ENERGY CONSERVATION MEASURE UPGRADES FOR SHAW CENTRE ARENA

CITY OF SALMON ARM

MECHANICAL SPECIFICATION

ISSUED FOR TENDER

2025-02-12

Engineer of Record Seal

Permit to Practice Number: 1001005

"The best way to predict the future is to create it" – Abraham Lincoln

Extropic.ca / ExtropicEnergy.com

TABLE OF CONTENTS

1 GENERAL

1.1 These specifications and drawings are intended to provide a complete and fully operating mechanical system as described herein and in complete accordance with applicable codes and ordinances. The work to be done shall include the provision of all labour, materials, tools, and equipment, as well as the application of a competent knowledge of construction required for the installation, testing, and commissioning of the complete mechanical system.

1.2 The drawings and specifications are a guide to establishing the quality of equipment, materials, workmanship, and performance. They are complementary to one another. The term "provide" shall mean to supply and install.

1.3 References to “Consultant” in this document shall mean Extropic Energy Inc.

1.4 Any discrepancies between drawings and specifications leaving in doubt the true intent of work shall be brought to the attention of the Consultant immediately.

1.5 Before submitting his tender, the Contractor shall examine the site and all existing conditions affecting the work under this contract. He shall investigate and satisfy himself that he can supply and install this work without any additional charges after the Contract is awarded.

1.6 The mechanical system shall comply with the requirements of the local municipal building by-laws, the current edition of the British Columbia Building Code, British Columbia Plumbing Code, British Columbia Fire Code, and all revisions and amendments thereto. The Contractor shall pay all fees, obtain all required permits, and obtain inspections and approvals from the inspection authority.

1.7 Furnish a written guarantee stating that all equipment supplied and all work executed under this contract will be free from defects of materials and workmanship for a period of one (1) year from the date of acceptance of the completed contract, and further that any defective materials that become evident during the guarantee period will be corrected at no additional cost to the Owner.

1.8 Employ only tradesmen having valid provincial trade certificates related to their work. All work shall be executed in a workmanlike manner and shall present a neat and finished appearance when completed. Workmanship shall be in accordance with recognized trade standards.

1.9 All materials used shall be new and the best of their respective kinds. All equipment installed shall be in accordance with the manufacturer's printed installation directions.

1.10 The Contractor shall familiarize himself with the building plans and shall cooperate with the Owner so that the work will not conflict with operations. Any conflicts or defaults which arise during the construction period must be resolved immediately.

1.11 Without additional charge or expense, make any necessary changes or additions to accommodate the structural, electrical and architectural conditions that are required for the completion of the work.

1.12 Insurance coverage shall be provided by the Contractor unless otherwise indicated.

1.13 Leave systems operating with work areas clean and to the satisfaction of the Consultant.

1.14 All demolished materials and equipment are the property of the contractor and shall be removed from the site, unless otherwise directed by the Owner.

1.15 Patch and make good any materials and equipment.

2 DESCRIPTION OF WORK

2.1 Be responsible for all work identified or implied by the drawings and specifications, including but not limited to;

.1 Installation and commissioning of all systems, including the equipment provided by the Owner where noted.

.2 Balancing of the water system. Make provisions for easy access to water balancers.

.3 Revision and testing of the plumbing systems in the area.

.4 Disposal of all unused material.

.5 Be responsible for the performance and commissioning of all equipment supplied and installed for the project (including all equipment supplied by the Owner where applicable).

3 STANDARD OF ACCEPTANCE

3.1 Means that item named and specified by manufacturer and/or catalogue number forms part of specification and sets standard regarding performance, quality of material and workmanship and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.

3.2 Where two or more manufacturers are listed, the manufacturer's name shown underlined or shown with a model name and/or number, was used in preparing the design. Tenders may be based on any one of those named, provided that they meet every aspect of the drawings and specifications.

3.3 Where other than the underlined manufacturer or named manufacturer is selected or approved, include for the cost of any resulting work (both under this Division and other Divisions) and any necessary redesign of installation or structure. Submit redesign drawings for review with Shop Drawings. Maintain installation, access and servicing clearances. Redesign drawings shall be to scale and of a standard equal to the Project Drawings.

