FORM OF TENDER FOR STIPULATED SUM

FOR

PRE-TENDER FOR PACKAGE ROOFTOP HVAC UNIT

FOR

205 GREENBANK RD.

WOODVALE PENTECOSTAL CHURCH – PHASE 2

OTTAWA, ONTARIO

Tenders to:

Hobin Architecture Inc.
c/o Goodkey Weedmark & Associates Limited
1688 Woodward Dr.
Ottawa, Ontario
K2C 3R8

ATTENTION: PETER CHAN, P.ENG, MBA, LEED AP & UZO UKEJE, M.ENG.

I/We have examined the Instructions to Bidders Section 00 21 13 Pages 1 to 4, and Package Rooftop HVAC Unit Section 23 74 00, pages 1 to 6 and all addenda thereto as acknowledged hereafter, as prepared by Goodkey, Weedmark & Associates Limited, and hereby offer to supply all the above units in accordance with the foregoing specifications for the sum of:

To supply one (1) nominal 3-ton Package Rooftop Air Handling Unit meeting specification Section 23 74 00 - Package Rooftop HVAC Unit:

Package Rooftop Unit Make and Model:_____

_____

Dollars ($_____) including shipping costs (HST extra).

I/We validate the above bid price for a period of 60 days from the tender date.

I/We acknowledge receipt of the following addenda and have included for the requirements thereof in My/Our tender:

List of Addenda

Addendum #1 dated: _____

Addendum #2 dated: _____

Addendum #3 dated: _____

ADDITIONAL INFORMATION

1. We meet the schedule as noted in the Instructions to Bidders. YES ☐ NO ☐

2. Equipment fully complies with specifications. YES ☐ NO ☐

   If NO, identify all deviations as they relate to the specific section of the specification on a separate attached page.

3. I/We offer the following additional cost saving measures for your consideration (HST extra):

		CREDIT
.1		$
.2		$
.3		$

4. I/We attach herewith specific make and model of equipment c/w dimensional data, weights, power data and performance data. I/We understand that our tender may be considered null and void without the attached information.

	List of Attached Pages	No. of Pages
.1		
.2		
.3		

5. The following tables do not need to be filled in if the exact information is included in the proprietary data sheets for each chiller selection:

SYSTEM PERFORMANCE CRITERIA:	ROOFTOP UNIT
Manufacturer & Model	
Airflow (CFM)	1050
ESP (In. W.C.)	0.6
Heating Capacity Input	
Heating Capacity Output	
Heating Stages	
Outdoor Air Temperature	-20°F
Supply Air Temperature	90°F
Space Air Temperature	74°F
Minimum Outdoor Air	10%
Cooling Capacity Total	
Cooling Capacity Sensible	
Outdoor Air Temperature:	95°F
Cooling Coil EAT (WB/DB)	80°F/67°F
Cooling Coil LAT (WB/DB)	55°F/54°F
Motor full load amps (FLA)	
Minimum circuit ampacity (MCA)	
Power	208V/3Ø/60Hz

6. I/we commit to a _____ week(s) delivery time to deliver the equipment herein to site, upon receipt of reviewed shop drawings from the client.

DATED THIS _____

SIGNATURE _____

NAME OF COMPANY _____

ADDRESS _____

EQUIPMENT MANUFACTURER _____

PART 1 - GENERAL

1.1 DELIVERY, HANDLING AND INSTALLATION

.1 Equipment will be delivered to: 205 Greenbank Rd.

.2 Include all shipping costs for delivery.

.3 Coordinate delivery of the unit with the contractor. The contractor will not expect the unit before the date identified on the tender form. However, delivery may vary slightly after the identified date to coordinate hoisting of the equipment.

.4 Receiving, unloading, inspecting, handling, placement and final installation will be done by Contractor to be appointed by Paladin Technologies.

1.2 TENDER PRICE

.1 Complete Tender Form in its entirety.

1.3 TENDER EVALUATION

.1 Tenders shall include shop drawing indicating the weight, size, any specific base frame requirements and power requirement of the quoted equipment.

.2 Tender acceptance will be based on specification conformance, equipment performance, equipment size & weight and delivery time, as noted in the completed tender form. Tender acceptance is not necessarily the lowest price.

1.4 ACCEPTANCE OF TENDER

.1 A Letter of Intent issued by the Paladin Technologies will confirm the acceptance of your tender and that your tender will be transferred to a mechanical contractor as a Cash Allowances in a subsequent contract for Paladin Technologies Office Expansion under a Stipulated Price Contract CCDC 2.

.2 The Letter of Intent will authorize you to proceed with preparation and submission of shop drawings and upon their approval by the Engineer, to manufacturer the proposed equipment.

1.5 PAYMENT

.1 Upon delivery of pre-tendered equipment to the site and assuming the equipment has been delivered on schedule either as identified on the tender form or as accepted by Paladin Technologies and Engineer, the invoice amount shall be submitted, for review and delay claims (if any) will be assessed.

.2 Contractor will submit an application for payment for this equipment only (including manufacturer's invoice). Payment shall be made to the Contractor in accordance with Standard Construction Practice.

1.6 INSURANCE & LIABILITY

.1 Suppliers/manufacturers shall carry General Liability Insurance in accordance with City of Ottawa's policy for work performed on site.

1.7 SHOP DRAWINGS

.1 Upon receipt of the letter of intent accepting your tender, within five (5) working days, submit to the Engineer, one (1) electronic copy of shop drawings indicating physical size, clearances, weights, performance data, service connections (piping, power, etc.), operating and control sequences, wiring diagrams, etc. for review.

.2 Fabrication of equipment shall not proceed until shop drawings are reviewed by Engineer.

.3 Upon shop drawing review, submit one (1) electronic copy of installation, operating & maintenance instructions specifically edited for the requirements of this machine for reference by the contractor & City of Ottawa’s personnel.

1.8 WARRANTY

.1 Refer to Section 23 74 00 – Package Rooftop HVAC Unit - for warranty requirements.

1.9 CLOSEOUT SUBMITTALS

.1 Submit operation and maintenance data for incorporation into manuals.

.2 Operation and maintenance manual (O&M) to be approved by, and final copies deposited with, Engineer before final inspection.

.3 Provide a schedule detailing the supplied component, name, address & phone no. of equipment vendor, parts supplier and warranty agent.

.4 Operation data to include:
- .1 Control schematics for each system including environmental controls.
- .2 Description of each system and its controls.
- .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
- .4 Operation instruction for each system and each component.
- .5 Description of actions to be taken in event of equipment failure.

.5 Maintenance data shall include:
- .1 Servicing, maintenance, operation and trouble-shooting instructions for unit.
- .2 Data to include schedules of tasks, frequency, tools required and task time.

.6 Performance data to include:
- .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
- .2 Equipment performance verification test results.
- .3 Special performance data as specified elsewhere.

.7 Approvals:
.1 Submit electronic format (pdf) copy of draft Operation and Maintenance Manual to Engineer for approval. Submission of individual data will not be accepted unless so directed by Engineer.
.2 Make changes as required and re-submit as directed by Engineer.
.3 Upon acceptance by Engineer submit one (1) electronic format (pdf) and two (2) hardcopies of O&M manuals to Paladin Technologies.

.8 Additional data:
.1 Prepare and insert additional data into operation and maintenance manual when the need becomes apparent during demonstrations and instructions specified above.

1.10 PROJECT SCOPES AND SCHEDULE

.1 This project is to provide one (1) 3-ton Package Rooftop HVAC Unit to site no later than November 8th, 2021 in order to install, test & commission the unit for operation by November 31st, 2021.

.2 Note: These dates maybe delayed depending on contractors' schedule, however the RTU must be available no later than the dates above.

1.11 INQUIRIES

.1 During tender period direct all inquiries to the Engineer:

Goodkey Weedmark & Associates Limited
1688 Woodward Dr.
Ottawa, Ontario
K2C 3R8

ATTENTION: PETER CHAN, P.ENG, MBA, LEED AP & UZO UKEJE, M.ENG.

Telephone: (613) -727-5111
Fax: (613) -727-5115

1.12 DELIVERY OF TENDERS

.1 Tenders shall be delivered in a sealed envelope or e-mailed to:

Hobin Architecture Inc.
c/o Goodkey Weedmark & Associates Limited
1688 Woodward Dr.
Ottawa, Ontario
K2C 3R8

ATTENTION: PETER CHAN, P.ENG, MBA, LEED AP & UZO UKEJE, M.ENG.

