 52 00

SECTION 01 61 00 - MATERIAL & EQUIPMENT

1. General

1.1. Products refer to materials, manufactured components and assemblies, fixtures and equipment incorporated in the Work.

1.2. Use only products of Canadian manufacture unless such products are not manufactured in Canada, are specified otherwise, or are not competitive.

1.3. Products for use in the Project and on which the Tender was based shall be in production at that time, with a precise model and shop drawings available for viewing.

1.4. Where equivalent products are specified, or where alternatives are proposed under "substitution of products", these products claimed by the Contractor as equivalent shall be comparable in construction, type, function, quality, performance, and, where applicable, in appearance, as approved. Where specified equivalents are used in the tendered bulk sum price for the Work, they shall be subject to final approval.

1.5. Incorporate products in the Work in strict accordance with manufacturers' directions unless specified otherwise.

1.6. Products delivered to the Project site for incorporation in the Work shall be considered the property of the Owner. Maintain protection and security of products stored on the site after payment has been made for them.

1.7. Do not install permanently incorporated labels, trademarks and nameplates, in visible locations unless required for operating instructions or by jurisdictional authorities.

2. Specified Products

2.1. Products specified by manufacturer's name, brand name or catalogue reference shall be the basis of the bid and shall be supplied for the Work without exception in any detail, subject to allowable substitutions as specified.

2.2. Where several proprietary products are specified, any one of the several will be acceptable.

2.3. For products specified by reference standards, the onus shall be on the supplier to establish that such products meet reference standard requirements. The Architect may require affidavits from the supplier, as specified in Section 01 33 00, or inspection and testing at the expense of the supplier, or both, to prove compliance. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such products are compatible with and harmless to Work with which they are incorporated.

3. Substitution Of Products During Progress Of Work

3.1. Products substituted for those specified or approved, or both, shall be permitted only if the listed product cannot be delivered to maintain construction schedule and if the delay is caused by conditions beyond the Contractor's control.

3.2. Obtain approval for substitutions. Application for approval of substitutions shall be made only by Contractor. Process proposals for substituted Work in accordance with procedures established for changes in the Work.

3.3. Submit, with request for substitution, documentary evidence that substituted products are equal to, or superior to, approved products, and a comparison of price and delivery factors for both specified or approved products, and proposed substitute.

3.4. Ensure that substituted products can be both physically and dimensionally incorporated in the Work with no loss of intended function, performance, space or construction time, and that spare parts and service are readily available. The Contractor shall be responsible for additional installation costs, including architectural and engineering fees, required by incorporation of substituted products, and for adaptations made otherwise necessary to ensure that above requirements are satisfied.

4. Product Handling

4.1. Manufacture, pack, ship, deliver and store products so that no damage occurs to structural qualities and finish appearance, nor in any other way detrimental to their function or appearance, or both.

4.2. Ensure that products, while transported, stored or installed, are not exposed to an environment which would increase their moisture content beyond the maximum specified.

4.3. Schedule early delivery of products to enable Work to be executed without delay. Before delivery, arrange for receiving at site.

4.4. Deliver package products, and store until use, in original unopened wrapping or containers, with manufacturer's seals and labels intact.

4.5. Label packaged products to describe contents, quantity and other information as specified.

4.6. Product handling requirements may be repeated and additional requirements specified, in other Sections.

5. Storage & Protection

5.1. Coordinate material delivery to ensure that areas within or on building are available to receive them.

5.2. Store manufactured products in accordance with manufacturer's instructions, when such instructions are attached to products or submitted by him.

5.3. Store finished products and woodwork under cover at all times.

5.4. Store and handle flammable liquids and other hazardous materials in approved safety containers and as otherwise prescribed by safety authorities. Store no flammable liquids or other hazardous materials in bulk within the Project.

5.5. Storage and special protection requirements may be repeated, and additional requirements specified, in other Sections.

6. Defective Products & Work

6.1. Products and Work found defective; not in accordance with the Specifications; or defaced or injured through negligence of the Contractor, his employees or subcontractors, or by fire, weather or any other cause will be rejected for incorporation in the Work.

6.2. Remove rejected products and Work from the premises immediately.

6.3. Replace rejected products and Work with no delay after rejection. Provide replacement products and execute replacement Work precisely as required by the Specification for the defective Work replaced. Previous inspection and payment shall not relieve the Contractor from the obligation of providing sound and satisfactory Work in compliance with this Project Manual.

7. Workers, Suppliers & Subcontractors

7.1. Assign Work only to workers, suppliers, and Subcontractors who have complete knowledge, not only of the conditions of this Project Manual, but of jurisdictional requirements, and reference standards and specifications.

7.2. Give preference to use of local workers, suppliers, and Subcontractors wherever possible.

8. Workmanship

8.1. Unless otherwise specified in a more detailed manner, workmanship shall be of the highest quality recognized by trade executing the Work in accordance with standard practices, by the best methods recommended by the manufacturer of the Product, and as approved by the Architect.

END OF SECTION 01 61 00

SECTION 01 77 00 – CONTRACT CLOSEOUT

1. Section Includes

1.1. Final cleaning.

1.2. Spare parts and maintenance materials.

1.3. Take over procedures.

2. Related Sections

2.1. Individual Specifications Sections: Specific requirements for operation and maintenance data.

3. Final Cleaning

3.1. Refer to the General Conditions of Contract.

3.2. Before final inspection, replace glass and mirrors broken, damaged and etched during construction, or which are otherwise defective.

3.3. In addition to requirements for cleaning-up specified in General Conditions of the Contract, include in Work final cleaning by skilled cleaning specialists on completion of construction.

3.4. Remove temporary protections and make good defects before commencement of final cleaning.

3.5. Remove waste products and debris other than that caused by the Owner, other contractors or their employees, and leave the Work clean and suitable for occupancy by Owner.

3.6. Remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.

3.7. Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

3.8. Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors and ceilings.

3.9. Vacuum clean and dust building interiors, behind grilles, louvres and screens as affected by Work.

3.10. Wax, seal, shampoo, buff or prepare floor finishes, as recommended by the manufacturer. Use products compatible with products used by building maintenance staff.

3.11. Broom clean and wash all horizontal and vertical surfaces as affected by Work.

3.12. Clean up and make good exterior grades, lawns, planting and surfaces after removal of temporary access and facilities.

3.13. Removing of visible labels left on materials, components, and equipment.

3.14. Maintain cleaning until Owner has taken possession of building or portions thereof.

4. Spare Parts And Maintenance Materials

4.1. Spare parts and maintenance materials provided shall be new, not damaged or defective, and of the same quality and manufacture as Products provided in the Work. If requested, furnish evidence as to type, source and quality of Products provided.

4.2. Defective Products will be rejected, regardless of previous inspections. Replace products at own expense.

4.3. Store spare parts and maintenance materials in a manner to prevent damage, or deterioration.

4.4. Provide spare parts, special tools, maintenance and extra materials in quantities specified in individual specification Sections.

4.5. Provide items of same manufacture and quality as items in the Work.

5. Demonstration Of Systems & Equipment

5.1. Give a complete demonstration of all systems and equipment in the presence of the Consultant at the following times:

5.2. When each is 100% completed at the request of the Contractor.

5.3. At time of inspection to validate final completion.

5.4. At final completion for the benefit of the maintenance staff for the Project.

5.5. Responsible personnel representing the Subcontractor responsible for the Work being demonstrated shall be present at each demonstration.

6. Submittals

6.1. Submit with application for substantial performance certificate.

6.1.1. Certificate of substantial completion inspection report from electrical utility or inspection.

6.1.2. Certificate of verification of fire alarm system.

6.1.3. Certificate from the Fire Marshal's Office and I.A.O. of final inspection of sprinkler system.

6.1.4. Air balance reports.

6.1.5. Other reports required or specified.

6.1.6. Maintenance Manuals and Operating Instructions.

6.2. Submit with application for release of final payment:

6.2.1. Final project record drawings.

6.2.2. Extra stock.

6.2.3. Performance bonds which shall remain in effect for one (1) year after take-over date.

6.2.4. Completed Liability Insurance Policy extended for one (1) year from take-over date.

6.2.5. Written guarantee covering all workmanship and materials used in the Work.
6.2.6. Maintenance bonds as specified.
6.2.7. Extended Warranties as specified
6.2.8. Certificate from Workers' Compensation Board.
6.2.9. Certificate from Health Services Tax Division.

7. Final Inspection Procedures

7.1. Schedule, make arrangements for and administer final inspections and close out in the following stages.

7.2. Contractor's Inspection:

7.2.1. Determination that Project meets requirements for substantial performance and inspection is the responsibility of the Contractor.

7.2.2. The Contractor and all Subcontractors shall conduct an inspection of the work, identify deficiencies and defects; repair as required. Notify the Consultant in writing of satisfactory completion of the contractor's Inspection and that corrections have been made. Request a Consultant's Substantial Performance Inspection.

7.3. Consultant's Inspection: Consultants and the Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The contractor shall correct Work accordingly.

7.4. Substantial Performance Inspection:

7.4.1. When the items noted above are complete, request a substantial performance inspection of the Work by the Consultant, and the Contractor. If Work is deemed incomplete by the Consultant, complete the outstanding items and request a re-inspection.

7.4.2. Substantial performance inspections shall be scheduled to begin within eight working days of the Contractor's request.

7.4.3. Present at the substantial performance inspection will be:

7.4.3.1. The Consultant and his Sub-consultants that he requires and notifies.
7.4.3.2. The Owner's representatives, upon notification by the Consultant.
7.4.3.3. The Contractor and such Subcontractors that he considers are required.
7.4.3.4. The Contractor will compile a substantial performance deficiency list at this inspection and issue it to the Consultant and Owner.
7.4.3.5. The Contractor shall correct substantial performance deficiencies before a date agreed upon by the Contractor and Consultant.
7.4.3.6. Upon the Consultant's approval of substantial performance, the Contractor shall submit an application for a substantial performance certificate.
7.4.3.7. When the Contractor has satisfied himself that these corrections have been completed in a satisfactory manner by his inspection he shall schedule a

final Contractor's inspection by the Consultant, and the Owner's representatives if required, within five working days of the Contractor's request.

7.4.3.8. Upon the Consultant's approval of completion, the Contractor shall submit an application for a completion certificate.

8. Substantial Performance

8.1. The Consultant will issue a Certificate of Substantial Performance when satisfied outstanding deficiencies noted during inspections prior to the substantial completion inspection have been corrected, the Work is substantially complete and is so certified by the Owner.

8.2. A list of remaining deficiencies to be rectified before final acceptance will be attached to the Certificate of Substantial Performance.

8.3. Make submissions specified in Subparagraph 1.06 of this Section.

9. Certificate For Release Of Amount Due At Substantial performance

9.1. The Consultant will issue to the Owner a certificate for release of money in an amount equal to the amount due the Contractor under the Agreement providing he is satisfied the Work has been substantially completed.

9.2. The certificate shall indicate the date of substantial performance.

9.3. Payment shall be due upon date of substantial performance.

10. Completion Certificate

10.1. The Consultant will issue a Certificate of Completion (DSS Document DC670-92) when he is satisfied that outstanding deficiencies noted during inspections have been corrected and the Work is completed and is so certified by the Owner.

10.2. The date of the completion certificate will commence the required sixty (60) day period before release of final payment.

11. Certificate For Release Of Final Payment

11.1. The Consultant will issue to the Owner a certificate for release of final payment sixty (60) days after date of completion certificate providing he is satisfied the Work has been completed.

11.2. The certificate will be in an amount equal to the remaining money due the Contractor under the Contract, and shall indicate the date of final completion.

11.3. Payment shall be due upon date of final completion.

12. Warranties

12.1. Establishment of Warranties:

12.1.1. Warranties shall commence on date of substantial performance certificate.

12.2. Warranty Period:

12.2.1. The Owner will advise the Consultant of defects observed during warranty periods.

12.2.2. The Consultant will notify the Contractor of defects observed during warranty period and request him to remedy the defects in accordance with the Contractor documents.

12.2.3. Thirty (30) days before expiration of warranties the Owner's representatives, the Consultant and the Contractor will inspect the Work as arranged by the Contractor noting defects of products and workmanship.

12.2.4. The Contractor shall immediately remedy such noted defects.

END OF SECTION 01 77 00

CONTRACTOR'S CHECKLIST

Enclose the following documents with your bid:

□ ***Bid Security as required in section 21.1 (Information for Tenderers)*** **-** in the amount of 10% of the Contract Price (before HST).

□ ***Contract Security for bids over $100,000 as required in section 22.6.1.1 (Information for Tenderers)*** – required upon award.

□ ***Certificate of Insurance*** indicating a minimum of **$5,000,000** ***Commercial General Liability Insurance*** per occurrence and ***Commercial Auto Liability Insurance*** covering all owned, non-owned and hired vehicles for a minimum combined single limit of **$2,000,000** per occurrence and ***Builder's Risk Insurance*** in the amount of the contract price. ***Please comply with the insurance requirements as indicated in the sample insurance form (attached)***

□ ***Tentative Work Schedule (Timelines)*** – Subsequently, within five (5) business days of tender award the successful tenderer shall provide a schedule clearly indicating timelines for completion of all aspects of the project.

□ ***Workers' Compensation Board Letter*** of Good Standing

□ ***Certificates of good standing with CRCA*** **(**Canadian Roofing Contractors Association**)** ***and RCANS*** **(**Roofing Contractors Association of Nova Scotia**).**

□ ***Certificate of Recognition from one of the seven safety audit companies that jointly sign with the WCB***:

- East Coast Mobile Medical Inc.
- HSE Integrated
- Nova Scotia Construction Safety Association
- Nova Scotia Trucking Safety Association
- Occupational Health & Educational Services (2002) Inc.
- Safety Services Nova Scotia
- Stantec Inc.

This list can be found on WCB's website: www.wcb.ns.ca.

□ ***Completed HRCE Safety Plan***

□ ***Applicable Warranty Information***

CSIO

CERTIFICATE OF LIABILITY INSURANCE

This certificate is issued as a matter of information only and confers no rights upon the certificate holder and imposes no liability on the insurer. This certificate does not amend, extend or alter the coverage afforded by the policies below.

1. CERTIFICATE HOLDER - NAME AND MAILING ADDRESS		2. INSURED'S FULL NAME AND MAILING ADDRESS	
Halifax Regional Centre for Education		Contractors Name and Address	
33 Spectacle Lake Drive			
Dartmouth, NS	POSTAL CODE B3B 1X7		POSTAL CODE

3. DESCRIPTION OF OPERATIONS/LOCATIONS/AUTOMOBILES/SPECIAL ITEMS TO WHICH THIS CERTIFICATE APPLIES (but only with respect to the operations of the Named Insured)

Insured project details and address: (List specific Project details)

Policy Includes: Contractual Liability, Primary and Non-Contributory, Waiver of Subrogation, Broad Form Property Damage

4. COVERAGES

This is to certify that the policies of insurance listed below have been issued to the insured named above for the policy period indicated notwithstanding any requirements, terms or conditions of any contract or other document with respect to which this certificate may be issued or may pertain. The insurance afforded by the policies described herein is subject to all terms, exclusions and conditions of such policies.

LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS

TYPE OF INSURANCE	INSURANCE COMPANY AND POLICY NUMBER	EFFECTIVE DATE YYYY/MM/DD	EXPIRY DATE YYYY/MM/DD	LIMITS OF LIABILITY (Canadian dollars unless indicated otherwise)		
				COVERAGE	DED.	AMOUNT OF INSURANCE
COMMERCIAL GENERAL LIABILITY ☐ CLAIMS MADE OR ☑ OCCURRENCE ☑ PRODUCTS AND / OR COMPLETED OPERATIONS ☑ EMPLOYER'S LIABILITY ☑ CROSS LIABILITY ☑ TENANTS LEGAL LIABILITY ☑ POLLUTION LIABILITY EXTENSION	XX Insuance 123Binder (Wrap - Up Liability)	2017/11/20	2018/11/20	COMMERCIAL GENERAL LIABILITY BODILY INJURY AND PROPERTY DAMAGE LIABILITY - GENERAL AGGREGATE		$5,000,000
				- EACH OCCURRENCE		$5,000,000
				PRODUCTS AND COMPLETED OPERATIONS AGGREGATE		$5,000,000
				☐ PERSONAL INJURY LIABILITY OR ☑ PERSONAL AND ADVERTISING INJURY LIABILITY		$1,000,000
				MEDICAL PAYMENTS		$25,000
				TENANTS LEGAL LIABILITY		$1,000,000
				POLLUTION LIABILITY EXTENSION		$2,000,000
☑ NON-OWNED AUTOMOBILES ☐ HIRED AUTOMOBILES	XX Insurance 123 Binder	2017/11/20	2018/11/20	NON OWNED AUTOMOBILE		$2,000,000
AUTOMOBILE LIABILITY ☑ DESCRIBED AUTOMOBILES ☐ ALL OWNED AUTOMOBILES ☐ LEASED AUTOMOBILES ** ** ALL AUTOMOBILES LEASED IN EXCESS OF 30 DAYS WHERE THE INSURED IS REQUIRED TO PROVIDE INSURANCE	XX Insurance 123 Binder	2017/11/20	2018/11/20	BODILY INJURY AND PROPERTY DAMAGE COMBINED		$2,000,000
				BODILY INJURY (PER PERSON)		
				BODILY INJURY (PER ACCIDENT)		
				PROPERTY DAMAGE		
EXCESS LIABILITY ☐ UMBRELLA FORM ☐				EACH OCCURRENCE		
				AGGREGATE		
OTHER LIABILITY (SPECIFY) ☑ Builders Risk - All Risk	XX Insurance 123 Binder	2017/11/20	2018/11/20	Limit - (Project Limit)		
☐				Extra Expense		$1,000,000
☑ Professional Liability	XX Insurance 123 Binder	2017/11/20	2018/11/20	Limit of Liability - Per Claim		$5,000,000

5. CANCELLATION

Should any of the above described policies be cancelled before the expiration date thereof, the issuing company will endeavor to mail 30 days written notice to the certificate holder named above, but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives.

6. BROKERAGE/AGENCY FULL NAME AND MAILING ADDRESS		7. ADDITIONAL INSURED NAME AND MAILING ADDRESS (but only with respect to the operations of the Named Insured)	
		Halifax Regional Centre for Education	
		33 Spectacle Lake Drive	
	POSTAL CODE		
BROKER CLIENT ID:		Dartmouth, NS	POSTAL CODE B3B 1X7

8. CERTIFICATE AUTHORIZATION

ISSUER	CONTACT NUMBER(S)			
	TYPE	NO.	TYPE	NO.
AUTHORIZED REPRESENTATIVE	TYPE	NO.	TYPE	NO.
SIGNATURE OF AUTHORIZED REPRESENTATIVE	DATE 2017/11/20		EMAIL ADDRESS	

HALIFAX REGIONAL CENTRE FOR EDUCATION

Project Safety Plan Outline

During the planning of each project, environmental and occupational health and safety issues will be assessed like any other key project component.

Prior to beginning a new project, tendering contractors shall examine the work area to identify potentially hazardous site specific situations.

Once identified, these hazards should be prioritized on this Hazard Assessments/Project Safety Plan Outline and corrective *actions* noted to eliminate or control each hazard. The dates of when and names of the persons who are responsible for completing the *action* should also be assigned.

Copies of the completed Safety Plan Outline shall be submitted as part of the tender document submittal, sent to the HRCE Operations Services Regional Manager, made available on the job site and communicated to the workers.

Project Name: _____

Project Location: _____

Project Start date: _____

Project End date: _____

Company Name: _____

Completed by: _____
(Contractor's project manager)

Date: _____

Copy to: _____

PLANNING:

Does the Contractor's Occupational Health and Safety Program deal with the work activities associated with this project? ☐ Yes ☐ No

Describe tasks to be undertaken:_____

_____

_____

_____

HAZARDS ASSESSMENT:

Identify the hazards that could present themselves on this project (e.g. live electrical wires, over water, confined space, etc) and describe what steps will be taken to prevent an incident (e.g. cover up, de-energize, safe work practices, netting, etc). Prioritize from #1 as needing immediate action.

#	Hazard	Required Action	Completed by	Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

ENVIRONMENTAL ASSESSMENT:

Identify the environmental issues that could present themselves on this project (e.g. oil spills, asbestos, etc.) and describe the action that will be taken to eliminate or reduce the risk of occurrence (e.g. mop kits, air sampling, etc.)

#	Hazard	Required Action	Completed by	Date
1				
2				
3				
4				
5				

EMERGENCY RESPONSE:

In the event of an incident, pre-plan the response and write up the procedures. Minimally, the following list should be completed and posted on site:

Contact	Phone #	Contact	Phone #
Fire	911	Poison Control	428-8161
Ambulance	911	Dangerous Goods	1-800-565-1633
Doctor	911	Waste Disposal	
Police	911	Insurance	
HRSB Office	493-5110	Min/Dept of Labour	1-800-952-2687
Min./Dept.of Transport.		Min/Dept of Environment	1-800-565-1633

- Identify and arrange source of first aid, ambulance and rescue.
- Accidents will be reported to: _____
- Accidents will be investigated by: _____
- Back-up call to: _____
- HRCE # emergency/after hours: day 493-5110 after 4:00 pm 442-2476

SAFETY MEETINGS:

On this project, given the nature of the work and the anticipated size of the work force, the following frequency will apply:

Site meetings _____

Site Audits _____

Follow up with HRSB Manager: _____

SITE IMPLEMENTATION:

- Health and Safety Rep & Safety Committee:
  Establish liaison between HRSB, contractor, site administration
  First Aid, PPE, other safety items as required.

- Documentation:
  Applicable MSDS
  Safety program
  Applicable work procedures
  Permits
  First Aid Certification

TRAINING:

The following training/testing will be mandatory on site:

1) _____

_____

2) _____

_____

3) _____

_____

TENTATIVE SCHEDULE OF WORK:

1) Date Project Will Commence: _____

2) Number of Weeks to Complete Project: _____ weeks

NOTE:

Within one week of tender award the successful bidder shall provide a schedule clearly indicating timelines for completion of all aspects of the project.

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises of installation of Owner supplied Natural Gas fired condensing heating boilers, Natural Gas fired burners, controls and associated equipment as specified herein.

.2 The work under this contract includes, but is not limited to the following:

- .1 Demolition of existing boiler room including:
  - .1 Removal and disposal of existing above-ground oil storage tank and concrete pad. Existing tank to be removed by Contractor and disposed of to Provincial and Municipal Regulations.
  - .2 Asbestos and lead abatement within boiler room to Provincial Regulations.
  - .3 Removal and disposal of existing boilers. Burners to be removed and turned over to HRCE.
  - .4 Removal and disposal of existing redundant heating water, fuel oil and make-up water piping as indicated and as required, including all redundant accessories, supports, hangers and brackets.
  - .5 Removal and disposal of existing domestic hot water storage tank and expansion tanks, including all redundant supports, hangers and brackets.
  - .6 Removal and turn over to HRCE, existing circulating pumps.
  - .7 Removal and disposal of existing boiler breeching.
  - .8 Disconnect and disposal of electrical feeders and disconnects.
- .2 Removal and retain for reuse:
  - .1 Existing hot water 3-way mixing valves.
  - .2 Existing temperature sensors.
- .3 Receive and install new gas-fired condensing boilers, pre-purchased by HRCE. Provide all labour and equipment required to off-load and put in place.
- .4 Provide new hydronic piping, pumps and accessories to complete installation of boilers.
- .5 Provide new gas-fired condensing domestic hot water heater. Including all required domestic water piping and insulation.
- .6 Provide new Natural Gas piping and accessories as specified in contract documents.
- .7 Provide new boiler exhaust and combination air piping.
- .8 Provide electrical connections for all new equipment.
- .9 Provide all required EMCS modifications for a complete control package.
- .10 Provide all cutting, patching, painting and repair of damaged surfaces to “like new” condition.
- .11 Provide fire stopping and smoke sealing as required.
- .12 Provide new paint on boiler room floor, clean up and preparation prior to paint.
- .13 Provide all required licenses and permits.

.14 Provide and coordinate user training, commissioning, As-builts and Operation and Maintenance Manuals.

.15 Provide concrete housekeeping pads for all equipment.

1.2 CONTRACT METHOD

.1 Supply equipment, material and controls installation under single, stipulated price contract.

1.3 CONTRACTOR USE OF PREMISES

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

.1 Owner occupancy.

.2 Partial owner occupancy.

.3 Work by other contractors.

.4 Fuel deliveries.

.5 Other delivery or service providers.

.2 Co-ordinate use of premises under direction of Owner(s) Project Coordinator.

.3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

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

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

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

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

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

.6 Notify Engineer, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent work are co-ordinated.

.8 Supplier's responsibility for errors and omissions in submission is not relieved by Engineer’s review of submittals.

.9 Supplier's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Engineer review.

1.2 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit shop drawings bearing stamp and signature of qualified professional Engineer registered or licensed in Province of Nova Scotia, where necessary.

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

.4 Allow five (5) working days for Engineers review of each submission.

.5 Adjustments made on shop drawings by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Owner's Project Coordinator prior to proceeding with Work.

.6 Make changes in shop drawings as Engineer may require, consistent with Contract Documents. When resubmitting, notify Engineer in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, in duplicate, containing:

- .1 Date.
- .2 Project title and number.
- .3 Supplier's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.8 Submissions include:

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

.9 After Engineer's review, distribute copies.

.10 Submit eight (8) copies of shop drawings for each requirement requested in Specification Sections and as Engineer may reasonably request.

.11 Submit eight (8) copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Engineer where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit eight (8) copies of test reports for requirements requested in specification Sections and as requested by Engineer:

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.13 Submit eight (8) copies of certificates for requirements requested in specification Sections and as requested by Engineer:

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.14 Submit eight (8) copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Engineer:

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit eight (8) copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Engineer:

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

.16 Submit four (4) copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Engineer.

.17 Delete information not applicable to project.

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

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

1.3 SAMPLES

.1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Engineer's business address.

.3 Notify Engineer in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.4 Adjustments made on samples by Engineer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Engineer prior to proceeding with Work.

.5 Make changes in samples which Engineer may require, consistent with Contract Documents.

.6 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Health and safety considerations required to ensure that Contractor shows due diligence towards health and safety on construction sites, and meets the requirements laid out in HRCE – Health and Safety Policy and Procedures.

1.2 REFERENCES

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

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

.1 Material Safety Data Sheets (MSDS).

.3 Province of Nova Scotia:

.1 Occupational Health and Safety Act, (Latest Revision).

1.3 SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.

.3 Submit 4 copies of Contractor's authorized representative's work site health and safety inspection reports to HRCE – Site Construction Manager or authority having jurisdiction weekly.

.4 Submit copies of reports or directions issued by Federal, and Provincial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit WHMIS MSDS - Material Safety Data Sheets.

.7 HRCE – Site Construction Manager will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor. Revise plan as appropriate and resubmit plan to HRCE – Site Construction Manager.

.8 HRCE – Site Construction Manager's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

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

1.4 FILING OF NOTICE

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

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with HRCE – Site Construction Manager prior to commencement of Work.

1.7 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.8 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.9 COMPLIANCE REQUIREMENTS

.1 Comply with Occupational Health and Safety Act, General Regulation, Nova Scotia (latest edition).

.2 Comply with Occupational Health and Safety Act, Industrial and Commercial Establishments Regulation, R.R.Q.

.3 Comply with Occupational Health and Safety Regulations, 1996.

.4 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C.

.5 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.10 UNFORSEEN HAZARDS

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

1.11 HEALTH AND SAFETY CO-ORDINATOR

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have site-related working experience specific to activities associated with work **in the heating, ventilation and EMCS Control Fields**.

.2 Have working knowledge of occupational safety and health regulations.

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

1.12 POSTING OF DOCUMENTS

.1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.13 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by HRCE – Site Construction Manager

.2 Provide HRCE – Site Construction Manager with written report of action taken to correct non-compliance of health and safety issues identified.

.3 HRCE – Site Construction Manager may stop work if non-compliance of health and safety regulations is not corrected.

1.14 WORK STOPPAGE

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

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC):

.1 CCDC 2-94, stipulated price contract.

1.2 INSPECTION

.1 Refer to CCDC 2 – Stipulated Price Contract.

.2 Allow Engineer access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.3 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Engineer instructions, or law of Place of Work.

.4 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Provide equipment required for executing inspection and testing by appointed agencies.

.2 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.3 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Engineer at no cost to Engineer. Pay costs for retesting and re-inspection.

1.4 ACCESS TO WORK

.1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

1.5 PROCEDURES

.1 Notify appropriate agency and Engineer in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.6 REJECTED WORK

.1 Refer to CCDC 2 – Stipulated Price Contract.

.2 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Engineer as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.3 Make good other Contractor's work damaged by such removals or replacements promptly.

.4 If in opinion of Engineer it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, HRCE – Site Construction Manager will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Engineer.

1.7 REPORTS

.1 Submit 4 copies of inspection and test reports to HRCE – Site Construction Manager.

.2 Provide copies to subcontractor of work being inspected or tested and/or manufacturer or fabricator of material being inspected or tested.

1.8 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC):

.1 CCDC 2-94, Stipulated Price Contract.

.2 Within text of each specification section, reference may be made to reference standards.

.3 Conform to these reference standards, in whole or in part as specifically requested in specifications.

.4 If there is question as to whether products or systems are in conformance with applicable standards, Engineer reserves right to have such products or systems tested to prove or disprove conformance.

1.2 QUALITY

.1 Refer to CCDC 2 – Stipulated Price Contract.

.2 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.3 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.

.4 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.5 Should disputes arise as to quality or fitness of products, decision rests strictly with Engineer based upon requirements of Contract Documents.

.6 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.7 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Engineer of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Engineer at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Engineer reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Engineer.

.9 Touch-up damaged factory finished surfaces to Engineer's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

1.6 MANUFACTURER'S INSTRUCTIONS

.1 Unless otherwise indicated in specifications install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Engineer in writing, of conflicts between specifications and manufacturer's instructions, so that Engineer will establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Engineer to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Engineer if required work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Engineer reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Engineer, whose decision is final.

1.8 CO-ORDINATION

.1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 CONCEALMENT

.1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation inform Engineer if there is interference. Install as directed by Engineer.

1.10 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Engineer of conflicting installation. Install as directed.

1.12 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Engineer.

1.15 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Construction Documents Committee (CCDC):

.1 CCDC 2-94, Stipulated Price Contract.

1.2 PROJECT CLEANLINESS

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

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by HRCE – Site Construction Manager. Do not burn waste materials on site.

.3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

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

.5 Provide and use marked separate bins for recycling.

.6 Dispose of waste materials and debris off site.

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

.8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.9 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

.1 Refer to CCDC 2 – Stipulated Price Contract.

.2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.4 Prior to final review remove surplus products, tools, construction machinery and equipment.

.5 Remove waste products and debris other than that caused by Owner or other Contractors.

.6 Remove waste materials from site at regularly scheduled times or dispose of as directed by HRCE – Site Construction Manager. Do not burn waste materials on site.

.7 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.8 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 General description of Work.

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Maintain security measures established by existing facility.

1.3 MATERIALS SOURCE SEPARATION PROGRAM

.1 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and/or recyclable materials, including containers to deposit reusable and/or recyclable materials.

.2 Locate containers in locations acceptable to the HRCE, to facilitate deposit of materials without hindering daily operations.

.3 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition. Transport to Government-approved and authorized recycling facility in accordance with applicable guidelines and codes.

1.4 DISPOSAL OF WASTES

.1 Burying of rubbish and waste materials is prohibited.

.2 Burning of waste materials is prohibited.

.3 Disposal of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers is prohibited.

1.5 SCHEDULING

.1 Coordinate work with other activities at site to ensure timely and orderly progress of the work.

Part 2 Products

2.1 NOT USED

.1 Not Used

Part 3 Execution

3.1 APPLICATION

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate Government regulations and codes.

3.2 CLEANING

.1 Remove tools and waste materials on completion of work, and leave work area in clean and orderly condition.

.2 Clean up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

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

.2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.

.3 Copy will be returned after final inspection with Engineer's comments.

.4 Revise content of documents as required prior to final submittal.

.5 Two weeks prior to Substantial Performance of the Work, submit to the Engineer four (4) final copies of operating and maintenance manuals in English.

.6 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.7 Furnish evidence, if requested, for type, source and quality of products provided.

.8 Defective products supplied under this contract will be rejected, regardless of previous inspections. Replace products at own expense.

.9 Pay costs of transportation.

1.2 FORMAT

.1 Organize data as instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 8-1/2” X 11” with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.9 Provide 1:1 scaled CAD files in drawing format on CD.

1.3 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project:

.1 Date of submission; names.

.2 Addresses and telephone numbers of Consultant and Supplier.

.3 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Training: refer to Section 01 79 00 - Demonstration and Training.

1.4 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Include installed colour coded wiring diagrams.

.3 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.4 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.5 Provide servicing and lubrication schedule, and list of lubricants required.

.6 Include manufacturer's printed operation and maintenance instructions.

.7 Include sequence of operation by controls manufacturer.

.8 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.9 Provide installed control diagrams by controls manufacturer.

.10 Provide list of original manufacturer's spare parts and recommended quantities to be maintained in storage.

.11 Additional requirements: as specified in individual specification sections.

1.5 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to location as directed; place and store.

.4 Receive and catalogue items. Submit inventory listing to Owner's Project Coordinator. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.6 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site; place and store.

.4 Receive and catalogue items. Submit inventory listing to Owner's Project Coordinator. Include approved listings in Maintenance Manual.

1.7 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Owner's Representative.

1.8 WARRANTIES AND BONDS

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

.2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Owner's Project Coordinator for approval.

.3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.

.4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.

.5 Submit, warranty information made available during construction phase, to Owner's Project Coordinator.

.6 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Owner's Project Coordinator.

.9 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.

.2 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.3 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.

.4 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.10 Respond in a timely manner to oral or written notification of required construction warranty repair work.

1.9 PRE-WARRANTY CONFERENCE

.1 Meet with Owner's Project Coordinator, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Owner's Project Coordinator.

.2 Owner's Project Coordinator will establish communication procedures for:

.1 Notification of construction warranty defects.

.2 Determine priorities for type of defect.

.3 Determine reasonable time for response.

.3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.

.4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.10 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Engineer.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 Construction Contractor.

1.11 GUARANTEE

.1 Guarantee the work for a period of 1 year from the date of acceptance by the Engineer and Owner's Representative or for longer periods as called for in the Tender Documents.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 22 30 05 – Domestic Water Heaters.

.2 Section 23 52 00 – Heating and Boilers.

.3 Section 25 05 01 – EMCS: General Requirements.

1.2 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.

.2 Owner will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

.3 Demonstrate operation of Control Systems.

1.3 QUALITY CONTROL

.1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.4 SUBMITTALS

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

.2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Engineer or Owner’s Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Give time and date of each demonstration, with list of persons present.

1.5 CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

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

.3 Testing, adjusting and balancing have been performed in accordance with Section 01 91 13 – General Commissioning (CX) Requirements and Equipment and systems are fully operational.

1.6 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

1.7 DEMONSTRATION AND INSTRUCTIONS

.1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled agreed upon times, at the designated location.

.2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.

.3 Review contents of manual in detail to explain aspects of operation and maintenance.

.4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.8 TRAINING

.1 Equipment supplier's representative to provide two days on-site training per building.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

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

.2 Related Sections:

.1 Section 22 30 05 – Domestic Water Heaters.

.2 Section 23 52 00 – Heating Boilers.

.3 Section 25 05 01 – EMCS: General Requirements.

.3 Acronyms:

.1 Cx - Commissioning.

.2 EMCS - Energy Monitoring and Control Systems.

.3 O&M - Operation and Maintenance.

.4 PI - Product Information.

.5 PV - Performance Verification.

.6 TAB - Testing, Adjusting and Balancing.

1.2 GENERAL

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

.1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.

.2 Ensure appropriate documentation is compiled into the Operation and Maintenance Manuals.

.3 Effectively train O&M staff.

.2 Supplier will direct Cx process, operating equipment and systems, troubleshooting and making adjustments as required:

.1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.

.2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

1.3 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the non-functional system, including related systems as deemed required by Engineer or Owner's Representative, to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections to determine acceptability and proper performance of such items to be borne by Supplier. Above costs to be in form of progress payment reductions or hold-back assessments.

1.4 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Engineer or Owner's Representative before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

1.5 SUBMITTALS

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

- .1 Submit no later than four (4) weeks after award of Contract:
  - .1 Name of Supplier's Cx Representative.
  - .2 Draft Cx documentation.
  - .3 Preliminary Cx schedule.
- .2 Request in writing to Engineer or Owner's Representative for changes to submittals and obtain written approval at least eight (8) weeks prior to start of Cx.
- .3 Submit proposed Cx procedures to Engineer or Owner's Representative where not specified and obtain written approval at least eight (8) weeks prior to start of Cx.
- .4 Provide additional documentation relating to Cx process required by Engineer or Owner's Representative.

1.6 STARTING AND TESTING

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

1.7 WITNESSING OF STARTING AND TESTING

.1 Provide fourteen (14) days' notice prior to commencement.

.2 Engineer and Owner's Representative to witness of start-up and testing.

.3 Supplier's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

1.8 MANUFACTURER'S INVOLVEMENT

.1 Provide manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Engineer or Owner's Representative:

- .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
- .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.2 Integrity of warranties:

- .1 Use manufacturer's trained start-up personnel to maintain integrity of warranty.
- .2 Verify with manufacturer that testing as specified will not void warranties.

.3 Qualifications of manufacturer's personnel:

- .1 Experienced in design, installation and operation of equipment and systems.
- .2 Ability to interpret test results accurately.
- .3 To report results in clear, concise, logical manner.

1.9 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and testing in following distinct phases:

- .1 Included in delivery and installation:
  - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
  - .2 Visual inspection of quality of installation.
- .2 Start-up: follow accepted start-up procedures.
- .3 Operational testing: document equipment performance.
- .4 System PV: include repetition of tests after correcting deficiencies.
- .5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Engineer or Owner's Representative after distinct phases have been completed and before commencing next phase.