3.4 Where two or more items of equipment and/or material, of the same type, are required, provide products of a single manufacturer.

3.5 A visible manufacturer's nameplate shall indicate manufacturer's name, model number, serial number, capacity data, electrical characteristics and approval stamps.

4 ADDITION OF ACCEPTABLE MANUFACTURERS

4.1 Material/products considered to satisfy the specification, but of a manufacturer other than those named in the Specification may be submitted to the Consultant for consideration not later than five (5) working days prior to closing of tender

4.2 Addition of manufacturer's names to the specifications will be in writing by the Consultant.

5 CASH ALLOWANCES

5.1 Cash Allowance No.1-Automatic controls.

.1 Include the following "Cash Allowance" in the tender sum and the applicable overhead and profit.

.2 Fifty-thousand dollars ($50,000), for the supply, installation, and commissioning of the Automatic Controls and Instrumentation systems.

.3 This work shall be completed by the selected Controls Contractor. **Automated Logic—Care Systems Services LTD**. (915 Kalamalka Lake Rd., Vernon, BC (250)558-5409)The successful mechanical subcontractor shall submit his price for evaluation to the Owner within fourteen (14) calendar days of the signing of the General Contract.

.4 The bids shall remain firm for acceptance by the Owner for a period of sixty (60) days from the signing of the General Contract.

.5 To facilitate the evaluation of the building automation systems, this control contractor (Care System Ltd.) shall be included in the submissions of the successful mechanical contractor, as well as a complete and detailed description of all proposals. These submissions shall include user manuals for software and technical information for all equipment.

5.2 Cash Allowance No.2- Refrigeration, Ice Plant Connections and Desuperheater

.1 Include the following "Cash Allowance" in the tender sum and the applicable overhead and profit.

.2 Ninety-six thousand dollars ($ 96,000), for the supply, installation, and commissioning of the Desuperheater to the existing Ice Plant.

.3 This work shall be completed by the selected Refrigeration contractor, **YETI Refrigeration Inc. (397-1st Ave. Prince George, BC (250)-562-1160).** The successful mechanical subcontractor shall submit his price for evaluation to the Owner within fourteen (14) calendar days of the signing of the General Contract.

.4 The bids shall remain firm for acceptance by the Owner for a period of sixty (60) days from the signing of the General Contract.

.5 To facilitate the evaluation of the refrigeration system addition, this refrigeration contractor (YETI Refrigeration Inc.) shall be included in the submissions of the successful mechanical contractor, as well as a complete and detailed description of all_proposals. These submissions shall include user manuals for software and technical information for all equipment.

5.3 Cash Allowance No.3- Preparation of Record Drawings

.1 Include the following "Cash Allowance" in the tender sum and the applicable overhead and profit.

.2 One thousand dollars ($ 1000) for preparing, supplying, and completing record drawings. This one sum includes all disciplines: Structural, Mechanical, and Electrical.

.3 This work shall be completed by Extropic Energy Inc. #305-1350 St. Paul Street, Kelowna, BC.

6 EXISTING SERVICES

6.1 Confirm locations and routings of all existing services which might be affected by the work. Protect existing and repair any damage occasioned by the work. Accommodate work changes in location and routing as may be necessary.

7 CUTTING & PATCHING

7.1 Be responsible for all cutting, patching, digging, canning and coring required to accommodate the mechanical services. Make good all revisions to match the original condition.

7.2 Verify the location of existing service runs and structural reinforcement within existing roof, floors and walls prior to cutting. Cutting of structural building components shall only take place upon the receipt of specific written approval of the Structural Consultant. Repairs to existing services damaged as a result of cutting is included in this section of the work.

8 MISCELLANEOUS METAL

8.1 Be responsible for all miscellaneous steel work relative to the Specifications, including but not limited to support of equipment.

8.2 All steel work shall be prime coated, ready for paint finish.

9 ACCESSIBILITY

9.1 Install all work so as to be readily accessible for adjustment, inspection, operation and maintenance.

10 ACCESS DOORS

10.1 Install at all concealed dampers, traps, unions, valves, water hammer arrestors, special equipment, and trap primers.