Telephone: (613) -727-5111
Fax: (613) -727-5115

not later than 2:00 p.m. E.S.T. on 28 day of July, 2021

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society of Sanitary Engineering (ASSE)
- .1 ASSE (Plumbing) 1013-2011, Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
- .2 ASSE (Plumbing) 1015-2011, Performance Requirements for Double Check Backflow Prevention Assemblies and Double Check Fire Protection Backflow Prevention Assemblies.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM F402-18, Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Usedfor Joining Thermoplastic Pipe and Fittings.
- .2 ASTM F437-15, Standard Specification for Threaded Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- .3 ASTM F438-17, Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
- .4 ASTM F439-19, Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.
- .5 ASTM F442/F442M-20, Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe (SDR-PR).
- .6 ASTM F493-20, Standard Specification for Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

.3 Canadian Standards Association (CSA)
- .1 CAN/CSA B64 Series-11 (R2016), Backflow Preventers and Vacuum Breakers.
- .2 CSA B64.10-17/B64.10.1-17, Selection and Installation of Backflow Preventers/Maintenance and FieldTesting of Backflow Preventers.

.4 [Factory Mutual.]

.5 National Fire Protection Association
- .1 NFPA (Fire) 13, Standard for the Installation of Sprinkler Systems, [2019 Edition for NBC] [2013 Edition for the OBC].

.6 NSF International (NSF)
- .1 NSF/ANSI/CAN 61-2020, Drinking Water System Components - Health Effects.

.7 Ontario Regulation
- .1 ONTARIO OBC-2012, 2012 Ontario Building Code Compendium

.8 Underwriters Laboratories (UL) .

.9 Underwriters Laboratories of Canada (ULC)
- .1 ULC/ORD C263.1-99-r2018, Sprinkler-Protected Windows Systems.

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with Section 20 05 01 - Mechanical General Requirements and in accordance with NFPA (Fire) 13, working plans and design requirements.

.2 Pipe layout shall be the Contractors responsibility and fully coordinated with other trades.

.3 [Contractor shall submit shop drawing documents to Factory Mutual in accordance with Factory Mutual Standards; Contractor shall pay for all cost associated with submission.]

1.4 ENGINEERING DESIGN CRITERIA

.1 Design system in accordance with [Factory Mutual and] NFPA (Fire) 13 using following parameters:
- .1 System shall be wet pipe systems as indicated.
- .2 All areas shall be designed for hazard coverage indicated with design area and associated densities.
- .3 Pipe size and layout:
  - .1 Hydraulic design.
  - .2 Sprinkler layout to NFPA (Fire) 13 and with sprinkler centred in short direction of ceiling tile andno less than 300 mm from the tile's edge. Sprinkler contractor shall be responsible to provide sprinkler and piping layout fully coordinated with other systems.
  - .3 The hydraulic design shall be sized to accommodate the highest and most remote zones [and where indicated accommodate future building addition].
  - .4 Allow for additional sprinklers and pipe distribution to suit electrical, architectural and structural coordination.
  - .5 Sprinklers shown are for architectural coordination, coverage to suit NFPA (Fire) 13 requirements. Provide additional sprinklers as required.
- .4 Water supply:
  - .1 Base design on NFPA (Fire) 13 and obtain water supply data from nearest fire hydrant. Hydraulic calculations shall commence at water main connection at street. Provide as part of hydraulic calculation submission, fire hydrant flow test data and deduct 10% as safety factor based on available pressure value.
- .5 Drawings and calculations shall be certified by a Professional Engineer licensed in the Province of Ontario.
- .6 Sprinkler system to be seismically restrained to Ontario Building Code and NFPA (Fire) 13 requirements.
- .7 [Final installations to be reviewed by Professional Engineer licensed in the Province of Ontario. NFPA (Fire) 13 compliance letter to be stamped by Hydraulic Design Engineer and submitted at end of contract.]

1.5 DRAWING PREPARATION

.1 Review architectural, structural, mechanical and electrical drawings to determine interferences affecting the distribution layout prior to shop drawing submission.

1.6 MAINTENANCE DATA

.1 Provide maintenance data for incorporation into manual specified in Section 20 05 01 - Mechanical General Requirements.

1.7 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Provide spare sprinklers and tools as required by NFPA (Fire) 13.

1.8 ACCEPTABLE SPRINKLER CONTRACTORS

.1 Contractors shall be members of Canadian Automatic Sprinkler Association (CASA).

.2 Acceptable contractors:
- .1 Escape Fire Protection, Orleans, tel: 613-830-4308, e-mail: escapefire@rogers.com
- .2 Forbes Fire Protect Inc., Orleans, tel: 613-822-2341, e-mail: jim@forbesfire.com
- .3 Lowe Fire Protection, Ottawa, tel: 613-739-5693, e-mail: rtlowefire@on.aibn.com
- .4 Ottawa Sprinkler Installations Limited, Ottawa, tel: 613-727-1803,e-mail: ottawa_sprinkler@on.aibn.com
- .5 Secure Fire Protection / Noti-secur inc., Ottawa, tel: 613-744-072 2, e-mail: sales@noti-secur.com
- .6 SimplexGrinnell, Ottawa, tel: 613-526-0435, e-mail: balonzo@simplexgrinnell.com
- .7 Viking Fire Protection Inc., Nepean, tel: 613-225-9540, e-mail: sspearing@vikingfire.ca
- .8 Vipond Fire Protection, Div. of Vipond Inc., Ottawa, tel: 613-225-0538,e-mail: marc.langlois@vipond.ca

PART 2 - PRODUCTS

2.1 PIPE, FITTINGS AND VALVES

.1 Pipe:
- .1 Ferrous: to NFPA (Fire) 13.
- .2 Ferrous hot dipped galvanized: to NFPA (Fire) 13 in corrosive or damp environments.

.2 Fittings and joints to [FM and] NFPA (Fire) 13:
- .1 Ferrous: screwed, welded, flanged or roll grooved.
- .2 All exposed piping shall be rigid piping.

.3 Flexible sprinkler drops:
- .1 Braided flexible stainless steel sprinkler drops, cULus and FM listed for fire protection service for installation on suspended ceiling grids, wood or metal stud/joist or furring channels.
- .2 25 mm (1") nominal ID braid hose and fitting made of 304 stainless steel, 1206 kPa (175 psi) maximumworking pressure, 178 mm (7") minimum bending radius within length of 750 mm to 1800 mm as per cULus. The maximum amount of allowable bends as per cULus are as follows: 750 mm (36") (5 bends); 1200 mm (48") (8 bends); 1500 mm (60") (10 bends); 1800 mm (72") (12 bends).
- .3 Inlet nipple 25 mm (1") NPT with straight or 90° reducer for 13 mm (½") or 20 mm (¾") NPT sprinkler.
- .4 A steel bracket with square bar, adjustable centre bracket and adjustable end brackets suitable for ceiling types. End bracket shall have permanent securement to ceiling system.
- .5 Acceptable material: Victaulic Model VicFlex AH2; [Viking model VKFD28B].

.4 Valves:
- .1 ULC [and FM] listed for fire protection service.
- .2 Up to NPS 2: bronze, screwed ends, OS&Y rising stem gate or ball valve.
- .3 NPS 2½ and over: cast iron, flanged or roll grooved ends, OS&Y rising stem gate or butterfly type.
- .4 Check valves: swing type as above.

.5 Ball drip check valve.

.5 Pipe hangers:
.1 [FM and] ULC listed for fire protection services.

.6 Sprinkler system shall be rated at 1380 kPa (200 psi).

.7 CPVC Pipe System:
.1 Application: Residential suite floors starting downstream of zone isolation valve and flow switch.
.2 General:
.1 CPVC fire sprinkler pipe and fittings shall be permitted for NFPA (Fire) 13 light hazard applications in residential suite floors only. Sprinkler pipe to be fully approved for use inNFPA (Fire) 13 Light Hazard applications. CPVC fire sprinkler pipe and fittings shall be extruded/molded from CPVC compounds.
.3 Pipe and Fittings:
.1 Pipe shall meet or exceed the requirements of ASTM F442 in standard dimension ratio(SDR) 13.5
.2 Fittings shall meet or exceed the requirements of ASTM F437 (schedule 80 threaded),ASTM F438 (schedule 40 socket) or ASTM F439 (schedule 80 socket).
.3 Both pipe and fittings shall be listed by Underwriters Laboratories (UL) for use in wet automatic fire sprinkler systems and shall bear the logo of the Listing Agency.
.4 Solvent Welding:
.1 All socket type joints shall be assembled with solvent cements that meet or exceed the requirements of ASTM F493. Safe handling of solvent cements shall be in accordance with ASTM F402. The solvent cements shall be approved for use with BlazeMaster CPVC pipe and fittings.
.5 Acceptable material: BlazeMaster.