.4 Document require tests on approved PV forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Engineer or Owner's Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:

- .1 Minor equipment/systems: implement corrective measures approved by Engineer or Owner's Representative.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Engineer or Owner's Representative.

.3 If evaluation report concludes that major damage has occurred, Engineer or Owner's Representative shall reject equipment:

.1 Rejected equipment to be removed from site and replace with new.

.2 Subject new equipment/systems to specified start-up procedures.

1.10 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Engineer or Owner's Representative for approval before commencement of commissioning.

.2 Start-up documentation to include:

.1 Factory and on-site test certificates for specified equipment.

.2 Pre-start-up inspection reports.

.3 Signed installation/start-up check lists.

.4 Start-up reports,

.5 Step-by-step description of complete start-up procedures, to permit Engineer or Owner's Representative to repeat start-up at any time.

1.11 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit to Engineer or Owner's Representative for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.12 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide manpower and materials, assume costs for re-commissioning.

1.13 START OF COMMISSIONING

.1 Notify Engineer or Owner's Representative at least fourteen (14) days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

1.14 COMMISSIONING PERFORMANCE VERIFICATION

.1 Carry out Cx:

.1 Under accepted simulated operating conditions, over entire operating range, in all modes.

.2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

1.15 WITNESSING COMMISSIONING

.1 Engineer or Owner's Representative to witness activities and verify results.

1.16 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.

.3 Provide copies to Engineer or Owner's Representative within five (5) days of test and with Cx report.

1.17 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Engineer or Owner's Representative.

.2 Report problems, faults or defects affecting Cx to Engineer or Owner's Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Engineer or Owner's Representative.

1.18 COMPLETION OF COMMISSIONING

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of final payment.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Engineer or Owner's Representative.

1.19 TRAINING

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

.2 Section 22 30 05 – Domestic Water Heaters.

.3 Section 23 52 00 – Heating Boilers.

.4 Section 25 05 01 – EMCS: General Requirements.

1.20 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS

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

1.21 OWNER'S PERFORMANCE TESTING

.1 Performance testing of equipment or system by Engineer or Owner's Representative will not relieve Supplier from compliance with specified start-up and testing procedures.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 This Section specifies roles and responsibilities of Commissioning Training.

.2 Related Sections:

.1 Section 22 30 05 – Domestic Water Heaters.

.2 Section 23 52 00 – Heating Boilers.

.3 Section 25 05 01 – EMCS: General Requirements.

1.2 TRAINEES

.1 Trainees: personnel selected for operating and maintaining this facility. Includes Manager, building operators, maintenance staff, security staff, and technical specialists as required.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.3 INSTRUCTORS

.1 Engineer or Owner's Representative will provide:

.1 Descriptions of systems.

.2 Instruction on design philosophy, design criteria, and design intent.

.2 Certified factory-trained manufacturers' personnel: to provide instruction on the following:

.1 Start-Up, operation, shut-down of equipment, components and systems.

.2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.

.3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.

.3 Equipment manufacturer to provide instruction on:

.1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

1.4 TRAINING OBJECTIVES

.1 Training to be detailed and duration to ensure:

.1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.

.2 Effective on-going inspection, measurements of system performance.

.3 Proper preventive maintenance, diagnosis and trouble-shooting.

.4 Ability to update documentation.

.5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.5 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Training materials to include:

- .1 Operating Manual.
- .2 Maintenance Manual.
- .3 "As-Built" Contract Documents.

.3 Engineer or Owner's Representative Manager will review training manuals.

.4 Training materials to be in a format that permits future training procedures to same degree of detail.

.5 Supplement training materials:

- .1 Transparencies for overhead projectors.
- .2 Multimedia presentations.
- .3 Manufacturer's training videos.
- .4 Equipment models.

1.6 SCHEDULING

.1 Include in Commissioning Schedule time for training.

.2 Deliver training during regular working hours.

.3 Training to be completed prior to acceptance of measures.

1.7 RESPONSIBILITIES

.1 Be responsible for:

- .1 Implementation of training activities,
- .2 Coordination among instructors,
- .3 Quality of training, training materials,

.2 Engineer or Owner's Representative will evaluate training and materials.

.3 Upon completion of training, provide written report, signed by Instructors, witnessed by Engineer or Owner's Representative.

1.8 TRAINING CONTENT

.1 Training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:

- .1 Review of key systems.
- .2 Functional requirements.
- .3 System philosophy, limitations of systems and emergency procedures.

.4 Review of system layout, equipment, components and controls.

.5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.

.6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, adjustment of control settings and emergency procedures.

.7 Maintenance and servicing.

.8 Trouble-shooting diagnosis.

.9 Inter-Action among systems during integrated operation.

.10 Review of O&M documentation.

.3 Provide specialized training as specified in relevant Technical Sections of the specifications.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 The disturbance or removal or disposal of asbestos-containing materials from buildings within the scope of this Bid.

.2 The disturbance, or removal and disposal of hazardous materials will be performed in strict compliance with applicable regulatory requirements.

.3 The Trade Contractor to file a Notice of Project for Abatement as required when working in close proximity to asbestos containing materials. (The Trade Contractor may elect to hire an Asbestos Contractor to file the appropriate WCB documentation).

1.2 DEFINITIONS

.1 Asbestos Contractor: Is the Subcontractor retained by the Trade Contractor who is licensed by the Governing Authorities to conduct the removal and/or disposal of asbestos containing materials.

1.3 DOCUMENTATION

.1 The Asbestos Contractor will maintain the following documentation on-site:

.1 N.S. Regulation for Asbestos.

.2 Workers' Compensation Board “Notice of Project for Abatement” (NOPA) and attached to the NOPA the site specific asbestos abatement work procedures intended for use.

.3 The Asbestos Contractor’s Corporate Occupational Health & Safety Program.

.4 The Asbestos Contractor’s Exposure Control Plan.

.5 Material Safety Data Sheets (MSDS) for regulated products used on the project.

.6 Canadian Standards Association CSA Z-190 “Selection, Care and Use of Respirators”.

1.4 WORK

.1 Where Type 1 asbestos control measures are required, they shall be followed and the costs of such shall be included as part of the work.

.2 Type 2 asbestos abatement shall be performed by the Trade Contractors, follow all appropriate type 2 asbestos protocols and all work shall be included as part of the work.

.3 Type 3 asbestos abatement shall be performed by the Trade Contractor or specialist Subcontractor, follow all appropriate type 3 asbestos protocols and all work shall be included as part of the work.

.4 For Type 2 and Type 3 work performed, indicate the Asbestos Contractor in Section 00 43 00 of the Tender Submission.

1.5 EXISTING CONDITIONS

.1 A current copy of all of the Building Asbestos Reports has been included as part in this specification enclosed for the relevant buildings and areas of work.

1.6 PROCEDURES AND REQUIREMENTS

.1 The disturbance or handling of asbestos materials must be conducted following Type 1, Type 2 or Type 3 operation in accordance with procedures as defined by the Workers' Compensation Board of Nova Scotia as well as Nova Scotia Regulations and Statutes and Owner guidelines.

.2 The HRCE and the Consultant must be notified prior to any disturbance, removal, handling and disposal of asbestos containing materials in addition to those materials.

.3 A copy of the site specific work procedures intended for use on this Project must also be submitted to the Project Safety Representative and HRCE, with the NOPA. The schedule anticipated for asbestos work must be included with the Bid.

.4 Asbestos containing materials may have to be disturbed to facilitate the installation of new components or the modification of existing components as outlined within these specifications and drawings. Where available, existing asbestos condition audit reports have been provided in this specification section. These reports describe the type of asbestos containing material within a building including its known location and the risk level appropriate for the nature of the disturbance.

.5 HRCE and the Consultant, must be notified prior to any disturbance, removal, handling and disposal of asbestos containing materials including ceilings with asbestos texture cost, asbestos acoustic tiles and walls with asbestos drywall compound (confirmed, suspected or unknown) in addition to those materials.

Part 2 Description of Work

2.1 GENERAL

.1 The work specified herein shall be the disturbance, removal, handling and disposal of known asbestos-containing materials by competent persons trained, knowledgeable and qualified in Type 1, 2 & 3 work procedures. Asbestos Contactor is responsible to train its workers to meet qualification requirements when working with the Type 1, 2 & 3 situations.

.2 Any worker deemed by the Owner or Consultant in their absolute discretion to be inadequately trained or unfit to perform their duties will be removed from the project.

.3 All platforms used to access the asbestos materials will be constructed or used in accordance with the requirements of Regulations and the applicable CSA Standard.

.4 All necessary documentation will be the responsibility of the Asbestos Contractor.

.5 The health and safety of all tradesmen in the areas affected during asbestos work will be the sole responsibility of the Trade Contractor, and should the Asbestos Contractor require the assistance of any other trade during the removal, he will provide all necessary equipment and training required to these trades.

.6 The Asbestos Contractor will assume total responsibility for the erection and maintenance of all signs and the integrity of all enclosures and barriers related to the asbestos work.

.7 The Asbestos Contractor will provide all necessary labour, materials, insurance, permits and equipment necessary to carry out the work in accordance with all applicable regulations and this documentation.

.8 The Asbestos Contractor will provide all necessary labour to secure the required utilities for all asbestos work.

.9 If any asbestos containing materials not mentioned herein are to be impacted by the scheduled work, the Trade Contractor is to receive direction from HRCE.

.10 In order to perform Asbestos abatements all contractors must have their documentation on Site and available at all times for review by the Consultant, and HRCE Site Safety coordinator. All documents must be received at least 24 hours prior to work commencing. Special consideration may only be given to emergency abatement actions.

.11 All air monitoring and inspections will be conducted by a qualified Occupational Health & Safety (O H & S) consultant (where required).

.12 The Occupational Health and Safety (O H & S) consultant will be commissioned by the Construction Manager and paid by the Asbestos Contractor.

.13 The O H & S consultant will have full access to all documentation.

.14 The Asbestos Contractor will not demobilize from an area of removal until the O H & S consultant has inspected the completed area.

.15 The Asbestos Contractor will not begin work in a new area without informing the O H & S consultant in writing.

.16 All HEPA vacuums and negative-air units to be used on the Project are to be D.O.P. (dioctyl phthalate) tested at the beginning of the work, and at the discretion of the O H & S consultant.

Part 3 Waste Handling and Disposal

3.1 GENERAL

.1 Disposal of all asbestos waste will be performed in accordance with Nova Scotia Regulations.

.2 The Owner will provide a waste generator number that must appear on all waste transfer manifests, if required.

END OF SECTION

Part 1 General

1.1 REFERENCES:

.1 CSA-A23.1-94/A23.2-94, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.2 CSA-A3000-98, Cementitious Materials Compendium.

.3 CNS A2043-86, Air-Entraining Admixtures for Concrete.

.4 CNS A2245-91, Chemical Admixtures for Use in Producing Flowing Concrete.

.5 CSA-G40.20/G40.21-98, General Requirements for Rolled or Welded Structural Quality Steels.

1.2 CONSTRUCTION

.1 Inspection and testing of concrete and Quality Control concrete materials will be carried out in accordance with CSA-A23.1.

1.3 CERTIFICATES

.1 Provide certification indicating the concrete supplier is certified in accordance with the Atlantic Provinces Ready Mix Concrete Association Program or equivalent.

.1 Only concrete supplied from such certified plants shall be acceptable to the client and plant certification shall be maintained for the duration of the fabrication and erection until the warranty period expires.

.2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mix, and will comply with CSA-A23.1.

.3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1.

Part 2 Products

2.1 MATERIALS

.1 Portland Cement: to CSA-A3000.

.2 Water: to CSA-A23.1.

.3 Aggregates: to CSA-A23.1. Coarse aggregates to be normal density.

.4 Air entraining Admixture: to CNS A2043.

.5 Chemical Admixtures: to CNS A2245. Engineer to approve accelerating or set retarding admixtures during cold and hot weather placing.

.6 Acrylic adhesive for dowel anchorage: to ASTM C881-90, Type IV, Grade 3, Class A, B, and C.

.1 Acceptable Materials

.1 Sika Powerfix 4 by Sika.

.2 Epcon Acrylic 7 by ITW Ramset/Red Head.

.3 HIT HY150 Injection Adhesive System by HILTI.

.4 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.

.7 Structural steel: to CSA-G40.21, Grade 300W for embedded angles and bars.

.8 Curing Compound:

.1 To CSA-A23.1, white and to ASTM C309.

.2 Curing compound to be white pigmented. Subject to compatibility with specified finishes, removal may be required.

.3 Acceptable Materials:

.1 Kurez Vox by Euclid Chemical Company.

.2 Sealtight 1220 White Pigmented Curing Compound by W.R. Meadows.

.3 Florseal by Sternson Construction Products.

.4 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.

2.2 MIXES

.1 Proportion normal density concrete in accordance with A23.1, Alternate 1, to give following quality for concrete:

.1 For concrete in all exterior concrete slabs, ramps, steps, etc.:

.1 Type 10 Portland Cement.

.2 Minimum compressive strength at 28 days: 25 MPa.

.3 Class of exposure: N.

.4 Maximum water/cement ratio: 0.45

.5 Nominal maximum size of coarse aggregate: 20 mm.

.6 Slump at time and point of discharge: 80 mm ñ 30 mm.

.7 Air Content: 5 to 8% (interior).

Part 3 Execution

3.1 PREPARATION

.1 Obtain Engineer's approval before placing concrete. Provide 24 hour notice prior to placing of concrete.

.2 Obtain Engineer's approval before placing concrete. Provide 24 hour notice prior to placing of concrete.

.3 Prior to placing of concrete obtain Engineer's approval of proposed method for protection of concrete during placing and curing.

.4 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.5 Do not place load upon new concrete until authorized by Engineer.

3.2 CONSTRUCTION

.1 Do cast-in-place concrete work in accordance with CSA-A23.1.

.2 Reinforcing steel, embedded parts, etc., shall be secured in position prior to placing concrete.

.3 Pumping of concrete is permitted only after approval of equipment and mix.

.4 Ensure reinforcement and inserts are not disturbed during concrete placement.

.5 Finishing:

.1 Concrete in accordance with CSA-A23.1-00.

.2 New housekeeping pad surface to have Class 'A' finish, to Table 19.

3.3 SITE TOLERANCE

.1 New housekeeping pad surface to have Class 'A' finish, to Table 19.

.2 For housekeeping pad surface: Straight Edge Method tolerance shall be within 4 mm in 1.5 metres.

3.4 ALTERATIONS

.1 Prepare existing floor slab as detailed and Partial Removals as required to provide for installation of new work.

.2 Remove all laitance, dirt, dust, debris, adhesives, grease, or other substances that would interfere with the bond between the base course concrete and the new housekeeping pad concrete.

.3 Install dowels where new concrete abuts existing.

3.5 FIELD QUALITY

.1 Inspection and testing of concrete and Control concrete materials will be carried out by a Testing Laboratory designated by Engineer in accordance with CAN/CSA-A23.1.

.2 Owner will pay for costs of tests.

.3 Inspection or testing by Engineer will not augment or replace Contractor's quality control nor relieve him of his contractual responsibility.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Firestopping and smoke seals within mechanical assemblies (i.e. inside ducts, dampers, piping) and electrical assemblies (i.e. inside cable trays) are specified in Sections 21, 22, 23, 25 and 26.

1.2 SUMMARY

.1 Only tested firestop systems shall be used in specific locations as follows:

.1 Penetrations for the passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

.2 Openings in fire rated walls, floors and roofs both empty and those containing penetrations such as cables, conduits, cable trays, pipes, ducts and similar penetrating items.

.3 Penetrations through smoke barriers and construction enclosing compartmentalized areas involving openings containing penetrating items.

1.3 DEFINITIONS

.1 Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, water and hot gases through penetrations in fire rated wall and floor assemblies.

1.4 REFERENCES

.1 Underwriters' Laboratories of Canada (ULC):

.1 Guide BXUVC, Fire Resistance Ratings.

.2 Guide XHEZC, Firestop Systems.

.3 CAN/ULC-S101, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

.4 CAN/ULC-S102, Standard Test Method for Surface Burning Characteristics of Building Materials.

.5 CAN/ULC-S115, Standard Method of Fire Tests of Firestop Systems.

.6 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings.

.2 Underwriters Laboratories Inc. (UL):

.1 Guide BXUV7, Fire Resistance Ratings Certified for Canada.

.2 Guide XHEZ7, Through-penetration Firestop Systems Certified for Canada.

.3 UL 2079, Tests for Resistance of Building Joint Systems.

.3 American Society for Testing and Materials (ASTM):

.1 ASTM E 2174-01, Standard Practice for On-site Inspection of Installed Fire Stops.

.2 ASTM E 2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.

.4 International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments

1.5 QUALITY ASSURANCE

.1 Firestop installation must meet requirements of CAN/ULC S115 tested assemblies that provide a fire rating as indicated.

.2 Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

.3 For firestop applications for which no ULC or UL tested system is available through a manufacturer, a manufacturer's Engineering Judgment derived from similar ULC or UL fire resistance designs to be submitted to local Authorities Having Jurisdiction for their review and approval prior to installation. Engineer Judgment drawings must follow requirements set forth by the International Firestop Council.

.4 Installer Qualifications: Certified, licensed, or otherwise qualified by the firestopping manufacturer as having necessary experience and training to install firestopping per specified requirements.

1.6 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Shop Drawings: Submit shop drawings indicating ULC or UL design, showing typical installation details including reinforcement, anchorage, fastenings and method of installation for each type of firestopping condition.

.3 Schedule: Provide schedule indicating material to be used, building elements to be protected, hourly rating and appropriate references.

.4 Submit manufacturer's specifications and technical data for each material including the composition and limitations, and manufacturer's installation instructions.

.5 Submit material safety data sheets (MSDS) provided with products delivered to job site.

.6 Manufacturer's Engineering Judgment identification number and drawing details when no ULC or UL fire resistance design is available for an application.

1.7 SYSTEM PERFORMANCE

.1 Firestopping Materials: Provide firestopping systems of sufficient thickness, width and density to provide and maintain fire resistance rating as indicated and in accordance with ULC and UL design numbers.

.2 Provide a seal completely filling all annular spaces to prevent the passage of flame, smoke and gases through the opening in the fire separation in which it is installed.

.3 Material Compatibility: Provide materials which are compatible with all materials used in the system including materials used in or on penetrating items as well as all construction materials used in conjunction or contiguous with the system.

.4 Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire resistance rated systems.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Comply with manufacturer's recommended requirements for temperature, relative humidity and substrate moisture content during application and curing of materials.

.2 Do not proceed with installation of firestopping materials when temperatures or weather conditions exceed manufacturer's recommendations.

.3 Ventilate solvent based and moisture-cure firestopping per manufacturer's instructions by natural means or, where inadequate, by forced air circulation.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to Site in Manufacturer's sealed and labeled containers intact. Handle and store materials in accordance with manufacturer's instructions.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURERS

.1 Provide firestopping and smoke seal systems that are ULC Listed or UL Certified for use in Canada when tested in accordance with CAN/ULC-S115 from the following manufacturers: A/D Fire Protection Systems, 3M Fire Protection Products, Hilti Canada Ltd. and Tremco Sealants and Coatings.

2.2 MATERIALS

.1 Silicone Sealants: For use in openings with penetrating items subject to high movement, multiple penetration systems, combustible pipes up to 50 mm diameter and as a sealant for smoke barrier construction.

.2 Intumescent Caulk: For general use as a firestop sealant with insulated and un-insulated pipes, electrical cables and conduit, and ducts.

.3 Spray: For use with multiple penetration systems, plumbing, mechanical, electrical, and where sprayed sealant application is required or desired.

.4 Mortar: For use in large openings, static non-moving penetrations such as cable trays, multiple penetration systems, electrical and communication bundles, conduits, non-combustible sleeves, and insulated pipes.

.5 Collars: For use in openings with single combustible pipe penetrations greater than 50 mm diameter.

.6 Pillows: For use in openings with cable tray, multiple cable penetrations where retrofitting of penetrating items is anticipated, and as a temporary firestop system.

2.3 ACCESSORIES

.1 Back-up and Forming Materials: Batt insulation to CAN/ULC-S702-1997, mineral wool fiber.

.1 Acceptable products: Roxul SAFE, Fibrex Safing Insulation.

.2 Anchoring Devices: Non-combustible, to manufacturer's recommendations and in accordance with the tested system being installed.

.3 Primers: As required by firestopping manufacturer and compatible with selected system.

.4 Water: Potable.

.5 Tape: Pressure sensitive masking tape as recommended by the firestopping manufacturer.

2.4 SCHEDULE OF FIRESTOP RATINGS

.1 Firestop system installation must meet requirements of CAN/ULC-S115 tested assemblies that provide a fire rating as follows:

.1 For non-combustible penetrations through a fire separation provide a firestop system with an F-Rating as indicated below:

Fire resistance rating of separation	Required F-Rating of firestopping assembly
30 minutes	20 minutes
45 minutes	45 minutes
1.0 hour	45 minutes
1.5 hours	1.0 hour
2.0 hours	1.5 hours
3.0 hours	2.0 hours
4.0 hours	3.0 hours

.2 For combustible pipe penetrations through a fire separation, provide a firestop system with an F-Rating which is equal to the fire resistance rating of the construction being penetrated.

.3 For penetrations through a firewall or horizontal fire separation provide a firestop system with an FT-Rating equal to the fire resistance rating of the construction being penetrated.

.4 For joints provide a firestop system with an Assembly Rating as determined by CAN/ULC-S115 equal to the fire resistance rating of the construction being penetrated.

Part 3 Execution

3.1 PREPARATION

.1 Do not install firestopping until Work within opening has been completed. Coordinate with other applicable Sections.

.2 Schedule work of other trades so that firestopping can be inspected prior to being covered by subsequent construction.

.3 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.4 Clean surfaces to receive firestopping free of dirt, dust, grease, oil, rust, loose materials, form release agents, frost, moisture or any other matter which would impair the bond of firestopping material to the substrate and penetrating items.

.5 Prime substrates in accordance with manufacturer's instructions.

.6 Do not apply firestopping and smoke seals to surfaces previously painted or treated with sealers, curing compounds, water repellent or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.7 Ensure that anchoring devices, back-up materials, clips, sleeves, supports and other related materials used in the actual fire tests are provided.

.8 Mask where necessary to prevent firestopping materials from contacting adjoining surfaces that will remain exposed upon completion of Work.

.9 Maintain insulation around pipes and ducts penetrating fire separation.

.10 Coordinate location and proper selection of cast-in-place firestop devices with trade responsible for the work. Ensure device is installed before placement of concrete.

.11 Installation is not to proceed until submittals have been completed.

3.2 INSTALLATION

.1 Install firestopping material and components in accordance with ULC/UL fire resistance design and manufacturer's instructions.

.2 Seal holes or voids made by through penetrations, poke-through termination devices, and un-penetrated openings to ensure continuity and integrity of fire separation are maintained.

.3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.4 Provide leak-proof dams as required to seal openings and contain liquid sealants, putty or mortar until cured. Install damming in accordance with manufacturer's instructions.

.5 Tool or trowel exposed surfaces to a neat finish.

.6 Remove excess compound promptly as work progresses and upon completion.

3.3 FIELD QUALITY CONTROL

.1 Notify HRCE – Site Construction Manager when completed installations are ready for inspection prior to concealing or enclosing area containing firestopping materials.

.2 Following field inspections, provide all repair as required to ensure compliance with the Contract Documents.

.3 Install permanent warning labels provided by firestopping material manufacturer adjacent to openings that may be re-penetrated or disturbed. This card should contain the following information:

.1 Warning that the opening has been firestop protected.

.2 Indicate the firestop system used (ULC/UL Design No.).

.3 F rating or FT rating.

.4 Fire stop product(s) used.

.5 Person to contact and phone number in case of modification or new penetration of firestop system.

3.4 CLEANING AND PROTECTION

.1 Upon completion of this work, remove all materials, equipment and debris from the site.

.2 Leave work area and adjacent surfaces in a condition acceptable to the Engineer.

.3 Protect work until Interim Inspection.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 – Submittal Procedures.

1.2 EXAMINATION

.1 Examine the work of other trades for defects or discrepancies and report same to the HRCE – Site Construction Manager in writing.

.2 No work shall proceed until all such defects have been corrected and surfaces are acceptable.

.3 Installation of any part of the work shall constitute acceptance of relevant surfaces as being satisfactory and no later claims will be considered when the final work is judged unsatisfactory because of same.

.4 Examine all civil, electrical and mechanical drawings to determine the full extent of the work. Later claims will not be allowed for work inadvertently omitted from the estimate through lack of such examination and co-ordination.

1.3 DELIVERY AND STORAGE

.1 Deliver materials to the site in manufacturer's original containers with labels and seals intact.

.2 Store materials at temperatures recommended by the manufacturer of the material concerned.

.3 Particular attention shall be given to the protection during transportation and storage of materials subject to damage by low temperatures.

.4 Paint and materials shall be stored in a well ventilated area with temperature range of 7 to 30°C.

.5 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of the Engineer. After completion of operations, return areas to clean condition.

.6 Provide minimum one 9kg fire extinguisher in work area.

.7 Take all necessary precautionary measures to prevent fire hazards and spontaneous combustion. Cotton waste, cloths and materials which may constitute a fire hazard shall be placed in closed metal containers and removed from the site at the end of each day.

1.4 MATERIAL SAFETY DATA SHEETS

.1 Prior to commencement of construction supply a complete set of applicable Material Safety Data Sheets (MSDS) to the Owner In addition, Contractor to display the applicable MSDS in the immediate work area.

1.5 VENTILATION

.1 As required by the MSDS, contractor to supply equipment to properly ventilate the construction area.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Comply with WHMIS regarding use, handling, storage and disposal of hazardous materials.

.2 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturers' recommendations.

.3 Apply paint only in areas where dust is no longer being generated by related construction activities such that airborne particles will not affect the quality of the finished surface.

.4 Apply paint only when surface to be painted is dry, properly cured and adequately prepared.

.5 Painting in occupied areas to be carried out during silent hours only. Schedule operations to approval of Engineer.

1.7 QUALIFICATIONS

.1 Work of this section to be carried out by a proven and competent painting contractor.

.2 The contractor shall maintain a competent crew of painters throughout the duration of the project.

1.8 PRODUCT DATA

.1 Submit product data in accordance with Section 01 33 00 - Submittals.

.2 Submit full records of all products used. List each product in relation to finish formula and include the following:

.1 Finish formula designation.
.2 Product type and use.
.3 Manufacturer's product number.
.4 MSDS.
.5 Manufacturer's application instructions.
.6 Maximum VOC classification.

1.9 SAMPLES

.1 If requested submit 300mmx200mm sample panels of each paint type.

1.10 COLORS

.1 The paint color to be as indicated on drawings and texture to match existing installations.

1.11 INSPECTION

.1 The contractor shall document all aspects of the work, including: materials used, quantities, equipment, daily production records, ambient conditions, batch dry film thicknesses and any other pertinent information.

Part 2 Products

2.1 MATERIALS

.1 Materials shall be first quality products, factory prepared and mixed.

.2 Paint shall be a fungistatic protective containing no mercurials, arsenic, phenols or other metal complexes.

.3 Concrete floor and housekeeping pad:

.1 One coat primer – sealed CAN/CGSB 1.118-M89.

.2 Two coats semi-gloss alkyd CAN/CGSB – 1.57.

Part 3 Execution

3.1 PREPARATION

.1 Clean existing boiler room floor using high pressure water to remove all loose flaking paint and any other contaminants. Power tool clean all rusted areas to SSPC-SP-11 (Bare metal) and feather back existing ‘in tact’ coating.

3.2 GENERAL

.1 Workmanship shall be first class in all respects. Materials shall be used in accordance with the manufacturer's instructions obtaining full coverage with each coat.

.2 No paints shall be applied at temperatures lower than 10^{o}C or under dusty or other unsuitable conditions.

.3 A uniform ambient temperature shall be maintained during paint application and for at least 24 hours after finish of work in each area.

.4 All areas shall be broom clean before painting is started on any area.

.5 Materials shall be thoroughly mixed before application and applied evenly, free from sags, runs, crawls, and other defects; do all cutting in neatly.

.6 Where two coats of the same paint are to be applied, the first coat shall be tinted to differentiate from the final coat. Tinting shall be performed by the Paint Manufacturer.

.7 Primer and intermediate coats of paint shall be completely integral before application of the succeeding coats.

.8 All finish work shall be uniform in sheen, colour and texture.

.9 Clean droppings and over-spray as work progresses.

3.3 APPLICATION

.1 Apply in strict accordance with manufacturers recommendations.

.2 Apply each coat at the proper consistency.

.3 Each coat of finish should be dry and hard before a following coat is applied.

.4 Paint all exposed mechanical and electrical conduit & piping. Colour and texture to match adjacent surfaces except where specific colour identification is noted in mechanical specifications.

.5 Paint all exposed metal deck and structural and miscellaneous steel including exterior railings.

.6 The paint shall have good flowing and brushing properties and shall dry or cure free of streaks or sags to yield the desired finish specified.

3.4 PROTECTION

.1 Provide and use sufficient drop sheets to protect construction work, floors, and other finished work.

.2 Remove electric plates and surface hardware before painting and replace after paint is dry.

.3 Protect other building elements, fixtures and equipment.

END OF SECTION

Part 1 General

1.1 GENERAL

.1 This section covers items common to all Mechanical Sections.

1.2 SCOPE OF WORK

.1 The work of this section includes all labour, materials, and equipment necessary for the complete installation of the mechanical systems shown on the drawings and described in these specifications.

.2 It is the requirement of this work to provide all systems complete, functioning in intended system operation, notwithstanding that every item necessarily required may not be specifically mentioned.

1.3 EQUIPMENT LIST

.1 Complete list of equipment and materials to be used on this project and forming part of tender documents including manufacturer's name, model number and details of materials, and submit for approval.

.2 Submit for approval within 7 days after award of contract.

1.4 SUBMITTALS

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

.2 Submit shop drawings to be approved by Engineer.

.3 Shop drawings to show:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances. eg. access door swing spaces

.4 Shop drawings and product data accompanied by:

- .1 Detailed drawings of bases, supports, and anchor bolts.
- .2 Acoustical sound power data, where applicable.
- .3 Points of operation on performance curves.
- .4 Manufacturer to certify current model production.
- .5 Certification of compliance to applicable codes.

.5 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .2 Operation and maintenance manual approved by, and final copies deposited with, HRCE – Site Construction Manager before final inspection, to be reviewed by Engineer.
- .3 Operation data to include:
  - .1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.4 Maintenance data to include:

.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.6 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to HRCE – Site Construction Manager for approval. Submission of individual data will not be accepted unless directed by HRCE – Site Construction Manager.

.2 Make changes as required and re-submit as directed by HRCE – Site Construction Manager.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 Contractor shall obtain 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.2 Submit to HRCE – Site Construction Manager for approval of Engineer and make corrections as directed.

.3 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.5 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 EQUIPMENT INSTALLATION

.1 In accordance with Manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

1.7 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, and components.

1.8 TRIAL USAGE

.1 HRCE – Site Construction Manager may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Heating Boilers.

.2 Heating System Circulator Pumps.

.3 Domestic Hot Water Heater.

1.9 PROTECTION OF OPENINGS

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

1.10 ELECTRICAL

.1 This contractor is responsible for all wiring required for controls systems, including obtaining 120V sources from the electrical system.

1.11 PREPARATION FOR FIRESTOPPING

.1 Provide Firestopping and Smoke Seals. Refer to Section 07 84 00 – Firestopping and Smoke Seal.

.2 Contractor to identify all locations where mechanical penetrations are required through fire rated separations including type and sizing.

1.12 EXISTING CONDITIONS

.1 Connect into existing systems at times coordinated with HRCE – Site Construction Manager.

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

1.13 TESTS

.1 Give 48 h written notice of date for all tests.

.2 Insulate or conceal work only after testing and approval by HRCE – Site Construction Manager.

.3 Conduct tests in presence of HRCE – Site Construction Manager.

.4 Bear costs including retesting and making good.

.5 Equipment: test as specified in relevant sections.

.6 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.14 ACCESS DOORS

.1 Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.

.2 Flush mounted 600 x 600 mm for body entry and 300 x 300 mm for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

.1 Special areas such as all pool areas, locker rooms, high humidity areas, use stainless steel with brushed satin or polished finish as directed by Engineer and as indicated on drawings.

.2 Remaining areas: use prime coated steel.

.4 Installation:

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.3 Installation is specified in applicable sections.

.5 Acceptable material: Buensod, LeHage, Zurn.

1.15 SLEEVES

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.4 Sizes: 6 mm minimum clearance between sleeve and un-insulated pipe or between sleeve and insulation.

.5 Installation:

- .1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.
- .2 Other floors: Terminate 25 mm above finished floor.
- .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:

- .1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.
- .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
- .3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.
- .4 Ensure no contact between copper pipe or tube and sleeve.

.7 Pipe Sleeves:

- .1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated.
- .2 Schedule 40 steel pipe.
- .3 Sleeves with annular fin continuously welded at midpoint:
  - .1 Through foundation walls.
  - .2 Where sleeve extends above finished floor.
- .4 Sizes: minimum 6 mm clearance all around, between sleeve and un-insulated pipe or between sleeve and insulation.
- .5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm above other floors.
- .6 Fill voids around pipes:
  - .1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.
  - .2 Where sleeves pass through walls or floors, provide space for fire stopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.

.3 Ensure no contact between copper tube or pipe and ferrous sleeve.

.4 Fill future-use sleeves with lime plaster or other easily removable filler.

.5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt-Mar-78.

1.16 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

1.17 DEMONSTRATION, OPERATING AND MAINTENANCE INSTRUCTIONS

.1 Where specified elsewhere in Divisions 21, 22, 23, 25 and 26 Manufacturers to provide demonstrations and instructions.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections. Provide minimum 8 hour instruction.

.5 When deemed necessary, Engineer will record these demonstrations for future reference.

1.18 INTERPRETATION OF PLANS AND SPECIFICATIONS

.1 These specifications are to be considered as an integral part of the plans which accompany them and neither the plans not the specifications shall be used alone. Any item which is omitted in one but which is reasonably implied in the other shall be considered properly and sufficiently specified and must, therefore, be provided by this Contractor.

.2 Misinterpretation of the plans or specifications shall not relieve this Contractor of responsibility; final interpretation of details and clauses remains with the Engineer.

.3 Where uncertainty exists in the passing of pipes and location of equipment, the General Contractor and or project manager shall be consulted before work is started. Where such materials and equipment have been installed so as to cause interference with the inside treatment of the building, they shall be removed and relocated without additional cost to the Owner.

.4 The plans do not necessarily show all valves, duct offsets, access panels, connections, balancing fittings, bases, isolators, flexible connections, drains, etc., and this Contractor shall not avail himself of these obvious omissions, but shall install the work complete in essential details so that it will function properly, can be easily balanced and so that repairs and removal of equipment can easily be made.

.5 Building dimensions shall not be scaled from the Mechanical plans but shall be obtained from on-site dimensions of the building. Any discrepancy between the drawings and the building shall be questioned before proceeding with any installation.

1.19 CO-OPERATION OF CONTRACTORS

.1 This Contractor shall become familiar with the work of other Contractors and in laying out and installing the work shall co-operate with the other Contractors, so as to facilitate the progress of the work as a whole and avoid interference or delays. Where interference exists, this Contractor shall notify the General Contractor and/or project manager and the engineer before installing the work. Any changes in the work or alterations of the Mechanical Contractor's schedule of procedure required for such co-operation will not be considered as a claim for extra compensation.

.2 Due to the complexities of many sub-trades, and the restrictive space available in this project, it is required that all trades co-operate closely so as to install all systems in their allotted locations as indicated on the drawings, or coordination on site.

1.20 ERRORS AND OMISSIONS

.1 The drawings are not intended to show every item of accessory equipment, but the Contractor shall tender on and install all essential details to provide for efficiency of operation and ease of maintenance.

.2 Should this Contractor discover errors or discrepancies in the plans or specification, he shall refer the matter to the Engineer for change or clarification and shall not proceed with that portion of the work until advised by the Engineer to do so.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

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

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):

.1 ASHRAE Standard 90.1-01, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

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

.1 ASTM C335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.2 ASTM C411-04, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.3 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.4 ASTM C547-2003, Mineral Fiber Pipe Insulation.

.3 Canadian General Standards Board (CGSB):

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

.2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts

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

.1 Material Safety Data Sheets (MSDS).

.5 Manufacturer's Trade Associations:

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

.6 Underwriters' Laboratories of Canada (ULC):

.1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings

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

1.3 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC ss:

.1 CRF: Code Rectangular Finish.

.2 CPF: Code Piping Finish.

1.4 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 – Submittal Procedures.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures:

.1 Submit for approval Manufacturer’s catalogue literature related to installation, fabrication for pipe, fittings, valves and jointing recommendations.

.4 Samples:

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

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.

1.5 QUALITY ASSURANCE

.1 Installer: specialist in performing work of this Section, and have at least 3 years successful experience in this size and type of project, qualified to standards member of TIAC.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:

.1 Protect from weather, construction traffic.

.2 Protect against damage.

.3 Store at temperatures and conditions required by manufacturer.

.3 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

.2 Materials to be tested in accordance with ASTM C411.

2.2 INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.

.3 Materials:

.1 CAN/ULC-S702/ASTM C547, rigid mineral fiber sleeving for piping.

.2 Acceptable materials: Fiberglas Canada; Knauf; Manson.

.4 Thermal Conductivity "k" shall not exceed 0.034 W/m.°C at 24°C mean temperature when tested in accordance with ASTM C335.

.5 TIAC Code C-2: Rigid moulded mineral fibre with factory applied vapour retarder jacket.

.6 Material:

.1 CAN/ULC-S702/ASTM C547, rigid mineral fiber sleeving for piping and CGSB 51-GP-52Ma, vapour barrier jacket and facing material.

.2 Acceptable material: Knauf; Fiberglas Canada; Manson.