10.2 Locate access doors so that all concealed items are readily accessible for adjustment, operation and maintenance.

10.3 Do not locate access doors in feature wall or ceiling construction without the prior approval of the consultant. Locate in service areas wherever possible.

11 GUARDS AND COVERS

11.1 Provide removable protective guards on all exposed V-belt drives and shaft couplings in accordance with Worker's Compensation Board requirements.

11.2 Removable access covers shall be provided for all equipment installed under this project.

12 LUBRICATION OF EQUIPMENT

12.1 Lubricate all equipment prior to being operated, except sealed bearings, which shall be checked.

12.2 Use the lubricant recommended by the manufacturer for the service for which the equipment is specified.

13 ESCUTCHEONS

13.1 Provide escutcheons on all pipes passing through finished walls, floors and ceilings.

13.2 Escutcheons shall be chrome plated or stainless steel suitable for dimensions of piping and insulation.

14 PAINTING

14.1 Clean exposed bare metal surfaces supplied under Division 23, removing all dirt, dust, grease, and scale. Apply at least one coat of corrosion-resistant primer paint to all supports and equipment fabricated from ferrous metal. Paint all exposed ducts, equipment, and supports with two finishing coats of paint, the color of which to be as directed by the Owner.

14.2 As they are installed, paint all pipe hangers and exposed sleeves in exposed areas with a rust-inhibiting primer.

14.3 Repaint all marred factory finished equipment supplied under Division 23, to match the original factory finish.

15 PENETRATION OF FIRE SEPARATIONS

15.1 Seal all pipe and duct penetrations through fire separations with "3M Fire Barrier" system or equal U.L. Listed system.

16 SYSTEMS COMMISSIONING, VERIFICATION AND DEMONSTRATION

16.1 Be responsible for the performance and commissioning of all equipment provided under Division 23. Commissioning is the process of advancing the installation from the stage of static completion to full working order to specified requirements. It is the activation of the completed installation.

16.2 Acceptable Commissioning Contractors: Inland Technical Services, MDT Systems, Western Mechanical Services, KD Engineering, Novagreen

16.3 In consultation with the General Contractor, ensure that sufficient time is allowed and fully identified on the construction schedule for the proper commissioning of all mechanical systems.

16.4 Commissioning is concluded when mechanical systems have been balanced and the installation is in full working order and acceptable for use. The work will include the following:

.1 Balancing of domestic hot water recirculation systems.

.2 Adjust vibration isolators and seismic restraints for optimum performance. Provide a letter of certification.

.3 Verification that equipment is not short cycling.

.4 Set up all automatic control valves/dampers and automatic temperature control devices.

.5 Testing and debugging of the Building Automation System.

.6 Set up and test all alarms and protective devices.

.7 Obtain and review trend logs for all control points. Submit trend logs to the Consultant with detailed comments after verification of the proper operation of all control sequences.

16.5 At the conclusion of commissioning, demonstrate the operation of the systems to the Consultant and then to the Owner's Operating Staff.

16.6 At the completion of the commissioning, testing, balancing and demonstration, submit the following to the Consultant:

.1 A letter certifying that all work specified under this contract is complete, clean and operational in accordance with the specifications and drawings.

.2 Completed copies of all commissioning checklists plus copies of start-up reports from specialty contractors and vendors.

.3 "AS-BUILT" record drawings, as specified.

.4 B.C. The gas Inspection Dept. approves equipment and piping connections.

.5 A list of all alarm and protective devices tested, with the final operating settings.

16.7 The verification process shall include instructional seminars to demonstrate all systems and to explain the operation of each. The instruction shall include the following:

.1 Ease of access is provided throughout for servicing coils, filters, motors, drives, control dampers, and damper operators.

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

.1 Building Automation System control features.

.2 Pumps, desuperheaters.

.3 Tanks - domestic hot water.

.3 After demonstration obtain the Owner's signature certifying that the demonstration has been performed and completed to their satisfaction.