2.2 BACKFLOW PREVENTOR

.1 Double Check Valve Assembly (DCVA):
.1 Lead free construction, 304 stainless steel body, stainless steel fasteners and springs. Checks removable for maintenance. Rated for 60°C (140°F) and 1207 kPa (175 psi). Complete with [grooved end OS&Y gate valves] [flanged end OS&Y gate valves] [grooved end butterfly valves with integral supervisory switches]. Certified to CSA B64.5. ULC & FM listed. ASSE 1015 and NSF/ANSI/CAN 61 compliant.
.2 Provide suitable supervisory switches, where not integral to backflow preventer shut off valves.
.3 Acceptable material: Watts 757, Zurn 350AST.

.2 Reduced pressure principle type (RP):
.1 Lead free construction, 304 stainless steel body, stainless steel fasteners and springs. Checks removable for maintenance. Rated for 60°C (140°F) and 1207 kPa (175 psi). Complete with [grooved end OS&Y gate valves] [flanged end OS&Y gate valves] [grooved end butterfly valves with integral supervisory switches] and air gap drain fitting. Certified to CSA B64.4. ULC & FM listed. ASSE 1013 and NSF/ANSI/CAN 61 compliant.
.2 Provide suitable supervisory switches, where not integral to backflow preventer shut off valves.
.3 Acceptable material: Watts 957, Zurn 375AST.

.3 All backflow preventers shall be selected and installed in accordance with OBC & CSA B64.10.

2.3 SPRINKLERS

.1 General: to [FM,] NFPA (Fire) 13 and ULC listed for fire services.

.2 Provide wire guards in all mechanical rooms, storage areas, electrical rooms, and elevator machine room.

.3 All sprinklers shall have low zinc content (less than 10%) brass alloy and metal to metal sealing mechanism in the water ways.

.4 Acceptable materials: Viking, Grinnell, Victaulic and Tyco.

2.4 TAMPER RESISTANT SPRINKLER

.1 Fully concealed chrome finish, glass bulb type with lock ring, cup and cover, quick response for hazard coverage as indicated, 5.6 K factor, 68°C (155°F) rated, FM approved designed for institutional applications.

2.5 CONCEALED SPRINKLER

.1 Fully concealed pendent, quick response for hazard coverage as indicated, 5.6 K factor, enclosed escutcheon, separate two-piece design of mounting cup and coverplate, internal threaded closure, 68°C (155°F) rated, 13 mm (½") adjustment, FM approved, [white enamel] [chrome] finish, glass bulb type and white finish cover.

2.6 SEMI-RECESSED SPRINKLER

.1 Semi-recessed pendent, quick response for hazard coverage as indicated, 5.6 K factor, extended adjustable escutcheon, [chrome] [white enamel] finish, FM approved, glass bulb type; 68°C (155°F) rated, 13 mm (½") orifice.

2.7 UPRIGHT SPRINKLER

.1 Upright bronze, quick response for hazard coverage as indicated, 5.6 K factor, FM approved, chrome finish, glass bulb type [c/w wire guard]; 68°C (155°F) rated, 13 mm (½") orifice.

2.8 PENDANT SPRINKLER

.1 Pendant, quick response for hazard coverage as indicated, 5.6 K or factor, adjustable chrome escutcheon, FM approved, chrome finish, glass bulb type; 68°C (155°F) rated, 13 mm (½") orifice.

2.9 SIDEWALL SPRINKLER

.1 Sidewall quick response for hazard occupancy as indicated, FM approved, 5.6 K factor, chrome finish glass bulb with adjustable escutcheon plate, 68°C (155°F) rated, 13 mm (½") orifice.

2.10 DRY PENDANT SPRINKLER HEAD

.1 Pendant, standard or quick response for hazard occupancy as indicated, 5.6 K or 8.0 factor, chrome deflector, corrosion resistant coating FM approved, chrome finish, glass bulb type 68°C (155°F) rated, 13 mm(½") orifice. Size non-freeze barrel length to suit application and automatic drainage.

2.11 DRY SIDEWALL SPRINKLER

.1 Sidewall, quick response for hazard occupancy as indicated, 5.6 K factor, adjustable chrome escutcheon, chrome deflector, corrosion resistant coating FM approved, chrome finish, glass bulb type 68°C (155°F) rated, 13 mm (½") orifice. Size non-freeze barrel length to suit application and automatic drainage.

2.12 UPRIGHT HIGH TEMPERATURE SPRINKLER

.1 Upright bronze, quick response for hazard coverage as indicated, 5.6 K factor, FM approved, chrome finish, glass bulb type [c/w wire guard]; 141°C (286°F) rated, 13 mm (½") orifice.

2.13 SEMI-RECESSED HIGH TEMPERATURE SPRINKLER

.1 Semi-recessed pendent, quick response for hazard coverage as indicated, 5.6 K factor, adjustable escutcheon, [chrome] [white enamel] finish, FM approved, glass bulb type; 141°C (286°F) rated, 13 mm (½") orifice.

2.14 WINDOW SPRINKLER

.1 Pendant [horizontal sidewall] or [pendent vertical sidewall] window sprinkler, quick response for hazard coverage as indicated, 5.6 K factor, extended adjustable escutcheon, chrome finish, FM approved, glass bulbtype; 68°C (155°F) rated, 13 mm (½") orifice. Tyco Model [WS] c/w deep 2-piece adjustable escutcheons.

2.15 COLD STORAGE SPRINKLERS

.1 Pendant or horizontal sidewall sprinkler, quick or standard response for hazard coverage as indicated, 5.6 K or 8.0 K factor, chrome [white enamel] finish, 25 mm dia. flexible stainless steel hose (750-1800 mm), steel bracket assembly, rubber plugs to eliminate condensation, FM approved, glass tube type 68°C (155°F) rated,and barrel length as required.

2.16 SUPERVISORY SWITCHES

.1 General: to NFPA (Fire) 13 and ULC/FM listed for fire service.

.2 Die-cast enclosure over, die-cast base, all part corrosion resistant finish, paint finish.

.3 Valves:
- .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisorycapability.
- .2 Cover tamper activated by cover removal.
- .3 Two sets of SPDT contacts, 15.0 Amps @ 125/250 VAC, 2.5 Amps @ 30 VDC resistive.

.4 Flow switch type:
- .1 With normally open and normally closed contacts and supervisory capability.
- .2 0.63 l/s (10 GPM) Minimum flow rate.
- .3 Cover tamper activated by cover removal.
- .4 Two sets of SPDT contacts, 15.0 Amps @ 125/250 VAC, 2.0 Amps @ 30 VDC resistive.
- .5 Mechanical retard, adjustable from 10-90 seconds.

.5 Pressure alarm switch:
- .1 With normally open and normally closed contacts and supervisory capability.
- .2 On-off differential 6.9 kPa (1 psi) minimum.
- .3 Visible pressure indication: 206-1338 kPa (30-165 psi).
- .4 Adjustable range: 172-1207 kPa (25-175 psi).
- .5 Maximum operating pressure: 1207 kPa (175 psi).
- .6 SPDT for use with normally open or normally closed circuits, 250 VAC 15 A ¼ HP, 125 VAC 15 A1/8 HP, 250 VDC 0.2 A, 125 VAC 0.4 A, 30 VDC 2.0 A.
- .7 Die-cast aluminum cover with enamel red paint finish, zinc plated steel base.

2.17 ALARM CHECK VALVE ASSEMBLY

.1 Provide a listed alarm check valve system installed in accordance with FM and NFPA (Fire) 13, c/w ductile iron body, rubber faced clapper, external bypass trim, check valve, cut groove inlet and outlet, drain, alarm line strainer, non interruptible pressure switch, two (2) water gauges, wet pipe alarm valve, main drain valve, alarm test valve and excess pressure pump (1/3 HP - 120V 1Ø).

.2 Size to suit hydraulic design requirements.

.3 Pipe main drain to nearest floor drain or to exterior.

.4 Acceptable material: Victaulic, Viking, Grinnell.

2.18 FIRE DEPARTMENT CONNECTION

.1 Fully recessed type, 100 mm x 65 mm x 65 mm with "SPRINKLER" identification, polished chrome finishc/w caps and chains.