.7 Thermal Conductivity "k" shall not exceed 0.034 W/m°C at 24°C mean temperature when tested in accordance with ASTM C335.

2.3 INSULATION SECUREMENT

.1 For insulation systems:

.1 Tape: self-adhesive, aluminium, ULC labelled for less than 25 flame spread and less than 50 smoke developed.

.1 Acceptable Material: Fattal Insulatape by S. Fattal Canvas Inc.

.2 Lap seal adhesive: quick-setting for joints and lap sealing of vapour barriers.

.1 Acceptable Material: Childers CP.80; Foster 87-75 asbestos free at 6m²/L.

.3 Lagging adhesive: fire retardant coating.

.1 Acceptable Material: Childers CP.50A-HV2; Foster 30-36 asbestos free at 1.25 m²/L.

2.4 CEMENT

.1 Thermal insulating and finishing cement:

.1 Hydraulic setting or Air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

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

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 JACKETS

.1 Polyvinyl Chloride (PVC): (New exposed piping):

.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Minimum service temperatures: -20°C.

.3 Maximum service temperature: 65°C.

.4 Moisture vapour transmission: 0.02 perm.

.5 Thickness: .033 mm minimum.

.6 Fastenings:

.1 Standard to Manufacturer.

.7 Fitting covers, one piece, pre-moulded to match.

.2 Canvas: (New concealed piping):

.1 220 and 120 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: compatible with insulation.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with ANSI/NFPA 90A and ANSI/NFPA 90B.

.2 Apply materials in accordance with manufacturers' instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes:

.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

.6 Multi-layered: staggered butt joint construction.

.7 Vertical pipe over NPS 3: insulation supports welded or bolted to pipe directly above lowest pipe fitting. Thereafter, locate on 4.5 m centres.

.8 Expansion joints in insulation: terminate single layer and each layer of multiple layers in straight cut at intervals recommended by manufacturer. Leave void of 25 mm between terminations. Pack void lightly with flexible mineral insulation.

.9 Seal and finish exposed ends and other terminations with insulating cement.

.10 Expansion joints in piping: provide for adequate movement of expansion joint without damage to insulation or finishes.

.11 Flanges and unions at equipment, expansion joints, valves, other components requiring regular maintenance: omit insulation and bevel away from studs and nuts to permit use of tools without damage to insulation install insulation and finish to permit easy disassembly and replacement without damage to adjacent insulation and finishes.

.12 Secure pipe insulation by tape at each end and centre of each section, but not greater than 900 mm on centres.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: at expansion joints, valves, primary flow measuring elements flanges and unions at equipment.

.2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings and finishes: same as system.

.2 Jacket: To match adjacent pipe jacketing.

3.5 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1:

.1 Securements: Tape at 300 mm OC

.2 Seals: Lap seal adhesive, lagging adhesive.

.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: C-2 with Vapour Retarder Jacket:

.1 Securements: Tape at 300 mm oc.

.2 Seals: VR lap seal adhesive, VR lagging adhesive.

.3 Installation: TIAC Code: 1501-C.

.4 Thickness of insulation to be as listed in following table:

.1 Run-outs to individual units and equipment not exceeding 4000 mm long.

.2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp °C	TIAC Code	Pipe sizes (NPS) and insulation thickness (mm)				
			To 1	1 ¼ to 2	2 ½ to 4	5 to 6	8 & over
New Domestic Cold Water	4-13	C-2	25	25	25	-	-
New Hot Water Supply	60-94	A-1	25	25	25	25	25
New Hot Water Return	60-94	A-1	25	25	25	25	25

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for copper domestic water service used in the following:

.1 Copper incoming domestic water service, up to NPS 2 1/2.

.2 Hard drawn copper domestic hot and cold water services inside building.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 23 05 05 - Installation of Pipework.

1.3 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME):

.1 ANSI/ASME B16.18-01, Cast Copper Alloy Solder Joint Pressure Fittings.

.2 ANSI/ASME B16.22-01, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

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

.1 ASTM B88M-03, Standard Specification for Seamless Copper Water Tube (Metric).

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

.1 Material Safety Data Sheets (MSDS).

.4 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).

.5 National Research Council (NRC)/Institute for Research in Construction:

.1 NRCC 38728, National Plumbing Code of Canada (NPC) - 2015.

1.4 SUBMITTALS

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

.2 Submit product data for following: valves.

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

1.5 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29 06 – Health and Safety Requirements.

Part 2 Products

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building:

.1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

2.2 FITTINGS

.1 Cast copper, solder type: to ANSI/ASME B16.18.

.2 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

2.3 JOINTS

.1 Solder: 95/5 or tin copper alloy.

.2 Teflon tape: for threaded joints.

.3 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F492, complete with thermoplastic liner.

2.4 BALL VALVES

.1 NPS 2 and under, soldered:

.1 To ANSI/ASME B16.18, Class 150.

.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors.

.3 Standard of Acceptance: Crane, Jenkins.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with NPC.

.2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

3.2 VALVES

.1 Isolate equipment, fixtures and branches with ball valves.

3.3 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01 - Common Work Results.

.2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.4 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

3.5 START-UP

.1 Timing: Start up after:

.1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.

.3 Certificate of static completion has been issued.

.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:

.1 Establish circulation and ensure that air is eliminated.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.

.4 Rectify start-up deficiencies.

3.6 PERFORMANCE VERIFICATION

.1 Timing:

.1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.

.2 Procedures:

.1 Verify that flow rate and pressure meet Design Criteria.

.2 Sterilize HWS and HWC systems for Legionella control.

.3 Verify performance of temperature controls.

.4 Verify compliance with safety and health requirements.

.5 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.

.6 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

.3 Reports:

.1 In accordance with Section 01 91 13 – General Commissioning (Cx) Requirements.

.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:
- .1 The installation of drainage waste and vent piping.

.2 Related Sections:
- .1 Section 01 35 29.06 - Health and Safety Requirements.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM):
- .1 ASTM B32-03, Specification for Solder Metal.
- .2 ASTM B306-02, Specification for Copper Drainage Tube (DWV).

.2 Canadian Standards Association (CSA International):
- .1 CSA B67-1972 (R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
- .2 CAN/CSA-B125-01, Plumbing Fittings.

1.3 QUALITY ASSURANCE

.1 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:
- .1 Separate and recycle waste materials.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary Type DWV to: ASTM B306:
- .1 Fittings.
  - .1 Cast brass: to CAN/CSA-B125.
  - .2 Wrought copper: to CAN/CSA-B125.
- .2 Solder: lead free, tin-95:5, to ASTM B32.

.2 Above ground boiler condensate drain piping: CPVC c/w solvent weld fittings.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code, Provincial Plumbing Code and local authority having jurisdiction.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 19 - Waste Management and Disposal.

.3 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

.1 Canadian Gas Association (CGA):

.1 ANSI Z21.10.1-2001/CSA 4.1-2001, Gas Water Heaters - Volume I, Storage Water Heaters with Input Ratings Below 75,000 Btu Per Hour.

.2 ANSI Z21.10.3-2001/CSA 4.3-2001, Gas Water Heaters - Volume III - Storage Water Heaters, with Input Ratings Above 75,000 Btu Per Hour.

.3 CSA-B149.1-10, Natural Gas and Propane Installation Code.

.4 CSA-B149.2-10, Propane Storage and Handling Code.

.2 Canadian Standards Association (CSA International):

.1 CSA B51-97, Boiler, Pressure Vessel, and Pressure Piping Code.

.2 CAN/CSA-B139-00, Installation Code for Oil Burning Equipment.

.3 CAN/CSA-B140.0-M87 (R2001), General Requirements for Oil Burning Equipment.

.4 CSA B140.12-1976 (R2001), Oil-Fired Service Water Heaters and Swimming Pool Heaters.

.5 CAN/CSA C22.2No.110-94 (R1999), Construction and Test of Electric Storage Tank Water Heaters.

.6 CAN/CSA-C191 Series-00, Performance of Electric Storage Tank Water Heaters for Household Service.

.7 CAN/CSA-C309-M90 (R1998), Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate:

.1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.4 CLOSEOUT SUBMITTALS

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

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 19 - Waste Management and Disposal, and with Waste Reduction Workplan.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Consultant.

1.6 WARRANTY

.1 For the Work of this Section 22 30 05 - Domestic Water Heaters, the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to number of years specified for each product.

.2 Contractor hereby warrants domestic water heaters in accordance with CCDC2 GC 24, but for number of years specified for each product.

Part 2 Products

2.1 DHW HEATER AND STORAGE TANK

.1 The heater tank shall be constructed of 316L stainless steel. The primary condensing heat exchanger shall be constructed of 90/10 cupronickel. The secondary heat exchanger shall be constructed of 800H stainless steel and 90/10 cupronickel.

.2 Tank insulation shall be 2” thick water blown foam. Insulation shall be enclosed in a plastic jacket. All components shall be located on the front of the heater for easy service access. All related hardware shall be constructed of stainless steel studs with brass nuts. All water connection nipples shall be constructed of stainless steel and attached to the side of the tank. The top and bottom of the tank shall be smooth.

.3 The heaters shall be ETL listed and will exceed the minimum efficiency requirements of ASHRAE 90 lb.-1992. All heaters shall be approved in accordance with ASNI Z 21.10.3. All heaters will be supplied with a factory installed ASME rated temperature and pressure relief valve, a low water cut-off, a high temperature switch, an upper hot water sensor, a lower cold water sensor, and a condensate trap assembly ready for easy connection to a field supplied condensate drain.

.4 The heater shall have an integrated digital controller device with integral diagnostics, LED fault and temperature settings for establishing set point and temperature differential. Ignition shall be direct spark and take place at a speed pre-set for the burner blower. The control shall utilize an algorithm to fully adjust the burner modulating firing rate while maintaining the desired temperature.

The pre-mix stainless steel burner uses a 120 volt motor with pulse wave modulation control to change the fan speed, thus the combustion air volume of fuel and air through the burner to establish a continuous BTU input range equal to the water heating set point requirement. The digital LED control display shall provide means, via push buttons, for adjustments of operating temperatures, differential adjustment, ECO reset, service mode, and real time status mode. In addition, there shall be provided a computer connection for history, including all fault codes and hours of operation above 50% input, below 50% input, as well as real time status reporting of all operations. The burner assembly shall be mounted so as to be easily removed as an integral unit for ease of service.

.5 The heater combustion system can be designed for two pipe (intake and exhaust) closed combustion. Schedule 40 or 80 PVC or stainless steel piping materials are approved for venting applications (see installation manual for further venting details). (**NOTE: Foam core pipe is not an approved exhaust venting material).** The vent connections (intake and exhaust) shall be located on the bottom of the heater.

.6 **Horizontal Venting** shall be done as a balanced system only, thus requiring both intake and exhaust to terminate on the same side of the building. Vent terminations are to be concentric intake/exhaust fittings provided by Manufacturer.

.7 The total combined length of exhaust and intake vents cannot exceed 85 combined feet for 2" venting or 200 combined feet for 3" venting. Adequate combustion air must be supplied when drawing air from the mechanical room. Avoid the room contaminates listed in the installation manual. (Refer to appliance installation manual venting section for additional venting requirements).

.8 The heater shall be in compliance with the NOx emissions limit set forth in SCAQMD Rule 1146.2. The heater shall be factory assembled, test-fired for correct BTU input, and adjusted for proper combustion parameters. Complete operating and installation instructions shall be furnished with every heater as packaged by the manufacturer for shipping.

.9 The heater shall operate at altitudes up to 4500 feet above sea level without additional parts or adjustment.

.10 The surfaces of these products contacted by consumable water contain less than 0.25% lead by weight, as required by the Safe Drinking Water Act, Section 1417.

.11 Acceptable Products: HTP Phoenix PH-100-119 complete with vent kit, or approved equal.

Part 3 Execution

3.1 INSTALLATION

.1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.

.2 Provide insulation between tank and supports.

.3 Install natural gas fired domestic water heaters in accordance with CSA-B149.1.

3.2 FIELD QUALITY CONTROL

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for plumbing specialties and accessories.

.2 Related Sections:

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM A126-95 (2001), Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM B62-02, Specification for Composition Bronze or Ounce Metal Castings.

.2 Canadian Standards Association (CSA International):

.1 CSA-B79-94 (R2000), Floor, Area and Shower Drains, and Cleanouts for Residential Construction.

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.

.2 Indicate dimensions, construction details and materials for specified items.

.3 Shop Drawings:

.1 Submit shop drawings to indicate materials, finishes, dimensions, construction and assembly details and accessories for following: funnel floor drain.

.4 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, include:

.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.

Part 2 Products

2.1 DOMESTIC HOT WATER THERMAL EXPANSION TANK EXP-2

.1 ASME Construction.

.2 Diaphragm Type, Potable Water.

.3 Factory Charged.

.4 Maximum Working Pressure: 1033 kPa.

.5 Total volume: 16 L (4.4 gal).

.6 Dimensions: 381 mm (H) x 280 m Ø (15``H x 11``Ø).

.7 Acceptable Material:

.1 Amtrol THERM-X-TROL ST-12C.

.2 Xylem PTA.12.

.3 Armstrong AST.12.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 BACKFLOW PREVENTORS

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.

.2 Pipe discharge to terminate over nearest drain and service sink.

3.3 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada, provincial codes and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.4 TESTING AND ADJUSTING

.1 Floor drains:

.1 Verify operation of trap seal primer.

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

.3 Check operations of flushing features.

.4 Check security, accessibility, removeability of strainer.

.5 Clean out baskets.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 01 74 11 - Cleaning.

.2 Section 07 84 00 - Firestopping.

.3 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.2 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment and components.

3.3 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.4 AIR VENTS

.1 Install manual air vents at high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

3.5 DIELECTRIC COUPLINGS

.1 General: Compatible with system, to suit pressure rating of system.

.2 Locations: Where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: Isolating flanges.

3.6 PIPEWORK INSTALLATION

.1 Screwed fittings jointed with Teflon tape.

.2 Protect openings against entry of foreign material.

.3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main:

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.7 Install concealed pipework to minimize furring space, maximize headroom, and conserve space.

.8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.9 Install, except where indicated, to permit separate thermal insulation of each pipe.

.10 Group piping wherever possible and as indicated.

.11 Ream pipes, remove scale and other foreign material before assembly.

.12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.13 Provide for thermal expansion as indicated.

.14 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless otherwise indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use ball or butterfly valves at branch take-offs for isolating purposes except where otherwise specified.

.7 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.8 Use chain operators on valves NPS 2-1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.

.15 Check Valves:

.1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.

.2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

3.7 SLEEVES

.1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.

.2 Material: Schedule 40 black steel pipe.

.3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.4 Sizes: 6 mm minimum clearance between sleeve and un-insulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.

.2 Other floors: Terminate 25 mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:

.1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.

.2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.

.3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.8 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.9 PREPARATION FOR FIRESTOPPING

.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00 - Firestopping.

.2 Un-insulated unheated pipes not subject to movement: No special preparation.

.3 Un-insulated heated pipes subject to movement: Wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.

.4 Insulated pipes and ducts: Ensure integrity of insulation and vapour barriers.

3.10 FLUSHING OUT OF PIPING SYSTEMS

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

.2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 - Cleaning.

.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Engineer 48 hours minimum prior to performance of pressure tests.

.2 Pipework: Test as specified in relevant sections of Divisions 22 & 23.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of Division 22 & 23.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Engineer.

.6 Pay costs for repairs or replacement, retesting, and making good. Engineer to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Engineer.

3.12 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Engineer.

.2 Request written approval 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

.5 Perform draining and re-filling of piping systems as required to perform work.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 23 05 05 – Installation of Pipework.

.2 Section 23 21 13 – Hydronic Systems: Steel.

1.2 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):

.1 ANSI/ASME B31.1-1998, Power Piping.

.2 ANSI/ASME B31.3-2000, Process Piping Addenda A.

.3 ANSI/ASME B31.3-2001, Process Piping Addenda B.

.4 ANSI/ASME Boiler and Pressure Vessel Code-1998:

.1 Section I: Power Boilers.

.2 Section V: Non-destructive Examination.

.3 Section IX: Welding and Brazing Qualifications.

.2 American Welding Society (AWS):

.1 AWS C1.1-2000, Recommended Practices for Resistance Welding.

.2 AWS Z49.1-1999, Safety Welding, Cutting and Allied Process.

.3 AWS W1-2000, Welding Inspection Handbook.

.3 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-48.2-92, Spot Radiography of Welded Butt Joints in Ferrous Materials.

.4 Canadian Standards Association (CSA International):

.1 CSA W48 series-01, Filler Metals and Allied Materials for Metal Arc Welding.

.2 CSA B51-97, Boiler, Pressure Vessel and Pressure Piping Code.

.3 CSA-W117.2-01, Safety in Welding, Cutting and Allied Processes.

.4 CSA W178.1-02, Certification of Welding Inspection Organizations.

.5 CSA W178.2-01, Certification of Welding Inspectors.

1.3 QUALIFICATIONS

.1 Welders:

.1 Welding qualifications in accordance with CSA B51.

.2 Use qualified and licensed welders possessing certificate for each procedure performed from authority having jurisdiction.

.3 Furnish welder's qualifications to Engineer and Owner’s Project Coordinator.

.4 Each welder to possess identification symbol issued by authority having jurisdiction.

.2 Inspectors

.1 Inspectors qualified to CSA W178.2.

1.4 QUALITY ASSURANCE

.1 Registration of welding procedures in accordance with CSA B51.

.2 Copy of welding procedures available for inspection.

.3 Safety in welding, cutting and allied processes in accordance with CSA-W117.2.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Construction/Demolition Waste Management and Disposal Plan.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material for recycling.

.4 Divert unused metal materials from landfill to metal recycling facility.

Part 2 Products

2.1 ELECTRODES

.1 Electrodes: in accordance with CSA W48 Series.

Part 3 Execution

3.1 WORKMANSHIP

.1 Welding: in accordance with ANSI/ASME B31.1, B31.3, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1 and special procedures specified elsewhere in Division 15 applicable requirements of provincial authority having jurisdiction.

3.2 INSTALLATION REQUIREMENTS

.1 Identify each weld with welder's identification symbol.

.2 Backing rings:

.1 Where used, fit to minimize gaps between ring and pipe bore.

.2 Do not install at orifice flanges.

.3 Fittings:

.1 NPS 2 and smaller: install welding type sockets.

.2 Branch connections: install welding tees or forged branch outlet fittings.

3.3 INSPECTION AND TESTS - GENERAL REQUIREMENTS

.1 Review weld quality requirements and defect limits of applicable codes and standards with Engineer before work is started.

.2 Formulate "Inspection and Test Plan" in co-operation with Engineer.

.3 Do not conceal welds until they have been inspected, tested and approved by inspector.

.4 Provide for inspector to visually inspect welds during early stages of welding procedures in accordance with Welding Inspection Handbook. Repair or replace defects as required by codes and as specified.

3.4 SPECIALIST EXAMINATIONS AND TESTS

.1 General:

.1 Perform examinations and tests by specialist qualified in accordance with CSA W178.1 and CSA W178.2 and approved by Engineer.

.2 Inspect and test 10% of welds in accordance with "Inspection and Test Plan" by non-destructive visual examination and magnetic particle (hereinafter referred to as "particle") tests and spot gamma ray radiographic (hereinafter referred to as "radiography") tests.

.2 Hydrostatically test welds to requirements of ANSI/ASME B31.1.

.3 Visual examinations: include entire circumference of weld externally and wherever possible internally.

.4 Failure of visual examinations:

.1 Upon failure of welds by visual examination, perform additional testing as directed by Engineer of total of up to 10% of welds, selected at random by Engineer by radiographic particle tests.

3.5 REPAIR OF WELDS WHICH FAILED TESTS

.1 Re-inspect and re-test repaired or re-worked welds at Contractor's expense.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for thermometers and pressure gauges in piping systems.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 23 05 53.01 - Mechanical Identification.

1.3 REFERENCES

.1 American Society of Mechanical Engineers (ASME):

.1 ASME B40.100-01, Pressure Gauges and Gauge Attachments.

.2 ASME B40.200-01, Thermometers, Direct Reading and Remote Reading.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-14.4-M88, Thermometers, Liquid-in-Glass, Self Indicating, Commercial/Industrial Type.

.2 CAN/CGSB-14.5-M88, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

1.4 SUBMITTALS

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

.2 Submit shop drawings and product data.

.3 Submit manufacturer's product data for following items:

.1 Thermometers.

.2 Pressure gauges.

.3 Stop cocks.

.4 Syphons.

.5 Wells.

Part 2 Products

2.1 GENERAL

.1 Design point to be at mid point of scale or range.

2.2 DIRECT READING THERMOMETERS (HYDRONIC PIPING)

.1 Thermometer shall be 228 mm case and shall be constructed of a die cast aluminum case, non-mercury filled tube, aluminum stem with socket connections and separable brass socket.

.2 The scale range shall be 0-115°C, units shall be Imperial and Metric.

.3 The scale shall have a white background with black embossed figures and markings that have been applied through a hot stamp process to insure permanent legibility.

.4 The die cast aluminum case shall have a metallic blue-black finish and a clear acrylic window held in place with a removable stainless steel cap. The case shall have maximum adjustment angle of 300 degrees.

.5 The aluminum stem shall have a total length of 88.9 mm with an insertion length of 6.35 mm and shall come complete with socket connections.

.6 The separable brass socket shall have a total length of 88.9 mm with an insertion length of 63.5 mm and shall have 19 mm MNPT plumbing connection.

.7 Approved Product:

.1 Winters T100A.

.2 Trerice BX9.

.3 Weksler A9.

2.3 THERMOMETER WELLS

.1 Copper pipe: copper or bronze.

.2 Steel pipe: brass or stainless steel.

.3 Install thermowells for HVAC controls division where indicated, including bushings and fittings as required.

2.4 PRESSURE GAUGES (HYDRONIC PIPING)

.1 115 mm, dial type: to ASME B40.100, Grade 1A, stainless steel bourdon tube having 1.0% accuracy full scale unless otherwise specified. Units shall be Imperial and Metric.

.2 Approved Product:

.1 Trerice 620B.

.2 Winters PCT Series.

.3 Weksler BM Series.

.3 Provide:

.1 Siphon for steam service.

.2 Diaphragm assembly for corrosive service.

.3 Gasketted pressure relief back with solid front.

.4 Bronze stop cock.

Part 3 Execution

3.1 GENERAL

.1 Install so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading units.

.2 Install between equipment and first fitting or valve.

3.2 THERMOMETERS

.1 Install in wells on piping. Provide heat conductive material inside well.

.2 Install in locations as indicated.

.3 Install wells as indicated for balancing purposes.

.4 Use extensions where thermometers are installed through insulation.

3.3 PRESSURE GAUGES

.1 Install in following locations:

.1 Suction and discharge of pumps.

.2 Upstream and downstream of control valves.

.2 Install gauge cocks for balancing purposes, elsewhere as indicated.

.3 Use extensions where pressure gauges are installed through insulation.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Concrete housekeeping pads, hangers and supports for mechanical piping, ducting and equipment.

1.2 REFERENCES

.1 American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):

.1 ANSI/ASME B31.1-04, Power Piping.

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

.1 ASTM A125-1996 (R2001), Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307-04, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A563-04a, Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM).

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

.1 Material Safety Data Sheets (MSDS).

.5 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS):

.1 MSS SP58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.

.2 ANSI/MSS SP69-2003, Pipe Hangers and Supports - Selection and Application.

.3 MSS SP89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

.6 Underwriter's Laboratories of Canada (ULC).

1.3 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by MSS SP58.ASME B31.1 or

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

1.4 SUBMITTALS

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

.2 Shop drawings: submit drawings to be approved by Engineer.

.3 Submit shop drawings and product data for following items:

.1 Bases, hangers and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.4 Riser clamps.

.5 Pipe attachment.

.6 Shields and saddles.

.7 Sway braces.

.8 Middle attachment.

.4 Closeout Submittals:

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

1.5 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

Part 2 Products

2.1 GENERAL

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

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

.3 All fasteners to be used specified or otherwise shall be submitted to the Structural Engineer for approval prior to use on this project.

2.2 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized after manufacture.

.2 Use electro-plating galvanizing process.

.3 Ensure steel hangers in contact with copper piping are epoxy coated.

.2 Upper Attachments:

.1 Concrete:

.1 Inserts for cast-in-place concrete: galvanized steel wedge to MSS-SP58, type 18. ULC listed for pipe 3/4" (NPS 3/4) through NPS 8.

.1 Acceptable Material: Anvil fig. 281.

.2 Carbon steel plate with clevis, for surface mount: malleable iron socket and expansion case and bolt. Minimum two expansion cases and bolts for each hanger.

.1 Acceptable Material: Anvil, Plate Fig. 49, Socket Fig. 290, Expansion Case Fig. 117.

.2 Steel beam (bottom flange):

.1 Cold piping 2" (NPS 2) and under: malleable iron C clamp to MSS-SP58, type 19. ULC listed.

.1 Acceptable Material: Anvil fig. 61.

.2 Cold piping 2-1/2" (NPS 2-1/2) and larger and all hot piping: malleable iron beam clamp to MSS-SP58, type 28 or 29. ULC listed.

.1 Acceptable Material: Anvil fig. 229.

.3 Steel beam (top):

.1 Cold piping 2" (NPS 2) and under: malleable iron "top of beam" C clamp to MSS-SP58, type 19. ULC listed.

.1 Acceptable Material: Anvil fig. 61.

.2 Cold piping 2-1/2" (NPS 2-1/2) and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer, to MSS-SP58, type 25. ULC listed.

.1 Acceptable Material: Anvil fig. 227.

.4 Steel joist:

.1 Cold piping 2" (NPS 2) and under: steel washer plate with double locking nuts.

.1 Acceptable Material: Anvil fig. 60.

.2 Cold piping 2-1/2" (NPS 2-1/2) and larger and all hot piping: steel washer plates with double locking nut, carbon steel clevis and malleable iron socket.

.1 Acceptable material: Anvil: washer plate, Fig. 60; clevis, Fig. 66, socket, Fig. 290.

.5 Steel channel or angle (bottom):

.1 Cold piping 2" (NPS 2) and under; malleable iron C clamp to MSS-SP58, type 23. ULC listed.

.1 Acceptable Material: Anvil fig. 86.

.2 Cold piping 2-1/2" (NPS 2-1/2) and larger and all hot piping; universal channel clamp. ULC listed.

.1 Acceptable Material: Anvil fig. 226.

.6 Steel channel or angle (top):

.1 Cold piping 2" (NPS 2) and under; malleable iron "top of beam" C clamp to MSS-SP58, type 19. ULC listed.

.1 Acceptable Material: Anvil fig. 61.

.2 Cold piping 2-1/2" (NPS 2-1/2) and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer, to MSS-SP58, type 25. ULC listed.

.1 Acceptable Material: Anvil fig. 227.

.3 Middle Attachment (rod):

.1 Carbon steel threaded rod black electro-galvanized for mechanical rooms finish.

.1 Acceptable Material: Anvil fig. 146.

.4 Pipe Attachment:

.1 Cold piping, steel or cast iron: hot piping steel, with less than 1" (25 mm) horizontal movement; hot piping, steel, with more than 12" (300 mm) middle attachment (rod) length: adjustable clevis to MSS-SP58, type 1. ULC listed.

.1 Acceptable Material: Anvil fig. 260.

.2 Cold copper piping; hot copper piping with less than 1" (25 mm) horizontal movement; hot copper piping with more than 12"(300 mm) middle attachment (rod) length: adjustable clevis to MSS-SP58, type 1. Copper plated.

.1 Acceptable Material: Anvil fig. CT-65.

.3 Suspended hot piping, steel and copper, with horizontal movement in excess of 1" (25 mm); hot steel piping with middle attachment (rod) 12" (300 mm) or less; pipe roller to MSS-SP58, type 43.

.1 Acceptable Material: Anvil fig. 174.

.4 Bottom supported hot piping, steel and copper: pipe roller stand to MSS-SP58, Type 45.

.1 Acceptable Material: Anvil fig. 271.

2.3 RISER CLAMPS

.1 Steel or cast iron pipe: black carbon steel to MSS-SP58, type 42. ULC listed.

.1 Acceptable Material: Anvil fig. 261.

.2 Copper pipe: carbon steel copper finished to MSS-SP58, type 42.

.1 Acceptable Material: Anvil fig. CT-121.

2.4 SADDLES AND SHIELDS

.1 Cold piping 1-1/4" (NPS 1-1/4) and over: protection shield with high density insulation under shield with uninterrupted vapour barrier:

.1 Acceptable Material: Anvil fig. 167.

.2 Hot piping 1-1/4" (NPS 1-1/4) and over: protective saddle with insulation under saddle.

.1 Acceptable Material: Anvil fig. 160 to 166.

2.5 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).

.2 Load adjustability: 10 % minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops. Provide certificate of calibration for each hanger.

.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements approved by Structural Engineer. Submit calculations with shop drawings.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, and as indicated.

.3 Clamps on riser piping:

.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.

.2 Bolt-tightening torques to industry standards.

.3 Steel pipes: install below coupling or shear lugs welded to pipe.

.4 Cast iron pipes: install below joint.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 Use approved constant support type hangers where:

.1 Vertical movement of pipework is 13 mm or more,

.2 Transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:

.1 Transfer of load to adjacent piping or to connected equipment is not critical.

.2 Variation in supporting effect does not exceed 25 % of total load.

.8 Where pipe hangers are to be attached to ceiling where asbestos exists, work shall be done in accordance with all applicable codes and regulations.

3.3 HANGER SPACING

.1 Plumbing piping: to Canadian Plumbing Code, Provincial Code or authority having jurisdiction.

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.

.4 Copper piping: up to NPS 1/2: every 1.5 m.

.5 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

.6 Within 300 mm of each elbow.

Pipe Size: NPS	Rod Diameter	Maximum Spacing Steel	Maximum Spacing Copper
Up to 1-1/4	10 mm	2.1 m	1.8 m
1-1/2	10 mm	2.7 m	2.4 m
2	10 mm	3.0 m	2.7 m
2-1/2	10 mm	3.6 m	3.0 m
3	10 mm	3.6 m	3.0 m
3-1/2	10 mm	3.9 m	3.3 m
4	16 mm	4.2 m	3.6 m
5	16 mm	4.8 m	
6	22 mm	5.1 m	
8	22 mm	5.7 m	
10	22 mm	6.6 m	
12	22 mm	6.9 m	

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

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

3.7 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit Report as described in PART 1 - SUBMITTALS.

.2 Manufacturer's Field Services:

.1 Obtain written Report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

.2 Sustainable requirements for construction and verification.

.2 Related Sections: 01 33 00 – Submittal Procedures.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.2 National Fire Protection Association (NFPA):

.1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14-2003, Standard for the Installation of Standpipe and Hose Systems.

1.3 SUBMITTALS

.1 Product Data: in accordance with Section 01 33 00 – Submittal Procedures.

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

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:

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

.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

.2 Do not dispose of unused paint or coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes or existing installations).

.2 Construction:

.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use maximum of 25 letters/numbers per line.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Sprinklers: to NFPA 13.

.2 Natural Gas Piping: To CSA B.149.1-05.

2.5 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Legend: block capitals to following table:

Outside Dia. of Pipe or Insulation mm	Size of Letters mm
30	13
50	19
150	32
250	63
Over 250	88

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.4 Primary colour bands:

.1 At valves and fittings: 500 mm long.

.2 Elsewhere: 1000 mm long.

.5 Secondary colour bands: 50 mm wide, 75 mm in from one end of primary colour band.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive plastic-coated cloth with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C and intermittent temperature of 200°C. Apply to prepared surfaces, wrap tape around pipe or pipe covering with ends overlapping one (1) pipe diameter.

.3 Acceptable Material: W.H. Brady Inc.; Seton Nameplate Corp.

.7 Colours and Legends:

.1 Where not covered by table below submit legend, primary and secondary classification colours to Engineer for approval.

.2 Colours for legends, arrows: to following table:

.1 Pipe and valve identification.

Type of Piping Legend	Pipe Label Legend	Background Colour	Secondary Colour
Domestic Cold Water Supply	DOM. CWS	Green	
Heating Hot Water Supply	H.W. SUPPLY	Yellow	
Heating Hot Water Return	H.W. RETURN	Yellow	

2.6 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.7 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.8 CONTROLS COMPONENTS IDENTIFICATION

.1 All conduits to be identified with 7” orange and 7” brown paint stripes, min. 12’ c/c.

.2 All new control boxes, cabinets, panels and devices shall be labelled with engraved lamacoid tags, size 25 x 100 minimum, with 10mm letters.

2.9 LANGUAGE

.1 Identification in English.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and or CSA registration plates as required by respective agency.

3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 Stencil over final finish only.

.2 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.3 Adjacent to each change in direction.

.4 At least once in each small room through which piping or ductwork passes.

.5 On both sides of visual obstruction or where run is difficult to follow.

.6 On both sides of separations such as walls, floors, partitions.

.7 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.8 At beginning and end points of each run and at each piece of equipment in run.

.9 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.10 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Number valves in each system consecutively.

3.6 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 RELATED SECTIONS

.1 Division 01 – Commissioning Sections.

1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Commissioning Agent and Engineer within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems - 1998.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing - 2002

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract:

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.4 PURPOSE OF TAB

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

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.5 EXCEPTIONS

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

1.6 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.7 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to HRCE Representative and Engineer adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to HRCE Representative and Engineer in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.8 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.9 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by HRCE Representative and Engineer for verification of TAB reports.

1.10 START OF TAB

.1 Notify Commissioning Agent and Engineer 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weather stripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23.

.6 Provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

- .1 Proper thermal overload protection in place for electrical equipment.
- .2 Air systems:
  - .1 Filters in place, clean.
  - .2 Duct systems clean.
  - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
  - .4 Correct fan rotation.
  - .5 Fire, smoke, volume control dampers installed and open.
  - .6 Coil fins combed, clean.
  - .7 Access doors, installed, closed.
  - .8 Outlets installed, volume control dampers open.
- .3 Liquid systems:
  - .1 Flushed, filled, vented.
  - .2 Correct pump rotation.
  - .3 Strainers in place, baskets clean.
  - .4 Isolating and balancing valves installed, open.
  - .5 Calibrated balancing valves installed, at factory settings.
  - .6 Chemical treatment systems complete, operational.

1.11 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

- .1 HVAC systems: plus 10%, minus 0%.
- .2 Hydronic systems: plus or minus 5%.

1.12 ACCURACY TOLERANCES

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

1.13 INSTRUMENTS

.1 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.2 Calibrate within 3 months of TAB. Provide certificate of calibration to Commissioning Agent and Engineer.

1.14 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.15 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of HRCE Representative and Engineer, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculations procedures.

.4 Summaries.

1.16 TAB REPORT

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:

.1 Project record drawings.

.2 System schematics.

.3 Submit required copies of TAB Report to HRCE Representative and Engineer for verification and approval, in English in D-ring binders, complete with index tabs.

1.17 VERIFICATION

.1 Reported results subject to verification by Commissioning Agent and Engineer.

.2 Provide personnel and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results as directed by Commissioning Agent and Engineer.

.4 Pay costs to repeat TAB as required to satisfaction of HRCE Representative and Engineer.

1.18 SETTINGS

.1 After TAB is completed to satisfaction of HRCE and Engineer, replace drive guards, close access doors, lock devices in set positions ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.19 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by HRCE Representative and Engineer.

1.20 AIR SYSTEMS

.1 Not applicable.

1.21 LIQUID SYSTEMS

.1 Do TAB of the following systems, equipment and controls:

.1 Boiler Circulator Pumps.

1.22 OTHER TAB REQUIREMENTS

.1 General requirements applicable to work specified this paragraph:

.1 Qualifications of TAB personnel: as for air systems specified this section.

.2 Quality assurance: as for air systems specified this section.

1.23 POST-OCCUPANCY TAB

.1 As per Commissioning Plan; refer to Section 01 91 13 – General Commissioning (Cx) Requirements.

Part 2 Products

2.1 NOT USED

.1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 23 31 13 - Metal Ducts - Low Pressure to 500 Pa.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):

.1 ANSI/ASHRAE/IESNA 90.1-01, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

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

.1 ASTM B209M-02, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.2 ASTM C335-95, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.4 ASTM C547-00, Specification for Mineral Fiber Pipe Insulation.

.5 ASTM C553-00, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

.6 ASTM C612-00a, Specification for Mineral Fiber Block and Board Thermal Insulation.

.3 Canadian General Standards Board (CGSB):

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

.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (R1999).

.5 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC-S102-M88 (R2000), Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701-01, Thermal Insulation Polyotrene, Boards and Pipe Covering.

1.3 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as defined herein.

.3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:

.1 CRD: Code Round Ductwork,

.2 CRF: Code Rectangular Finish.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Requirements.

.2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

.3 Indicate VOC's for adhesives and solvents during application and curing.

1.5 MANUFACTURERS' INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with Section 01 33 00 – Submittal Requirements.

.2 Installation instructions to include procedures used and installation standards achieved.

1.6 QUALIFICATIONS

.1 Installer: specialist in performing work of this section, and have at least 3 years successful experience in this size and type of project, member of TIAC.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions recommended by manufacturer.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.

Part 2 Products

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24^{o}C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

2.3 JACKETS

.1 Canvas:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: Compatible with insulation.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

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

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 ULC Listed Canvas Jacket:

.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.5 Outdoor Vapour Retarder Mastic:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

.6 Tape: self-adhesive, aluminum, reinforced, 75 mm wide minimum.

.7 Contact adhesive: quick-setting.

.8 Canvas adhesive: washable.

.9 Tie wire: 1.5 mm stainless steel.

.10 Banding: 19 mm wide, 0.5 mm thick stainless steel.

.11 Fasteners: 4 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

2.5 VOC LIMITS

.1 Refer to Division 21 05 01 – Common Work Results for Mechanical.

Part 3 Execution

3.1 PRE-INSTALLATION REQUIREMENTS

.1 Pressure testing of ductwork systems complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer's instructions and as indicated.