17 SUBSTANTIAL PERFORMANCE REQUIREMENTS

17.1 Before the Consultant is requested to make an inspection for Substantial Performance of the work:

.1 Commission all systems and prove out all components, interlocks and safety devices.

.2 Submit a letter certifying that all work (including calibration of instruments and balancing of systems) is complete, operational, clean and all required submissions have been completed.

17.2 The work will not be considered to be ready for use or substantially complete until the following requirements have been met:

.1 All life safety items are completed and fully functional.

.2 All reported deficiencies have been corrected.

.3 Testing and balancing completed.

.4 Operating and Maintenance Manuals completed.

.5 "As Built" Record Drawing ready for review.

.6 System Commissioning has been completed and has been verified by Consultant.

.7 All demonstrations to the Owner have been completed.

18 OPERATING & MAINTENANCE MANUALS

18.1 The commissioning contractor shall prepare instruction manuals that include equipment manufacturers' operating and maintenance bulletins, a report on the balancing of the air and water systems, and a report on the chlorination of water mains.

18.2 The manufacturers' bulletins shall include:

.1 General description of the equipment and its operation.

.2 Normal maintenance and minor troubleshooting of each major item.

.3 Wiring diagrams.

.4 Control diagrams.

.5 Spare parts list.

.6 Local source of supply.

18.3 Submit three copies in suitably labelled hard-cover binders to the Consultant at least ten days prior to the Substantial Performance inspection date.

18.4 Provide a Flash drive copy of the Operating & Maintenance Manuals described above.

.1 The flash drive shall consist of all data in the manuals, arranged in a “pdf” format file, with an interactive menu system of bookmarks to match the manual format.

.2 Include the latest version of Adobe Acrobat Reader.

.3 Include “pdf” format copies of the as-built project drawings (contact the consultant for files).

.4 Submit the Flash Drive to the consultant for review and comment. Incorporate any suggested revisions.

19 SYSTEMS BALANCING

19.1 Acceptable Balancing Contractors: Inland Technical Services, MDT Systems, Western Mechanical Services, KD Engineering. Novagreen.

19.2 Adjust the new water systems to design flow conditions.

19.3 Adjust the domestic hot water recirculation system flow rates.

19.4 Include 3 copies of a balance report for inclusion in the manuals.

20 SHOP DRAWINGS

20.1 The Contractor shall provide PDF copies of shop drawings of all equipment for the Consultant's review. Submit clear and descriptive control sequences prior to installation.

21 AS-INSTALLED RECORD DRAWINGS

21.1 Maintain one set of record drawings at the site. Clearly mark in red any changes or deviations from the original design intent. Record all changes to the work as the installation progresses.

21.2 At the completion of the work, certify the drawing as being accurate, mark the drawing as "AS-BUILT," and send it to the Consultant upon Substantial Performance of this Contract.

22 IDENTIFICATION

22.1 Each piping system shall be colour coded for identification and labeled with the system identification code letters, including temperature and pressure, if applicable, and directional flow arrows.

.1 Identify all new piping to existing building identification standards.

.2 Identify piping adjacent to valves and where valves are in series at no more than 2m (6'-6") intervals. Identify piping at least once in each room and at 15m (50ft.) maximum spacing in open areas. Exception: gas piping to be identified at 2m (6'-6") intervals in ceiling plenums.

.3 Identify piping both sides where piping passes through walls, partitions and floors. Identify piping at point of entry and leaving each pipe chase and/or confined space. Identify piping accessible at each access opening.

.4 Identification labels may be stenciled. Identification arrows labels and letters may be vinyl cloth (Brady B500) or vinyl film (Brady B946), with adhesive compatible with the surface temperature.

.5 Identification colour bands for primary and secondary colours to indicate the type and degree of hazard shall be applied to overlap a minimum of 50mm (2"). Bands shall be Brady B550 vinyl cloth tape or Brady B946 vinyl tape, with adhesive compatible with the surface temperature.

22.2 Each piece of equipment shall be identified with its equipment schedule identification, e.g. supply fan SF-1, cooling coil CC-1, pump P-1.