.2 Reference drawing for exact identification.

2.19 TEST HEADER

.1 Recessed test header for testing backflow preventor.

.2 Cast brass construction with polished chrome finish with escutcheon plate reading "TEST HEADER" c/w cap & chains .

.3 FM & ULC listed and rated pressure of 2068 kPa (300 psi).

2.20 PRESSURE GAUGES

.1 ULC listed and to Section 23 05 19.01 - Thermometers and Pressure Gauges.

.2 Shall have maximum limit of not less than twice normal working pressure at point where installed.

2.21 INSPECTOR TEST STATION

.1 One piece design test and drain assembly, FM/ULC listed, 1034 kPa rated.

.2 Approved materials: Victaulic, A.G.F. Manufacturing Inc., National Fire Equipment Ltd. test and drain assembly.

2.22 SIGNS

.1 Signs for control drain and test valves: to NFPA (Fire) 13.

2.23 SPARE PARTS CABINET

.1 For storage of maintenance materials, spare sprinklers and special tools.

.2 Construct to sprinkler manufacturers standard.

2.24 DUST COLLECTOR SUPPLIED BY OTHERS

.1 In construction shop, provide a sub-sprinkler zone to serve dust collector c/w supervised valve. Rough-in andconnect strainer and sprinkler nozzle as per manufacturer's standards.

2.25 SPRINKLER - PROTECTED WINDOW SYSTEM

.1 Design system in accordance with NFPA (Fire) 13 and ULC/ORD-C263.1
  .1 Systems shall be wet pipe system, designed to meet requirements for window system Tyco Model WSonly.
  .2 Reference architectural for window system details.

2.26 DRY SYSTEM CHECK VALVE ASSEMBLY

.1 Provide a listed dry system alarm check valve assembly installed in accordance with FM and NFPA (Fire) 13,c/w ductile iron body, rubber faced clapper, cut groove inlet and outlet, antiflood device, dry accelerator, alarm pressure switch, air maintenance kit c/w restrictor, isolation valves, air regulator, strainer, check valve. Assembly to be supplied c/w all associated trim and fittings.

.2 Size to suit hydraulic design requirements.

.3 Pipe main drain to nearest floor drain.

.4 Acceptable material: Victaulic, Viking, Grinnell or equal.

2.27 DRY SYSTEM AIR SUPPLY

.1 Provide a complete air compressor and receiver tank package installed in accordance with FM and NFPA (Fire) 13, c/w with pressure switch, pressure relief valve, regulator, air filter/dryer and associated trim. Coordinate power and voltage with electrical

.2 The air supply must be regulated and of the proper size in order to resolve normal system air pressure within 30 min. as per NFPA (Fire) 13.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install, inspect and test to acceptance in accordance with [Factory Mutual's requirements and] NFPA (Fire) 13.

.2 Testing to be witnessed by Authority having jurisdiction.

.3 Test station to be piped to test drain riser.

.4 Install and test equipment to manufacturers' standards.

.5 Provide adequate pipe supports and bracing as per NFPA (Fire) 13 requirements and as follows:

.1 Fire protection contractor shall carry a structural engineer to design and certify the support system for any piping distribution system exceeding 100 mm (4") or where piping is grouped such that the distributed weight exceeds the building structure limits. (Note: In steel building structure the piping supports shall never be supported by a single joist or off the bottom chord of the joist or truss.

.6 Allow for pipe offsets due to structure, equipment, duct or other pipe interferences.

3.2 TESTING

.1 Test jockey pump to manufacturers standards and NFPA (Fire) 13. Submit startup report and test report.

.2 Install excess pressure pump across alarm valve in accordance with manufacturers instructions.

.3 Pressure test all piping systems as required by NFPA and provide pressure test verification documents [for inclusion in the commissioning report].

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
  .1 ASHRAE 90.1-2019 (I-P), Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society of Mechanical Engineers (ASME)
  .1 ASME BPVC.IV-2021, 2021 ASME Boiler and Pressure Vessel Code, Section IV: Heating Boilers.

.3 Canada National Standard (CAN)/Canadian Standards Association (CSA)
  .1 CSA B51-19, Boiler, Pressure Vessel, and Pressure Piping Code.
  .2 CSA B139 Series-19, Installation Code for Oil Burning Equipment.
  .3 CAN/CSA B140.0-03 (R2018), General Requirements for Oil Burning Equipment.
  .4 CSA B140.12-03 (R2018), Oil-Fired Service Water Heaters and Swimming Pool Heaters.
  .5 CSA B149.1-20, Natural Gas and Propane Installation Code.
  .6 CSA B149.2-20, Propane Storage and Handling Code.
  .7 CAN/CSA C22.2 No. 110-19, Construction and Test of Electric Storage Tank Water Heaters.
  .8 CAN/CSA C191-13 (R2018), CSA Standards on Performance of Electric Storage Tank Water Heaters.
  .9 CAN/CSA C309-M90 (R2019), Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.
  .10 CSA ANSI Z21.10.1-2019/CSA 4.1-2019, Gas Water Heaters - Volume 1, Storage Water Heaters withInput Ratings of 75,000 Btu Per Hour or Less.
  .11 CSA ANSI Z21.10.3-2019/CSA 4.3-2019, Gas Water Heaters - Volume III, Storage Water Heaters, with Input Ratings Above 75,000 Btu Per Hour, Circulating and Instantaneous.

.4 Underwriters Laboratories of Canada (ULC)
  .1 ULC S636-08, Standard for Type BH Gas Venting Systems.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 20 05 01 - Mechanical General Requirements.

.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 20 05 01 - Mechanical General Requirements.

1.5 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 GAS HIGH EFFICIENCY/CONDENSING DOMESTIC HOT WATER BOILER & PACKAGED STORAGE TANK

.1 General:

.1 The WATER HEATER shall be capable of full modulation firing down to 20% of rated input with a turn down ratio of 5:1.

.2 The WATER HEATER shall consist of a direct fired stainless steel heat exchanger mounted on top of aglass lined storage tank in a fashion that will reduce the amount of scale build-up that is known to reduce efficiency. The WATER HEATER shall have no visible pipes that connect the heat exchanger to the storage tank. Heat exchangers with input in excess of 200,000 Btu/Hr shall bear the ASME "H" stamp and shall be National Board listed. There shall be no banding material, bolts, gaskets or "O" rings in the header configuration. The stainless steel combustion chamber shall be designed to drain condensation to the bottom of the heat exchanger assembly. A built-in trap shall allow condensation to drain from the heat exchanger assembly. The WATER HEATER shall carry a three (3) year warranty against leaks (one (1) year parts).

.3 The WATER HEATER shall bear the ASME "HLW" stamp and shall be National Board listed for tanks in excess of 120 gallons. The tank shall have a working pressure of 150 psi. The tank shall be glass lined and fired to 1600°F to ensure a molecular fusing of glass and steel. The tank shall be completelyencased in high density insulation of sufficient thickness to meet the energy efficiency requirements ofthe latest edition of the ASHRAE 90.1. The tank shall be fitted with a brass drain valve.

.4 The WATER HEATER shall be certified and listed by C.S.A. International under the latest edition of theharmonized CSA ANSI Z21.10.3/CSA 4.3 test standard for the US and Canada. The WATER HEATERshall comply with the energy efficiency requirements of the latest edition of the ASHRAE 90.1. The WATER HEATER shall operate at a minimum of 96% thermal efficiency. The WATER HEATER shall be certified for indoor installation. The WATER HEATER's efficiency shall be verified through third party testing by AHRI and listed in AHRI the Certification Directory.

.2 Unit Construction:

.1 The WATER HEATER shall be constructed with a heavy gauge steel jacket assembly, primed and pre-painted on both sides. The combustion chamber shall be sealed and completely enclosed, independent of the outer jacket assembly, so that integrity of the outer jacket does not affect a proper seal. A burner/flame observation port shall be provided. The burner shall be a premix design and constructed of high temperature stainless steel with a woven metal fibre outer covering to provide modulating firing rates. The WATER HEATER shall be supplied with a gas valve designed with negative pressure regulation and be equipped with a variable speed blower system, to precisely control the fuel/air mixture to provide modulating WATER HEATER firing rates for maximum efficiency. The WATER HEATER shall operate in a safe condition at a de-rated output with gas supply pressures as low as 4 inches of water column.