.3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes:

.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, Hangers in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment:

.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: At 300 mm oc in horizontal and vertical directions, minimum two rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: Conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Boiler Combustion Air Intakes	C-1	yes	25

3.4 FIELD QUALITY CONTROL

.1 Verification requirements in accordance with Section 01 45 00 – Quality Control.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Related Sections:

.1 Section 01 91 13 – General Commissioning (Cx) Requirements.

.2 Section 23 08 02 – Cleaning and Start-up of Mechanical Piping.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM E202-04, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

1.3 CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS

.1 In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

1.4 HYDRONIC SYSTEMS - PERFORMANCE VERIFICATION (PV)

.1 Perform hydronic systems performance verification after cleaning is completed and system is in full operation.

.2 When systems are operational, perform following tests:

.1 Conduct full scale tests at maximum design flow rates, temperatures and pressures for continuous consecutive period of 48 hours to demonstrate compliance with design criteria.

.2 Verify performance of hydronic system circulating pumps as specified, recording system pressures, temperatures, fluctuations by simulating maximum design conditions and varying:

.1 Pump operation.

.2 Boiler operation.

.3 Pressure bypass open/closed.

.4 Control pressure failure.

.5 Maximum heating demand.

.6 Boiler failure.

.7 Outdoor reset. Re-check heat exchanger output supply temperature at 100% and 50% reset, maximum water temperature.

1.5 HYDRONIC SYSTEM CAPACITY TEST

.1 Perform hydronic system capacity tests after:

.1 TAB has been completed

.2 Verification of operating, limit, safety controls.

.3 Verification of primary and secondary pump flow rates.

.4 Verification of accuracy of temperature and pressure sensors and gauges.

.2 Calculate system capacity at test conditions.

.3 Using manufacturer's published data and calculated capacity at test conditions, extrapolate system capacity at design conditions.

.4 When capacity test is completed, return controls and equipment status to normal operating conditions.

.5 Submit sample of system water to approved testing agency to determine if chemical treatment is correct. Include cost.

.6 Heating system capacity test:

.1 Perform capacity test when ambient temperature is within 10% of design conditions. Simulate design conditions by:

.1 Increasing OA flow rates through heating coils (in this case, monitor heating coil discharge temperatures to ensure that coils are not subjected to freezing conditions) or

.2 Reducing space temperature by turning of heating system for sufficient period of time before starting testing.

.2 Test procedures:

.1 Open fully heat exchanger, heating coil and radiation control valves.

.2 With boilers on full firing and hot water heating supply temperature stabilized, record flow rates and supply and return temperatures simultaneously.

.3 Conduct flue gas analysis test on boilers at full load and at low fire conditions.

1.6 GASEOUS FUEL SYSTEMS

.1 Operation tests:

.1 Measure gas pressure at gas meter outlet and at burner manifold.

.2 Verify details of temperature and pressure compensation at meter.

.3 Verify settings, operation, venting of high and low pressure cut-outs, alarms.

.4 Check terminals of vents for gas pressure regulators.

1.7 POTABLE WATER SYSTEMS

.1 When cleaning is completed and system filled:

.1 Verify performance of equipment and systems as specified elsewhere in Division 23.

.2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.

.3 Confirm water quality consistent with supply standards, verifying that no residuals remain resulting from flushing and/or cleaning.

1.8 REPORTS

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

1.9 TRAINING

.1 In accordance with Section 01 79 00 – Demonstration and Training.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Procedures and cleaning solutions for cleaning mechanical piping systems.

.2 Related Sections:

.1 Section 01 91 13 – General Commissioning (Cx) Requirements.

.2 Section 23 08 01 – Performance Verification Mechanical Piping Systems.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM E202-00, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

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

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittals Procedures. Include product characteristics, performance criteria, and limitations.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittals Procedures:

.1 Instructions: submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 06 – Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 – Common Product Requirements.

.2 Waste Management and Disposal:

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

Part 2 Products

2.1 CLEANING SOLUTIONS

.1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.

.2 Sodium carbonate: 0.40 kg per 100 L water in system.

.3 Low-foaming detergent: 0.01 kg per 100 L water in system.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 CLEANING HYDRONIC AND STEAM SYSTEMS

.1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.

.2 Cleaning Agency:

.1 Retain qualified water treatment specialist to perform system cleaning.

.3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.

.4 Cleaning procedures:

.1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:

.1 Cleaning procedures, flow rates, elapsed time.

.2 Chemicals and concentrations used.

.3 Inhibitors and concentrations.

.4 Specific requirements for completion of work.

.5 Special precautions for protecting piping system materials and components.

.6 Complete analysis of water used to ensure water will not damage systems or equipment.

.5 Conditions at time of cleaning of systems:

.1 Systems: free from construction debris, dirt and other foreign material.

.2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.

.3 Strainers: clean prior to initial fill.

.4 Install temporary filters on pumps not equipped with permanent filters.

.5 Install pressure gauges on strainers to detect plugging.

.6 Report on Completion of Cleaning:

.1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

.7 Hydronic Systems:

.1 Fill system with water, ensure air is vented from system.

.2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).

.3 Use water metre to record volume of water in system to +/- 0.5%.

.4 Add chemicals under direct supervision of chemical treatment supplier.

.5 Closed loop systems: circulate system cleaner at 60 degrees C for at least 36 h. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.

.6 Flush velocity in system mains and branches to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.

.7 Add chemical solution to system.

.8 Establish circulation, raise temperature slowly to maximum design 82°C minimum. Circulate for 12 h, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38°C. Drain as quickly as possible. Refill with clean water. Circulate for 6 h at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

3.3 START-UP OF HYDRONIC SYSTEMS

.1 After cleaning is completed and system is filled:

.1 Establish circulation and expansion tank level, set pressure controls.

.2 Ensure air is removed.

.3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.

.4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.

.5 Clean out strainers repeatedly until system is clean.

.6 Commission water treatment systems as specified in Section 23 25 00 - HVAC Water Treatment Systems.

.7 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.

.8 Repeat with water at design temperature.

.9 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.

.10 Bring system up to design temperature and pressure slowly over a 48 hour period.

.11 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.12 Adjust pipe supports, hangers, and springs as necessary.

.13 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.

.14 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.

.15 Check operation of drain valves.

.16 Adjust valve stem packing's as systems settle down.

.17 Fully open balancing valves (except those that are factory-set).

.18 Check operation of over-temperature protection devices on circulating pumps.

.19 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

3.4 FIELD QUALITY CONTROL

.1 Verification requirements in accordance with Section 01 45 00 – Quality Control.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for piping, valves and fittings for gas fired equipment.

.2 Related Sections:

.1 Section 23 05 05 - Installation of Pipework.

.2 Section 23 08 01 – Performance Verification of Mechanical Piping Systems.

1.2 REFERENCES

.1 American Society for Testing and Materials International (ASTM):

.1 ASTM A47/A47M-99 (2004), Standard Specification for Ferritic Malleable Iron Castings.

.2 ASTM A53/A53M-04, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

.2 Canadian Standards Association (CSA International):

.1 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel.

.3 Canadian Standards Association (CSA)/Canadian Gas Association (CGA):

.1 CAN/CSA B149.1HB-00, Natural Gas and Propane Installation Code Handbook.

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

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

.2 Indicate on manufacturer’s catalogue literature following: valves.

.3 Submit WHMIS MSDS in accordance with Section 01 35 29 06 – Health and Safety Requirements and Section 21 05 01 – Common Work Results for Mechanical. Indicate VOC's for adhesive and solvents during application and curing.

.3 Test Reports: submit certified test reports from approved testing agent indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Closeout Submittals: submit maintenance and engineering data for incorporation into manual in accordance with Section 01 78 00 – Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 06 – Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Materials and products in accordance with Section 01 61 00 – Common Product Requirements.

2.2 PIPE

.1 Steel pipe: to ASTM A53/A53M, Schedule 40, as follows:

.1 NPS 1/2 to 2, screwed.

.2 NPS 2 1/2 and over, plain end.

2.3 JOINTING MATERIAL

.1 NPS ½ to 2: Screwed fittings: pulverized lead paste.

.2 NPS 2-1/2 and over: Welded fittings: to CSA W47.1.

.3 Flange gaskets: non-metallic flat.

.4 Brazing: to ASTM B837.

2.4 FITTINGS

.1 Steel pipe fittings, screwed (NPS ½ to 2), flanged or welded (NPS 2-1/2 and over):

.1 Malleable iron: screwed, banded, Class 150.

.2 Steel pipe flanges and flanged fittings: to ASME B16.5.

.3 Welding: butt-welding fittings.

.4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47/A47M.

.5 Bolts and nuts: to ASME B18.2.1.

.6 Nipples: schedule 40, to ASTM A53/A53M.

2.5 VALVES

.1 Provincial Code approved, lubricated ball type.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PIPING

.1 Install in accordance with Section 23 05 05 - Installation of Pipework, CAN/CSA B149.1, supplemented as specified.

.2 Install drip points:

.1 At low points in piping system.

.2 At connections to equipment.

3.3 VALVES

.1 Install valves with stems upright or horizontal.

.2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

3.4 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Test system in accordance with CAN/CSA B149.1 and requirements of authorities having jurisdiction.

.2 Obtain reports within 3 days of review and submit immediately to Commissioning Agent and Engineer.

.3 Verification requirements in accordance with Section 01 45 00 – Quality Control.

3.5 ADJUSTING

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

.2 Pre-Start-Up Inspections:

.1 Check vents from regulators, control valves, terminate outside building in approved location, protected against blockage, damage.

.2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.6 CLEANING

.1 Cleaning: in accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems, supplemented as specified.

.2 Perform cleaning operations as specified in Section and in accordance with manufacturer's recommendations.

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation for steel piping, valves and fittings for hydronic systems in building services piping.

.2 Related Sections:

.1 Section 23 05 05 - Installation of Pipework.

.2 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.3 Section 23 08 01 - Performance Verification of Mechanical Piping.

.4 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME):

.1 ASME B16.1-98, Cast Iron Pipe Flanges and Flanged Fittings.

.2 ASME B16.3-98, Malleable Iron Threaded Fittings.

.3 ASME B16.5-03, Pipe Flanges and Flanged Fittings.

.4 ASME B16.9-01, Factory-Made Wrought Butt-welding Fittings.

.5 ASME B18.2.1-03, Square and Hex Bolts and Screws (Inch Series).

.6 ASME B18.2.2-87 (R1999), Square and Hex Nuts (Inch Series).

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

.1 ASTM A47/A47M-99, Standard Specification for Ferritic Malleable Iron Castings.

.2 ASTM A53/A53M-02, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

.3 ASTM A536-84 (1999) e1, Standard Specification for Ductile Iron Castings.

.4 ASTM B61-02, Standard Specification for Steam or Valve Bronze Castings.

.5 ASTM B62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.

.6 ASTM E202-00, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

.3 American Water Works Association (AWWA):

.1 AWWA C111-00, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Canadian Standards Association (CSA International):

.1 CSA B242-M1980 (R1998), Groove and Shoulder Type Mechanical Pipe Couplings.

.2 CAN/CSA W48-01, Filler Metals and Allied Materials for Metal Arc Welding (Developed in cooperation with the Canadian Welding Bureau).

.5 Manufacturer's Standardization of the Valve and Fittings Industry (MSS).

.1 MSS-SP-70-98, Cast Iron Gate Valves, Flanged and Threaded Ends.

.2 MSS-SP-71-97, Cast Iron Swing Check Valves Flanged and Threaded Ends.

.3 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.

.4 MSS-SP-85-02, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual in accordance with Section 01 78 00 – Closeout Submittals.

.3 Submit required copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 35 29 06 – Health and Safety Requirements. Indicate VOC's for adhesives and solvents during application and curing.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 45 00 – Quality Control.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Waste Management and Disposal.

1.6 MAINTENANCE

.1 Extra Materials:

.1 Provide following spare parts:

.1 Valve seats: one for every ten valves, each size. Minimum one.

.2 Discs: one for every ten valves, each size. Minimum one.

.3 Stem packing: one for every ten valves, each size. Minimum one.

.4 Valve handles: two of each size.

.5 Gaskets for flanges: one for every ten flanges.

Part 2 Products

2.1 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:

.1 Up to NPS 8: Scheduled 40.

2.2 PIPE JOINTS

.1 NPS2 and under: screwed fittings with lead-free pipe dope.

.2 NPS2-1/2 to NPS 8:

.1 Welding fittings and flanges to CAN/CSA W48.

.2 Rolled grooved c/w Victaulic #107 Quick Vic couplings w/EHP gaskets -30°F to 250°F, if the following conditions are met:

.1 Victaulic includes 10 year warranty on material.

.2 Victaulic factory trained representative supplies on-site tool and product installation training.

.3 Grooved products have current CRN numbers.

.4 Contractor provides grooved product submittals.

.5 Victaulic flange adaptors used where required.

.3 Pipe thread: taper.

.4 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.

2.3 FITTINGS

.1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.

.2 Grooved fittings: Victaulic ductile iron.

.3 Pipe flanges and flanged fittings:

.1 Cast iron: to ASME B16.1, Class 125.

.4 Butt-welding fittings: steel, to ASME B16.9.

.5 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.

2.4 VALVES

.1 Connections:

.1 NPS 2 and smaller: screwed ends.

.2 NPS 2 1/2 and larger: flanged ends or roll grooved.

.2 Butterfly valves: Application: Isolating equipment and branches.

.1 NPS 2-1/2 and over (Roll grooved):

.1 Victaulic Vic 300 Master seal butterfly valve c/w EHP seat -30°F to 250°F.

.3 Gate valves: Application: Isolating equipment and branches:

.1 NPS 2 and under:

.1 Mechanical Rooms: Class 125, rising stem, solid wedge disc, bronze body.

.1 Approved Product: Jenkins 810J or approved equal.

.2 NPS 2-1/2 and over (flanged):
.1 Mechanical Rooms: rising stem, solid wedge disc, cast iron body.
.1 Operators: Hand wheel.
.1 Approved Product: Jenkins 452J or approved equal.

.4 Swing check valves: to MSS-SP-71:
.1 NPS 2 and under:
.1 Class 125, swing, with composition disc, bronze body.
.1 Approved Product: Jenkins 4041TJ or approved equal.
.2 NPS 2 ½ and over:
.1 Flanged:
.1 Class 125, swing, w/composition disc, cast iron body.
.1 Approved Product: Jenkins 587J or approved equal.
.2 Roll Grooved: Victaulic #716.

.5 Ball valves:
.1 NPS 2 and under: class 150, brass body, PTFE ball disc packing.
.1 Approved Product: Jenkins 201J or approved equal.

Part 3 Execution

3.1 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 05- Installation of Pipe Work.

3.2 CLEANING, FLUSHING AND START-UP

.1 In accordance with Section 23 08 02 - Cleaning and Start-Up of Mechanical Piping Systems.

3.3 TESTING

.1 Test system in accordance with Section 21 05 01 - Common Work Results for Mechanical.

3.4 BALANCING

.1 Balance water systems to within plus or minus 5% of design output.

.2 Refer to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC for applicable procedures.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 The supply and installation of Hydronic Specialties Equipment.

.2 Related Sections:

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

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME):

.1 ASME-04, Boiler and Pressure Vessel Code.

.2 American Society for Testing and Materials, (ASTM):

.1 ASTM A47/A47M-99, Specification for Ferritic Malleable Iron Castings.

.2 ASTM A278M-01, Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650°F (345°C).

.3 ASTM A516/A516M-96 (e1), Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.

.4 ASTM A536-84 (1999) e1, Specification for Ductile Iron Castings.

.5 ASTM B62-93, Specification for Composition Bronze or Ounce Metal Castings.

.3 Canadian Standards Association (CSA International):

.1 CSA B51-03, Boiler, Pressure Vessel, and Pressure Piping Code.

1.3 SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Division 01 – General Requirements:

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Indicate on product data expansion tanks, air vents, separators, valves, strainers, heat exchanger and low loss header.

.3 Indicate VOC's for all adhesives and solvents during application and curing.

.3 Closeout Submittals:

.1 Submit maintenance data in accordance with Section 01 78 00 – Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 06 – Health and Safety Requirements.

1.5 DELIVERY STORAGE AND DISPOSAL

.1 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Waste Management and Disposal.

Part 2 Products

2.1 MATERIAL

.1 Sustainable Requirements:

.1 Materials and resources in accordance with Section 01 61 00 – Common Product Requirements.

2.2 AUTOMATIC AIR VENT

.1 Industrial float vent: solid brass body and cover and NPS 1/2 connection and rated at 1039 kPa working pressure.

.2 Float: solid material suitable for 132°C (270°F) working temperature.

.3 Air release without shut-off.

.4 Approved Products: Spirotherm Spirotop VTP.

2.3 LOW LOSS HEADER: LLH-1

.1 Steel pressure vessel designed and constructed as per ASME Section VIII.

.2 Insulated with a minimum of 25 mm Thermal Insulation complete with jacket suitable for exposed installations.

.3 Working pressure: 1 MPa.

.4 Flow Rate: 9.4 l/s (149 gpm).

.5 Complete with high capacity automatic air vent and 50 mm drain/flush tapping.

.6 Connection Sizes: Minimum 100 mm (4") ANSI Class Flange.

.7 Approved Product: Viessmann Model 250/150.

.8 Approved Alternate Manufacturers:

.1 Caleffi 549 Hydrocal

.2 Xylem PSH.4

2.4 CIRCUIT BALANCING VALVE

.1 ANSI flanged connections or roll grooved ends.

.2 Ductile Iron body, ASTM A536, epoxy resin coated.

.3 Max Working Pressure: 1207 kPa (175 psig).

.4 Max Working Temperature: 121°C (250°F).

.5 Nominal Flow Rate: as required.

.6 Approved Product:
- .1 Armstrong Armflo CBV4G
- .2 Victaulic TA Series
- .3 Xylem Circuit Setter Plus

2.5 PIPE LINE STRAINER (NPS 2-1/2" AND UP)

.1 Ductile Iron Body to ASTM A536 w/enamel coating.

.2 304 SS 1.5mm (0.062") perforated strainer screen.

.3 Size: as indicated on drawings.

.4 Approved Product:
- .1 Victaulic #732
- .2 Armstrong
- .3 BSG

2.6 PIPE LINE STRAINER (UP TO NPS 2)

.1 Bronze Body (ASTM B62).

.2 Threaded connection.

.3 Y-Pattern type.

.4 Screen with 1.19 mm perforations.

.5 Working pressure: 860 kPa (125 psi.).

2.7 HYDRONIC EXPANSION TANK: ET-1

.1 Replaceable bladder design.

.2 ASME Section VIII, Division I Construction.

.3 Integral Floor Stand.

.4 Pre-charged to 82.7 kPa (12 psi.).

.5 Max Working Pressure: 861 kPa (125 psi.).

.6 Tank Volume: 200 L (50 gal).

.7 1039 mm x 610 mm Ø (40" x 24" Ø).

.8 Approved Product:

.1 Amtrol Model 200 L

.2 Armstrong

.3 Xylem B-200LA

Part 3 Execution

3.1 GENERAL

.1 Install as indicated and to manufacturer's recommendations.

.2 Run drain lines and blow off connections to terminate above nearest drain.

.3 Maintain proper clearance to permit service and maintenance.

.4 Should deviations beyond allowable clearances arise, request and follow HRCE Representative's and Engineer's directive.

.5 Check shop drawings for conformance of all tappings for ancillaries and for equipment operating weights.

3.2 STRAINERS

.1 Install in horizontal or down flow lines.

.2 Ensure clearance for removal of basket.

.3 Install ahead of each pump.

.4 Install ahead of each automatic control valve larger than NPS 1 and as indicated.

3.3 AIR VENTS

.1 Install at high points of systems.

3.4 EXPANSION TANKS

.1 Adjust expansion tank pressure to suit design criteria.

.2 Install lock shield type valve at inlet to tank.

3.5 VERIFICATION

.1 Verification requirements in accordance with Section 01 91 13 – General Commissioning (Cx) Requirements.

3.6 PRESSURE SAFETY RELIEF VALVES

.1 Run discharge pipe to terminate above nearest drain.

3.7 SUCTION DIFFUSERS

.1 Install on inlet to pumps having suction size greater than 50.

3.8 PERFORMANCE VERIFICATION

.1 In accordance with Section 23 08 01 - Performance Verification of Mechanical Piping Systems, supplemented as specified herein.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials, equipment selection, installation and start up for hydronic system pumps.

1.2 RELATED SECTIONS

.1 Section 21 05 01 – Common Work Results for Mechanical.

.2 Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

1.3 REFERENCES

.1 American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE):

.1 Standard 90.1-2001 Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 Electrical Equipment Manufacturers Advisory Council (EEMAC).

.3 Canadian Standards Association (CSA International):

.1 CAN/CSA-B214-01, Installation Code for Hydronic Heating Systems.

.4 National Electrical Manufacturers Association (NEMA):

.1 NEMA MG 1-2003, Motors and Generators.

1.4 HEALTH AND SAFETY

.1 Do construction occupational health and safety in accordance with Section 01 35 29 06 – Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Waste and Management Disposal.

Part 2 Products

2.1 VERTICAL IN-LINE CIRCULATORS

.1 Volute: cast iron radially split with tapped openings for venting, draining and gauge connections.

.2 Impeller: stainless steel.

.3 Shaft: stainless steel with bronze sleeve bearing, integral thrust collar.

.4 Seal assembly: mechanical seal to 135^{o}C.

.5 Motor: VFD rated to NEMA 31.1

.6 Approved Product:

.1 Armstrong 4380

.2 Xylem E-80 Series

.3 Taco KV Series

Part 3 Execution

3.1 INSTALLATION

.1 Do Work in accordance with CAN/CSA-B214.

.2 In line circulators: install as indicated by flow arrows. Support at inlet and outlet flanges or unions. Install with bearing lubrication points accessible.

.3 Ensure that pump body does not support piping or equipment. Provide stanchions or hangers for this purpose. Refer to manufacturer's installation instructions for details.

.4 Pipe drain tapping to floor drain, if required.

.5 Install volute venting pet cock in accessible location.

.6 Check rotation prior to start-up.

.7 Install pressure gauge test cocks.

3.2 START-UP

.1 General:

.1 In accordance with Section 01 91 00 – General Commissioning (Cx) Requirements; supplemented as specified herein.

.2 In accordance with Manufacturer's recommendations.

.2 Procedures:

.1 Before starting pump, check that cooling water system over-temperature and other protective devices are installed and operative.

.2 After starting pump, check for proper, safe operation.

.3 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.

.4 Check base for free-floating, no obstructions under base.

.5 Run-in pumps for 12 continuous hours.

.6 Verify operation of over-temperature and other protective devices under low- and no-flow condition.

.7 Eliminate air from scroll casing.

.8 Adjust water flow rate through water-cooled bearings.

.9 Adjust flow rate from pump shaft stuffing boxes to manufacturer's recommendation.

.10 Adjust alignment of piping and conduit to ensure true flexibility at all times.

.11 Eliminate cavitation, flashing and air entrainment.

.12 Adjust pump shaft seals, stuffing boxes, glands.

.13 Measure pressure drop across strainer when clean and with flow rates as finally set.

.14 Replace seals if pump used to degrease system or if pump used for temporary heat.

.15 Verify lubricating oil levels.

3.3 PERFORMANCE VERIFICATION (PV)

.1 General:

.1 In accordance with Section 01 91 00 – General Commissioning (Cx) Requirements: General Requirements, supplemented as specified herein.

.2 In accordance with manufacturer's recommendations.

.2 Exclusions:

.1 This paragraph does not apply to small in-line circulators.

.3 Assumptions: these PV procedures assume that:

.1 Manufacturer's performance curves are accurate.

.2 Valves on pump suction and discharge provide tight shut-off.

.4 Multiple Pump Installations - Series and Parallel:

.1 Repeat PV procedures specified above for pump performance and pump BHP for combinations of pump operations.

.5 Mark points of design and actual performance at design conditions as finally set upon completion of TAB.

.6 Commissioning Reports: In accordance with Division 01 – Commissioning Sections. Reports supplemented as specified herein. Reports to include:

.1 Record of point(s) of actual performance at maximum and minimum conditions and for single and parallel operation as finally set at completion of commissioning on pump curves.

.2 Pump performance curves (family of curves).

3.4 OPERATION REQUIREMENTS

.1 Operational requirements in accordance with Section 01 79 00 – Demonstration and Training.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials, components, equipment and chemicals for installation of complete HVAC water treatment system.

.2 Related Sections:

.1 Section 01 91 00 – General Commissioning (Cx) Requirements.

.2 Section 23 08 02 – Cleaning and Start-up of Mechanical Piping Sections.

1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME):

.1 ASME Boiler and Pressure Vessel Code, Section VII-2004.

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

.1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit required copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 35 29 06 – Health and Safety Requirements. Indicate VOC's for adhesives and solvents during application and curing.

.2 Shop Drawings:

.1 Submit Manufacturer printed shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.3 Quality assurance submittals: submit following in accordance with Section 01 45 00 – Quality Control.

.4 Closeout Submittals:

.1 Submit operation and maintenance data for incorporation into manual in accordance with Section 01 78 00 – Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 45 00 – Quality Control.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 21 05 01 – Common Work Results for Mechanical.

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

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 01 61 00 – Common Product Requirements.

2.2 MANUFACTURER

.1 Equipment, chemicals, service provided by one supplier.

2.3 POT FEEDER

.1 Bypass Feeder: provide one bypass feeder with a capacity of 5 gallons. The feeder shell shall be constructed of 10 gauge steel minimum. Tank heads shall be a minimum of 9 gauge steel. The bypass feeder shall be rated at 2 MPa (300 psi.).

.2 The tank shall have a minimum opening of 80 mm (3 ½ inches) and a continuous threaded closure requiring a minimum of 2 turns to close and seal completed with a ring gasket seal. The gasket shall not be restrained from movement.

.3 Acceptable Materials:
- .1 Neptune DBF-5HP.
- .2 Approved Equal.

2.4 LINE-FILTER

.1 General filtration Model GF010.

.2 Include (10X) spare filter cartridges.

2.5 CHEMICAL FEED PIPING

.1 Resistant to chemicals employed. Pressure rating: 860 kPa.

2.6 WATER TREATMENT FOR HYDRONIC SYSTEMS

.1 Hot water heating system: pot feeder, 25 L, operating pressure 860 kPa.

.2 Micron filter for each pot feeder:
- .1 Capacity 2% of pump recirculating rate at operating pressure.
- .2 Six (6) sets of filter cartridges for each type, size of micron filter.

2.7 CHEMICALS

.1 Provide 1 years supply.

2.8 TEST EQUIPMENT

.1 Provide one set of test equipment for each system to verify performance.

.2 Complete with carrying case, reagents for chemicals, specialized or supplementary equipment.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install HVAC water treatment systems in accordance with ASME Boiler Code Section VII, and requirements and standards of authorities having jurisdiction, except where specified otherwise.

.2 Ensure adequate clearances to permit performance of servicing and maintenance of equipment.

3.3 CHEMICAL FEED PIPING

.1 Install crosses at changes in direction. Install plugs in unused connections.

3.4 CLEANING OF MECHANICAL SYSTEM

.1 Provide copy of recommended cleaning procedures and chemicals for approval by Engineer.

.2 Flush mechanical systems and equipment with approved cleaning chemicals designed to remove deposition from construction such as pipe dope, oils, loose mill scale and other extraneous materials. Use chemicals to inhibit corrosion of various system materials that are safe to handle and use.

.3 Examine and clean filters and screens, periodically during circulation of cleaning solution, and monitor changes in pressure drop across equipment.

.4 Drain and flush systems until alkalinity of rinse water is equal to make-up water. Refill with clean water treated to prevent scale and corrosion during system operation.

.5 Disposal of cleaning solutions approved by authority having jurisdiction.

3.5 WATER TREATMENT SERVICES

.1 Provide water treatment monitoring and consulting services for period of one year after system start-up. Service to include:

.1 Initial water analysis and treatment recommendations.

.2 System start-up assistance.

.3 Operating staff training.

.4 Visit plant every 5 days during period of operation and as required until system stabilizes, and advise on treatment system performance.

.5 Provide necessary recording charts and log sheets for one year operation.

.6 Provide necessary laboratory and technical assistance.

.7 Provide clear, concise, written instructions and advice to operating staff.

3.6 FIELD QUALITY CONTROL

.1 Start-up:

.1 Start up water treatment systems in accordance with manufacturer's instructions.

.2 Commissioning:

.1 Commissioning Agency: to be installing water treatment sub-contractor.

.2 Timing:

.1 After start-up deficiencies rectified.

.2 After start-up and before TAB of connected systems.

.3 Pre-commissioning Inspections: verify:

.1 Presence of test equipment, reagents, chemicals, details of specific tests performed, and operating instructions.

.2 Suitability of log book.

.3 Currency and accuracy of initial water analysis.

.4 Required quality of treated water.

.4 Commissioning procedures - applicable to Water Treatment Systems:

.1 Establish, adjust as necessary and record automatic controls and chemical feed rates.

.2 Monitor performance continuously during commissioning of connected systems and until acceptance of project.

.3 Establish test intervals, regeneration intervals.

.4 Record on approved report forms commissioning procedures, test procedures, dates, times, quantities of chemicals added, raw water analysis, treated water analysis, test results, instrument readings, adjustments made, results obtained.

.5 Establish, monitor and adjust automatic controls and chemical feed rates as necessary.

.6 Visit project at specified intervals after commissioning is satisfactorily completed to verify that performance remains as set during commissioning (more often as required until system stabilizes at required level of performance).

.7 Advise HRCE Representative and Engineer in writing on matters regarding installed water treatment systems.

.5 Commissioning procedures - Closed Circuit Hydronic Systems:

.1 Analyze water in system.

.2 Based upon an assumed rate of loss approved by Engineer, establish rate of chemical feed.

.3 Record types, quantities of chemicals applied.

.6 Training:

.1 Commission systems, perform tests in presence of, and using assistance of, assigned O&M personnel.

.2 Train O&M personnel in softener regeneration procedures.

.7 Certificates:

.1 Upon completion, furnish certificates confirming satisfactory installation and performance.

.8 Commissioning Reports:

.1 To include system schematics, test results, test certificates, raw and treated water analyses, design criteria, other data required by HRCE Representative and Engineer.

.9 Commissioning activities during Warranty Period:

.1 Check out water treatment systems on regular basis and submit written report to HRCE Representative and Engineer.

.3 Verification requirements in accordance with Section 01 91 13 – General Commissioning (Cx) Requirements.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

.2 Related Sections:

.1 Section 07 84 00 - Firestopping.

.2 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.3 Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

.4 Section 23 07 13 – Duct Insulation.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

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

.1 ASTM A480/A480M-03c, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.

.2 ASTM A635/A635M-02, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.

.3 ASTM A653/A653M-03, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Department of Justice Canada (Jus):

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

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

.1 Material Safety Data Sheets (MSDS).

.5 National Fire Protection Association (NFPA):

.1 NFPA 90A-02, Standard for the Installation of Air-Conditioning and Ventilating Systems.

.2 NFPA 90B-02, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.3 NFPA 96-01, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition 1995 and Addendum No. 1, 1997.

.2 SMACNA HVAC Air Duct Leakage Test Manual, 1985, 1st Edition.

.3 IAQ Guideline for Occupied Buildings Under Construction 1995, 1st Edition.

.7 Transport Canada (TC):

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29 06 – Health and Safety Requirements for the following:

.1 Sealants.

.2 Tape.

.3 Proprietary Joints.

.3 Co-ordinate submittal requirements and provide submittals required in accordance with Section 01 33 00 – Submittal Procedures.

.4 Submit Indoor Air Quality (IAQ) Management Plan.

.5 Indicate VOC's for adhesives and solvents during application and curing.

1.4 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 06 – Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

.2 Store and manage hazardous materials in accordance with Division 21 05 01 – Common Work Results for Mechanical and Manufacturer's Written Instructions.

.3 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Waste Management and Disposal.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and resources in accordance with Section 01 61 00 – Common Product Requirements.

2.2 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C

.2 Seal classification:

.1 Class C: transverse joints and connections made air tight with gaskets, sealant or combination thereof. Longitudinal seams unsealed.

2.3 SEALANT

.1 Sealant: oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.

.2 Indicate VOC's during application and curing.

2.4 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.5 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.6 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:

.1 Rectangular: standard radius.

.2 Round: five piece.

.3 Mitred elbows, rectangular:

.1 To 400 mm: with double thickness turning vanes.

.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: 45 degrees entry on branch.

.2 Round main and branch: enter main duct at 45 degrees with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.4 Main duct branches: with splitter damper.

.5 Transitions:

.1 Diverging: 20 degrees maximum included angle.

.2 Converging: 30 degrees maximum included angle.

.6 Offsets:

.1 Full radiused elbows or as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area:

.1 Maximum included angles: as for transitions.

2.7 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 – Firestopping, Fire Damper Manufacturer's written instructions and local authority having jurisdiction.

.2 Fire stopping material and installation must not distort duct.

2.8 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.

.3 Joints: to ASHRAE and SMACNA.

2.9 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment:

.1 Hanger configuration: to ASHRAE and SMACNA.

.2 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE and SMACNA:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.3 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.2 For steel joist: manufactured joist clamp.

.3 For steel beams: manufactured beam clamps.

Part 3 Execution

3.1 GENERAL

.1 Do not break continuity of insulation vapour barrier with hangers or rods.

.2 Support risers in accordance with ASHRAE and SMACNA.

.3 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

3.4 FIELD QUALITY CONTROL

.1 Verification requirements in accordance with Section 01 45 00 – Quality Control.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Materials, accessories and installation for breechings, chimneys and stacks.

.2 Related Sections:

.1 Division 21 05 01 – Common Work Results for Mechanical.

.2 Section 23 52 00 – Heating Boilers.

.3 Section 22 30 05 – Domestic Water Heaters.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

.2 Underwriters' Laboratories of Canada (ULC).

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

.1 Material Safety Data Sheets (MSDS).

1.3 CODES AND APPLICABLE STANDARDS

.1 All products furnished under this Section shall conform to the requirements of The National Fuel Gas Code, ANSI Z223.1/NFPA-54 where applicable and shall comply with and be listed to UL 1738, the U.S. Standard for Venting Systems for Gas – Burning Appliances, Category II, III and IV and ULC-S636-95, the Canadian Standard for Type BH gas vent systems. Components coming in direct contact with products of combustion shall carry the appropriate UL or ULC.

.2 It can also comply to Standard UL-641 and ULC-S609 for venting of L-Vent certified appliances.

1.4 WARRANTIES

.1 The Manufacturer shall warrant the Positive Pressure Vent System against defects in material and workmanship for a period of 15 years from the date of original installation. Any portion of the vent repaired or replaced under the warranty shall be warranted for the remainder of the original warranty period.

1.5 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.1 Submit required copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 35 29 06 – Health and Safety Requirements – indicate VOC’s for all adhesives and solvents during application and curing.

.2 Shop Drawings:

.1 Submit Manufacturer printed shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Indicate following:

.1 Methods of sealing sections.

.2 Methods of expansion.

.3 Details of thimbles.

.4 Bases/Foundations.

.5 Supports.

.6 Guy details.

.7 Rain caps.

.8 Barometric Relief Dampers.

.3 Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.

.4 Closeout Submittals:

.1 Submit operation and maintenance data for incorporation into manual in accordance with Section 01 78 00 – Closeout Submittals.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with CEPA and applicable Provincial /Territorial regulations.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 06 – Health and Safety Requirements.

.3 Certificates:

.1 Catalogued or published ratings: obtained from tests carried out by independent testing agency or manufacturer signifying adherence to codes and standards.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions, Section 01 61 00 – Common Product Requirements and Section 21 05 01 – Common Work Results for Mechanical.

.2 Waste Management and Disposal:

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

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 01 61 00 – Common Product Requirements.

2.2 SINGLE-WALL POSITIVE PRESSURE VENT

.1 The vent shall be of single wall, factory built type, designed for use in conjunction with Category I II, III or IV condensing or non-condensing gas fired appliances or as specified by the heating equipment manufacturer.

.2 Maximum continuous flue gas temperature shall not exceed 550°F (288°C).

.3 Vent shall be ULC listed for a maximum positive pressure rating of 6" w.c. and shall have passed at 35" w.c.

.4 The vent system shall be continuous from the appliance's flue outlet to the vent termination outside the building. All system components shall be UL/cUL listed and supplied from the same manufacturer.

.5 The vent shall be constructed from 29 ga., Type 304 stainless steel.

.6 All system components such as vent supports, roof or wall penetrations, terminations, appliance connectors and drain fittings require to install the vent system shall be UL listed and provided by the vent manufacturer.

.7 Vent layout shall be designed and installed in compliance with manufacturer's installation instructions and all applicable local codes.

2.3 DOUBLE-WALL POSITIVE PRESSURE VENT

.1 The vent shall be of double wall, factory built type, designed for use in conjunction with Category I II, III or IV condensing or non-condensing gas fired appliances or as specified by the heating equipment manufacturer. Can also be used on L-Vent certified appliances.

.2 Maximum continuous flue gas temperature shall not exceed 550°F (288°C).

.3 Vent shall be listed for a maximum positive pressure rating of 6" w.c. and shall have passed at 35" w.c.

.4 The vent system shall be continuous from the appliance's flue outlet to the vent termination outside the building. All system components shall be listed to UL or ULC standard and supplied from the same manufacturer.

.5 The vent shall be constructed with an inner and outer tube, where the annular air space between the tubes is 1 inch.

.6 The inner tube (flue gas conduit) shall be constructed from 20 ga., Type 304 stainless steel.

.7 The outer tube (jacket) shall be constructed from 441 stainless steel, with a minimum wall thickness of .020" for 4" through 10" diameter vents, and .024" for 12" to 24" diameter vents.

.8 All system components such as vent supports, roof or wall penetrations, terminations, appliance connectors and drain fittings require to install the vent system shall be listed to UL/ULC standard and provided by the vent manufacturer.