.1 Provide laminated plastic plates with black face and white centre of minimum size 90mm x 40mm x 2.5mm (3-1/2" x 1-1/2" x 3/32") engraved with 12mm (1/2") high lettering. Use 25mm (1") high lettering for major equipment.

.2 Apply nameplates securely in conspicuous places, on cool surfaces.

23 VIBRATION ISOLATION

23.1 Provide vibration isolation on all motor driven equipment with motors of ½ HP and greater power output (as indicated on the motor nameplate) and on piping and ductwork, as specified herein. For equipment less than ½ HP, provide neoprene grommets at the support points.

24 SEISMIC RESTRAINTS

24.1 Provide cable restraints on all isolated equipment and seismic restraint on all other equipment, piping and ductwork, all in general accordance with SMACNA Guidelines

24.2 Include in the Tender the services of a BC Professional engineer, regularly employed in the design of restraint systems to review and sign-off on all seismic supports and restraints. Submit "sealed and signed" Letters of Assurance from the Seismic Engineer.

24.3 It is the entire responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.

24.4 All resiliently mounted equipment, including piping and ductwork, shall be provided with seismic restraining devices (snubbers).

24.5 Slack Cable Systems

.1 Slack cable restraints as supplied by Vibra-Sonic Control.

.2 Restraint systems as detailed in SMACNA "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems" as reviewed by the "Office of the State Architect, Structural Safety Section" for California. If lesser restraint than recommended by SMACNA is proposed to meet local NBCC seismic requirements, provide shop drawings of details certified by a B.C. registered structural consultant.

25 PIPING INSTALLATION

25.1 Ream pipe ends. Clean scale and dirt, inside and outside before and after assembly.

25.2 During construction, protect all openings in piping and equipment, by capping or plugging to prevent entry of dirt.

25.3 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.

25.4 Slope supply piping up (1:480) in direction of flow and drain from low points. Slope return piping down (1:480) in the direction of flow.

25.5 Use eccentric reducers at pipe size change installed to provide positive drainage.

25.6 Provide clearance for access for maintenance of equipment, valves and fittings.

25.7 Install unions or flanges in connections to all equipment and specially components.

25.8 Arrange piping connections to allow ease of access and for removal of equipment.

25.9 Align and independently support piping connections adjacent to equipment to prevent piping stresses being transferred.

25.10 Install valves with stems upright or horizontal unless approved otherwise.

25.11 Install valves to isolate each piece of equipment, and as indicated.

25.12 Construct piping to allow for expansion and contraction.

25.13 Tests and Cleaning

.1 Hydrostatically test all pipes for at least 8 hours prior to insulating.

.2 Repair all leaks as required for zero loss.

.3 Thoroughly flush all new domestic water piping.

26 THERMOMETERS AND GAUGES

26.1 Select thermometers and gauges so that their operating range falls in the middle half of the scale range.

26.2 Thermometers shall be pipe mounted stem type in copper, brass or bronze well installed so as not to restrict flow. Thermometers shall be non-mercury actuated adjustable angle type, 225 mm (9") scale length, white background with black lettering, with both Celsius and Fahrenheit scales.

26.3 Pressure gauges shall be 115mm (4 1/2") diameter, phosphor bronze bourdon tube type with white background and black lettering. Provide needle valve ahead of each gauge. Provide kPa and PSIG scales. Use extensions where gauges are installed through insulation.

27 INSULATION - PIPING

27.1 As applicable, use the latest edition of the "B.C. Insulation Contractors Association (BCICA) Standards Manual" as a reference standard if sufficient detail/information is not specified herein.

27.2 Preformed pipe covering with integral vapour barrier.

.1 Thermal Conductivity at 24°C. - 0.033 W/m/°C.

.2 Acceptable Manufacturers: Certainteed 500 ASJ/SSL, Fiberglas 850 ASJ/SSL or equal.

27.3 Insulation Accessories

.1 All insulation accessories (adhesives, tape, coatings, etc.) shall be approved for the specific application.