.3 Unit Control:

.1 The WATER HEATER shall utilize a 24 VAC control circuit and components. The control system shall have an electronic display for WATER HEATER set-up, WATER HEATER status, and WATER

HEATER diagnostics. All components shall be easily accessed and serviceable from the front and top of the jacket. The WATER HEATER shall be equipped with; an all-bronze circulating pump; high limit temperature control; ASME certified temperature and pressure relief valve; inlet & outlet water temperature sensors; flue temperature sensor; runtime contacts; alarm contacts; low water flow protection and built-in freeze protection. The manufacturer shall verify proper operation of the burner, all controls and the heat exchanger by connection to water and venting for a factory fire test prior to shipping.

.2 The WATER HEATER shall feature a Smart Control with a 2-line, 16 character LCD display, pump delay with freeze protection and pump exercise. Supply voltage shall be 120 volt / 60 hertz / single phase.

.4 Venting:

.1 The WATER HEATER shall be installed and vented with a Direct Vent Sidewall system with a horizontal sidewall termination of both the vent and combustion air. The flue shall be CPVC or Stainless Steel sealed vent material terminating at the sidewall with the manufacturers specified vent termination. A separate pipe shall supply combustion air directly to the WATER HEATER from the outside. The air inlet pipe may be PVC, CPVC, or Stainless Steel sealed pipe. The air inlet must terminate on the same sidewall with the manufacturer's specified air inlet cap. The WATER HEATER'stotal combined air intake length shall not exceed 100 equivalent feet. The WATER HEATER's total combined exhaust venting length shall not exceed 100 equivalent feet. Foam Core pipe is not an approved material for exhaust piping. Venting material must meet CSA standard approved for use withspecific equipment being supplied.

.5 The WATER HEATER shall be approved for 180°F operation.

.6 The WATER HEATER shall have an independent laboratory rating for Oxides of Nitrogen (NOx) of 20 ppm orless, corrected to 3% O2.

.7 The WATER HEATER shall operate at altitudes up to 4,500 feet above sea level without additional parts or adjustments.

.8 The Firing Control System shall be Direct Spark Ignition with Electronic Supervision

.9 Capacity: refer to Drawing Schedule.

.10 Acceptable material: Lockinvar Shield, or as per Alternative Material approval by Addendum in accordance with Instructions to Tenderers.

2.2 GAS HIGH EFFICIENCY/CONDENSING DOMESTIC HOT WATER BOILER & STORAGE TANK [OPTION]

SPEC NOTE: Reference Boiler Spec for your specification.

.1 General:

.1 Reference condensing boiler (Camus-Dynaforce) for boilers used as domestic hot water heaters.

.2 Hot Water Storage Tank:

.1 Glass lined steel insulated & jacketed tank - Niles Steel Tank's Ultonium lining is applied to the interiorsurface of the steel providing a tough water wear resistant lining which minimizes the effects of high temperature hot water.
.2 Designed for 180°F.
.3 Sturdy steel jacket - heavy gauge steel jacket.
.4 2" high density foam insulation - minimizes heat loss with an R value of 12.5
.5 Magnesium anode rod - for protection and longer service life.
.6 Two ¾" aquastat NPT fittings - located in the lower and upper part of the tank.

.7 All tanks are constructed and certified - in accordance with ASME IV, Part HLW for 125 psi (862 kPa).
.8 Five year limited warranty on steel tank - provides warranty protection against tank failure resulting from defects in materials and workmanship.
.9 Acceptable material: Niles NST or equal.

2.3 GAS HIGH EFFICIENCY/CONDENSING DOMESTIC HOT WATER BOILER & INTEGRAL STORAGE TANK

.1 General:
.1 Gas fired high efficiency condensing hot water boiler with integral tank and controls including safeties. The DHW boiler shall be design certified by CSA International and shall meet the requirements of CSAANSI Z21.10.3/CSA 4.3. The boiler shall bear the ASME "H" stamp and shall be national board listed. Models 292 - 502 are available with ASME `HLW' stamp upon request.

.2 Combustion Chamber:
.1 The combustion chamber shall be sealed and completely enclosed, of the outer independent jacket assembly. The Stainless Steel combustion chamber shall be designed to drain condensation to the bottom of the heat exchanger assembly. A condensate collection box shall be employed to trap and neutralize flue product condensate.

.3 Burner:
.1 The burner shall be a premix design and constructed of high temperature Stainless Steel with knitted metal fibre outer covering to provide modulating firing rates. The burner shall provide equal distribution of heat through the entire heat exchanger. A window view port shall be provided for visual inspection ofthe boiler during firing.

.4 Heat Exchanger:
.1 The heat exchanger shall be inspected and tested to ASME Section IV requirements. The ASME Section IV seal of approval will not be provided as standard for jurisdictions not requiring the ASME Section IV seal of approval. The heat exchanger shall be a multi-pass stainless steel all welded construction heat exchanger with maximum working pressure of 160 PSI (1100 kPa). A temperature and pressure relief of valve of 100 psi shall be furnished with the heater.

.5 Storage Tank:
.1 The storage tank shall be CSA Certified. The stainless steel storage tank shall be rated with a maximum working pressure of 160 PSI (1100 kPa) with a 10 year warranty.

.6 Integrated Combustion and Operating Controls:
.1 The CSA certified control module shall incorporate at least the following features:
.2 A high resolution LCD display.
.3 Two levels of access (user, installer).
.4 Real time data collection and diagnostics of selected parameters with PC interface.
.5 ModBus RTU ready.
.6 Heater modulation to shut down on high temperature flue gas detection.
.7 The controller shall employ a direct spark ignition with up to five (5) trials for ignition followed by a lock-out condition.

.7 Venting and Air Intake Options
.1 The boiler shall be vented as a through-wall (vertical or horizontal) Category IV condensing appliance for up to 100 equivalent ft using CPVC material approved for use on condensing application under standard ULC S636 or equivalent, or as permitted by the local jurisdiction. The following air intake options shall be utilized: Outside air sealed direct (vertical or horizontal);
.2 Outside air sealed direct (vertical or horizontal);
.3 Outside air ducted to jacket flange;

.4 Indoor air.

.8 Gas Train:
.1 The gas train shall consist of a dual seat gas valve with a pressure regulating electro-hydraulic actuator to provide slow opening, fast closing, safety shutoff and air/gas ratio control.

.9 External Jacket and Fasteners:
.1 The external jacket shall be of stainless steel mirror finish panels and heavy gauge painted steel assembled utilizing interference fit locks and minimal non-strip self tap screws.

.10 Acceptable material: [_____], or as per Alternative Material approval by Addendum in accordance with Instructions to Tenderers.

2.4 GAS (HIGH EFFICIENCY/CONDENSING DOMESTIC HOT WATER AND HEATER)

.1 To CSA ANSI Z21.10.3 - Gas Water Heater and ASHRAE 90.1 compliant, with performance as indicated on drawing schedule. Thermal efficiency of 95% [minimum 92%].

.2 Construction: water heater(s) shall be of the seamless glass lined steel tank construction in which the glass coating is applied to the water side surfaces of the tank after the tank has been assembled and welded. The condensing flue coil shall be coated on the flue gas side with acid resistant glass lining designed for use in condensing heaters. The tanks shall be foam insulated and equipped with a ASME rated temperature pressure relief valve. The water heater shall be UL listed, CSA listed and exceed the minimum efficiency requirements of ASHRAE 90.1.

.3 Gas burner: the heater shall be suitable for sealed combustion direct venting using a 100 mm (4") diameter ULC S636 PVC air intake pipe and 100 mm (4") diameter ULC S636 PVC exhaust pipe for a total distance of26 equivalent metres (85 equivalent feet) of vent and 30 equivalent metres (100 equivalent feet) of intake. The heater shall be factory assembled and tested. The power burner shall be of a design that requires no special calibrations on start up. The heater(s) shall be approved for 0 mm (0") clearances to combustibles.

.4 Provide 100 mm (4") dia. fusible PVC direct vent kit. Package as per manufacturer's recommendations.

.5 Controls: the controls shall be an integrated solid state temperature and ignition control device with integral diagnostics, LED fault display capability and a digital display of temperature settings.

.6 Power: 120 volt single phase, 15 Amps.

.7 Three (3) year tank warranty.

.8 Provide condensate neutralization kit. Size as per manufacturer's recommendations.

.9 Acceptable material: A.O. Smith Cyclone, Bradford white model EF-series, Rheem Spiderfire, or as per Alternative Material approval by Addendum in accordance with Instructions to Tenderers.