.9 Vent layout shall be designed and installed in compliance with manufacturer's installation instructions and all applicable local codes.

2.4 ACCESSORIES

.1 Cleanouts: bolted, gasketted type, full size of breeching, as indicated.

.2 Hangers and supports: in accordance with recommendations of Sheet Metal and Air Conditioning Contractors National Association Inc. (SMACNA) as indicated.

.3 Vent termination as per boiler manufacturer's recommendations.

.4 Expansion sleeves with heat resistant caulking, held in place as indicated.

2.5 ACCEPTABLE MANUFACTURERS

.1 Security Chimneys International, Secure Seal.

.2 Industrial Chimney – VIC.

.3 Chiminee Lining IPP.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION – GENERAL

.1 Follow manufacturer's and SMACNA installation recommendations for shop fabricated components.

.2 Suspend breeching as per manufacturer's inspections.

.3 Support chimneys at bottom, roof and intermediate levels as indicated.

.4 Install thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney. Pack annular space with heat resistant caulking.

.5 Install flashings on chimneys penetrating walls as per Manufacturer's instructions.

.6 Install exit cones and cleanouts, as indicated.

.7 The vent system shall be routed to maintain minimum clearance to combustibles as specified by the manufacturer.

3.3 FIELD QUALITY CONTROL

.1 Verification requirements in accordance with Section 01 45 00 – Quality Control.

3.4 CLEANING

.1 Proceed in accordance with Section 01 79 11 – Cleaning.

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

.3 The vent system and breeching shall be inspected and cleaned before the final connection to the appliances.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 American Boiler Manufacturer's Association (ABMA).

.2 American National Standards Institute (ANSI):

.1 ANSI Z21.13-2004/CSA 4.9-2004, Gas-Fired Low-Pressure Steam and Hot Water Boilers.

.3 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME):

.1 ANSI/ASME Boiler and Pressure Vessel Code, Section IV, 2004.

.4 Canadian Gas Association (CGA):

.1 CAN/CSA-B149.1-05, Natural Gas and Propane Installation Code.

.5 Canadian Standards Association (CSA International):

.1 CSA B51-03, Boiler, Pressure Vessel, and Pressure Piping Code.

.6 Electrical and Electronic Manufacturer's Association of Canada (EEMAC).

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

.1 Material Safety Data Sheets (MSDS).

1.2 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial /Territorial regulations and authority.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 06 – Health and Safety Requirements.

1.3 UNLOADING, HANDLING AND STORING

.1 Packing, shipping, handling and unloading:

.1 Store and handle in accordance with manufacturer's written instructions, Section 01 61 00 – Common Product Requirements and Section 21 05 01 – Common Work Results for Mechanical.

.2 Waste Management and Disposal:

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

Part 2 Products

2.1 HEATING BOILERS B-1 and B-2

.1 Boilers to be provided by Owner and shipped to site. This Contractor shall off-load and put in place in Boiler Room.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Boiler to be shipped to site by others. Unloading, storage on-site and final locating by this Contractor.

.2 Install in accordance with ANSI/ASME Boiler and Pressure Vessels Code Section IV, regulations of Province having jurisdiction, except where specified otherwise, and manufacturers recommendations.

.3 Make required piping connections to inlets and outlets recommended by boiler manufacturer.

.4 Maintain clearances as indicated or if not indicated, as recommended by manufacturer for operation, servicing and maintenance without disruption of operation of any other equipment/system.

.5 Pipe hot water relief valves full size to nearest drain.

.6 Pipe blow down/drain to blow down tank/floor drain.

.7 Natural gas fired installations - in accordance with CAN/CSA-B149.1.

3.3 MOUNTINGS AND ACCESSORIES

.1 Safety valves and relief valves:

- .1 Run separate discharge from each valve.
- .2 Terminate discharge pipe as indicated.
- .3 Run drain pipe from each valve outlet and drip pan elbow to above nearest drain.

.2 Blow down valves:

- .1 Run discharge to terminate as indicated.

3.4 FIELD QUALITY CONTROL

.1 Commissioning:

.1 Manufacturer to:

.1 Certify installation.

.2 Start up and commission installation.

.3 Carry out on-site performance verification tests.

.4 Demonstrate operation and maintenance.

.5 Assist Commission Agent in building Commissioning in accordance with Section 01 91 00 – General Commissioning (Cx) Requirements.

.2 Provide Engineer and Commissioning Agent at least 24 hours notice prior to inspections, tests, and demonstrations. Submit written report of inspections and test results.

3.5 CLEANING

.1 Proceed in accordance with Section 01 74 11 – Cleaning.

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

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Methods and procedures for start-up, verification and commissioning, for building Energy Monitoring and Control System (EMCS) and includes:

.1 Start-up testing and verification of systems.

.2 Check out demonstration or proper operation of components.

.3 On-site operational tests.

.2 Related Sections:

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 78 00 – Closeout Submittals.

.3 Section 01 79 00 – Demonstration and Training.

.4 Section 25 05 01 – EMCS: General Requirements.

1.2 DEFINITIONS

.1 Design Criteria: All pertinent information for the design, including key assumptions and limitations including such as temperature, occupancy, codes, references and indoor air quality.

.2 Design Intent: a detailed explanation of the ideas, concepts and criteria that are defined by the Owner to be important.

.3 PID – Proportional, Integral and Derivative.

1.3 CONTROLS VERIFICATION

.1 EMCS contractor shall test each point system, and sequence, and submit verification reports to satisfaction of HRCE Site Representative.

.2 Reports required:

.1 Point Verification Report. – See Appendix C.

.2 System Verification Report.

.3 Sequence Verification Report.

.4 Above noted reports shall be submitted prior to interim inspection, or substantial performance.

1.4 DESIGN REQUIREMENTS

.1 Confirm with HRCE Site Representative that Design Criteria and Design Intents are still applicable.

.2 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intents.

1.5 SUBMITTALS

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

.2 Final Report: submit report to HRCE Site Representative.

.1 Include measurements, final settings and certified test results.

.2 Bear signature of commissioning technician and supervisor

.3 Report format to be approved by HRCE Site Representative before commissioning is started.

.4 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to HRCE Site Representative in accordance with Section 01 78 00 - Closeout Submittals.

.5 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

1.6 CLOSEOUT SUBMITTALS

.1 Provide documentation, O&M Manuals, and training of O&M personnel for review by HRCE Site Representative before interim acceptance in accordance with Section 01 78 00 – Closeout Submittals.

1.7 CONTROL SYSTEM CHECKOUT AND TESTING

.1 Start-up Testing: All testing listed in this article shall be performed by the Contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Owner's Representative is notified of system demonstration.

.1 The Contractor shall furnish all labour and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.

.2 The mechanical design engineer shall reserve the right to use any piece of electrical equipment, device, or material for such reasonable lengths of time and at such times as he may require to make complete and thorough tests of same before the final completion and acceptance.

.3 Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.

.4 Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures per manufacturers' recommendations.

.5 Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.

.6 Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The Contractor shall check all control valves and automatic dampers to ensure proper action and closure. The Contractor shall make any necessary adjustments to valve stem and damper blade travel.

.7 Verify that the system operation adheres to the Sequences of Operation.

.8 Alarms and Interlocks:

.1 Check each alarm separately by including an appropriate signal at a value that will trip the alarm.

.2 Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.

.3 Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

.9 Mechanical deficiencies which may inhibit operation/control of the mechanical systems shall be brought to the attention of HRCE Site Representative.

1.8 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

.1 Demonstration:

.1 Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed its own tests.

.2 The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" in this specification. The HRCE Site Representative will be present to observe and review these tests. The HRCE Site Representative shall be notified at least 10 days in advance of the start of the testing procedures.

.3 The demonstration process shall follow that approved in "Submittals". The approved checklists and forms shall be completed for all systems throughout the demonstration.

.4 The contractor shall provide at least two persons equipped with two-way communication, and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes.

.5 The purpose is to demonstrate the calibration, response, and action of every point/object and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.

.6 For educational facilities and buildings over 20,000 square feet, the contractor shall provide a controls representative on site for two days to assist HRCE testing and to be available to respond to telephone inquiries during the testing period. For other buildings, the controls representative is to be available to respond to telephone inquiries by HRCE during the test period.

.7 As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed. This will form part of the **"Point Verification Report" Appendix IV**. Verification of all input/output points with regards to proper operation. HRCE Site Representative will inspect 100% of all points for physical installation, including conduit, wire, labels, connections, etc. HRCE Site Representative commissioning agent may choose to randomly inspect 50% of each point type for input/output response.

Any failure will result in termination of inspection and future 100% inspections will be at the contractor's cost.

.7 **Contractor to provide representative on-site for two (2) days to assist HRCE testing and to be available to respond to telephone inquiries during this period.**

.2 Final Acceptance:

.1 This phase shall consist of verifying to HRCE Site Representative that the deficiencies as identified during "Demonstration" have been rectified. If deficiencies are still found, the Contractor will have one week to correct them and costs for additional inspection shall be billed to the contractor.

.2 Demonstrate compliance with "System Performance".

.3 Demonstrate and simulate compliance with Sequences of Operation through all modes of operation.

.4 Demonstrate complete operation of Operator Interface.

.5 Additionally, the following items shall be demonstrated:

.1 DDC Loop Response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in setpoint, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the setpoint, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the contractor.

.2 Optimum Start/Stop. The contractor shall supply a trend data output showing the capability of the algorithm. The hour-by-hour trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.

.3 Operational logs for each system that indicate all setpoints, operating points, valve positions, mode, and equipment status shall be submitted to the HRCE Site Representative. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.

.4 A power failure for the building will be simulated and proper system operation and recovery observed.

.3 Any tests that fail to demonstrate the proper operation of the system shall be repeated at a later date. The Contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

.4 **Point Verification Reports Appendix IV –** To be completed by the contractor and forwarded to the HRCE Site Representative prior to completing Demonstration. HRCE Site Representative will provide blank forms in Microsoft Excel format to the contractor as requested.

.5 The HRCE Representative will require testing, verification, of all commissioning for all points, and full simulation of all sequences. This contractor is to commit the necessary resources, manpower, and devices (example - radios) to allow HRCE Site Representative to complete commissioning.

.6 All software, database files, modem, phone number and instruction must be provided to HRCE Site Representative 10 days in advance of inspections.

.7 All repeat testing and commissioning due to noncompliance to specification will be at the contractor's expense.

.8 All tests described in this specification shall have been performed to the satisfaction of both the HRCE Site Representative prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the HRCE Site Representative. Such tests shall then be performed as part of the warranty.

.9 The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved.

1.9 CLEANING

.1 The contractor shall clean up all debris resulting from its activities daily. The contractor shall remove all cartons, containers, crates, etc., under its control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.

.2 At the completion of work in any area, the contractor shall clean all of its work, equipment, etc., keeping it free from dust, dirt, and debris, etc.

.3 At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

Part 2 Products

2.1 EQUIPMENT

.1 Provide sufficient instrumentation to verify and commission the installed system. Provide two-way radios.

.2 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.

.3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than 2 months prior to tests.

.4 Locations to be approved, readily accessible and readable.

.5 Application: to conform to ASHRAE Guideline 0-2005 – The Commissioning Process and Guideline 1.1 – 2007 – The HVAC Commissioning Process.

Part 3 Execution

3.1 PROCEDURES

.1 General: test installation of each system part after completion of mechanical and electrical hook-ups, to verify correct installation and function.

.1 Test each system independently and then in unison with other related systems.

.2 Commission each system using procedures prescribed by the HRCE Site Representative.

.3 Commission integrated systems using procedures prescribed by HRCE Site Representative.

.4 Debug HRCE Programming.

.5 Optimize operation and performance of systems by fine-tuning PID values and modifying programming as required.

.6 Test full scale emergency evacuation and life safety procedures including operation and integrity of smoke management systems under normal and emergency power conditions as applicable.

.2 Include following activities:

.1 Test and calibrate field hardware including stand-alone capability of each controller.

.2 Verify each analog to digital convertor.

.3 Test and calibrate each analog input using calibrated digital instruments.

.4 Test each binary input to ensure proper settings and switching contacts.

.5 Test each binary output to ensure proper operation and lag time.

.6 Test each analog output to ensure proper operation of controlled devices. Verify tight closure and signals.

.7 Test operating software.

.8 Test application software and provide samples of logs and commands.

.9 Debug software.

.10 Provide point verification list in table format including point identifier, point commissioning technician and HRCE Site Representative comments. This document will be used in final start-up testing.

.3 Demonstration: Upon satisfactory completion of tests, perform point-by-point test of entire system under direction of HRCE Site Representative and provide:

.1 Two technical personnel capable of re-calibrating field hardware and modifying software.

.2 Detailed daily schedule showing items to be tested and personnel available.

.3 HRCE Site Representative Acceptance signature to be on executive and applications programs.

.4 Demonstration testing is to be in accordance with the following conditions:

.1 Commissioning to commence during final start-up testing.

.2 O&M personnel may assist in commissioning procedures as part of training.

.3 Commissioning to be supervised by qualified supervisory personnel and HRCE Site Representative.

.4 Commission systems considered as life safety systems before affected parts of the facility are occupied.

.5 Operate systems as long as necessary to commission entire project.

.6 Monitor progress and keep detailed records of activities and results.

3.2 ADJUSTING

.1 Final adjusting: upon completion of commissioning as reviewed by HRCE Site Representative, set and lock devices in final position and permanently mark settings.

3.3 DEMONSTRATION

.1 Demonstrate to HRCE Site Representative operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and General Requirements Specification Sections, apply to this Section.

.2 Related Sections:

.1 Section 25 05 02 - EMCS: Shop Drawings, Product Data and Review Process.

.2 Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA):

.1 ANSI/ISA 5.5-1985, Graphic Symbols for Process Displays.

.2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics (IEEE):

.1 ANSI/IEEE 260.1-2004, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):

.1 ASHRAE STD 135-R2008, BACNET - Data Communication Protocol for Building Automation and Control Network.

.4 Canadian Standards Association (CSA International):

.1 CAN/CSA-Z234.1-(R2006), Canadian Metric Practice Guide.

.5 Consumer Electronics Association (CEA):

.1 CEA-709.1-C-2010, Control Network Protocol Specification.

.6 Department of Justice Canada (Jus):

.1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

.2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.7 Electrical and Electronic Manufacturers Association (EEMAC):

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

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

.1 Material Safety Data Sheets (MSDS).

.9 Transport Canada (TC):

.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.10 Standard Construction Contract Documents – Version 2008.

1.3 ACRONYMS AND ABBREVIATIONS

.1 Acronyms used in EMCS: See Appendix II.

1.4 SUMMARY

.1 This Section includes the EMCS (Energy Management Control System) equipment for HVAC systems and components, including open protocol control components for HVAC functions.

.2 The control system shall be as shown and consist of a high-speed, peer-to-peer network of Direct Digital Control (DDC) controllers residing and communicating on a **BACnet/IP Network**. The graphics shall be generated on the existing HRCE server. Each mechanical system, building floor plan, and control device will be depicted by point-and-click graphics. Systems using gateways to route proprietary devices and object to BACnet are not acceptable.

.3 All further references within this section to the term "network", unless specifically excepted, refers to the BACnet network between the DDC panels referenced within these specifications.

.4 Provide EMCS for all HVAC functions. Refer to schematics, floor plans, point list and sequence of operation.

.5 HRCE is committed to development of a LAN base communication system for all EMCS and related systems. The Contractor will provide and install any and all media convertors required to connect the BACnet system specified under this specification to the HRCE LAN network. All routers, switches, cabling or other related material required for the connection to the media convertor within the building is the responsibility of this Contractor.

.6 HRCE will institute a server based data synchronization program. This Contractor shall ensure that all devices supplied under this contract are set up to work with this program.

1.5 CODES AND STANDARDS

.1 All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:

.1 Canadian Electrical Code (latest version).

.2 National Building Code (latest addition).

.3 ASHRAE 135-2001.

.4 FCC Regulation, Part 15- Governing Frequency Electromagnetic Interference.

.5 Underwriters Laboratories UL916.

1.6 SYSTEM PERFORMANCE

.1 Performance Standards. The system shall conform to the following:

.1 Graphic Display. The system shall display a graphic with 20 dynamic points/objects with all current data within 10 seconds.

.2 Graphic Refresh. The system shall update a graphic with 20 dynamic points/objects with all current data within 10 seconds.

.3 Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be less than 2 seconds. Analog objects should start to adjust within 2 seconds.

.4 Object Scan. All changes of state and change of analog values will be transmitted over the high-speed Ethernet network such that any data used or displayed at a controller or workstation will have been current within the previous 2 seconds.

.5 Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 45 seconds.

.6 Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 1 second. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.

.7 Performance. Programmable controllers shall be able to execute DDC PID control loops at a frequency of at least once per second. The controller shall scan and update the process value and output generated by this calculation at this same frequency.

.8 Multiple Alarm Annunciation. All workstations on the network must receive alarms within 5 seconds of each other.

.9 Reporting Accuracy. The system shall report all values with an end-to-end accuracy equal to or better than those listed in Table 1.

.10 Stability of Control. Control loops shall maintain measured variable at setpoint within the tolerances listed in Table 2.

.2 TABLE 1: Reporting Accuracy

Measured Variable	**Reported Accuracy**
Space Temperature	±0.5ºC
Ducted Air	±0.5ºC
Outside Air	±1.0ºC
Dewpoint	±1.5ºC
Water Temperature	±0.5ºC
Delta-T	±0.15ºC
Relative Humidity	±5% RH
Water Flow	±5% of full scale
Airflow (terminal)	±10% of full scale *(see Note 1)*
Airflow (measuring stations)	±5% of full scale
Air Pressure (ducts)	±25 Pa
Air Pressure (space)	±3 Pa
Water Pressure	±2% of full scale *(see Note 2)*

Measured Variable	**Reported Accuracy**
Electrical (A, V, W, Power factor)	5% of reading
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO_2)	±50 ppm
Note 1: 10%-100% of scale	
Note 2: For both absolute and differential pressure	
Note 3: Not including utility-supplied meters	

.3 TABLE 2: Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa ±3 Pa	0-1.5 kPa -25 to 25 Pa
Airflow	±10% of full scale	
Temperature	±0.5ºC	
Humidity	±5% RH	
Fluid Pressure	±10 kPa	0-1 kPa
" " differential	±250 Pa	0-12.5 kPa

1.7 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures and 25 05 02 - EMCS: Submittals and Review Process.

.2 Submit for review:

.1 Equipment list and systems manufacturers within 10 days after award of contract.

.2 List existing field control devices to be re-used included in tender, along with unit price.

.3 Quality Control:

.1 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.

.2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.

.3 Submit proof of compliance to specified standards with shop drawings and product data in accordance with Section 25 05 02 - EMCS: Submittals and Review Process. Label or listing of specified organization is acceptable evidence.

.4 In lieu of such evidence, submit certificate from testing organization, approved by HRCE Site Representative, certifying that item was tested in accordance with their test methods and that item conforms to their standard/code.

.5 For materials whose compliance with organizational standards/codes/specifications is not regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.

.6 Permits and fees: in accordance with general conditions of contract.

.7 Submit certificate of acceptance from authority having jurisdiction to HRCE Site Representative.

.8 Existing devices intended for re-use: submit test report.

1.8 COORDINATION

.1 Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

.2 Coordinate equipment from other divisions including “Intrusion Detection,” “Lighting Controls,” “Motor Control Centers,” “Panelboards,” and “Fire Alarm” to achieve compatibility with equipment that interfaces with those systems.

.3 Coordinate supply of conditioned electrical circuits for control units.

.4 Coordinate with the Owner's IT department on locations for UNC's, Ethernet communication cabling and TCP/IP addresses

1.9 OWNERSHIP OF PROPRIETARY MATERIAL

.1 The owner shall sign a copy of the manufacturer’s standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to owner as defined by the manufacturer’s license agreement, but shall protect manufacturer’s rights to disclosure of trade secrets contained within such software. All project developed software and documentation shall become the property of the owner. These include, but are not limited to project graphic images, record drawings, project database, project specific application programming code, and all other associated documentation.

Part 2 Products

2.1 APPROVED MANUFACTURERS

.1 Manufacturers Agent/Product: Subject to compliance with requirements, provide products by one of the following pre-qualified manufacturers:

.1 Alerton – Advanced Energy Management.

Part 3 Execution

3.1 INSTALLATION

.1 Installation: to manufacturer’s recommendations.

.2 Installation by a manufacturers authorized product dealer and supplier.

3.2 MISCELLANEOUS REQUIREMENTS

.1 Remove existing devices where indicated. Turn over to Owner.

.2 Relocate existing devices where indicated or required for access.

.3 Air Handler devices shall be accessible.

3.3 WIRING AND RACEWAYS

.1 General: Provide copper wiring, plenum cable, and raceways as specified.

.2 All insulated wire to be copper conductors. UL labelled for 90C minimum service.

.3 Electrical work shall be in accordance with Canadian Electrical Code, latest edition, Electrical wiring, terminal blocks and other high voltage contacts shall be fully enclosed or properly guarded and marked to prevent accidental injury to personnel.

.4 All wiring in mechanical rooms and ceiling spaces shall be in accordance with the latest edition electrical code. Conformance with this code will be the responsibility of the Contractor.

.5 Low voltage wiring must be run in conduit unless HRCE Site Representative approves it to be run above suspended ceilings. All wiring under this section shall be by this contractor and shall include furnishing labour and miscellaneous material to make connections for all wiring related to the programmable controller:

.1 All wiring shall be concealed in cable tray or conduit from the stand-alone control panel to the ceiling space (as high as possible). Conduit is required in all areas.

.2 Low voltage wiring shall not be run in conduit containing high voltage wiring.

.3 Communication or shielded control wiring shall be installed away from high voltage wiring where possible.

.4 Provide all power wiring in EMT conduit.

.5 Identify each wire and cable in a permanent manner with wire numbers referenced to EMCS hardware address.

.6 Network (communication) wiring shall be run separately from other wiring.

.7 All control wiring to comply with manufacturers recommendations.

.8 Controls contractor to provide and install relays in motor starter's control circuit wiring as required to allow EMCS control.

.9 All new control wiring to be yellow in color.

.10 120V receptacles to be placed within 10 feet of new DDC panels.

.11 When the Subcontractor is interfacing into existing starters with hand-off-auto switches, it is the responsibility of the Subcontractor to ensure that the piece of equipment which they are controlling from the starter, the Owner can override the S.A.C.P. signal and operate the equipment in the hand position.

.12 Where there is a start/stop switch in place of a starter, the Contractor shall provide for manual override capability. S.A.C.P. (Stand Alone Control Panel) LED modules with HOA switch are acceptable providing the manual starter label reads "Manual Override within S.A.C.P. #". (Lamicoid Label Required).

.13 All heating circulation pumps and AHU heating coil valves shall be wired for fail safe operation. (i.e. Heating controls to normally open position, cooling and outside air dampers fail to normally closed position).

.14 Provide 120V, 15A power to each control panel from distribution panel and provide new locking circuit breakers. If emergency power exists, control panel shall be connected to the emergency power circuit.

.15 All networking and control device wiring to be continuous wire runs only, no splicing is permitted.

.16 All I/O wiring passing near or within the enclosure of a VFD will be shielded, with the shield terminated at the controller end.

.17 All I/O wiring will be suitably identified using adhesive wire-marker or equivalent at the controller end.

.18 All I/O wiring within controller enclosure shall be neat and tidy and suitably bundled and strapped or contained in wire duct or equivalent.

.19 All I/O wiring that requires a transition to a different conductor to meet electrical code requirement shall be executed using a terminal strip. Marret connections are not acceptable for any connection other than to connect low-voltage pigtails at the device end (e.g. Thermistors, 24 VAC/VDC transducers, actuators, etc.).

.20 Low voltage I/O wiring may be mixed together within a conduit.

.21 Power Wiring:

.1 Provide power wiring and transformers and ground to each controller and transducer as per the manufacturer's specifications.

.2 Each Building Controller will have its own dedicated power supply. No other controller or I/O device will be powered from this supply.

.3 Custom Application Controllers may share a common power supply, but this supply will not be used for any other device (e.g. I/O devices).

.4 Power wiring shall not be mixed with I/O wiring in a conduit.

.22 All control wiring to have a one (1) year warranty.

.23 Wiring in plenum spaces to be FT6 or in conduit.

3.4 EXAMINATION

.1 The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the HRCE Site Representative for resolution before rough-in work is started.

.2 The Contractor shall inspect the site to verify that equipment may be installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the HRCE Site Representative for resolution before rough-in work is started.

.3 The Contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate or if any discrepancies occur between the plans and the Contractor's work, and the plans and the work of others – the Contractor shall report these discrepancies to the HRCE Site Representative and shall obtain written instructions for any changes necessary to accommodate the Contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the Contractor to report such discrepancies shall be made by and at the expense of this Contractor.

3.5 PROTECTION

.1 The Contractor shall protect all work and material from damage by its work or employees, and shall be liable for all damage thus caused.

.2 The Contractor shall be responsible for its work and equipment until finally inspected, tested, and accepted. The Contractor shall protect any material that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.6 COORDINATION

.1 Site:

.1 Where the mechanical work will be installed in close proximity to, or will interfere with work of other trades, the Contractor shall assist in working out space conditions to make a satisfactory adjustment. If the Contractor installs its work before coordinating with other trades, so as to cause any interference with work of other trades, the Contractor shall make the necessary changes in its work to correct the condition without extra charge.

.2 Coordinate and schedule work with all other work in the same area, or with work which is dependent upon other work, to facilitate mutual progress.

.2 The Contractor shall furnish all tools necessary to interface to the control system for test and balance purposes.

.3 Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the Contractor as follows:

.1 Each supplier of controls product is responsible for the configuration, programming, start-up, and testing of that product to meet the sequences of operation described in this section.

.2 This Contractor shall coordinate and resolve any incompatibility issues that arise between the control products provided under this Section and those provided under other sections or divisions.

3.7 GENERAL WORKMANSHIP

.1 Install equipment, piping, and wiring/raceway parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

.2 Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

.3 Install all equipment in readily accessible locations as defined by Canadian Electrical Code (latest version).

.4 All wiring shall be verified for its integrity to ensure continuity and freedom from shorts and grounds.

.5 All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.8 FIELD QUALITY CONTROL

.1 All work, materials, and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this specification.

.2 Contractor shall continually monitor the field installation for code compliance and quality of workmanship.

.3 Contractor shall have work inspected by local and provincial authorities having jurisdiction over the work.

3.9 EXISTING EQUIPMENT

.1 Wiring: The Contractor may reuse any abandoned wires. The integrity of the wire and its proper application to the installation is the responsibility of the Contractor. The wire shall be properly identified and tested as per this specification. Unused or redundant wiring must be properly identified as such.

.2 Local Control Panels: The Contractor may reuse any existing local control panel to locate new equipment. All redundant equipment within these panels must be removed. Panel face cover must be patched to fill all holes caused by removal of unused equipment, or replaced with new.

.3 Unless otherwise directed, the Contractor is not responsible for the repairs or replacement of existing energy equipment and systems, valves, dampers, or actuators. Should the Contractor find existing equipment that requires maintenance, the HRCE Site Representative is to be notified immediately.

.4 Temperature Sensor Wells: The Contractor may reuse any existing wells in piping for temperature sensors. These wells shall be modified as required for proper fit of new sensors.

.5 Indicator Gauges: Where these devices remain and are not removed, they must be made operational and recalibrated to ensure reasonable accuracy. Maintain the operation of existing pneumatic transmitters and gauges.

.6 Room Thermostats: Shall be removed and turned over to the Owner, unless otherwise noted.

.7 Electronic Sensors and Transmitters: Unless specifically noted otherwise, remove and deliver to the Owner.

.8 Controllers and Auxiliary Electronic Devices: Deliver to the Owner upon removal.

.9 Pneumatic Controllers, Relays and Gauges: Deliver to Owner upon removal.

.10 Damper Actuators, Linkages and Appurtenances: Deliver to Owner upon removal.

.11 Control Valves: Salvage, recondition, and reuse.

.12 The mechanical system must remain in operation between the hours of 6 a.m. and 6 p.m., Monday through Friday. No modifications to the system shall cause the mechanical system to be shut down for more than 15 minutes or to fail to maintain space comfort condition during any such period. Perform cutover of controls that cannot meet these conditions outside of those hours.

.13 The scheduling of fans through existing or temporary time-clocks or control system shall be maintained throughout the DDC system installation.

.14 Install control panels where shown.

.15 Modify existing starter control circuits, if necessary, to provide Hand/Off/Auto control of each starter controlled.

.16 Patch holes and finish to match existing.

3.10 WIRING INSTALLATION

.1 All control and interlock wiring shall comply with national and local electrical codes.

.2 All NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway per NEC.

.3 All low-voltage wiring shall meet NEC Class 2 requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit).

.4 Where NEC Class 2 (current-limited) wires are in concealed and accessible locations including ceiling return air plenum, approved cables not in raceway may be used, provided that cables are UL listed for the intended application. For example, cables used in ceiling plenum shall e UL listed specifically for that purpose.

.5 All wiring in mechanical, electrical, or service rooms or where subject to mechanical damage shall be installed in raceway at levels below 3m.

.6 Do not install Class 2 wiring in raceway containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

.7 Do not install wiring in raceway containing tubing.

.8 Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it, and *neatly* tied at 2m intervals.

.9 Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.

.10 All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.

.11 All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

.12 Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, the Contractor shall provide step-down transformers.

.13 All wiring shall be installed as continuous lengths, with no splices permitted between termination points/objects.

.14 Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.

.15 Size of raceway and size and type of wire shall be the responsibility of the Contractor, in keeping with the manufacturer's recommendation and Canadian Electrical Code requirements, except as noted elsewhere.

.16 Include one pull string in each raceway 2.5 cm or larger.

.17 Use coded conductors throughout with different coloured conductors.

.18 Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.

.19 Conceal all raceways, except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm from high-temperature equipment (e.g., steam pipes or flues).

.20 Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.

.21 Adhere to Electrical Code requirements where raceway crosses building expansion joints.

.22 Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of all vertical raceways.

.23 The Contractor shall terminate all control and/or interlock wiring, and shall maintain updated (as-built) wiring diagrams with termination identified at the job site.

.24 Flexible metal raceways and liquid-tight, flexible metal raceways shall not exceed 1 m in length and shall be supported at each end. Flexible metal raceway less than ½" electrical trade size shall not be used. In areas exposed to moisture including chiller and boiler rooms liquid-tight, flexible metal raceways shall be used.

.25 Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (per code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

.26 FT6 wiring must be used where wires are run through a space used as a plenum. Controls wiring to meet manufacturers recommend installation guidelines.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Methods and procedures for shop drawings submittals, preliminary and detailed review process including review meetings, for building Energy Monitoring and Control System (EMCS).

.2 Related Sections:

.1 Section 25 05 01 - EMCS: General Requirements.

.2 Section 25 01 11 - EMCS: Start-up, Verification and Commissioning.

1.2 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures and 21 05 01 – Common Work Results:

.1 Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and start-up instructions for each type of product indicated.

.1 Each control device labelled with setting or adjustable range of control.

.2 Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, and method of field assembly, components, and location and size of each field connection.

.1 Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.

.2 Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

.3 Details of control panel faces, including controls, instruments, and labeling.

.4 Written description of sequence of operation.

.5 Schedule of dampers including size, leakage, and flow characteristics.

.6 Schedule of valves including close-off and flow characteristics.

.7 Trunk cable schematic showing programmable control unit locations and trunk data conductors.

.8 Listing of connected data points, including connected control unit and input device.

.9 System graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.

.10 System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

.3 Protocol Implementation Conformance/BACnet Interoperability Building Blocks Statements clarifying which BACnet objects and services are supported by each controller.

.4 ANSI / ASHRAE™ Standard 135-2001, BACnet PIC/BIBB Statement: Proof of Compliance Level 3 or higher is required to protect building owner by reducing future maintenance and expansion costs.

.5 Samples: For each color required, of each type of thermostat cover.

.6 Software and Firmware Operational Documentation: Include the following:

.1 Engineering, Installation, Operation and Maintenance manuals.

.2 Program Software Backup: On a magnetic media or compact disc, complete with data files.

.3 Device address list.

.4 Printout of software application and graphic screens.

.5 Licenses, guarantee, and warranty documents for all equipment and systems.

.7 Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

.8 Schedules:

.1 Within two weeks of contract award, provide a schedule of the work indicating the following:

.1 Intended sequence of work items.

.2 Start dates of individual work items.

.3 Duration of individual work items.

.4 Planned delivery dates for major material and equipment, and expected lead times.

.5 Milestones indicating possible restraints on work by other trades or situations.

.2 Provide monthly written status reports indicating work completed, revisions to expected deliver dates, etc. an updated project schedule shall be included.

.9 Qualification Data: For firms and persons specified in “Quality Assurance” Article.

.10 Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors. Revise Shop Drawings to reflect actual installation and operating sequences.

1.3 QUALITY ASSURANCE

.1 Bids by wholesalers, distributors, mechanical contractors and non-franchised contractors shall not be acceptable.

.2 The contractor shall have an established working relationship with the control system manufacturer, and be an authorized representative of the manufacturer at bid time.

.3 The contractor shall have successfully completed control system manufacturers classes on the control system. HRCE reserves the right to request proof of training.

.4 The system manufacturer shall, as a minimum, manufacture and supply the Unitary Equipment Controller, Advanced Application Controller and Graphical User Interface.

.5 All work described in this section shall be installed, wired, circuit tested and calibrated by factory certified technicians qualified for this.

.6 The Contractor shall have a full service facility within 200 km of the project that is staffed with engineers trained in Integrating Interoperable Systems and technicians fully capable of providing routine emergency maintenance service on all system components.

.7 Mechanical equipment manufacturers that are listed as approved to provide DDC type controls may submit a bid with factory mounted controls, and shall also provide a separate bid for their products less all controls, actuators, valve assemblies and sensors, which are specified to be provided by the EMCS contractor.

.8 Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

.9 Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."

.10 Comply with Canadian Electric Code, UL-916 Energy Management Systems, ULC, FCC Part 15, subpart J, Class B Computing Devices.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with Regional and Municipal, regulations.

.7 Label location of salvaged material's storage areas and provide barriers and security devices.

.8 Ensure emptied containers are sealed and stored safely.

.9 Divert unused metal materials from landfill to metal recycling facility as approved by HRCE Site Representative.

.10 Fold up metal and plastic banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements that are common to Sections of Division 26 – Electrical.

.2 Sustainable requirements for construction and verification.

1.2 RELATED SECTIONS:

.1 Sections of Division 01.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International) Latest Edition of the following:

.1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24th Edition), Safety Standard for Electrical Installations.

.2 CSA-C22.3 No. 7-06, (Underground Systems).

.3 CAN3-C235-83, (R2006) Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC) Latest Edition of the following:

.1 EEMAC 2Y-1, Light Gray Colour for Indoor Switch Gear.

.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS) Latest Edition of the following:

.1 Material Safety Data Sheets (MSDS).

1.4 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235-83 (R2006).

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.5 SUBMITTALS

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

.1 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.

.2 Where applicable, include wiring, single line and schematic diagrams.

.3 Include wiring drawings or diagrams showing interconnection with work of other Sections.

.2 Product Data: submit WHMIS MSDS in accordance with Section 01 35 29 06 – Health and Safety Requirements.

.3 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.

.4 Submit number of copies of drawings and specification to authority having jurisdiction and inspection authorities.

.5 If changes are required, notify Engineer of these changes before they are made.

.4 Quality Control:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to provincial inspection authorities for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Engineer.

.5 Manufacturer's Field Reports: submit to Engineer manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing , as described in PART 3 - FIELD QUALITY CONTROL.

1.6 OPERATION AND MAINTENANCE DATA

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

.2 Include in Operation and Maintenance Data:

.1 Details of design elements, construction requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion of feature of installation.

.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded view, technical descriptions of items and parts lists. Advertising or seals literature not acceptable.

.3 Wiring and schematic diagrams and performance curves.

.4 Names and addresses of local suppliers for items included in maintenance manuals.

.5 Copy of reviewed shop drawings.

1.7 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Section 01 78 00 – Closeout Submittals.

1.8 QUALITY ASSURANCE

.1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification:

.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.

.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.2 Site Meetings:

.1 In accordance with HRCE – Sub-Contract Agreements.

.2 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, and/or in appropriate NMS Section, schedule site visits, to review Work, at stages listed.

.1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.

.2 Twice during progress of Work at 25% and 60% complete.

.3 Upon completion of Work, after cleaning is carried out.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 06 – Health and Safety Requirements.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Engineer with schedule within 30 days after award of Contract.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling.

1.10 SYSTEM STARTUP

.1 Instruct Engineer and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.11 ELECTRICAL DRAWINGS

.1 Drawings are diagrammatic.

.2 Obtain accurate dimensions from architectural and equipment layout drawings.

1.12 PERMITS, FEES AND INSPECTION

.1 Submit to Electrical Inspection Department necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Obtain an electrical work permit and pay associated fees.

.3 Engineer will provide drawings, specifications required by Provincial Electrical Inspection Department at no cost.

.4 Notify Engineer of changes required by the Provincial Inspection Department prior to making changes.

.5 Within 30 days of award of contract, submit a list of suppliers and delivery dates for equipment.

Part 2 Products

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction, before delivery to site and submit such approval as described and in PART 1 - Submittals.

2.2 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction, inspection authorities and Engineer.

.2 Signs, minimum size 178 x 254 mm.

2.3 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for copper conductors.

2.4 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: 3 mm thick plastic engraving sheet, matt white finish face, black core, lettering accurately aligned and engraved into core, mechanically attached with self-tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	11 x 51 mm	1 line	3 mm high letters
Size 2	13 x 73 mm	1 line	5 mm high letters
Size 3	13 x 22 mm	2 lines	3 mm high letters
Size 4	13 x 160 mm	1 line	10 mm high letters
Size 5	13 x 89 mm	2 lines	5 mm high letters
Size 6	25 x 102 mm	1 line	13 mm high letters
Size 7	25 x 102 mm	2 lines	13 mm high letters

.3 Wording on nameplates to be approved by Engineer prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Identification to be English.