.2 Install flexible foamed elastomeric or flexible closed cell preformed piping insulation. Secure longitudinal and butt joints with adhesive. Insulate all fittings and components. To obtain the specified thickness, apply in layers with staggered joints.

27.4 Insulation Termination Points

.1 Terminate insulation 75 mm (3") back from all uninsulated fittings to provide working clearance and terminate insulation at 90° and finish with reinforced scrim cloth and vapour barrier mastic system. Cover onto pipe and over the insulation vapour barrier. On concealed hot services terminate insulation 75mm (3") back from all uninsulated fittings, cut off at 90° and apply reinforced scrim cloth and breather mastic system.

.2 Cut back insulation at 45° and finish with a silicone caulking sealant around the base of thermometer wells, pressure gauges, flow switches and pressure and control sensors.

27.5 Pipe Insulation Schedule:

.1 Insulate all valves and pipe mounted equipment.

.2 Provide 25mm (1") insulation for all domestic hot water and hot water recirculation pipes 50mm (2") and smaller. 40mm (1.5") for all domestic hot water hot water and recirculation pipes 50mm (2") or greater.

.3 Provide 25mm (1") insulation for all domestic cold water pipes.

28 INSULATION - EQUIPMENT

28.1 As applicable, use the latest edition of the "B.C. Insulation Contractors Association (BCICA) Standards Manual" as a reference standard if sufficient detail/information is not specified herein.

28.2 Flexible glass fibre insulation with integral vapour barrier.

.1 Thermal Conductivity at 24°C. - 0.042 W/m/°C.

.2 Acceptable Manufacturers: Certainteed STP Ductwrap #75, Fiberglas AF300 (type II) RFFRK, Knauf FSK Ductwrap, Manson Alley-Wrap FSK.

28.3 Rigid glass fibre insulation with integral vapour barrier.

.1 Thermal Conductivity at 24°C. - 0.042 W/m/°C.

.2 Acceptable Manufacturers: Certainteed STP Ductwrap #75, Fiberglas AF300 (type II) RFFRK, Knauf FSK Ductwrap, Manson Alley-Wrap FSK.

28.4 Insulation Accessories

.1 All insulation accessories (adhesives, tape, coatings, etc.) shall be approved for the specific application.

29 DOMESTIC WATER SYSTEMS - PIPING, VALVES AND FITTINGS

29.1 Piping and Fittings

.1 Hot and cold water and hot water recirculation piping: Type L copper with wrot copper fittings and 95/5 Sn/Sb, Silvabrite 100 or other lead free solder joints.

29.2 Gate Valves

.1 Solder or screwed end joints 50mm (2") and smaller: Crane 1320 or 428, Jenkins 300P or 810, Lunkenheimer 2133 or 2127, Red & White 281A or 280, Neuman-Hattersley A41SE or A40AT / 33X, Kitz 41 or 40.

.2 Flanged ends 65mm (2½") and larger: Crane 465-1/2, Jenkins 404, Lunkenheimer 1430C, Red & White 421A, Neuman-Hattersley 504, Kitz 72.

29.3 Ball Valves

.1 Ball: (in lieu of gate valves or as specified)

.2 50mm (2") and smaller, brass two piece body, blow-out proof stem, PTFE seats, brass chrome plate ball, lever handle operator, 1035 kPa (150 PSIG) rating.

.3 Acceptable Products:

.1 Solder joint type: Red & White / Toyo 5049A, Apollo, Crane, Jenkins, Kitz, Lunkenheimer 746FS or 747FS, Neuman-Hattersley, Nibco, Watts, Worcester.

.2 Threaded joint type: Red & White / Toyo 5044A, Apollo-70 Series, Crane 93-TF, Grinnell 3700 full port, Jenkins-1101-T, Kitz 58, Lunkenheimer 746F or 747F, Neuman-Hattersley 1969AT, Nibco T-580-BR, Watts B-6000, Worcester 4211-RT.

29.4 Balance: (for domestic hot water recirculation)

.1 30mm (1¼") and smaller, globe lockshield, for maximum system temperature, bronze body and trim, Teflon; polytetrafluoroethylene (PTFE), disc, female by male union connection, 690 kPa (100 psig) rating. Acceptable Products: Dahl 13012 or 13013 with memory stop, Dunham Bush 840A, Red & White / Toyo 250LS or 251LS, Grinnell GBV-T threaded.