2.5 TANKLESS GAS - FIRED WATER HEATER

.1 Internally mounted, tankless, gas-fired, direct vent, water heater(s) design certified to the ANSI Z21.10.3 standard for gas-fired water heaters. Each water heater shall produce no more than 55 ppm NOx emissions when tested in accordance with the Rules and Regulations of the South Coast Air Quality Management District (SCAQMD). The water heater shall have stainless steel burners, solid brass water flow control valve, and solid brass inlet and outlet water connections, a minimum thermal efficiency rating of 94%, and a temperature thermostat with an adjustable setpoint range of 98°F to 140°F. The water heater shall be

microprocessor controlled and utilize a direct electronic ignition system (with no standing pilot), fully modulating gas control valve, turbine flow meter, automatic electro-mechanical water flow control valve, and water temperature thermistors to maintain outlet water temperature between ±2°F of setpoint temperature. Water heater(s) shall also be capable of storing and displaying a history of up to 9 diagnostic maintenance codes, via the display on the temperature thermostat controller. The following internal safety devices shall beincorporated: flame failure lockout, boiling protection lockout, thermal overheat protection, internal freeze protection for ambient temperatures as low as -30°F, and lockout protection in the event of a blocked flue. Include internal condensate neutralizer Guardian overheat film wrap (OFW) for safety.

.2 Provide concentric vent kit as per manufacturer's recommendations.

.3 Power: 120 Volt single phase.

.4 Heat exchanger shall be warranted against material defects or workmanship for a period of 12 years' from thedate of purchase. All other parts shall be warranted against material defects or workmanship for a period of
5 years' from the date of purchase.

.5 Capacity: Refer to drawing schedule.

.6 Acceptable material: Rinnai, Bradford White, Rheem, Takagi, Noritz.

2.6 ELECTRIC

.1 To CAN/CSA C22.2 No. 110, CAN/CSA C191 [and CAN/CSA C309 for glass-lined storage tanks], with two immersion type elements, and surface mounted adjustable thermostats.

.2 Tank: [____] L ([____] Gal.), [glass] [nickel] [polymerized fluorocarbon] [or] [combination] lined steel, [_____] mmdia x [_] mm high ([____]" x [____]", [50] mm (2") mineral wool or fibreglass insulation, enamelled steel jacket, [3] year warranty certificate.

.3 Acceptable material: Bradford White, Rheem or equal.

2.7 GAS (ATMOSPHERIC)

.1 To [CSA ANSI Z21.10.1/CSA 4.1] [CSA ANSI Z21.10.3/CSA 4.3] with recovery rate of [_____] L/h ([____] Gal./hr.) based on [56]°C ([____]°F rise and [_____] W ([____] Btu/hr.) input.

.2 Tank: [____] L ([____] Gal.), [glass] [nickel] [polymerized fluorocarbon] [or] [combination] lined steel, [_____] mmdia x [_] mm high ([____]" x [____]", [50] mm (2") mineral wool or fibreglass insulation, enamelled steel jacket.

.3 Gas burner: complete with high limit control, gas valve, gas pressure regulator, 100% safety shut-off, stainless steel burners,

.4 [3] year warranty certificate.

.5 Acceptable material: Rheem Universal or equal.

2.8 GAS (POWER BURNER)

.1 To [CSA ANSI Z21.10.1/CSA 4.1] [CSA ANSI Z21.10.3/CSA 4.3] with a recovery rate of [_____] L/h ([___] Gal./hr.) based on [56]°C ([___]°F rise and [_____] W ([___] Btu/hr.) input. Thermal efficiency of 83%.

.2 Tank: [___] L ([___] Gal.), [glass] [nickel] [polymerized fluorocarbon] [or] [combination] lined steel, [_____] mmdia x [_] mm high ([___]" x [___]", [50] mm (2") fibreglass insulation, enamelled steel jacket.

.3 Gas burner: complete with high limit control, gas valve, gas pressure regulator, 100% safety shut-off, firepower gas burner with air distribution ring.

.4 [3] year warranty certificate.

.5 Acceptable material: Rheem Xtreme or equal.

2.9 OIL

.1 To CAN/CSA B140.0 and CSA B140.12, with recovery rate of. [_____] L/h ([___] Gal./hr.) based on [56]°C([_____]°F rise and [_____] W ([___] Btu/hr.) input.

.2 Tank: [___] L ([___] Gal.), [glass] [nickel] [polymerized fluorocarbon] [or] [combination] lined steel, [_____] mmdia x [_] mm high ([___]" x [___]", [50] mm (2") mineral wool or fibreglass insulation, enamelled steel jacket.

.3 Oil burner: complete with one-piece combustion chamber, oil burner with flame retention head andturbo-static disc, combustion safety controls.

.4 [10] year warranty certificate.

.5 Acceptable material: [_____].

2.10 STEAM - STORAGE

.1 Tank:

.1 [Vertical on steel legs] [Horizontal on steel saddles]; shell, steel fabricated to CSAB51, and provincial regulations complete with all connections including [[280 x B51, and provincial regulations complete with all connections including [[280 x 380] mm (11" x 15") manhole], factory applied [glass] [nickel] [polymerized fluorocarbon] [or] [combination] lined.

.2 Capacity, [_____] L ([___] Gal.); dimensions, [_____] mm dia. x [_____] mm long ([___]' x [___]"); workingpressure, [_____] kPa ([_____] psi).

.2 Heater:

.1 Removable [double walled design] U-tube bundle of 12 mm (NPS ¾) copper seamless tubing, copper plated carbon steel tube plate, cast iron head, brass tube supports and tie rods; shell lining [or 90/10 copper/nickel heat exchanger with stainless steel flanges].

.2 Capacity, [_____] L/s ([___] GPM); tank side, [_____]°C ([_____]°F) inlet, [_____]°C ([_____]°F) outlet; tube side, steam pressure [_____] kPa ([___] psi). Maximum working pressure: [860] kPa (125 psi).

.3 Accessories: heater bundle vacuum breaker.

.4 Acceptable material: [_____].

.5 Steam control valve:
.1 Self actuating, modulating valve, [cast iron body] [bronze body], 860 kPa (125 psi), two-ply thermostatic bellows and copper capillary tubing with bulb in well, tight shut-off, removable compositiondisc, temperature adjustment setting.
.2 Acceptable material: [_____].

2.11 INSTANTANEOUS HOT WATER HEATER

.1 Plate heat exchanger type to ASME, and provincial regulations, skid mounted 60 psi. Unit designed for 550 kPa (80 psi) working pressure water side and 103 kPa (15 psi) steam side.

.2 Contractor shall supply two (2) instantaneous domestic hot water heater and install them in parallel so that each heater provides 100% of water capacity.

.3 Unit shall be pre-piped on a pre-manufactured steel base with no storage tank and shall contain the following:
.1 Plate and frame heat exchanger designed specifically for use with steam as the primary heating medium.
.2 Electro-pneumatic control valve, temperature sensor and electronic controller enclosed in water resistant, NEMA 4 panel.
.3 Steam trap for trouble free operation under all load conditions, able to overcome significant backpressure in the condensate return line.
.4 Ball valve with pneumatic actuator on the steam inlet for emergency, hi-limit shut-off and tight shut-off when the unit is not in use.
.5 Compressed air filter/regulator.
.6 Extra overheat controller and temperature probe.
.7 Gasket temperature rating: 160°C (320°F) operating. 180°C (356°F) peak.

.4 Capacity of each heater: [____] L/s ([____] GPM) of water from [____]°C ([____]°F) to [____]°C ([____]°F) when supplied with 1956 kg/hr. (26,358 lbs./hr.) of steam at 100 kPa (15 psi). maximum water pressure drop of 70 kPa (10 psi). Outlet water temperature shall be controlled to within ±5°F,

.5 Acceptable material: Spirax Sarco EH-CP2-HWS-ST.

2.12 STEAM - INSTANTANEOUS

.1 Shell and tube type: to CSA B51S1, and provincial regulations. [90/10] copper/nickel heat exchanger with stainless steel flanges. Unit designed for 1034 kPa (150 psi) working pressure for both tube and shell circuits.

.2 Shell: [mild steel with cast iron heads] steel or cast iron support saddles.

.3 Tubes: removable, [double walled design] NPS ¾ seamless hard drawn copper tube [or factory sealed 90/10 copper/nickel].

.4 Vacuum breaker on steam side.