.6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

2.5 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or 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 – 2018.

.4 Use colour coded wires in communication cables, matched throughout system.

2.6 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 13 mm wide auxiliary colour.

	Primary	**Auxiliary**
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 Kv	Yellow	Blue
up to 15 Kv	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow
51-240V	Yellow	

	Primary	Auxiliary
Above 240V	Yellow	Green
Fire Alarm	Red	
Emergency Lighting & Exit Signs	(ac) Orange	White
Emergency Lighting & Exit Signs	(dc) Brown	White
Mechanical Controls	Orange	

.4 Confirm color coding prior to start of work (to match existing).

2.7 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel:

.1 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1-1958.

2.8 ACCEPTANCE OF ALTERNATIVE MATERIALS

.1 Acceptable Materials:

.1 Where materials are specified by the trade name, refer to the "Instructions to Bidders" for procedure to be followed in applying for approval of alternatives.

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do underground systems in accordance with CSA C22.3 No.7-06 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 51 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

3.4 MOUNTING HEIGHTS

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

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

3.5 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Provide upon completion of work, load balance report for the following: phase and neutral currents on panelboards, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct and pay for following tests:

.1 Test meters to ensure accuracy by applying know loads to panel being metered.

.2 Test communication from meters to central metering control center.

.3 Carry out tests in presence of Engineer or HRCE Site Construction Manager.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 AS-BUILT RECORD DRAWING BY CONTRACTOR

.1 General: To be read in conjunction with Section 01 78 00 – Closeout Submittals.

.2 Site Records:

.1 Obtain sets of white prints and mark thereon all changes as work progresses and as changes occur. Incorporate all information issued in Addenda, Site Instructions, Change Orders and all changes in actual installation as a result of site conditions and coordination. At the end of the project, obtain a copy of CAD files of tender documents and update the CAD files to reflect the As-Built conditions.

.3 As-Built Drawings:

.1 Prior to start of testing, balancing and adjusting, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 13 mm high as follows: AS-BUILT DRAWINGS - This drawing has been revised to show electrical systems as installed, Signature of Contractor and Date.

.3 Submit to the Project Manager for approval and make all corrections as directed.

.4 Testing, balancing and adjusting to be performed using as-built drawings.

.5 Hand over 100 % updated CAD files and one hard copy of as-built drawings with Operating and Maintenance Manuals.

3.7 CONTROL OF HAZARDOUS ENERGY

.1 Lockout and TAG out all electrical and other equipment before performing work as per CAN/CSA-Z460-05.

3.8 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

.1 Section 01 61 00 – Common Product Requirements.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International) Latest Edition of the following:

.1 CAN/CSA-C22.2, No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2 No.65 Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC) Latest Edition of the following:

.1 EEMAC 1Y-2, 1961 Bushing Stud Connectors (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA) Latest Edition.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material for recycling.

.4 Divert unused wiring materials from landfill to metal recycling facility as approved by Engineer or HRCE Site Construction Manager.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors to consist of:

.1 Connector body and stud clamp for stranded, copper or conductors.

.2 Clamp for stranded copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors.

.5 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable, flexible conduit, as required.

.5 Joints required in connecting all wiring up to and including # 8, are to be made using twist-on connectors.

.6 Joints for all other wiring shall be made using colour-keyed compression type connectors followed by a layer of CSA approved vinyl plastic tape or heat shrink insulation tube.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install bushing stud connectors in accordance with EEMAC 1Y-2 NEMA.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 00 – Common Work Results for Electrical.

.3 Section 26 05 20 – Wire and Box Connectors - 0 – 1000 V.

.4 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

.1 CSA C22.2 No .0.3-01 (R2005), Test Methods for Electrical Wires and Cables Latest Edition.

.2 CAN/CSA-C22.2 No. 131-M89 (R2004), Type TECK 90 Cable Latest Edition.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: solid for #10 AWG and smaller; stranded for #8 AWG and larger. Minimum size: #12 AWG.

.2 Conductors: size as indicated, with 600V insulation of chemically cross-linked thermosetting polyethylene material rated RW90, RWU90 for wiring installed underground in conduit.

.3 Conductors: all wiring shall be copper.

.4 Neutral conductor insulated for 600V shall be continuous with no fuses, switches, or breaks of any kind.

.5 Wiring requirements for specialized systems such as fire alarm, public address, etc. are indicated in the respective specification sections or on drawings.

.6 The voltage drop shall in no case exceed 3% of the line volts for branch circuits.

.7 Voltage drop shall be calculated based on 80% of the circuit breaker current rating for all branch circuits unless noted otherwise.

.8 Voltage drop for motor branch circuits shall be calculated based on current equal to 80% of the ampacity of the branch circuit conductors.

.9 Branch circuit conductor sizes specified on drawings are the minimum required. Upsize branch circuit conductor sizes as required so that the voltage drop is less than the maximum value permitted.

2.2 TECK CABLE

.1 Cable: to CAN/CSA-C22.2 No. 131.

.2 Conductors:
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.

.3 Insulation:
- .1 Type: ethylene propylene rubber.
- .2 Chemically cross-linked thermosetting polyethylene rated type RW90, 600V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking.

.6 Overall covering: thermoplastic polyvinyl chloride material.

.7 Fastenings:
- .1 Channel type supports for two or more cables at 1.5 m centers.
- .2 Threaded rods: 13 mm dia. to support suspended channels.

.8 Connectors:
- .1 Watertight, approved for TECK cable.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from galvanized steel strip.

.4 Connectors: Steel set screw.

.5 AC-90 cables may only be used:
- .1 As individual cable drops from junction boxes to devices and fixtures provided the horizontal components are not longer than 1.5 m, do not run from room to room, are adequately supported and are run concealed.
- .2 For wiring of outlets or devices in cabinetry where it is impractical to install conduit.

.6 AC-90 shall not be permitted in masonry walls.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

.2 Use vibration proof expanding spring wire connectors for No. 10 and smaller.

3.3 INSTALLATION OF TECK CABLE 0-1000 V

.1 Group cables wherever possible on channels.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

.3 Use only for portions of feeders located outdoors, unless indicated otherwise.

3.4 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

.3 Fixture drops are to run from the junction box in the respective room and not to fixtures in other rooms. Fixture drops shall be from the side of the outlet boxes and not through the cover plate. Maximum of four fixture drops from any single junction box. AC 90 cables shall be secured within 300mm of the junction boxes.

.4 Support and securing of AC 90 cables shall not be derived from suspended ceiling support wires or by lying on top of the ceiling.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results – Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE) Latest Edition of the following:

.1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSAC22.1 – 2018, Canadian Electrical Code, Part 1.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material, in appropriate on-site bins for recycling.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Engineer or HRCE Site Construction Manager.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.

.2 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.3 Insulated grounding conductors: green, type RW90.

.4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:

.1 Grounding and bonding bushings.

.2 Protective type clamps.

.3 Bolted type conductor connectors.

.4 Thermit welded type conductor connectors.

.5 Bonding jumpers, straps.

.6 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using copper welding by thermit process.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

.9 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators, distribution panels, outdoor lighting, cable tray, access floor, pedestals, static flooring, and natural gas entrance piping.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform tests before energizing electrical system.

.3 Disconnect ground fault indicator during tests.

3.4 COMMISSIONING

.1 Carry out commissioning of grounding in accordance with the requirements as stipulated in the Commissioning Plan.

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material, in appropriate on-site bins for recycling.

.4 Divert unused metal materials from landfill to metal recycling facility as approved by Engineer.

.5 Fold up metal banding, flatten and place in designated area for recycling.

Part 2 Products

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 x 2.5 mm thick, surface mounted or suspended.

Part 3 Execution

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps:

- .1 One-hole steel straps to secure surface conduits and cables 51mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 51mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems:

- .1 Support individual cable or conduit runs with 6 m dia. threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 10 mm dia. threaded rod hangers where direct fastening to building construction is impractical.

.8 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.

.9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.11 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Engineer.

.13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.14 Powder actuated fasteners are not acceptable.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 CSA C22.1-2006, Canadian Electrical Code, Part 1.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Collect and separate plastic, paper packaging and corrugated cardboard.

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1 - 2018.

.2 102 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

.1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 x 51 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.2 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.3 102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

2.3 CONDUIT BOXES

.1 Cast FS or FD boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.4 FITTINGS FOR FLEXIBLE CONDUIT

.1 Threaded type steel couplings and fittings.

.2 Bushing and connectors with nylon insulated throats.

.3 Knock-out fillers to prevent any debris.

.4 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

.5 Double locknuts and insulated bushings on sheet metal boxes.

.6 Compression nut, grounding ferrule, sealing ring and body shop.

2.5 FITTINGS FOR THIN WALL CONDUIT

.1 Set screw type fittings.

.2 Double locknuts and insulated bushings on sheet metal boxes.

2.6 FITTINGS IN WET OR DAMP LOCATIONS

.1 Watertight fittings on conduit in wet or damp locations.

2.7 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, and armoured cable connections. Reducing washers are not allowed.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Canadian Standards Association (CSA) Latest Edition of the following:

- .1 CAN/CSA C22.2 No. 18.3-04 Conduit, Tubing and Cable Fittings.
- .2 CSA C22.2 No. 45-M 1981 (R2003) Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-09 Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M 1985 (R2003), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-06, Rigid PVC (Unplasticized) Conduit.

1.2 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Collect and separate plastic, paper packaging and corrugated cardboard.

Part 2 Products

2.1 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45-M 1981 (R003), galvanized steel threaded.

.2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83 – M 1985 (R003), with couplings.

.3 Rigid PVC conduit: to CSA C22.2 No. 211.2-06.

.4 Flexible metal conduit: to CSA C22.2 No. 56-04, steel and liquid-tight flexible metal.

2.2 CONDUIT FASTENINGS

.1 One-hole steel straps to secure surface conduits 51 mm and smaller. Two-hole steel straps for conduits larger than 51 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1.5 m oc.

.4 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Galvanized rigid steel couplings shall be used with all rigid steel threaded conduit.

.2 Rain tight EMT connectors shall be used on "vertical" sections of conduit runs where terminating into tops of electrical equipment incorporating drip shields or hoods.

.3 Fittings: Use Set screws connectors and fittings for EMT. Coating: same as conduit.

.4 Factory "ells" where 90 degree bends are required for 25 mm and larger conduits.

.5 Couplings and connectors for PVC rigid conduit shall be CSA approved for their respective use.

.6 Connectors for flexible conduit, shall be set screw galvanized steel.

.7 Connectors for liquid tight flexible conduit shall be water tight, compression type galvanized steel.

.8 Threaded plastic or metal bushings to be installed on all EMT connectors sizes 35 mm and larger.

.9 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.10 Factory "ells" where 90 degree bends are required for NPS 1 25 mm and larger conduits.

2.4 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Use rigid galvanized steel threaded conduit for general feeders, controls and communications where indicated.

.4 EMT shall be installed as a complete system.

.5 Support of electrical systems raceway shall be independent of any type of suspended ceiling support rods, wires, etc. and mechanical piping or duct systems.

.6 Use electrical metal tubing (EMT) for all work, unless otherwise indicated, for panelboard feeders, branch circuit wiring, fire alarm and communications, etc., where not installed underground unless specifically indicated otherwise. Provide a separate green ground for all conduit systems, including E.M.T.

.7 Use rigid PVC conduit underground. Include a separate ground wire.

.8 Flexible Metal Conduit:

.1 Use flexible metal conduit for connection to surface or recessed fluorescent fixtures.

.2 Flexible metal conduit, permitted above T-bar ceilings, for drops to various fire alarm devices mounted on flush outlet boxes in finished ceiling. Minimum size of flexible conduit: 22 mm, Maximum length of drop: 1.5 m.

.3 For connection to access Floor Boxes and under floor smoke detectors, include a separate ground wire.

.9 Use flexible metal conduit for connection to motors in dry areas connection to motors in dry areas.

.10 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment, furniture and transformers. Include a separate ground wire.

.11 Install conduit sealing fittings in hazardous areas. Fill with compound.

.12 Minimum conduit size for lighting and power circuits: 22 mm.

.13 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.14 Mechanically bend steel conduit over 22 mm dia.

.15 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.16 Install fish cord in empty conduits.

.17 Run 3 – 25 mm spare conduits up to ceiling space for each flush panel. Terminate these conduits in 153 x 153 x 102 mm junction boxes in ceiling space.

.18 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.19 Dry conduits out before installing wire.

.20 Securely fasten in place within 83 mm of each outlet box, junction box, cabinet, coupling or fitting, maximum spacing between supports as follows:

.1 1.5 m for 21 mm trade size conduit and smaller.

.2 2 m for 27 mm to 35 mm trade size conduit.

.3 3 m for 41 mm trade size and larger.

.21 Ground Wires:

.1 Provide a separate green ground wire in all conduits including EMT.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on suspended or surface channels.

.4 Do not pass conduits through structural members except as indicated.

.5 Do not locate conduits less than 76 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials and installation for standard and custom breaker type panel boards.

1.2 RELATED SECTIONS

.1 Sections of Division 01.

.2 Section 26 05 00 - Common Work Results - Electrical.

.3 Section 26 28 21 - Moulded Case Circuit Breakers.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International) Latest Edition of the following:

.1 CSA C22.2 No.29–M 1989 (R2004), panel boards and enclosed panel boards.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, corrugated cardboard, packaging material for recycling in accordance with Waste Management Plan.

.4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Engineer.

Part 2 Products

2.1 PANELBOARDS

.1 Panel boards: to CSA C22.2 No.29–M 1989 (R2004) and product of one manufacturer:

.1 Install circuit breakers in panel boards before shipment.

.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 Panel boards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panel boards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panel board and key panel boards alike.

.6 Copper bus with neutral of same ampere rating as mains.

.7 Mains: suitable for bolt-on breakers.

.8 Trim with concealed front bolts and hinges.

.9 Trim and door finish: baked grey enamel.

2.2 BREAKERS

.1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panel boards except as indicated otherwise.

.3 Main breaker: separately mounted on bottom of panel to suit cable entry, where required.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Nameplate for each panel board size 4 engraved as indicated. Secure with double faced type.

.3 Nameplate for each circuit in distribution panel boards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.4 APPROVED MANUFACTURERS:

.1 Eaton Electrical.

.2 Schneider Electric.

.3 Siemens.

Part 3 Execution

3.1 INSTALLATION

.1 Locate panel boards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Mount panel boards to height specified in Section 26 05 00 - Common Work Results - Electrical or as indicated.

.3 Connect loads to circuits.

.4 Connect neutral conductors to common neutral bus with respective neutral identified.

3.2 TESTS

.1 Test each branch breaker to verify that it controls the load indicated on the drawing and panel directory.

3.3 COMMISSIONING

.1 Carry out commissioning of panel boards in accordance with the requirements as stipulated in the Commissioning Plan.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Materials for moulded-case circuit breakers.

1.2 RELATED SECTIONS

.1 Sections of Division 01.

.2 Section 26 24 17 – Panel boards Breaker Type.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International) Latest Edition of the following:

.1 CSA-C22.2 No. 5-2 (R2007), Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.

.2 Include time-current characteristic curves for breakers with ampacity of 100 A and over.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

.2 Collect and separate for disposal paper, plastic, corrugated cardboard, packaging material for recycling in accordance with Waste Management Plan.

.3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.

Part 2 Products

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

2.2 ACCEPTABLE MATERIALS

.1 Breakers shall be compatible with panel boards specified in Section 26 24 17 – Panel boards Breaker Type and shall meet the KA ratings as indicated.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Division 01 – General Requirements.

.2 Section 26 05 00 – Common Work Results – Electrical.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/National Electrical Manufacturer's Association (NEMA).

1.3 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed shop drawings, product literature, specifications and datasheets in accordance with Division 01 – General Requirements. Include product characteristics, performance criteria, and limitations.

.1 Submit required copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Division 01 – General Requirements. Indicate VOC's for adhesives and solvents during application and curing.

.2 Quality assurance submittals: submit in accordance with Division 01 – General Requirements.

.3 Indicate:

.1 Mounting method and dimensions.

.2 Starter size and type.

.3 Layout of identified internal and front panel components.

.4 Enclosure types.

.5 Wiring diagram for each type of starter.

.6 Interconnection diagrams.

1.4 OPERATION AND MAINTENANCE DATA

.1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Division 01- General Requirements.

.2 Include operation and maintenance data for each type and style of starter.

1.5 QUALITY ASSURANCE

.1 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01 – General Requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 26 05 00 - Common Work Results Electrical.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Division 01 – General Requirements.

Part 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Division 01 – General Requirements and Section 26 05 00 – Common Work Results Electrical.

2.2 MATERIALS

.1 Starters: NEMA Type.

2.3 MANUAL MOTOR STARTERS

.1 Single and Three phase manual motor starters of size, type, rating as indicated and NEMA 12 type enclosure or as indicated, with components as follows:

.1 Switching mechanism, quick make and break.

.2 One or Three overload heater(s), manual reset, trip indicating handle.

.2 Accessories:

.1 Toggle switch: standard labelled as indicated.

.2 Indicating light: standard type and colour as indicated.

.3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.4 FULL VOLTAGE MAGNETIC MOTOR STARTERS

.1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:

.1 Contactor solenoid operated, rapid action type.

.2 Motor overload protective device in each phase, manually reset from outside enclosure.

.3 Wiring and schematic diagram inside starter enclosure in visible location.

.4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.

.2 Combination type starters to include disconnect switch with operating lever on outside of enclosure to control disconnect provision for:

.1 Locking in "OFF" position with up to 3 padlocks.

.2 Independent locking of enclosure door.

.3 Provision for preventing switching to "ON" position while enclosure door open.

.3 Accessories:

.1 HOA Selector switches: standard labelled hand-off-auto.

.2 Indicating lights: standard type and color as indicated.

.3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.

2.5 CONTROL TRANSFORMER

.1 Single phase, dry type, control transformer with primary voltage as indicated and secondary voltage to match control signal voltage, complete with secondary fuse, installed in with starter as indicated.

.2 Size control transformer for control circuit load plus 20% spare capacity.

2.6 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.

.3 Magnetic motor starter label size 4.

2.7 ACCEPTABLE MANUFACTURERS

.1 Eaton Electrical, Square D, Siemens.

2.8 VOC LIMITS

.1 Refer to Section 26 05 00 – Common Work Results Electrical.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical and manufacturer's instructions.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

.5 Verifications requirements in accordance with Division 01 – General Requirements.

3.4 CLEANING

.1 Proceed in accordance with Division 01 – General Requirements.

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

END OF SECTION

ASBESTOS SURVEY/
LEAD ANALYSIS

ASBESTOS SURVEY,
Joseph Howe School

2557 Maynard Street
Halifax, N.S.
B3K 3V6

Prepared by:

Maritime Testing (1985) Limited
116-900 Windmill Rd
Dartmouth, N.S.

Prepared for:

Halifax Regional School Board
90 Alderney Dr., 3rd floor
Dartmouth, N.S.
B2Y 4S8

January 7, 1999

NEO-1256.10

INTRODUCTION

The Halifax Regional School Board has undertaken a mandate to conduct asbestos inventories in each of the schools in the School Board region. Maritime Testing (1985) Limited (MTL) was retained by the Board to conduct these inventories and prepare the asbestos survey reports. This report on Joseph Howe School represents one of the schools surveyed as part of this comprehensive inventory.

METHODS

Each school was inspected for building materials that might be composed of asbestos containing minerals (ACMs). Types of materials examined and sampled as needed could include but not necessarily be limited to:

mechanical systems:	insulation on pipes, fittings, boilers, air conveyance systems, structural materials
flooring:	sheet flooring, vinyl tiles
ceilings:	suspended ceilings, rigid ceilings, texture coats
walls:	texture coats, wallboards, plasters
building exterior:	wall panels, panels under entrances

Please note the following limitations regarding these surveys:

1. Sampling and inspection was not conducted if permanent visible damage would result from these activities. In such circumstances, inference is made to the potential for ACMs to be present based upon other observations made in the building (for example, holes are not cut into wall cavities to determine if insulated pipe work is present).

2. In each school, every room that was accessible was surveyed. In cases where access to a room was not possible, inference on that room is made based on what was observed throughout the rest of the school.

3. Plaster, unlike many other materials in schools such as floor tiles, ceiling tiles, etc., was originally fabricated on site. Each batch, which typically would be wheel barrow sized, could potentially be a bit different from the next. Asbestos, typically chrysotile, was used as well as other materials (hairs, wood) as a strengthening material and was applied “in shovelfuls” more or less at the discretion of the worker. Samples collected routinely in schools are based upon perceived differences in texture, age of construction, etc., and may not reflect

small differences from one batch to another, particularly since sample sizes are kept small to reduce damage. Accordingly, samples of plaster identified as not containing asbestos may well not be precisely indicative of the overall composition of the plaster in general. As a result, plaster should be assumed to contain asbestos unless a specific sample from the area in question has been analysed and shown to be asbestos free.

All inspections were scheduled such that sampling could be conducted after normal school hours. This school was surveyed on December 21, 1998.

Samples collected at the school were examined under both stereo and polarised light microscopy to determine fibre types and relative percentages of each asbestos mineral if it was present. As well, any ACMs were further categorised into one of three categories as noted below:

Priority 1: materials representing a potential health risk with normal routine building use and which require immediate removal. Such materials may include damaged ceiling tiles, damaged pipe insulation, damaged friable boiler insulation.

Priority 2: materials which do not pose a health risk under normal school usage but which pose a periodic risk to maintenance and custodial staff or which are currently undamaged but which might easily be damaged in the future; these materials require removal during the next suitable time (ie a major school break, next planned renovation project). Such materials may include undamaged ceiling tiles, damaged pipe insulation above ceilings, undamaged texture coats.

Priority 3: Non-friable materials or materials that are in good condition, are not generally accessible, and which currently pose no risk to any occupant. Such materials may include floor tiles, transite panels, mechanical insulation in good repair.

Refer to Appendix A for a summary of the Priorities of the ACMs.

All data are also available on an asbestos inventory data base accessible from the school board offices prepared specifically by MTL for this project.

For a list of materials sampled, refer to Appendix B. Refer to Appendix C for a diagram of the school floor plan and sample locations. For a list of locations and quantities of

asbestos containing materials, refer to Appendix D. Refer to Appendix E for a room by room account of ACM's. Refer to Appendix F for photos of Priority 1 ACMs.

INVENTORY RESULTS.

This building was constructed in 1966.

Boiler Room: The two boilers in the boiler room are encased in steel. The insulation under the steel jacket does not contain asbestos. A gasket on Boiler #1 was sampled and contains asbestos(>85% chrysotile). The ACM gaskets exist on the hatches and between sections of both boilers. The gaskets are a Priority 3. The insulation on the exhaust and breeching contains 60% chrysotile asbestos. The insulation is in good condition and is a Priority 3. All pipes throughout the boiler room are insulated with fibreglass on the runs with asbestos containing cement (60% chrysotile) on the elbows. The cement on an elbow on the North Supply Line south of the stairwell at ceiling level is damaged and a Priority 2. The cement on an elbow on the green water supply line near the water meter is damaged and a Priority 2. The remaining elbows throughout the boiler room are in good condition and a Priority 3.

The floor of the boiler room is concrete and the walls are concrete block. The ceiling is constructed of plaster that contains asbestos (60% chrysotile). In areas where there is damage, the ceiling is a Priority 1. Undamaged areas are a Priority 2.

Exterior: No materials on the exterior contain asbestos.

Floors:None of the floor coverings in this school contain asbestos.

Walls:None of the wall materials contain asbestos.

Ceilings: None of the ceiling materials in this school (outside of the boiler room) contain asbestos.

Pipe Systems: The pipes throughout the school are insulated with fibreglass on the runs and asbestos containing cement (60% chrysotile) on the elbows. The only insulated elbows observed at student level are located at the radiator in the Gymnasium Hall Foyer. The insulation is in good condition but is prone to damage and a Priority 2. Above the ceiling throughout the school, the pipes are insulated with fibreglass on the runs and asbestos cement on the elbows. In the gymnasium, the pipe elbows above student level are insulated with asbestos cement. The cement on the elbows is in good condition and a Priority 2.

Appendix A:

Summary: The following is a summary of Priority of the various ACMs at this school:

Priority 1:	- Boiler Room, damaged plaster ceiling
Priority 2:	- Boiler Room, North Supply Line south of the stairwell at ceiling, damaged asbestos cement on pipe elbow
	- Boiler Room, elbow on the green water supply line 3 ft. south of water, damaged asbestos cement on pipe elbow
	- Boiler Room, plaster ceiling that is not visibly damaged
	- at radiator located in Gymnasium Hallway Foyer, asbestos cement on pipe elbows
	- asbestos cement on pipe elbows in gymnasium
Priority 3:	- gaskets on boilers
	- insulation on boiler breeching and exhaust
	- throughout school, asbestos cement on pipe elbows above ceiling, in the boiler room

Appendix B:

Samples taken and locations		
Sample description	**Location**	**ACM**
Boiler Room		
ceiling plaster	above boilers	yes
boiler insulation	boiler #1	no
boiler gasket	boiler #1	yes
boiler exhaust and breeching	exhaust from boiler #2	yes
cement on pipe elbow	hot water supply (yellow)	yes
cement on pipe elbow	hot water return	yes
cement on pipe elbow	water supply line (green)	yes
Exterior		
trowelled on mortar	underside of Main Entrance Overhang	no
Floors		
12" tile, white with black streaks	Room 102	no
9" tile, white with black streaks	south west exit outside of Room 102	no
9" tile, white with black and gray streaks	Room 101	no
9" tile, beige with brown and white streaks	Inside Main Entrance	no
9" tile, beige with white streaks	Janitor's Office	no
Ceilings		
2'x2' suspended tile	Room 102	no
2'x2' suspended tile	Room 102	no
2'x2' suspended ceiling tile	Room 102	no
2'x2' suspended ceiling tile	Room 110	no
plaster	Janitor Room	no
Pipes		
asbestos cement on pipe elbow above ceiling	Room 103 and 104	yes

Samples taken and locations		
Sample description	**Location**	**ACM**
asbestos cement on pipe elbow above ceiling	south hallway	yes
Miscellaneous		
straight run on roof drain	gymnasium stage	no

Appendix C:
Floor Plan and Sample Locations

Appendix D:

Quantity and locations of ACMs.

Boiler Room

Description	Locations	Quantity
plaster ceiling	boiler room	1118 ft^2
boiler exhaust and breeching	from both boilers	15" dia.x 30'
cement on pipe elbows	throughout boiler room	50

Pipes

Description	Locations	Quantity
asbestos cement on elbows below ceiling	Gym Hall Foyer at radiator	2
asbestos cement on elbows below ceiling	throughout gym stage above student level	19
asbestos cement on elbows above ceiling	north hallway	7
asbestos cement on elbows above ceiling	Room 110	9
asbestos cement on elbows above ceiling	Room 111	10
asbestos cement on elbows above ceiling	Room 109	12
asbestos cement on elbows above ceiling	Room 108	9
asbestos cement on elbows above ceiling	Room 106	11
asbestos cement on elbows above ceiling	Room 107	14
asbestos cement on elbows above ceiling	Room 103 & 104	22
asbestos cement on elbows above ceiling	Main Lobby	34
asbestos cement on elbows above ceiling	south hallway	24
asbestos cement on elbows above ceiling	Administration Office	20
asbestos cement on elbows above ceiling	Room 102	20
asbestos cement on elbows above ceiling	Room 101	19
asbestos cement on elbows above ceiling	Room 114	6

Miscellaneous

Description	Locations	Quantity
asbestos cement on roof drain	Gymnasium Stage	19

Appendix E:

ACM's Room by Room (for quantities refer to Appendix C).

Room	ACMs
Boiler Room	ceiling, boiler gaskets, boiler exhaust and breeching, cement on all pipe elbows
north hallway	asbestos cement on pipe elbows above ceiling
Room 110	asbestos cement on pipe elbows above ceiling
Room 111	asbestos cement on pipe elbows above ceiling
Room 109	asbestos cement on pipe elbows above ceiling
Room 108	asbestos cement on pipe elbows above ceiling
Room 106	asbestos cement on pipe elbows above ceiling
Room 107	asbestos cement on pipe elbows above ceiling
Room 103 & 104	asbestos cement on pipe elbows above ceiling
Main Lobby	asbestos cement on pipe elbows above ceiling
south hallway	asbestos cement on pipe elbows above ceiling
Administration Office	asbestos cement on pipe elbows above ceiling
Room 102	asbestos cement on pipe elbows above ceiling
Room 101	asbestos cement on pipe elbows above ceiling
Room 114	asbestos cement on pipe elbows above ceiling
Gymnasium Stage	asbestos cement on pipe elbows above student level, asbestos cement on roof drain elbow

Appendix F: Photos of Priority 1s.

Damaged plaster ceiling in Boiler Room

ALL-TECH
ENVIRONMENTAL SERVICES LIMITED

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Bedford, NS B4A 2Z5
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Ph: 902.835.3727
Fax: 902.835.5266
Email: email@toalltech.com

May 25th, 2018

Tyler Bell
Operations Services
Halifax Regional School Board

Project: #24279

BULK ASBESTOS / LEAD ANALYSIS REPORT

On May 25th, 2018, Steve Wells of ALL-TECH Environmental Services Ltd. was on site at Joseph Howe School, located at 2557 Maynard Street in Halifax, Nova Scotia. Five (5) bulk samples were collected for asbestos analyses and five (5) samples of paint for were collected lead analyses. The samples of material were submitted to International Asbestos Testing Laboratories (IATL), in Mount Laurel, New Jersey, USA for asbestos and lead analysis. IATL is an internationally accredited laboratory with NIST-NVLAP, AIHA, and the New York Department of Health, NY-DOH.

1.0 Asbestos Analysis

What is Asbestos?

Asbestos is a generic term which is used to describe a group of naturally occurring fibrous mineral silicates (fibrous rock). Six main types of asbestos are; chrysotile, amosite, crocidolite, anthophyllite, tremolite, and actinolite. Heat, corrosion, and tensile qualities of asbestos have been so beneficial, that from the dates 1900 to 1980, asbestos was used worldwide in over 3000 different commercial products. Asbestos has been used in fireproofing materials, friction products, reinforcing building materials, insulations materials (thermal/acoustic), etc.

Results

The samples were analysed by IATL for asbestos identification by Polarized Light Microscopy (PLM), utilizing Dispersion Staining Techniques (DS). The EPA 600/R-93/116 Analytical Method was followed. The results of the analyses are presented in Table 1.0.

Table 1.0
Asbestos Analyses of Bulk Samples
Joseph Howe School
2557 Maynard Street, Halifax, Nova Scotia

Sample #	Location	Description	Results (%)
001	Roof Drain – Gym	Insulation	**None Detected**

Sample #	Location	Description	Results (%)
002	**On Boilers around Holes in Jacket**	**Insulation**	**30% Chrysotile**
003	Boiler Door	Insulation	**None Detected**
004	Boiler	Brick	**None Detected**
005	Boiler Room	Yellow Straight Run Insulation	**None Detected**

2.0 Lead Based Coating Analysis

Lead is a naturally-occurring metal that is present throughout the environment in rocks, soil, water and air. It has been used as a pigment in many paints for centuries, and in some applications it is still used today. From an occupational health standpoint, intact dry lead paint or particles poses little hazard, but a serious hazard can be created when lead coatings or demolished structures are disturbed. Construction workers who weld, cut or blast structural steel coated with lead-based paint or demolish painted surfaces with lead paint are at significant risk of lead poisoning. The samples of material were submitted to International Asbestos Testing Laboratories (IATL), in Mount Laurel, New Jersey, USA for lead analysis. IATL is an internationally accredited laboratory with NIST-NVLAP, AIHA, and the New York Department of Health, NY-DOH.

Results

The samples were analyzed in the lab following the ASTM D3335-85A "Standard Method to Test for Low Concentrations of lead in Paint by Atomic Absorption Spectrophotometry". The sampling results for lead content are reported in percent by weight. Results of the lead analysis are presented in Table 2.0.

Table 2.0
Lead Analysis of Paint Samples
Joseph Howe School
2557 Maynard Street, Halifax, Nova Scotia

Sample #	Description	Results (%)	Guideline (%)
L001	Grey Paint – Duct	0.065	**0.1**
L002	Green Paint – Water Tank	<0.0063	**0.1**
L003	Blue Paint – Wall	0.019	**0.1**
L004	Beige Paint – Wall	0.018	**0.1**

Sample #	Description	Results (%)	Guideline (%)
L005	Yellow Paint – On Pipes and Boilers	0.20	**0.1**

Conclusion:

Asbestos:

Results of the asbestos analyses indicate that Sample 002 (Insulation) ***contains 30% chrysotile asbestos***. Nova Scotia's Department of Labour and Advanced Education considers building material as asbestos containing if it contains asbestos at a concentration greater than or equal to 0.5% asbestos fibres.

Lead:

Results of the lead analyses indicate that Sample L005 (Yellow Paint on Pipes and Boilers) **DOES *contain lead at a concentration above 0.1%.*** The Nova Scotia Department of Labour and Workforce Developments' maximum concentration for lead in contaminated soil is 1000 mg/kg (0.1%).

It has been a pleasure providing this service to you. If you should have any questions regarding this report, please do not hesitate to call our office 902-835-3727 or email us (email@toalltech.com).

Thank you and have a great day,

Alisha Glogowski, B.Sc.
Environmental Scientist
ALL-TECH Environmental Services Ltd.

Attached: IATL Results – Asbestos/Lead Analyses

ALL-TECH
ENVIRONMENTAL SERVICES LIMITED

iATL INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 5/23/2018
Report No.: 563894 - Lead Paint
Project: 2557 Maynard
Project No.:

LEAD PAINT SAMPLE ANALYSIS SUMMARY

Lab No.: 6512613 **Description:** Grey Paint **Result (% by Weight):** 0.065
Client No.: 001 **Location:** Duct **Result (ppm):** 650
Comments:

Lab No.: 6512614 **Description:** Green Paint **Result (% by Weight):** <0.0063
Client No.: 002 **Location:** Water Tank **Result (ppm):** <63
Comments: ***

Lab No.: 6512615 **Description:** Blue Paint **Result (% by Weight):** 0.019
Client No.: 003 **Location:** Wall **Result (ppm):** 190
Comments:

Lab No.: 6512616 **Description:** Beige Paint **Result (% by Weight):** 0.018
Client No.: 004 **Location:** Wall **Result (ppm):** 180
Comments:

Lab No.: 6512617 **Description:** Yellow Paint **Result (% by Weight):** 0.20
Client No.: 005 **Location:** On Pipes And Boilers **Result (ppm):** 2000
Comments:

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 5/16/2018
Date Analyzed: 05/23/2018
Signature:
Analyst: Chad Shaffer

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

iATL INTERNATIONAL
ASBESTOS TESTING LABORATORIES

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CERTIFICATE OF ANALYSIS

Client:	ALL-TECH Environmental Services Limited	Report Date:	5/23/2018
	20 Duke St.,Suite 109	Report No.:	563894 - Lead Paint
	Bedford NS B4A 2Z5	Project:	2557 Maynard
		Project No.:	
Client:	ALL131		

Appendix to Analytical Report:

Customer Contact:
Method: ASTM D3335-85a, US EPA SW846 3050B:7000B

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com
iATL Office Manager: cdavis@iatl.com
iATL Account Representative: Cassie Doherty
Sample Login Notes: See Batch Sheet Attached
Sample Matrix: Paint
Exceptions Noted: See Following Pages

General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and ir our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

This report shall not be reproduced except in full, without written approval of the laboratory.

Information Pertinent to this Report:

Analysis by ASTM D3335-85a by AAS

Certification:
- National Lead Laboratory Program (NLLAP): AIHA-LAP, LLC No. 100188
- NYSDOH-ELAP No. 11021

Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation.
All results are based on the samples as received at the lab. iATL assumes that appropriate sampling methods have been used and that the data upon which these results are based have been accurately supplied by the client.
Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Apendix B.
Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies.
LSD=0.2 ppm MDL=0.005% by weight. RL= 0.010% by weight (based upon 100 mg sampled).

Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a complete list with highlighted disclaimers pertinent to this project. For a full explanation of these and other disclaimers, please inquire at **customerservice@iatl.com.**

* Insufficient sample provided to perform QC reanalysis (<200 mg)
** Not enough sample provided to analyze (<50 mg)
*** Matrix / substrate interference possible.

iATL INTERNATIONAL
ASBESTOS TESTING LABORATORIES

9000 Commerce Parkway Suite B
Mt. Laurel, New Jersey 08054
Telephone: 856-231-9449
Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 5/22/2018
Report No.: 563928 - PLM
Project: 2557 Maynard
Project No.: 24279

PLM BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 6512887
Client No.: 001
Analyst Observation: White Insulation
Client Description: Insulation
Location: Roof Drain-Gym
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
95 Cellulose

Percent Non-Fibrous Material:
5

Lab No.: 6512888
Client No.: 002
Analyst Observation: White Insulation
Client Description: Insulation
Location: On Boilers Around Holes In Jacket
Facility:

Percent Asbestos:
30 *Chrysotile*

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
70

Lab No.: 6512889
Client No.: 003
Analyst Observation: Tan Insulation
Client Description: Insulation
Location: Boiler Door
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 6512890
Client No.: 004
Analyst Observation: Tan Brick
Client Description: Brick
Location: Boiler
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
None Detected

Percent Non-Fibrous Material:
100

Lab No.: 6512891
Client No.: 005
Analyst Observation: Yellow Insulation
Client Description: Yellow Straight Run Insulation
Location:
Facility:

Percent Asbestos:
None Detected

Percent Non-Asbestos Fibrous Material:
60 Cellulose
20 Fibrous Glass

Percent Non-Fibrous Material:
20

Please refer to the Appendix of this report for further information regarding your analysis.