.2 40mm (1½") and larger, plug type, wrench adjustable stop, for maximum system temperature, semi-steel body, resilient plug seals, EPT or RS 55, max. 120°C (250°F) operating temperature, 860kPa (125 psig), threaded end connections for up to 50 mm (2"), flanged end connections on 65mm (2½") and larger. Acceptable Products: DeZurik 435 with 487 adjustable stop, Homestead Ballcentric, Neuman-Hattersley 170M or 171M, Grinnell GBV-T or GBV

29.5 Vacuum relief: (for hot water tanks installations)

.1 Up to 12 mm (½"), 860 kPa (125 psig) rating. Acceptable Products: 12 mm (½") Watts 36A, Cash Acme.

.2 19 mm (¾") and larger, 860 kPa (125 psig) rating. Acceptable Products: 18 mm (3/4") Watts 36A, Cash Acme.

30 DRAIN, WASTE AND VENT SYSTEMS - PIPING AND FITTINGS

30.1 Piping and fittings - above grade

.1 Waste and vent piping 50mm (2") and smaller: DWV copper with cast brass fittings and solder joints.

.2 Waste and vent piping 65mm (2.5") and larger: Cast iron soil pipe and fittings with mechanical joint couplings.

30.2 Install cleanouts as shown on the drawings and as required by the B.C. Plumbing Code.

31 REFRIGERATION SYSTEMS

31.1 Scope of Work

.1 Work to be completed by YETI Refrigeration Inc.

.2 Provide a complete and operating Desuperheater connected to the ICE PLANT refrigeration system., including, but not limited to

.1 All piping, devices, and valves required up to and including the Desuperheater

.2 Insulation of all piping and heat exchangers associated with the refrigeration contract (ammonia, brine, water).

.3 Supply and installation of the Desuperheater.

.4 All power and control wiring from MCC to refrigeration equipment (If required).

.5 Automatic controls for associated ammonia and water systems. (If required)

.6 All ammonia and water piping and fittings.

31.2 Ammonia Piping

.1 Ammonia piping NPS 1½ and smaller: Schedule 80 steel pipe.

.2 Ammonia piping NPS 2 and larger: Schedule 40 steel pipe.

.3 Fittings: NPS1½ and under: screwed or socket welded, NPS 2 and over: butt welded.

.4 Unions: NPS 1½ and under: screwed, NPS 2 and over: flanged.

.5 Gaskets: mineral fibre or soft lead composition. Install accurately in grooves of unions and fittings.

.6 Pipe Testing Ammonia piping: Test with nitrogen to 1724 kPa (250 psi) on the high pressure side and 1034 kPa (150 psi) on the low pressure side of the system.

31.3 Ammonia Valves and Accessories

.1 Isolation valves: Iron or steel body globe or angle type valves. NPS 1½ and under: screwed or socket welded, NPS 2 and over: flanged, socket welded or butt welded. Valves shall have flanged bonnets and seal caps.

.2 Check valves: Lift or swing type. Check valves larger than NPS 1 shall have manual lifting stems. Refrigeration Specialties type CK-1, Henry or approved equal.

.3 Strainers: Provide upstream of ammonia control valves and expansion valves. Refrigeration Specialties type NTFF, Henry or approved equal.

.4 Control Valves: Refrigeration Specialties or approved equal.

.5 All ammonia valves shall be the product of a single manufacturer.

31.4 Initial Ammonia Charge

.1 Provide complete initial charges of refrigerant R-717 (ammonia) into the system and oil into each compressor.

.2 Oil charging shall be to manufacturer's recommendations.

.3 Provide a hand operated oil pump for adding oil to the compressor crankcases.

.4 Reuse existing ammonia charge only where testing has proven charge satisfactory.