.5 Capacity: [____] L/s ([____] GPM) of water from [_____]°C ([_____]°F) to [_____]°C ([_____]°F) when supplied with [_____] W ([____] Btu/hr.) of steam at [____] kPa ([____] psi). Maximum water pressure drop of [____] kPa ([____] psi).

.6 [Number of passes: [_____]].

.7 Acceptable material: [_____].

.8 Control valve:
.1 Self actuating, modulating valve, [cast iron body if flanged ends] [bronze body if screwed ends], 860 kPa (125 psi), two-ply thermostatic bellow and copper capillary tubing with bulb in well, tight disc shut-off, removable composition disc, temperature adjustment setting.
.2 Acceptable material: [_____].

2.13 ELECTRIC INSTANTANEOUS WATER HEATER

.1 Instantaneous water heater (IWH1) shall be 6.5 kW, 208V/1Ø to heat 1.9 lpm @ a temperature rise of 37°C and adjusted to provide a maximum DHW temperature of 55°C. Unit shall have ABS-UL 94Vo rated cover. Element shall be replaceable cartridge insert. Unit shall have a replaceable filter in the inlet connector and a flow regulator in the outlet connector. Element shall be iron free, nickel chrome material. Heater shall be fittedwith 10 mm compression nuts and sleeves to eliminate need for soldering. Heater shall be installed upright with water connections on top only. Hot water storage tanks prohibited.

2.14 ACCESSORIES

.1 Water Heater Pan:
.1 28 ga. aluminum, 65 mm (2½") high, 25 mm (1") CPVC drain connection.
.2 Select diameter such that pan extends minimum 50 mm (2") beyond water heater on all sides.
.3 Acceptable material: Oatey, or equal.

.2 Water Safety valve:
.1 Resettable, testable, full port water isolation valve c/w actuator, water sensor and control module. Shuts off water when a leak is detected by water in the pan. Module includes two (2) colour LED light and audible alarm to indicate status. Operable by battery power or 120V plug, suitable for use with potable water from 0.6°C (33°F) to 104°C (220°F). Maximum shut-off pressure 862 kPa (125 psi).
.2 Acceptable material: Taco Leakbreaker.

.3 BRV: Combination Ball Relief Valve:
.1 Lead free.
.2 Relief setting 515 kPA (75 psi).
.3 Acceptable material: Watts LFBRV, or equal.

2.15 TRIM AND INSTRUMENTATION

.1 Drain valve: 25 mm (NPS [1]) with hose end.

.2 Thermometer: [100 mm (4") dial type with red pointer and thermowell filled with conductive paste] [_____].

.3 Pressure gauge: 75 mm (3") dial type with red pointer, [syphon,] and shut-off cock.

.4 Thermowell filled with conductive paste for control valve temperature sensor.

.5 ASME rated temperature and pressure relief valve sized for full capacity of [heater] [control valve], having discharge terminating over floor drain and visible to operators.

.6 Magnesium anodes adequate for [20] years' of operation and located for easy replacement.

2.16 ANCHOR BOLTS AND TEMPLATES

.1 Supply for installation by other Divisions.

.2 [Size anchor bolts to withstand seismic zone [4] acceleration and velocity forces].

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturer's recommendations [and] [authority having jurisdiction].

.2 Provide structural steel for [horizontal mounted tanks] [and] [for instantaneous heaters].

.3 Provide insulation between tank and supports.

.4 Install oil burning domestic water heaters in accordance with CSA B139.

.5 Install natural gas fired domestic water heaters in accordance with CSA B149.1.

.6 Install propane gas fired domestic water heaters in accordance with CSA B149.2.

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 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical General Requirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)
- .1 CAN/CSA B45 Series-02 (R2013), Plumbing Fixtures.
- .2 CAN/CSA B125-01, Plumbing Fittings.
- .3 CSA B651-18, Accessible Design for the Built Environment.

.2 Ontario Regulation
- .1 ONTARIO OBC-2012, 2012 Ontario Building Code Compendium.

.3 National Research Council Canada
- .1 NRCC NBCC-2015, National Building Code of Canada.

1.3 SHOP DRAWINGS

.1 Submit shop drawings and product data in accordance with Section 20 05 01 - Mechanical General Requirements.

.2 Indicate, for all fixtures and trim:
- .1 Dimensions, construction details, roughing-in dimensions.
- .2 Factory-set water consumption per flush at recommended pressure.
- .3 (For water closets, urinals): minimum pressure required for flushing.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data including monitoring requirements for incorporation into manuals specified in Section 20 05 01 - Mechanical General Requirements.

.2 Include:
- .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
- .2 Details of operation, servicing, maintenance.
- .3 List of recommended spare parts.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

.1 Fixture piping.
- .1 Hot and cold water supplies to each fixture:
  - .1 Supply stops shall be all brass with full turn brass seams and washer replaceable attachment shall be IPS inlet x compression OD outlet to fixture. All fixture stop valves shall be screw drivertype.

.2 Chrome plated in all exposed places.

.2 Waste:

.1 Cast brass adjustable style P-trap with cleanout on each fixture not having integral trap.

.2 Chrome plated in all exposed places.

.3 Sink and lavatory heavy gauge P-traps shall be cast brass adjustable style with 17 ga. seamless brass wall bend. Attachment nuts shall be brass, no zinc allowed. P-traps to be removable/union type or to include cleanout.

.4 Lavatory strainers shall be chrome plated cast brass with 17 ga. seamless brass tailpiece.

.5 All barrier-free lavatories and sinks shall have chrome plated offset tail piece in addition to P-trap with cleanout. Insulate P-trap and hot & cold water pipes with pre-formed & finished surface insulation. Armaflex insulation and tape not acceptable.

.2 Fixtures:

.1 Manufacture in accordance with CSA B45.

.2 All products, where applicable, shall be marked with manufacturer's name or product #.

.3 Trim, fittings: manufacture in accordance with CAN/CSA B125.

.4 Number, locations: Architectural drawings to govern.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type unless otherwise indicated.

.7 Reference drawing schedule for configuration and type.

2.2 CARRIERS

.1 Provide for all wall mounted plumbing fixtures.

2.3 ROUGHING-IN OF FIXTURES

.1 Rough-in for equipment supplied by other to be complete with valved supplies, wastes and vents, capped andassociated fitting piping & reducers.

2.4 PLUMBING FIXTURES

.1 Reference fixture schedule on drawings.

2.5 ACCEPTABLE MATERIALS

.1 Water Closets, Urinals, Lavatories, Sinks: American Standard, Crane, Kohler, Comtrac, Zurn, Toto, Moen.

.2 Stainless Steel Sinks: Franke, Kindred, Architectural Metal Industries, Novanni.

.3 Group Fountains: Bradley, Acorn.

.4 Faucets: Delta Commercial, Crane, T&S Brass, Chicago Faucets, American Standard, Moen, Sloan, Zurn.

.5 Tub & Shower: American Standards, Maxx, Crane, Longevity, Fiat.

.6 Tub & Shower Trim: Delta Commercial, Crane, Powers Symmons, American Standard, Moen, Zurn.

.7 Flush Valves: Delta Commercial, Crane, Sloan, Zurn, American Standard, Toto, Moen.

.8 Emergency Fixtures: Haws, Bradley, Guardian.

.9 Drinking Fountains: Elkay, Haws, Bradley.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Mounting heights:
- .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
- .2 Wall-hung fixtures: as indicated on architectural elevations.
- .3 Physically handicapped: to comply with most stringent of either NBCC, OBC or CAN/CSA B651.

3.2 URINALS

.1 Urinal waste pipe & fittings shall be DWV PVC equivalent to IPEX System 15 in accordance with specificationSection 22 13 18 - Drainage Waste and Vent - Plastic. Extend plastic piping up to combined waste from adjacent lavatory or other plumbing fixtures allowing dilution of waste.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified in this section.

.2 Adjustments:
- .1 Adjust water flow rate to design flow rates and sensors.
- .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Adjust flush valves to suit actual site conditions.

.3 Checks:
- .1 Water closets: flushing action.
- .2 Aerators: operation, cleanliness.
- .3 Vacuum breakers, backflow preventers: operation under all conditions.

- END OF SECTION -

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 This section shall be read in conjunction with specification Section 20 05 01 - Mechanical GeneralRequirements, all mechanical sections, and all other disciplines related to the project.

1.2 REFERENCES

.1 Air-Conditioning, Heating, and Refrigeration Institute (formerly ARI)
- .1 AHRI 210/240 (2017), Performance Rating of Unitary Air-Conditioning and Air-Source Heat PumpEquipment.