Date Received: 5/16/2018
Date Analyzed: 05/22/2018
Signature: Tiffany Lowe
Analyst: Tiffany Lowe

Approved By:
Frank E. Ehrenfeld, III
Laboratory Director

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Telephone: 856-231-9449
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CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 5/22/2018
Report No.: 563928 - PLM
Project: 2557 Maynard
Project No.: 24279

Appendix to Analytical Report

Customer Contact:
Method: US EPA 600, R93-116

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

iATL Customer Service: customerservice@iatl.com
iATL Office Manager: cdavis@iatl.com
iATL Account Representative: Cassie Doherty
Sample Login Notes: See Batch Sheet Attached
Sample Matrix: Bulk Building Materials
Exceptions Noted: See Following Pages

General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at www.iATL.com and ir our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

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Information Pertinent to this Report:

Analysis by US EPA 600 93-116: Determination of Asbestos in Bulk Building Materials by Polarized Light Microscopy (PLM).

Certifications:

- NIST-NVLAP No. 101165-0
- NYSDOH-ELAP No. 11021
- AIHA-LAP, LLC No. 100188

Quantification at <0.25% by volume is possible with this method. (PC) Indicates Stratified Point Count Method performed. (PC-Trace) means that asbestos was detected but is not quantifiable under the Point Counting regimen. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed (ex. analyze until positive instructions). Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, PLM is not consistently reliable in detecting asbestos in non-friable organically bound (NOB) materials. Quantitative transmission electron microscopy (TEM) is currently the only method that can pronounce materials as non-asbestos containing.

Analytical Methodology Alternatives: Your initial request for analysis may not have accounted for recent advances in regulatory requirements or advances in technology that are routinely used in similar situations for other qualified projects. You may have the option to explore additional analysis for further information. Below are a few options, listed as the matrix followed by the appropriate methodology. Also included are links to more information on our website.

Bulk Building Materials that are Non-Friable Organically Bound (NOB) by Gravimetric Reduction techniques employing PLM and TEM: ELAP 198.6 (PLM-NOB), ELAP 198.4 (TEM-NOB)

Loose Fill Vermiculite Insulation, Attic Insulation, Zonolite (copyright), etc.: US EPA 600 R-4/004 (multi-tiered analytical process)
Sprayed On Insulation/Fireproofing with Vermiculite (SOF-V): ELAP 198.8 (PLM-SOF-V)

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Mt. Laurel, New Jersey 08054
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Email: customerservice@iatl.com

CERTIFICATE OF ANALYSIS

Client: ALL-TECH Environmental Services Limited
20 Duke St.,Suite 109
Bedford NS B4A 2Z5

Client: ALL131

Report Date: 5/22/2018
Report No.: 563928 - PLM
Project: 2557 Maynard
Project No.: 24279

Soil, sludge, sediment, aggregate, and like materials analyzed for asbestos or other elongated mineral particles (ex. erionite, etc.): ASTM D7521, CARB 435, and other options available

Asbestos in Surface Dust according to one of ASTM's Methods (very dependent on sampling collection technique – by TEM): ASTM D 5755, D5756, or D6480

Various other asbestos matrices (air, water, etc.) and analytical methods are available.

Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a list with highlighted disclaimers that may be pertinent to this project. For a full explanation of these and other disclaimers, please inquire at **customerservice@iatl.com**.

1) Note: No mastic provided for analysis.
2) Note: Insufficient mastic provided for analysis.
3) Note: Insufficient material provided for analysis.
4) Note: Insufficient sample provided for QC reanalysis.
5) Note: Different material than indicated on Sample Log / Description.
6) Note: Sample not submitted.
7) Note: Attached to asbestos containing material.
8) Note: Received wet.
9) Note: Possible surface contamination.
10) Note: Not building material. 1% threshold may not apply.
11) Note: Recommend TEM-NOB analysis as per EPA recommendations.
12) Note: Asbestos detected but not quantifiable.
13) Note: Multiple identical samples submitted, only one analyzed.
14) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.080%.
15) Note: Analyzed by EPA 600/R-93/116. Point Counting detection limit at 0.125%.
16) Note: This sample contains >10% vermiculite mineral. See Appendix for Recommendations for Vermiculite Analysis.

Recommendations for Vermiculite Analysis:

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gange, homogeneous exfoliated books of mica, or mixed mineral composites).Please contact your client representative for pricing and turnaround time options available.

iATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004).

For New York State customers, NYSDOH requires disclaimers and qualifiers for various vermiculite containing samples that direct analysis via ELAP198.6 and ELAP198.8 for samples that contain >10% vermiculite mineral where ELAP198.6 may be used to evaluate the asbestos content of the material. However, any test result using ELAP198.6 will be reported with the following disclaimer: “ELAP198.6 method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing >10% vermiculite.”

Further information on this method and other vermiculite and asbestos issues can be found at the following: Agency for Toxic Substances and Disease Registry (ATSDR) www.atsdr.cdc.gov, United States Geological Survey (USGS) www.minerals.usgs.gov/minerals/, US EPA www.epa.gov/asbestos. The USEPA also has an informative brochure "Current Best Practices for Vermiculite Attic Insulation" EPA 747F03001 May 2003, that may assist the health and remediation professional.

The following is a summary of the analytical process outlines in the EPA 600/R-04/004 Method:

1)**Analytical Step/Method:** Initial Screening by PLM, EPA 600R-93/116
Requirements/Comments: Minimum of 0.1 g of sample. ~0.25% LOQ for most samples.

2)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

3)**Analytical Step/Method:** Wet Separation by PLM Gravimetric Technique, EPA R-04/004

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Client: ALL131

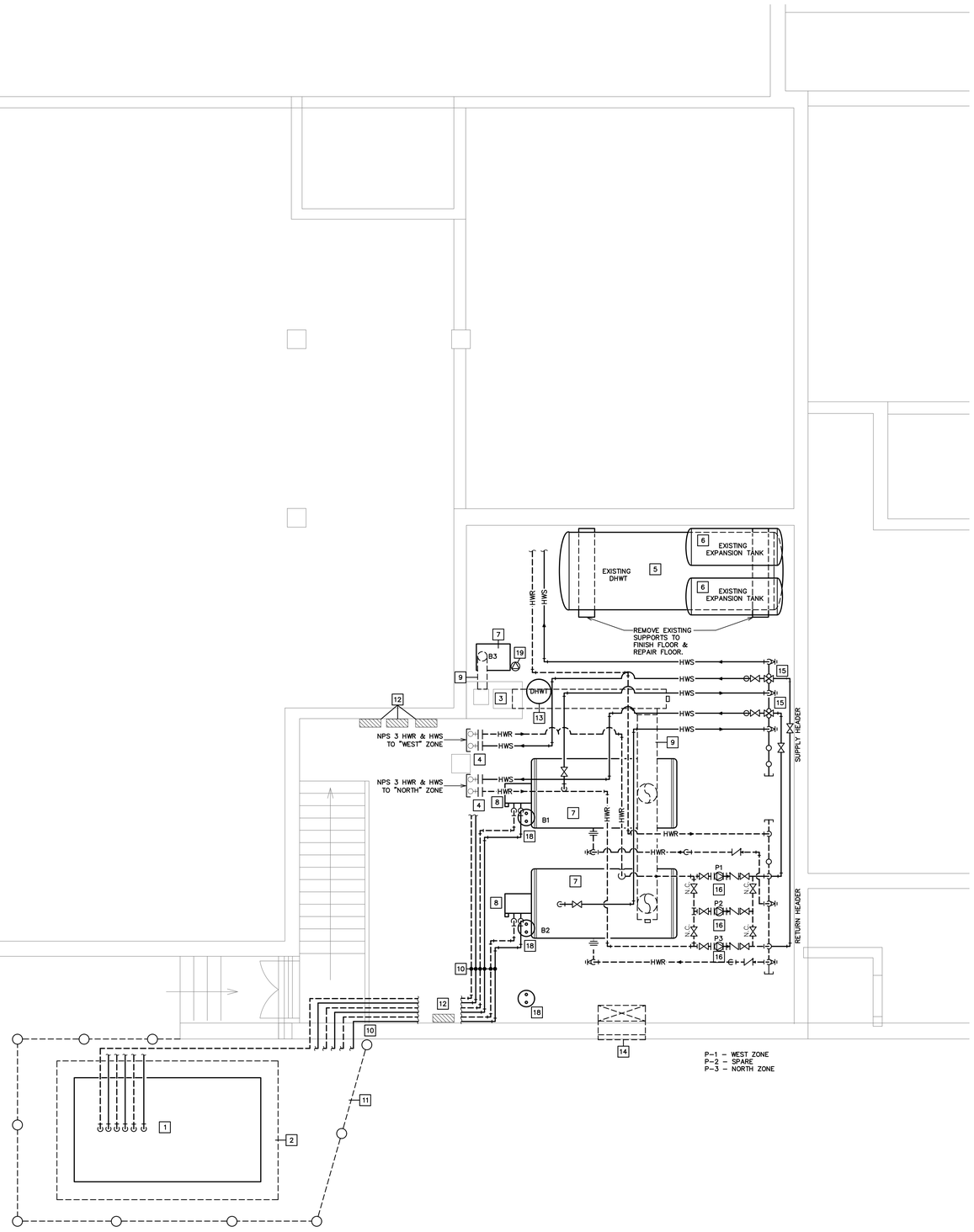
Report Date: 5/22/2018
Report No.: 563928 - PLM
Project: 2557 Maynard
Project No.: 24279

Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Floats" only.

4)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Sinks" only.

5)**Analytical Step/Method:** Wet Separation by TEM Gravimetric Technique, EPA R-04/004
Requirements/Comments: Minimum 50g** of dry sample. Analysis of "Suspension" only.

LOQ, Limit of Quantitation estimates for mass and volume analyses.
*With advance notice and confirmation by the laboratory.
**Approximately 1 Liter of sample in double-bagged container (~9x6 inch bag of sample).



1 M-1 BOILER ROOM ENLARGEMENT - DEMOLITION SCALE: 1:50

DEMOLITION – SYMBOL LEGEND

- EXISTING BREECHING TO BE REMOVED
- FOS — FUEL OIL SUPPLY PIPING TO BE REMOVED
- FOR — FUEL OIL RETURN PIPING TO BE REMOVED
- HWS — HEATING WATER SUPPLY PIPING TO BE REMOVED
- HWR — HEATING WATER RETURN PIPING TO BE REMOVED
- DOMESTIC COLD WATER PIPING TO BE REMOVED
- DOMESTIC HOT WATER PIPING TO BE REMOVED
- DOMESTIC HOT WATER RECIRC. PIPING TO BE REMOVED
- HWS — HEATING WATER SUPPLY PIPING TO REMAIN
- HWR — HEATING WATER RETURN PIPING TO REMAIN
- DOMESTIC COLD WATER PIPING TO REMAIN
- DOMESTIC HOT WATER PIPING TO REMAIN
- DOMESTIC HOT WATER RECIRC. PIPING TO REMAIN
- ISOLATION VALVE
- 3-WAY CONTROL VALVE c/w ELECTRONIC ACTUATOR
- PIPE UNION
- PIPE RISER DOWN
- VALVE ON RISER
- PIPE RISER UP
- NEW PIPE CAP
- TEMPERATURE SENSOR

2 M-1 LEGEND - DEMOLITION

MECHANICAL DRAWING NOTES – REMOVALS

1 – APPROXIMATE LOCATION OF EXISTING ABOVEGROUND FUEL-OIL TANK TO BE REMOVED. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH NOVA SCOTIA DEPARTMENT OF LABOR AND ADVANCED EDUCATION, FUEL-SAFETY DIVISION REGULATION. ALL SUPPORTING DOCUMENTS AND MANIFESTS SHALL BE PROVIDED TO HRCE & CONSULTANT. CONTRACTOR TO REMOVE AND DISPOSE OF TANK SLUDGE AT A DISPOSAL FACILITY AS APPROVED BY THE NOVA SCOTIA DEPARTMENT OF LABOR AND ADVANCED EDUCATION, FUEL-SAFETY DIVISION. ASSUME SLUDGE THICKNESS OF 150mm. USEABLE FUEL OIL WILL BE REMOVED FROM THE TANK BY HRCE PRIOR TO TANK REMOVAL.

2 – EXISTING CONCRETE PAD TO BE REMOVED. PATCH/REPAIR GROUND WHERE PAD WAS REMOVED WITH ASPHALT TO MATCH SURROUND.

3 – EXISTING MASONRY CHIMNEY TO BE REMAIN FOR NEW BOILER STACK. REMOVE EXISTING BREECHING AND CLEAN-OUT, REMOVE BRICK AND LINER ON SIDE OF CHIMNEY TO PERMIT INSTALLATION OF NEW LINER.

4 – REMOVE EXISTING HEATING PIPING TO THIS POINT. PRIOR TO PIPING REMOVAL, REMOVE ALL ASBESTOS AND FIBERGLASS PIPE INSULATION.

5 – EXISTING DOMESTIC WATER STORAGE TANK TO BE REMOVED.

6 – EXISTING EXPANSION TANKS TO BE REMOVED. REMOVE TANKS SUPPORT STAND AND ACCESSORIES, AND ALL REDUNDANT PIPING.

7 – EXISTING HEATING BOILER TO BE REMOVED AND DISPOSED OFF-SITE. REMOVE ALL ASSOCIATED DOMESTIC WATER, DRAIN PIPING AND ACCESSORIES. PRIOR TO REMOVING BOILER, REMOVE ALL ASBESTOS AND INSULATION FROM BOILER JACKET.

8 – EXISTING OIL FIRED BURNER TO BE TURNED OVER TO HRCE.

9 – EXISTING BOILER BREECHING AND HANGING ACCESSORIES TO BE REMOVED. PRIOR TO REMOVING BREACHING, REMOVE ALL ASBESTOS INSULATION.

10 – EXISTING FUEL OIL PIPING TO BE REMOVED. SEAL EXTERIOR WALL/FLOOR PENETRATIONS.

11 – EXISTING CHAIN-LINK FENCE TO BE REMOVED.

12 – EXISTING ELECTRICAL PANELS.

13 – EXISTING ELECTRIC DOMESTIC WATER TANK TO REMAIN UNTIL NEW DHWT IS IN OPERATION.

14 – EXISTING LOUVER & DUCTWORK TO BE REMOVED.

15 – EXISTING 3-WAY VALVES TO BE REMOVED AND RETAINED FOR REINSTALLATION.

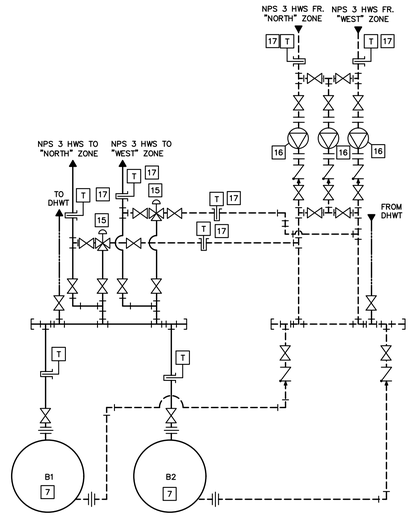
16 – EXISTING PUMPS TO BE REMOVED AND TURNED OVER TO HRCE.

17 – EXISTING TEMPERATURE SENSORS TO BE REMOVED AND RETAINED FOR REINSTALLATION.

18 – EXISTING OIL PIPING CONNECTIONS TO UNDER SLAB PIPING TO BE REMOVED TO BELOW SLAB AND CAPPED. REPAIR CONCRETE AROUND PIPES.

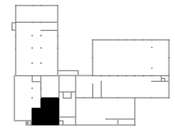
19 – EXISTING DHWR PUMP TO BE REMOVED. AND RETAINED FOR RE-INSTALLATION.

3 M-1 GENERAL NOTES - REMOVALS



4 M-1 HEATING SCHEMATIC - DEMOLITION SCALE: N.T.S

KEY PLAN



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NORTH

DATE yy-mm-dd	MARK	ISSUE
18/06/25	3	RE-ISSUED FOR TENDER
18/06/22	2	ISSUED FOR TENDER
18/06/01	1	ISSUED FOR REVIEW

STAMP

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA DATE Jun 25 2018 T. MCGREE 9111

SCALE	AS NOTED
DRAWN BY:	P.K.A.
CHECKED BY:	T.M.
REVIEWED BY:	T.M.
APPROVED BY:	T.M.
AS-BUILT CHECK	X.X.
DATE:	JUNE, 2018

PROJECT

JOSEPH HOWE ELEMENTARY - BOILER REPLACEMENT

HALIFAX, NOVA SCOTIA

PROJECT NO.: 10-18-042

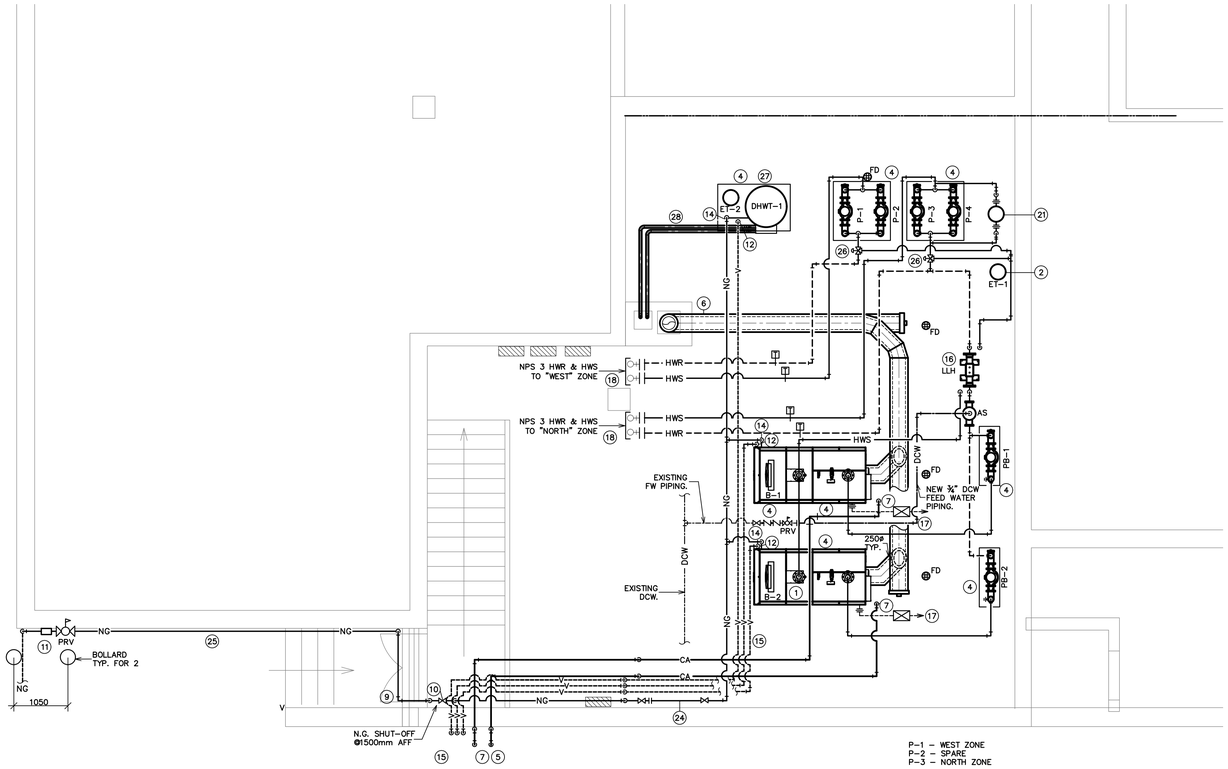
SHEET TITLE

PARTIAL BASEMENT FLOOR PLAN, DEMOLITION

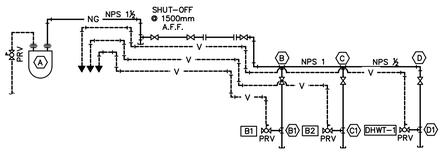
HRCE INTERNAL NO.: 3958

M-1

SHEET 1 OF 3



1 M-2 BOILER ROOM ENLARGEMENT - NEW WORK SCALE: 1:50



5 M-2 NATURAL GAS PIPING SCHEMATIC SCALE: N.T.S.

BOILER SCHEDULE

REF.	DESCRIPTION	INPUT (KW)	OUTPUT (KW)	N.G. INLET PRESSURE (kPa)	OPERATING PRESSURE (MAX.) (kPa)	RELIEF VALVE PRESSURE (kPa)	OPERATING TEMP. (MAX.) (°C)	POWER SUPPLY VOLTS	POWER SUPPLY PHASE	NOTES
B-1	HEATING BOILER NO. 1	423	402	2.75	517	206	80/60	115	1	PRE-PURCHASED CLEAVER BROOKS CLEARFIRE-CFC 1500 BY HRCE
B-2	HEATING BOILER NO. 2	423	402	2.75	517	206	80/60	115	1	PRE-PURCHASED CLEAVER BROOKS CLEARFIRE-CFC 1500 BY HRCE

PUMP SCHEDULE

REF.	DESCRIPTION	LOCATION	FLOW (L/S)	HEAD (m)	MOTOR RPM (@100%)	MANUFACTURER/MODEL	MOTOR SIZE HP	POWER SUPPLY VOLTS	POWER SUPPLY PHASE	CONTROLS MAN.	CONTROLS AUTO	NOTES
PB-1, PB-2	BOILER NO. 1 & 2 PRIMARY	BOILER ROOM	6.5	3	1200	BELL & GOSSETT e.80. 3x3x7C	3/4	120	1	MS		
P1, P2	HEATING LOOP WEST	BOILER ROOM	4.4	10	3600	BELL & GOSSETT e.90. 2AAC	2	208	3		VFD	
P3, P4	HEATING LOOP NORTH	BOILER ROOM	4.4	10	3600	BELL & GOSSETT e.90. 2AAC	2	208	3		VFD	

EXPANSION TANK SCHEDULE

EQIP. TAG	MANUFACTURER / MODEL	VOLUME (LITRES)	DIMENSIONS (mm'S)	REMARKS
ET-1	SEE SPECIFICATIONS	200	610ø x 1039H	HEATING SYSTEM

DOMESTIC HOT WATER HEATER SCHEDULE

REF.	DESCRIPTION	INPUT (KW)	CAPACITY (LITRES)	FIRST HOUR RATING (LITRES)	EFFICIENCY %	INLET PRESSURE (kPa)	POWER SUPPLY VOLTS	POWER SUPPLY PHASE	NOTES
DHWT-1	CONDENSING GAS DOMESTIC HOT WATER TANK	28	378	810	96	2.75	115	1	

6 M-2 MECHANICAL SCHEDULES

NEW WORK – SYMBOL LEGEND

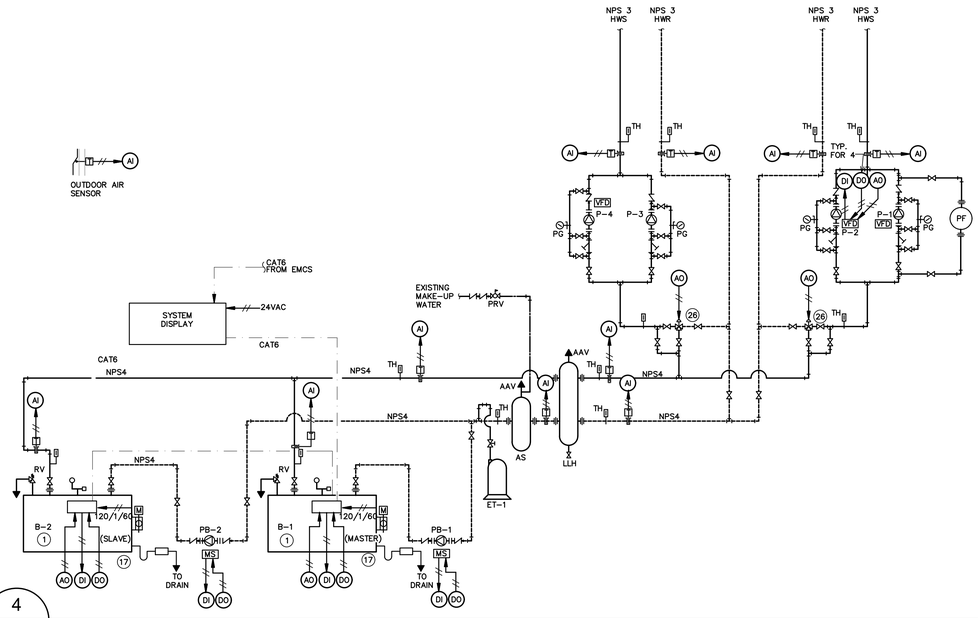
NEW COMBUSTION AIR DUCTWORK	EXISTING HEATING WATER SUPPLY PIPING TO REMAIN	LOCKSHIELD VALVE
NEW BOILER BREECHING	EXISTING HEATING WATER RETURN PIPING TO REMAIN	PIPE TEE DOWN
NEW NATURAL GAS PIPING	DOMESTIC COLD WATER PIPING TO REMAIN	PIPE UNION
NEW HEATING WATER SUPPLY PIPING	DOMESTIC HOT WATER PIPING TO BE REMAIN	RISER DOWN
NEW HEATING WATER RETURN PIPING	DOMESTIC HOT WATER RECIRC. PIPING TO REMAIN	VALVE ON RISER
NEW BOILER WATER SUPPLY PIPING	NATURAL GAS PRESSURE REGULATOR	RISER UP
NEW BOILER WATER RETURN PIPING	ISOLATION VALVE	PIPE CAP
NEW DRAIN PIPING	TEMPERATURE SENSOR	OUTDOOR AIR TEMPERATURE SENSOR
NEW CONDENSATE DRAIN PIPING	AIR SEPARATOR	CONTROL WIRING
NEW CONDENSATE DRAIN PIPING	MAGNETIC STARTER	ELECTRICAL SWITCH
NEW VENT LINE	CONCENTRIC PIPING REDUCER	PRESSURE GAUGE
NEW DOMESTIC COLD WATER PIPING	EXISTING TO NEW CONNECTION	THERMOMETER
NEW DOMESTIC HOT WATER PIPING		VARIABLE FREQUENCY DRIVE
NEW DOMESTIC HOT WATER RECIRC. PIPING		

2 M-2 LEGEND - NEW WORK

MECHANICAL DRAWING NOTES: NEW WORK

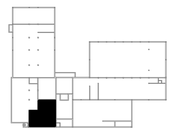
1. INSTALL NEW OWNER-SUPPLIED NATURAL GAS FIRED BOILERS. THIS CONTRACTOR SHALL PROVIDE PICK-UP, DELIVERY AND FINAL POSITIONING OF BOILERS ON-SITE. PROVIDE FINAL ASSEMBLY OF BOILER ON-SITE AS REQUIRED. INSTALL BOILER LOW-WATER CUT-OFF, PRESSURE RELIEF VALVE, AIR VENT, PRESSURE GAUGE AND ALL OTHER SUPPLIED ACCESSORIES. PROVIDE SAFETY VALVE DRAIN PIPING TO DRAIN, SIZE AS PER OUTLET OF SAFETY VALVE. ANCHOR NEW BOILER TO CONCRETE PAD AS PER MANUFACTURER'S INSTRUCTIONS WITH EPOXY-SET ANCHORS.
2. HYDRONIC EXPANSION TANK, ET-1, TO BE PIPED AS SHOWN.
3. PROVIDE NEW 350mm I.D. BOILER BREECHING AS PER MANUFACTURER'S INSTRUCTIONS. MATERIAL SHALL BE STAINLESS STEEL DOUBLE WALL POSITIVE PRESSURE TYPE AL29-4C C/W. 25mm. AIR SPACE. PROVIDE BOILER MANUFACTURER APPROVED VENT TERMINATION.
4. PROVIDE NEW 150mm CONCRETE HOUSEKEEPING PAD. REFER TO DETAIL 9/M-3
5. PROVIDE AND INSTALL REMOVABLE WIRE STEEL CAGE OVER EQUIPMENT INTAKES FOR DAMAGE PROTECTION. SECURE TO BUILDING FACE C/W STAINLESS STEEL HARDWARE. PRIME AND PAINT.
6. PROVIDE NEW 250mmø I.D. DOUBLE WALL BOILER VENT, AL29-4C. EXTEND VENT TERMINATION MINIMUM 900mm ABOVE TOP OF CURB. PROVIDE 304 STAINLESS STEEL CAP AT TOP OF PENETRATION. TOTAL LENGTH OF VENT = APPROX. 8.0 m. CONTRACTOR TO CONFIRM EXACT DIMENSIONS ON-SITE. PROVIDE SUPPORT OF VENTING AS PER MANUFACTURER'S INSTRUCTIONS. PROVIDE NEW PENETRATION AND ROOF CURB, FOR CONTINUATION AND ADDITIONAL DETAIL REFER TO 1/M-3 AND 3/M-3
7. PROVIDE 200mmø PVC-DWV SCHEDULE 40 BOILER COMBUSTION AIR PIPING. PIPING TO BE TO CSA B181.1 C/W PIPE CEMENT TO CSA B137.3. USE AIR INLET SCREEN AS PER BOILER MANUFACTURER'S INSTRUCTIONS. PROVIDE 45° ELBOW DOWN TERMINATION C/W INSECT SCREEN. WALL PENETRATION SHALL BE AS HIGH AS POSSIBLE.
8. FOR PIPING DETAILS REFER TO HEATING SYSTEM FLOW SCHEMATIC ON DRAWING.
9. NEW NPS 1¼ NATURAL GAS PIPING. SEAL WALL PENETRATION.
10. PROVIDE NEW NPS 1¼ NATURAL GAS MASTER SHUT-OFF VALVE. PROVIDE DIRT POCKET BEFORE VALVE INLET. PROVIDE IDENTIFICATION OF VALVE WITH SIGNAGE AS PER CSA B149.1-10.
11. NATURAL GAS METER SET AND BOLLARDS BY UTILITY. REFER TO DETAIL 6/M-3
12. INSTALL NEW NATURAL GAS PRESSURE REGULATOR. 14kPa INLET, REFER TO DETAIL 10/M-3
13. NEW NATURAL GAS PRESSURE REGULATOR VENT PIPES, SIZE AS PER CSA B.149.1-10. INCREASE SIZE AS NECESSARY/REQUIRED BY CSA
14. NEW NPS 1¼ NATURAL GAS PIPING DOWN TO BOILER CONNECTION. PROVIDE ISOLATION VALVE & DIRT POCKET.
15. PROVIDE NEW NATURAL GAS REGULATOR VENT PIPING TO EXTERIOR. PROVIDE GOOSENECK TERMINATIONS C/W INSECT SCREENS. PIPE ALL BOILER GAS-TRAIN PRESSURE SWITCH VENTS AS NECESSARY TO SAME TERMINATION POINT. SEAL EXTERIOR WALL PENETRATIONS. PAINT PIPING TO MATCH BUILDING EXTERIOR. SECURE PIPING TO EXTERIOR WALL. PROVIDE 1M CLEARANCE TO BUILDING OPENINGS AND 3M TO AIR INTAKES.
16. PROVIDE AND INSTALL NEW LOW-LOSS HEADER LLH-1. ANCHOR TO PAD AS PER MANUFACTURER'S RECOMMENDATIONS WITH EPOXY SET ANCHORS. PROVIDE AND INSTALL MANUFACTURER'S INSULATION, AND JACKETING KIT.
17. PROVIDE AND INSTALL NEW CONDENSATE TRAP FOR EACH BOILER, AND FOR THE BOILER STACK AND CONDENSATE TREATMENT NEUTRALIZATION TANK. PROVIDE NPS 1 CPVC CONDENSATE DRAINAGE PIPING TO INDIRECT DRAIN AS INDICATED.
18. CONNECT TO EXISTING PIPING AT THIS POINT.
19. EXISTING OUTDOOR AIR TEMPERATURE SENSOR TO REMAIN.
20. NOT USED
21. NEW CHEMICAL POT-FEEDER, LINE-FILTER AND DUPLEX STRAINER
22. BOILER B-1 TO BE SET AS "MASTER BOILER"
23. PROVIDE NEW APPROX. 1750x450x50mm THICK INSULATED PANEL, 20 GAUGE STEEL DOUBLE-SIDED. CONTRACTOR TO CONFIRM ALL DIMENSIONS ON-SITE. SEAL TO BUILDING OPENING. PROVIDE NEW GALVANIZED STEEL PROTECTIVE CAGE OVER OPENING AND C/A INLETS. SECURE TO BUILDING.
24. PROVIDE A 1 METER LONG SPOOL PIECE FOR NEW NATURAL GAS FLOW METER. FOR DETAILS REFER TO 12/M-3
25. MOUNT NATURAL GAS PIPING ALONG BUILDING WALL, SECURE TO WALL WITH WALL SUPPORTS AS PER CSA B149.1-10.
26. INSTALL EXISTING 3-WAY MIXING VALVES.
27. INSTALL NEW NATURAL GAS FIRED CONDENSING DOMESTIC HOT WATER TANK. REFER TO DETAIL 8/M-3
28. INSTALL NEW 50mmø COMBUSTION AIR AND EXHAUST VENT PIPING, CPVC SCHEDULE 40, ULC APPROVED. RUN EXHAUST VENT AND COMBUSTION AIR UP THROUGH EXISTING MASONRY CHIMNEY. PROVIDE CONCENTRIC VENT ADAPTOR ON TERMINATION. REFER TO DETAILS 3/M-3 AND 5/M-3

3 M-2 GENERAL NOTES - NEW WORK



4 M-2 HEATING & CONTROLS SCHEMATIC - NEW WORK SCALE: N.T.S

KEY PLAN



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NORTH

DATE yy-mm-dd	MARK	ISSUE
18/06/25	3	RE-ISSUED FOR TENDER
18/06/22	2	ISSUED FOR TENDER
18/06/1	1	ISSUED FOR REVIEW

STAMP

SCALE	AS NOTED
DRAWN BY:	P.K.A.
CHECKED BY:	T.M.
REVIEWED BY:	T.M.
APPROVED BY:	T.M.
AS-BUILT CHECK	X.X.
DATE:	JUNE, 2018

PROJECT
JOSEPH HOWE ELEMENTARY - BOILER REPLACEMENT
HALIFAX, NOVA SCOTIA

PROJECT NO.: 10-18-042

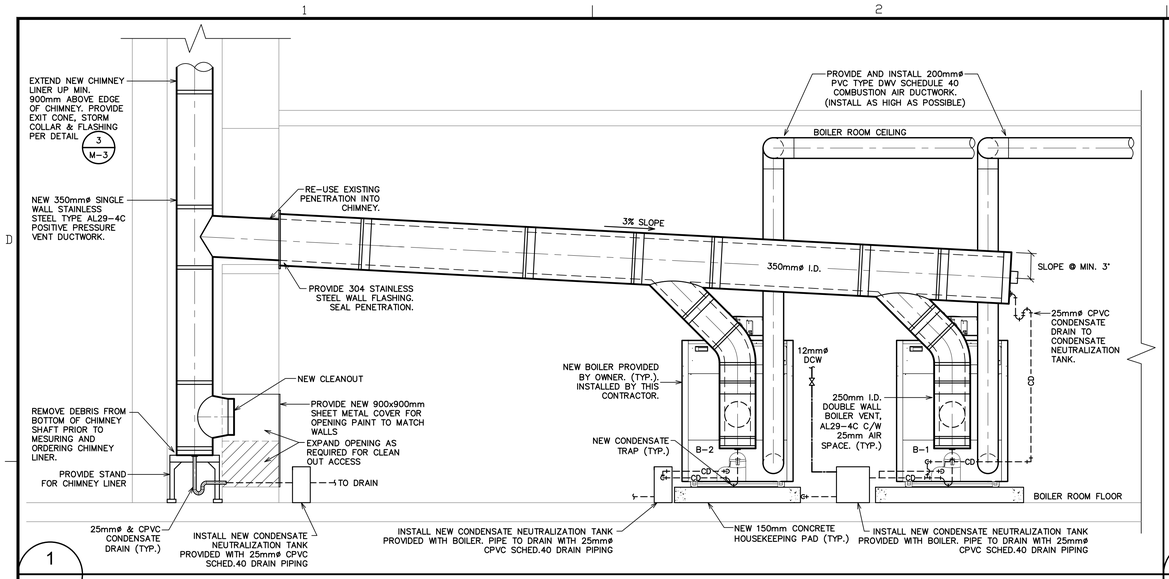
SHEET TITLE
PARTIAL BASEMENT FLOOR PLAN, NEW WORK

HRCE INTERNAL NO.: 3958

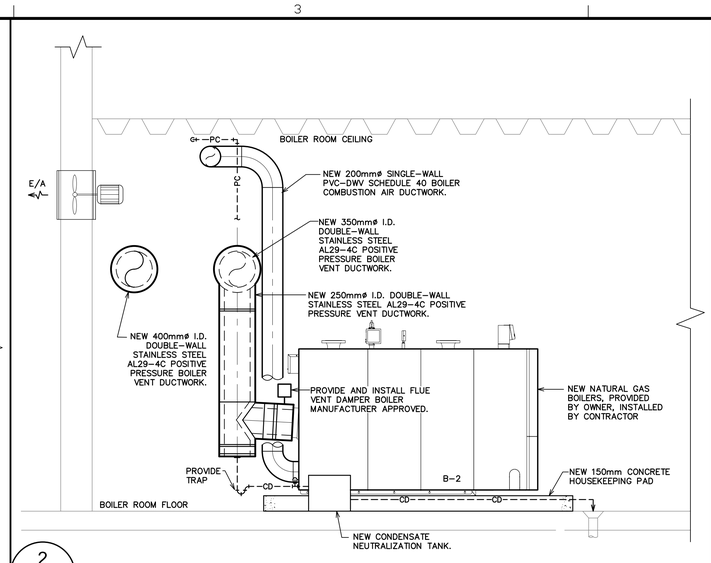
M-2

SHEET 2 OF 3

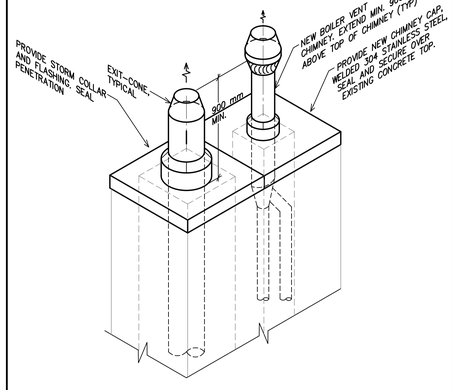
SHEET B1



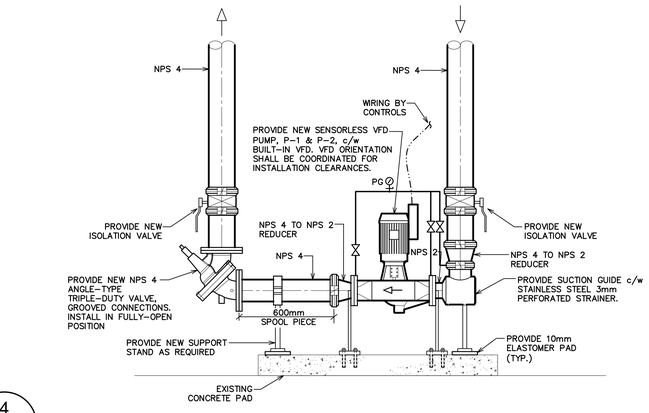
1 M-3 MECHANICAL ROOM NEW BOILER INSTALLATION SECTION 'A' SCALE: 1:25



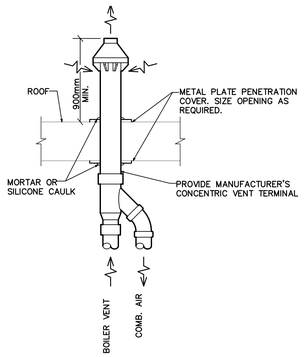
2 M-3 MECHANICAL ROOM NEW BOILER INSTALLATION SECTION 'B' SCALE: 1:25



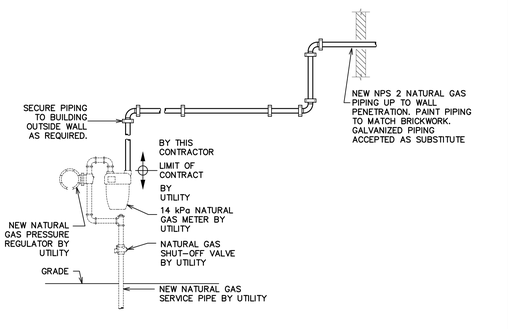
3 M-3 CHIMNEY DETAIL - NEW WORK N.T.S.



4 M-3 NEW INLINE PUMP - P-3 & P-4 - INSTALLATION DETAIL N.T.S.



5 M-3 CONCENTRIC DHW TANK VENT DETAIL N.T.S.



6 M-3 NATURAL GAS METER-SET DETAIL N.T.S.

PIPE SIZE CALCULATIONS : FIRST STAGE – 14 kPa				
PIPE SECTION	NATURAL GAS LOAD kW (MBH)	EQUIVALENT LENGTH (m)	MINIMUM SIZE	PLAN SIZE
A – LMR	874 (2990)	30.0	--	--
A – B	874 (2990)	22	NPS 1¼	NPS 1½
B – B1	423 (1445)	3.5	NPS 1	NPS 1
B – C	451 (1545)	2.0	NPS 1	NPS 1
C – C1	423 (1445)	3.5	NPS 1	NPS 1
C – D	28 (100)	4.5	NPS ½	NPS ½
D – D1	28 (100)	3.5	NPS ½	NPS ½

SCHEDULE GENERAL NOTES:

1. PIPE SIZES TAKEN FROM TABLE A-3 OF CSA STANDARD B149.1-10
2. TOTAL EQUIVALENT LENGTH DERIVED FROM TABLE A-16 OF CSA STANDARD B149.1-10
3. LMR = LONGEST MEASURED RUN (FUTURE PIPING)

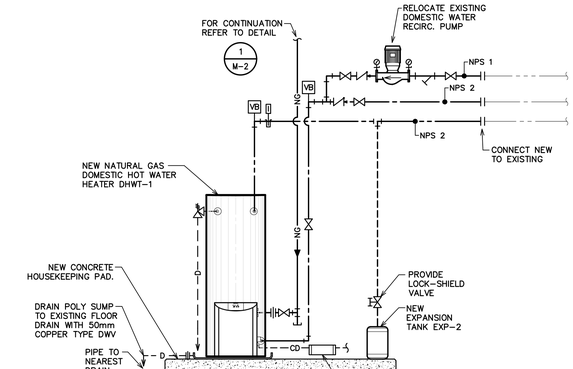
PIPE SIZE CALCULATIONS : SECOND STAGE – 2.75 kPa				
PIPE SECTION	NATURAL GAS LOAD (kW)	EQUIVALENT LENGTH (m)	MINIMUM SIZE	PLAN SIZE
B1 – B2	423 (1445)	3.0	NPS 1¼	NPS 1¼
C1 – C2	423 (1445)	3.0	NPS 1¼	NPS 1¼
D1 – D2	28 (100)	3.0	NPS ½	NPS ½

SCHEDULE GENERAL NOTES:

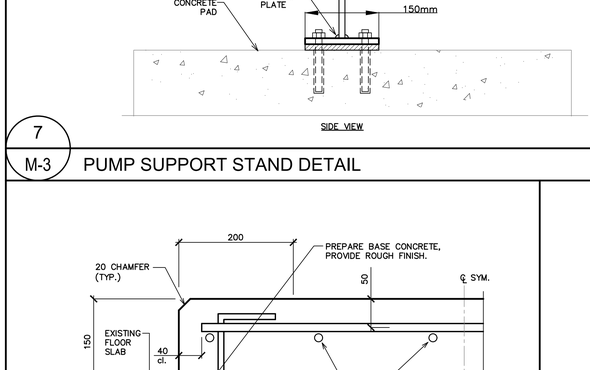
1. PIPE SIZES TAKEN FROM TABLE A-2 OF CSA STANDARD B149.1-10
2. TOTAL EQUIVALENT LENGTH DERIVED FROM TABLE A-16 OF CSA STANDARD B149.1-10
3. LMR = LONGEST MEASURED RUN (FUTURE PIPING)

EQUIPMENT LOAD SCHEDULE				
LOAD NUMBER	LOAD TYPE	MANUFACT.	MODEL	LOAD kW (MBH)
1	HEATING BOILER, B-1	SEE SPEC'S	SEE SPEC'S	423 (1445)
2	HEATING BOILER, B-2	SEE SPEC'S	SEE SPEC'S	423 (1445)
3	DOMESTIC HOT WATER TANK, DHWT-1	"REFER TO SPECIFICATION"	"REFER TO SPECIFICATION"	28 (100)

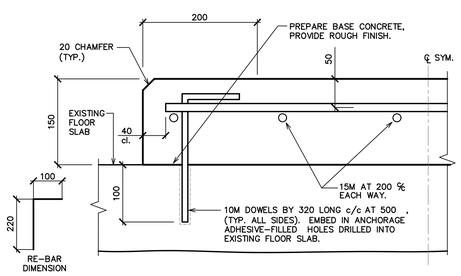
11 M-3 NATURAL GAS PIPE SIZING CALCULATIONS



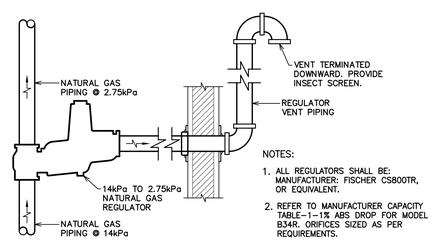
8 M-3 DOMESTIC HOT WATER HEATER DETAIL N.T.S.



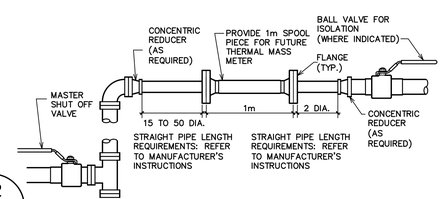
7 M-3 PUMP SUPPORT STAND DETAIL N.T.S.



9 M-3 NEW CONCRETE PAD DETAIL N.T.S.

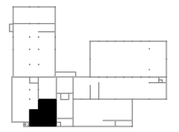


10 M-3 NAT. GAS PRESSURE REGULATOR DETAIL N.T.S.



12 M-3 THERMAL MASS FLOW METER DETAIL N.T.S.

KEY PLAN



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NORTH

DATE yy-mm-dd	MARK	ISSUE
18/06/25	3	RE-ISSUED FOR TENDER
18/06/22	2	ISSUED FOR TENDER
18/06/01	1	ISSUED FOR REVIEW

STAMP

SCALE	AS NOTED
DRAWN BY:	P.K.A.
CHECKED BY:	T.M.
REVIEWED BY:	T.M.
APPROVED BY:	T.M.
AS-BUILT CHECK	X.X.
DATE:	JUNE, 2018

PROJECT

JOSEPH HOWE ELEMENTARY - BOILER REPLACEMENT

HALIFAX, NOVA SCOTIA

PROJECT NO.: 10-18-042

SHEET TITLE

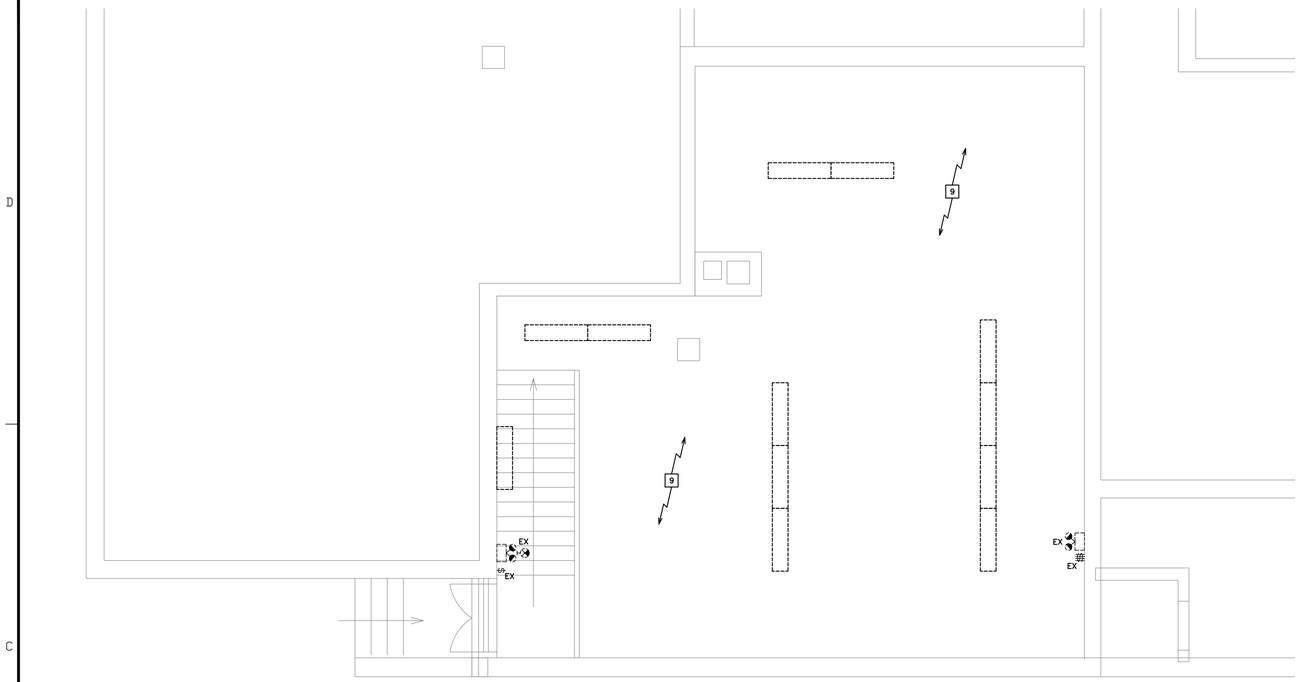
DETAILS & SCHEDULES

HRCE INTERNAL NO.: 3958

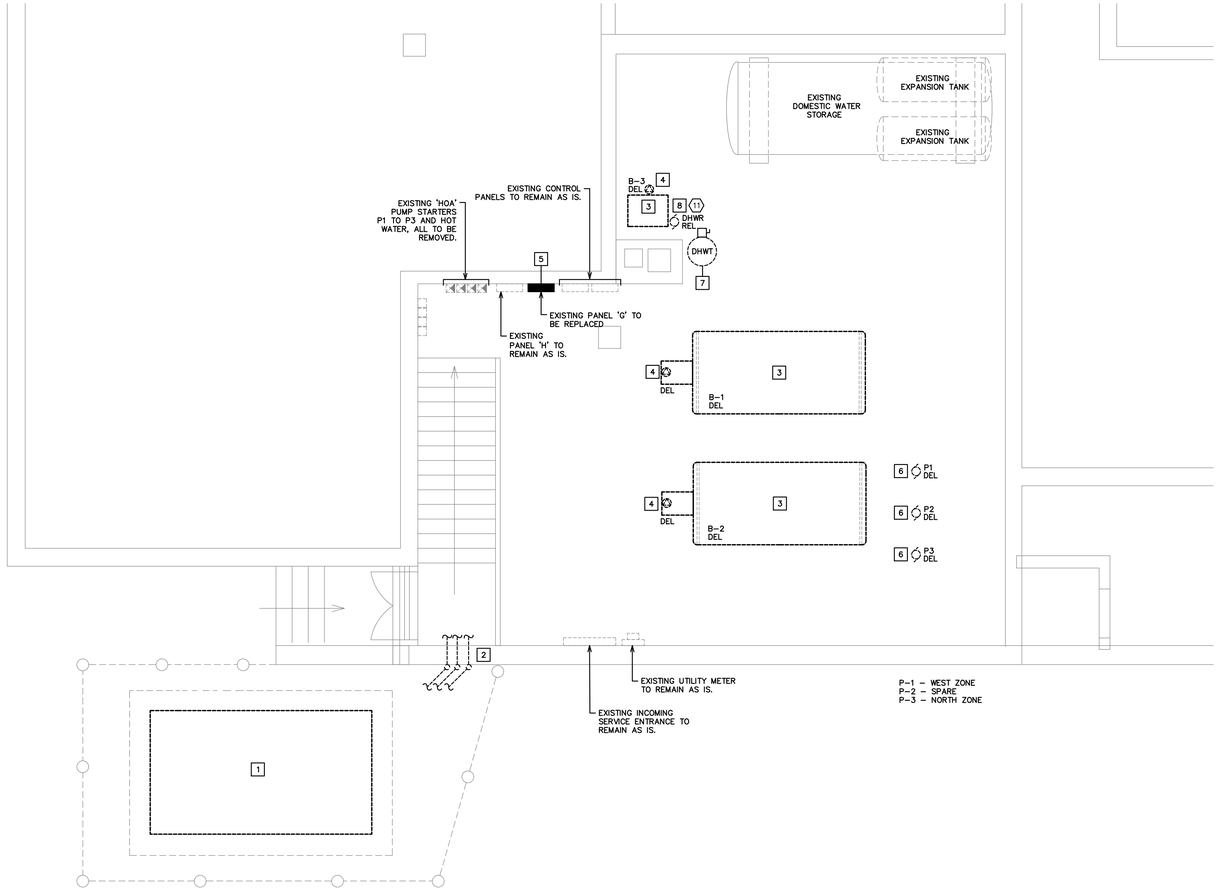
M-3

SHEET 3 OF 3

SHEET B1



1 E-1 BOILER ROOM ENLARGEMENT - LIGHTING - EXISTING CONDITIONS SCALE: 1:50



3 E-1 BOILER ROOM ENLARGEMENT - POWER AND SYSTEMS - DEMOLITION SCALE: 1:50

ELECTRICAL DRAWING NOTES – REMOVALS

1 – APPROXIMATE LOCATION OF EXISTING ABOVEGROUND FUEL–OIL TANK TO BE DECOMMISSIONED AND REMOVED BY OTHERS, INCLUDING REMOVAL OF ALL MONITORING WIRING AND ACCESSORIES. ALL LINE VOLTAGE WIRING AND CONDUITS, IF EXISTING MADE REDUNDANT BY DEMOLITION, SHALL BE REMOVED, BY ELECTRICAL CONTRACTOR BACK TO SOURCE OF SUPPLY.

2 – EXISTING BX FEEDERS TO BE REMOVED, BY ELECTRICAL CONTRACTOR BACK TO SOURCE OF SUPPLY. SEAL EXTERIOR WALL/FLOOR PENETRATIONS. TYPICAL FOR THREE FEEDERS.

3 – EXISTING HEATING BOILER TO BE REMOVED AND DISPOSED OFF–SITE BY OTHERS, ALL REDUNDANT LINE VOLTAGE WIRING, CONDUIT, DISCONNECTS AND STARTERS BACK TO SOURCE OF SUPPLY SHALL BE REMOVED BY ELECTRICAL CONTRACTOR.

4 – EXISTING OIL FIRED BURNER TO BE TURNED OVER TO HRCE

5 – EXISTING ELECTRICAL PANEL 'G' TO BE REPLACED WITH NEW (REFER TO PANEL LEGEND ON THIS DRAWING). ELECTRICAL CONTRACTOR SHALL RELOCATE EXISTING DEVICES, CONDUITS AND WIRING AS REQUIRED TO ALLOW FOR INSTALLATION OF NEW PANEL. MATCH EXISTING BRACING AND INTERRUPTING RATINGS. EXISTING PANEL 'G' IS FED FROM EXISTING SERVICE ENTRANCE PANEL.

6 – EXISTING PUMPS (TYPICAL FOR 3) TO BE REMOVED BY OTHERS AND TURNED OVER TO HRCE.

7 – EXISTING ELECTRICAL DOMESTIC HOT WATER TANK TO REMAIN UNTIL NEW DHWT IS IN OPERATION. ALLOW FOR DISCONNECTION AND REMOVAL OF EXISTING TANK AND CONNECTION OF NEW TANK. REFER TO MECHANICAL EQUIPMENT SCHEDULE FOR DETAILS. DISCONNECTION AND INSTALLATION OF NEW TO BE COORDINATED WITH MECHANICAL CONTRACTOR.

8 – EXISTING DHWR PUMP TO BE REMOVED, AND RETAINED FOR RE–INSTALLATION. DISCONNECTION AND INSTALLATION TO BE COORDINATED WITH MECHANICAL CONTRACTOR.

9 – EXISTING FLUORESCENT LUMINAIRES CONTAINING T12, 4FT FLUORESCENT LAMPS ARE TO BE REMOVED. ALL EXISTING SHALL BE REPLACED WITH NEW T8 FLUORESCENT FIXTURES SUPPLIED BY OWNER. NEW LAMPS TO BE T8 EQUIVALENT LED TUBES TO BE PROVIDED BY CONTRACTOR. EXISTING LUMINAIRE CONTROLS TO REMAIN AS IS.

2 E-1 DRAWING NOTES - REMOVALS N.T.S.

LIGHTING

EXISTING SURFACE MOUNTED LINEAR FLUORESCENT LUMINAIRE

EXISTING EMERGENCY LIGHTING SYSTEM DUAL REMOTE HEADS,

EXISTING EMERGENCY LIGHTING BATTERY UNIT C/W DUAL HEADS

EXISTING GREEN LED "RUNNING MAN" EXIT SIGN

LIGHTING CONTROL

$ $ # ## ONE, TWO, THREE AND FOUR GANG SINGLE POLE TOGGLE SWITCHES

POWER, EQUIPMENT CONNECTIONS AND CONTROLS

PB MUSHROOM HEAD PUSH BUTTON SWITCH C/W TWO (2) N/C CONTACTS, TWIST TO RESET BOILER SHUT–OFF SWITCH. SUPPLIED AND INSTALLED BY ELECTRICAL, SEE BOILER EMERGENCY SHUTOFF WIRING DIAGRAM ◇1

JB JUNCTION BOX

DIRECT CONNECTION

MOTOR CONNECTION

MAGNETIC MOTOR STARTER C/W H.O.A. AND 120V COIL

PANELBOARD

UNIT HEATER SURFACE MOUNTED C/W DISCONNECT SWITCH, LOW VOLTAGE THERMOSTAT, AND MOUNTING BRACKET

T LOW VOLTAGE THERMOSTAT WALL MOUNTED BY ELECTRICAL CONTRACTOR

M GAS METER

MISCELLANEOUS

EX INDICATES EXISTING DEVICE TO REMAIN

MV INDICATES EXISTING DEVICE TO BE MOVED

REL INDICATES EXISTING DEVICE IN RELOCATED POSITION

DEL INDICATES EXISTING DEVICE TO BE DEMOLISHED

INDICATES CONDUIT

◇1 ELECTRICAL DRAWING NOTES

⬡5 MECHANICAL EQUIPMENT (SEE SCHEDULE)

4 E-1 HEATER SCHEDULE N.T.S.

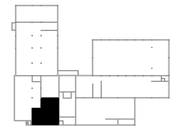
HEATER SCHEDULE

TYPE	DESCRIPTION	MANUFACTURER'S SERIES	WATTAGE	VOLTS	ø	NOTES
H1	UH–1	STELPRO #SHU1083C24/SHUDIS/T87K1015	10kw	208	3	–
H2	UH–2	STELPRO #SHU1083C24/SHUDIS/T87K1015	10kw	208	3	–

NOTES:
1.

5 E-1 LEGEND N.T.S.

KEY PLAN



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NORTH

DATE yy-mm-dd	MARK	ISSUE
18/06/25	1	ISSUED FOR TENDER

STAMP

REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA
JUN 25 2018
M. GEORGE
8210

SCALE	AS NOTED
DRAWN BY:	H.E.G.
CHECKED BY:	M.M.G
REVIEWED BY:	M.M.G.
APPROVED BY:	M.M.G.
AS–BUILT CHECK	X.X.
DATE:	JUNE, 2018

PROJECT
JOSEPH HOWE ELEMENTARY - BOILER REPLACEMENT

HALIFAX, NOVA SCOTIA

PROJECT NO.: 10–18–042

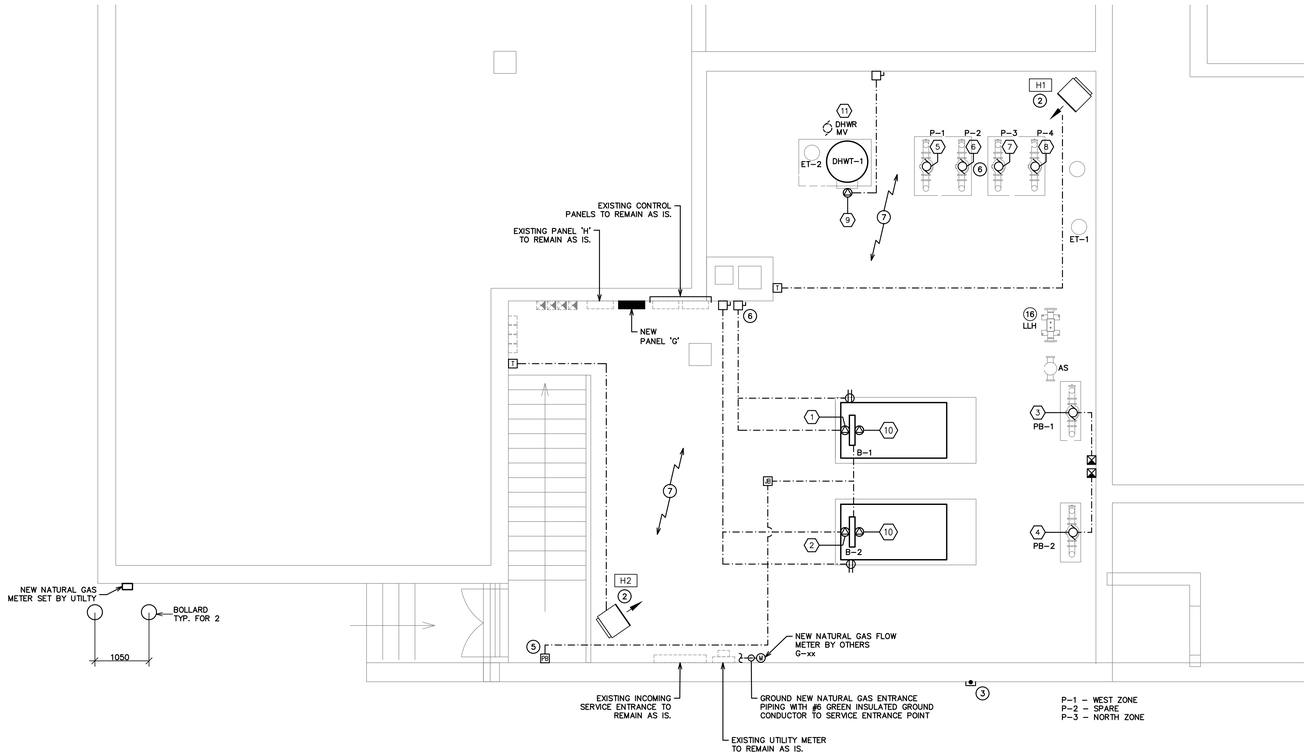
SHEET TITLE
BOILER ROOM ENLARGEMENT - DEMO, LEGEND AND DETAILS

HRCE INTERNAL NO.: 3958

E-1

SHEET 1 OF 2

SHEET B1



1 E-2 BOILER ROOM ENLARGEMENT - NEW WORK SCALE: 1:50

GENERAL NOTES:

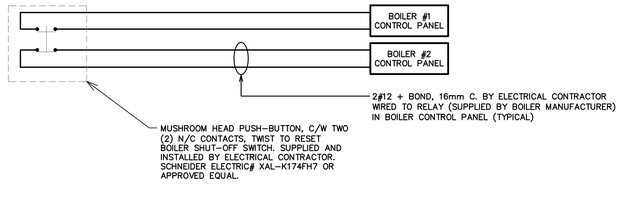
1. COORDINATE EXACT LOCATIONS FOR NEW DEVICES AND EQUIPMENT WITH MECHANICAL CONTRACTOR ON SITE PRIOR TO INSTALLATION. ENSURE REQUIRED CLEARANCES ARE MAINTAINED. ALL FEEDS FROM OVERHEAD SHALL BE SUPPORTED VERTICALLY WITH STRUT AS REQUIRED.
2. CONFIRM REQUIRED CONTROL COIL VOLTAGE FOR MAGNETIC STARTERS AND CONTACTORS WITH MECHANICAL CONTRACTOR PRIOR TO SUBMITTING SHOP DRAWINGS.
3. FOR EXISTING MOTOR CONNECTIONS TO BE REMOVED, ALL ASSOCIATED CONDUIT, WIRING, STARTERS AND DISCONNECTS SHALL BE REMOVED BACK TO SOURCE OF SUPPLY BY ELECTRICAL CONTRACTOR.

2 E-2 GENERAL NOTES N.T.S

ELECTRICAL DRAWING NOTES – NEW WORK

1. EXISTING HONEYWELL CONTROL PANEL TO REMAIN.
2. NEW 10kW ELECTRICAL UNIT HEATER (TYPICAL FOR 2), PROVIDED AND INSTALLED BY ELECTRICAL (REFER TO HEATER AND PANEL SCHEDULE). PROVIDE 3#6 RW90 IN 26mm EMT.
3. EXISTING OUTDOOR AIR TEMPERATURE SENSOR (INCLUDED WITH BOILER) TO REMAIN. ELECTRICAL CONTRACTOR SHALL SUPPLY AND INSTALL 16mm EMPTY CONDUIT FROM BOILER CONTROL PANEL TO BOX ON EXTERIOR FACADE. SENSOR AND WIRING INSTALLATION BY MECHANICAL CONTRACTOR. CONFIRM EXACT LOCATION WITH MECHANICAL CONTRACTOR PRIOR TO ROUGH-IN.
4. SUPPLY AND INSTALL 27mm EMPTY CONDUIT FROM EXISTING CONTROL PANEL TO NEW BOILER B-1 MASTER CONTROL PANEL. CONFIRM EXACT LOCATION FOR NEW AND EXISTING CONTROL PANEL WITH MECHANICAL CONTRACTOR PRIOR TO START OF WORK.
5. ELECTRICAL CONTRACTOR SHALL SUPPLY AND INSTALL NEW BOILER EMERGENCY SHUT OFF SWITCH AND 16mm EMT CONDUIT TO BOILER MASTER CONTROL PANEL. COORDINATE WITH MECHANICAL CONTRACTOR PRIOR TO START OF WORK. MOUNT NEW SWITCH AT MOUNTING HEIGHT OF 5'-0". REFER TO BOILER EMERGENCY SHUT-OFF WIRING DIAGRAM.
6. COORDINATE EXACT LOCATIONS FOR STARTERS AND DISCONNECT SWITCHES WITH MECHANICAL CONTRACTOR ON SITE PRIOR TO INSTALLATION. ENSURE REQUIRED CLEARANCES ARE MAINTAINED. ALL FEEDS FROM OVERHEAD SHALL BE SUPPORTED VERTICALLY WITH STRUT AS REQUIRED.
7. RELOCATE EXISTING LUMINAIRES AND ASSOCIATED CONDUITS ON CEILINGS TO ALLOW FOR NEW MECHANICAL DUCTWORK INSTALLATIONS ABOVE. COORDINATE RELOCATIONS WITH MECHANICAL CONSULTANT ON SITE PRIOR TO START OF WORK. ENSURE ADEQUATE LIGHT LEVELS ARE REACHED. ALL EXISTING SHALL BE REPLACED WITH NEW T8 FLUORESCENT FIXTURES SUPPLIED BY OWNER. NEW LAMPS TO BE T8 EQUIVALENT LED TUBES TO BE PROVIDED BY CONTRACTOR. EXISTING LUMINAIRE CONTROLS TO REMAIN AS IS. CIRCUIT TO THE SAME CIRCUIT SERVING EXISTING LUMINAIRES. ENSURE CIRCUIT IS NOT OVERLOADED.

3 E-2 GENERAL NOTES - NEW WORK N.T.S



4 E-2 BOILER EMERGENCY SHUT-OFF WIRING DIAGRAM N.T.S

MECHANICAL EQUIPMENT SCHEDULE

NO.	ITEM	DESCRIPTION	LOCATION	LOAD	VOLTS	ø	BREAKER	FEEDER	DISCONNECT	STARTER	PANEL	NOTES
1	B-1	HEATING BOILER NO.1	BASEMENT BOILER ROOM	–	120	1	15A-1P	2#12 RW90 + BOND, 1/2"C	30A	–	G	1,2
2	B-2	HEATING BOILER NO.2	BASEMENT BOILER ROOM	–	120	1	15A-1P	2#12 RW90 + BOND, 1/2"C	30A	–	G	1,2
3	PB-1	PUMP – BOILER NO.1 PRIMARY	BASEMENT BOILER ROOM	3/4 HP	120	1	35A-1P	2#10 RW90 + BOND, 1/2"C	–	MS	G	–
4	PB-2	PUMP – BOILER NO.2 PRIMARY	BASEMENT BOILER ROOM	3/4 HP	120	1	35A-1P	2#10 RW90 + BOND, 1/2"C	–	MS	G	–
5	P-1	PUMP – HEATING LOOP WEST	BASEMENT BOILER ROOM	2 HP	208	3	20A-3P	3#12 RW90 + BOND, 1/2"C	–	VFD (BY MECH)	G	–
6	P-2	PUMP – HEATING LOOP WEST	BASEMENT BOILER ROOM	2 HP	208	3	20A-3P	3#12 RW90 + BOND, 1/2"C	–	VFD (BY MECH)	G	–
7	P-3	PUMP – HEATING LOOP NORTH	BASEMENT BOILER ROOM	2 HP	208	3	20A-3P	3#12 RW90 + BOND, 1/2"C	–	VFD (BY MECH)	G	–
8	P-4	PUMP – HEATING LOOP NORTH	BASEMENT BOILER ROOM	2 HP	208	3	20A-3P	3#12 RW90 + BOND, 1/2"C	–	VFD (BY MECH)	G	–
9	DHWT-1	DOMESTIC HOT WATER TANK (DOMESTIC GAS)	BASEMENT BOILER ROOM	–	120	–	15A-1P	2#12 RW90 + BOND, 1/2"C	30A	–	G	–
10	LWCO	LOW WATER CUT-OFF DEVICE (TYPICAL FOR 2 DEVICES)	BASEMENT BOILER ROOM	–	120	1	–	2#12 RW90 + BOND, 1/2"C	–	–	–	3
11	DWHR	EXISTING DHW RECIRC. PUMP	BASEMENT BOILER ROOM	–	–	–	–	–	–	–	–	4

NOTES:
1. RED EMERGENCY SHUT-OFF SWITCH INSTALLED AND WIRED BY ELECTRICAL CONTRACTOR FOR EMERGENCY BOILER SHUT-OFF. REFER TO EMERGENCY BOILER SHUT-OFF WIRING DIAGRAM.
2. ELECTRICAL CONTRACTOR SHALL WIRE BOILER PUMP TO TERMINAL CONNECTIONS IN BOILER CONTROL PANEL AS PER MANUFACTURER'S RECOMMENDATIONS.
3. WIRE LWCO DEVICES TO BOILER CONTROL PANELS USING LIQUID TIGHT FLEXIBLE CONDUIT, COORDINATE WITH MECHANICAL CONTRACTOR.
4. DISCONNECT POWER TO PUMP TO ALLOW FOR REMOVAL. EXTEND EXISTING WIRING AND CONDUIT TO NEW LOCATION AND CONNECT. COORDINATE EXACT LOCATION WITH MECHANICAL CONTRACTOR.

STARTER LEGEND

MS= MANUAL TYPE MOTOR STARTER c/w O/L PROTECTION
HOA= MAGNETIC STARTER C/W HAND/OFF/AUTO SELECTOR SWITCH
VSD= VARIABLE SPEED DRIVE, SUPPLIED BY MECHANICAL CONTRACTOR, WIRED BY ELECTRICAL CONTRACTOR

5 E-2 MECHANICAL EQUIPMENT SCHEDULE N.T.S

PANEL VOLTAGE: 208

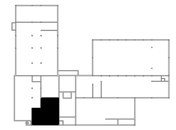
JOSEPH HOWE ELEMENTARY BOILER REPLACEMENT												NEW PANEL 'G' (TO REPLACE EXISTING)	
CCT	DESCRIPTION	WATTAGE A	WATTAGE B	WATTAGE C	P	BRKR AMPS	ø AB C	BRKR AMPS	P	WATTAGE A	WATTAGE B	WATTAGE C	DESCRIPTION	CCT
1	EXISTING						A						EXISTING	2
3							B						EXISTING	4
5	EXISTING						C						EXISTING	6
7	EXISTING						A							8
9	EXISTING						B						EXISTING	10
11							C							12
13	EXISTING						A							14
15	EXISTING						B						EXISTING	16
17							C							18
19	EXISTING						A							20
21	EXISTING						B						EXISTING	22
23							C							24
25	EXISTING						A						EXISTING	26
27	EXISTING						B						EXISTING	28
29	EXISTING						C						EXISTING	30
31	EXISTING						A						EXISTING	32
33	EXISTING						B						EXISTING	34
35	EXISTING						C						EXISTING	36
37							A						EXISTING	38
39	EXISTING						B						EXISTING	40
41							C						EXISTING ***	42
43	HEATING BOILER NO.1				1	15	A			3333				44
45	HEATING BOILER NO.2				1	15	B	40	3		3333		UNIT HEATER UH-1	46
47	BOILER NO.1 PRIMARY PUMP PB-1				1	35	C					3333		48
49	BOILER NO.2 PRIMARY PUMP PB-2				1	35	A			3333				50
51							B	40	3		3333		UNIT HEATER UH-2	52
53	HEATING LOOP WEST PUMP P-1				3	20	C					3333		54
55							A							56
57							B	20	3				HEATING LOOP NORTH PUMP P-3	58
59	HEATING LOOP WEST PUMP P-2				3	20	C							60
61							A							62
63	DOMESTIC HOT WATER (GAS)				1	15	B	20	3				HEATING LOOP NORTH PUMP P-4	64
65	SPARE				1	15	C							66
67	SPARE				1	15	A	15	1				SPARE	68
69	SPARE				1	15	B	15	1				SPARE	70
71	SPARE				1	15	C	15	1				SPARE	72

NOTES:

ELECTRICAL CONTRACTOR SHALL REPLACE EXISTING PANEL 'G' WITH NEW 225A, 120/208V, 3ø, 4W, 72 CIRCUIT PANELBOARD. CONFIRM ALL EXISTING TO REMAIN CIRCUITS PRIOR TO REPLACING PANEL. SUPPLY PANEL WITH ALL NEW BREAKERS AS REQUIRED (CONFIRM PRIOR TO ORDERING PANEL) TO FEED EXISTING AND NEW CIRCUITS AS INDICATED. RELOCATE ALL EXISTING CONDUITS, WIRING AND OTHER EXISTING DEVICES AS REQUIRED TO ALLOW FOR INSTALLATION OF PANELBOARD. REPLACE EXISTING INCOMING PANEL FEEDER AS REQUIRED TO COMPLY WITH CEC 2018. USE 250MCM Cu MINIMUM.

6 E-2 PANEL SCHEDULE 'G' N.T.S

KEY PLAN



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BUS: (902) 876-3182 FAX: (902) 876-2796
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REGISTERED PROFESSIONAL ENGINEER PROVINCE OF NOVA SCOTIA M. GEORGE 8210 DATE 2018 20th

SCALE	AS NOTED
DRAWN BY:	H.E.G.
CHECKED BY:	M.M.G
REVIEWED BY:	M.M.G.
APPROVED BY:	M.M.G.
AS-BUILT CHECK	X.X.
DATE:	JUNE, 2018

PROJECT
JOSEPH HOWE ELEMENTARY - BOILER REPLACEMENT
HALIFAX, NOVA SCOTIA

PROJECT NO.: 10-18-042

SHEET TITLE
BOILER ROOM ENLARGEMENT - NEW WORK, DETAILS AND SCHEDULES

HRCE INTERNAL NO.: 3958

E-2

SHEET 2 OF 2