.2 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .1 ANSI/ASHRAE 90.1-2019, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.3 American Society for Testing and Materials International (ASTM)
- .1 ASTM B117-19, Standard Practice for Operating Salt Spray (Fog) Apparatus

.4 Canadian Standards Association (CSA).

.5 UL BOCA National Building Code, Air Conditioners, Central Cooling.

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 00 21 13 - Instruction to Bidders.

.2 Indicate:
- .1 Complete internal wiring and any external panel wiring, both as schematics and as actually assembled.
- .2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes;include mass distribution drawings showing point loads.
- .3 Detailed composite wiring diagrams for control systems showing factory installed wiring and equipmenton packaged equipment or required for controlling devices or ancillaries, accessories, controllers.
- .4 Fan performance curves.
- .5 Details of vibration isolation.
- .6 Estimate of sound levels to be expected across each individual octave band in dB referred to A rating.
- .7 Type of refrigerant used.

1.4 MAINTENANCE DATA

.1 Provide maintenance data for incorporation into manual specified in Section 00 21 13 - Instruction to Bidders.

.2 Indicate:
- .1 Brief description of unit, indexed, with details of function, operation, control, and service for eachcomponent.

.3 Manufacturer's installation instructions shall govern and unless otherwise noted, operation, maintenance andservice of items. Include names and addresses of spare part suppliers.

.4 Include following:
.1 Provide for each unit, manufacturer's name, type, year, number of units, and capacity.

1.5 WARRANTY

.1 Contractor hereby warrants refrigeration compressors in accordance with GC 24, but for 5 years.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Roof mounted, self-contained single zone unit with gas burner and DX refrigeration and bear label of CSA,CGA, FM, UL and ULC.

.2 Unit shall comply with ASHRAE 90.1.

2.2 SUMMARY

.1 The contractor shall furnish and install package rooftop units as shown and scheduled on the contract documents. The units shall be installed in accordance with this specification and perform at the specifiedconditions as scheduled.

.2 Acceptable materials:
.1 Trane.
.2 York.
.3 Daikin.
.4 Lennox.
.5 Carrier.

2.3 GENERAL UNIT DESCRIPTION

.1 Units furnished and installed shall be combination gas heating/electric cooling packaged rooftops as scheduled on contract documents and these specifications. Units shall consist of insulated weather tight casing with compressors, air cooled condenser coil, condenser fans, evaporator coil, return air filters, supply motors and drives, gas-fired heating section, 100% modulating economizer and unit controls.

.2 Unit shall be 100% factory run tested and fully charged with R-410a.

.3 Unit shall have labels, decals, and/or tags to aid in the service of the unit and indicate caution areas.

.4 Capacity: Reference schedule on tender form.

2.4 UNIT CASING

.1 Cabinet: Galvanized steel, phosphatized, and finished with an air-dry paint coating with removable accesspanels. Structural members shall be 16 gauge with access doors and removable panels of minimum 20 gauge.

.2 Unit's cabinet surface shall be tested 500 hours in salt spray test in compliance with ASTM B117.

.3 Cabinet construction shall allow for all service/maintenance from one side of the unit.

.4 Cabinet top cover shall be one piece construction or where seams exits, it shall be double hemmed andgasket sealed.

.5 Access Panels: Water and airtight panels with handles shall provide access to filters, heating section, returnair section, supply air fan section, evaporator coil section, and unit control section.

.6 Insulation: Provide ½ inch thick coated fiberglass insulation on all exterior panels in contact with the returnand conditioned air stream.

2.5 AIR FILTERS

.1 Air Filters: Factory installed filters shall mount integral within the unit and shall be accessible thru accesspanels. Two-inch-thick glass fibre disposable media filters shall be provided.

2.6 FANS AND MOTORS

.1 Provide evaporator fan section with forward curved, double width, double inlet, centrifugal type fan.

.2 Provide self-aligning, grease lubricated, ball or sleeve bearings with permanent lubrication fittings.

.3 Provide units with belt driven, supply fans with adjustable motorsheaves.

.4 Outdoor fans shall be direct drive, statically and dynamically balanced, draw through in the vertical dischargeposition.

.5 Provide shafts constructed of solid hot rolled steel, ground and polished, with key-way, and protectivelycoated with lubricating oil.

.6 Provide a unit mounted disconnect.

2.7 GAS FIRED HEATING SECTION

.1 Completely assembled and factory installed heating system shall be integral to unit. UL and CGA approved specifically for outdoor applications for use downstream from refrigerant cooling coils. Threaded connection with plug or cap provided. Provide capability for gas piping connection through side of unit.

.2 Heating section shall be factory run tested prior to shipment.

.3 Gas Burner shall be single stage forced combustion type stainless steel power burner, negative pressure gasvalve, manual shut-off, hot surface ignition, and flame sensing safety control.

.4 Gas Burner Safety Controls: Provide safety controls for the proving of combustion air prior to ignition, and continuous flame supervision. Upon a failure to ignite, two attempts of ignition will occur before lockout of theignition system.

.5 Combustion blower shall be centrifugal type fan with built-in thermal overload protection on fan motor.

.6 Heat Exchanger: Provide drum and tube heat exchanger of free-floating design manufactured from 304 stainless steel. Factory pressure and leak tested.

.7 Limit controls: High temperature limit controls will shut off gas flow in the event of excessive temperaturesresulting from restricted indoor airflow or loss of indoor airflow.

2.8 EVAPORATOR COIL

.1 Provide configured aluminum fin surface mechanically bonded to copper tubing coil.

.2 Provide an independent expansion device for each refrigeration circuit. Factory pressure test at 450 psig andleak tested at 200 psig.

.3 Provide drain pan for base of evaporator coil constructed of PVC or galvanized steel with external connections.

2.9 CONDENSER SECTION

.1 Provide internally finned 3/8" seamless copper tube mechanically bonded to aluminum fins. Factory pressuretested to 450 psig.

.2 Provide vertical discharge, direct drive fans with aluminum blades. Fans shall be statically balanced. Motorsshall be permanently lubricated, with integral thermal overload protection in a weather tight casing.

2.10 REFRIGERATION SYSTEM

.1 Compressors: Provide hermetic scroll internal suction and discharge valves, and centrifugal oil pump. Internally isolated motors on springs. Provide suction gas cooled motor with over temperature and over current protection. Service pressure ports and refrigerant line filter driers shall beprovided on all refrigerant systems.

.2 Dehumidification Function: Refrigeration circuit shall be provided with hot gas reheat coil, modulating valves, electronic controller, supply air temperature sensor and a control signal terminal which allow the unit to have a dehumidification mode of operation, which includes supply air temperature control to prevent supply air temperature swings and overcooling of the space.

2.11 OUTDOOR AIR SECTION

.1 Provide a fully integrated factory installed 100% modulating enthalpy-based outside air economizer with unit return and barometric relief air dampers.

.2 Provide adjustable minimum position control located in the economizer section of the unit.

.3 Provide spring return motor for outside air damper closure during unit shutdown or power interruption.

.4 Economizer shall internally controlled to maintain discharge air temperature & provide free cooling.

2.12 OPERATING CONTROLS

.1 Provide standalone microprocessor unit mounted control with zone thermistor.

.2 Provide factory installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation.

.3 Provide the following factory installed and wired operating controls:
.1 Provide a minimum three minute off timer to prevent compressor from short cycling.

.4 Provide wall mounted 7-day programmable thermostat with touch screen digital display.

2.13 ROOF CURBS

.1 Rooftop equipment seismic curb 600 mm (24") high.

.2 The frame must provide continuous support for the equipment and must resist wind and seismic forces.

.3 All hardware must be plated with a rust resistant finish.

.4 Curb waterproofing shall consist of a continuous galvanized counter flashing nailed over the curbs waterproofing.

.5 Curbs shall have provision for 50 mm of insulation.

.6 The rooftop unit must be solidly fastened to the curb, and the curb anchored to the roof structure.

.7 Roof curb construction to conform to requirements of National Roofing Contractors Association (NRCA).

.8 Provide seismic restraint calculations from P.Eng. For all equipment connections to the structure.

2.14 ACCESSORIES

.1 Tool less condenser coil hail guards.

.2 Powered convenience outlet.

.3 Clogged filter switch.

.4 Fan failure switch.

.5 Hot gas reheat.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install as per manufacturers' instructions on roof curbs provided by manufacturer.

.2 Manufacturer to certify installation, supervise start-up and commission unit.

- END OF SECTION -