31.5 Heat Recovery Ammonia Desuperheater (Double Wall)

.1 Heat exchangers shall be registered for use in the province of British Columbia.
.2 The heat exchanger shall be sized for the application to ensure that the pressure drop in the refrigerant circuit shall not be more than 28 kPa (4 psi) under full load conditions.
.3 The heat exchanger must be fabricated of electro-chemically compatible materials adequately protected to prevent corrosion after field installation.

.2 Heat Exchanger Construction:
.1 The heat exchanger must be fabricated with a double wall separation between the fluid, with a vent path between the double wall that will allow either the refrigerant or the potable water to vent to the atmosphere in the event of a leak or tube failure.
.2 The outermost tube of the double wall shall be stainless steel type 304 to prevent rusting due to atmospheric moisture entering the vent path. The innermost tube of the double wall shall be Type L copper.
.3 The shell tube shall be ASTM-214 steel tubing and the vertical manifolds shall be ASTM A53, Grade A steel pipe to withstand the operating temperatures and pressures encountered with ammonia.
.4 The inner surface of the potable water tubes shall not be deformed to preclude cleaning and de-scaling by purely mechanical means, and each tube shall be accessible from at least one end for cleaning purposes.
.5 The heat exchanger will be framed and encased in an insulated 1.19 mm (18 gauge) galvanized casing.

31.6 HEAT EXCHANGER PERFORMANCE (Desuperheater DSPH-1)
.1 The performance for the first 3 passes through the heat exchanger at full load conditions are as follows:
.2 First Pass: Heat 16GPM potable water, 60/93.3F, 266.4 MBH, 1.5psi PD
.3 Second Pass: 93.3/126.0F, 261.6 MBH, 1.4psi PD
.4 Third Pass: 126.0/150.4F, 195.2 MBH, 1.4psi PD
.5 Using 225 TR R-717 @ 10/90F & 220F Dt, 2.9 psi PD
.6 Water shall be circulated by a stainless steel or bronze head pump through the heat exchanger at a flow rate of 60 L/s (16 GPM). Water temperature rise shall be from 4.44°C to 49°C (40°F to 130°F).
.7 Temperature of water will be regulated by a piped clamp type ammonia control valve to ensure water temperature does not exceed 93°C (200°F).
.8 Manufacturers: Doucette Industries, Model No. 98215

31.7 Water Piping, Valves and accessories
.1 All piping , valves and accessories from the desuperheater to the hot water storage tanks shall be installed by the mechanical/plumbing contractor.
.2 Piping: All water piping shall be type L copper to ASTM-B58.
.3 Fittings (Steel): NPS 1½ and under screwed, NPS 2 and over flanged or welded.
.4 Unions: NPS 1½ and under screwed, NPS 2 and over flanged.
.5 Fittings (Copper): Wrought copper with 95.5% tin, 4% copper, and 0.5% silver soldered joints.

32 DOMESTIC HOT WATER STORAGE TANKS (PHTK-1 & PHTK-2)

.1 Tank: Welded steel, ASME labelled for working pressure of (870 kPa 125 psig), steel support saddles, tappings for accessories, threaded connections of stainless steel, access manhole.

.2 Lining: Glass Lined tank - Alkaline borosilicate composition permanently fused to steel Complete with a HEAVY GAUGE STEEL JACKET - With baked enamel finish.

.3 Openings: All tanks shall be furnished with threaded openings for thermometer, relief valve, 2" recirculation lines, tank stat, and drain valve.

.4 Insulation - Storage Tanks meet or exceed R12.5 minimum thermal insulation requirements of the current edition of ASHRAE/IESNA 90.1

.5 Accessories: Tank drain, water inlet and outlet, thermometer range of (4 to 93 degrees C, 40 to 200 degrees F), ASME pressure relief valve suitable for maximum working pressure.

.6 Vertical Storage Tank: (thick epoxy) lining extended through flanges and couplings, sheet teflon isolation strip between tank and saddle, dielectric unions between tank and piping system; thermally insulated with (75 mm3 inch) glass fibre insulation with (aluminum) (steel) and jacket.

- .1 Overall Height: (2210) mm(83) inches).
- .2 Diameter: (914) mm (36) inches) diameter.
- .3 Nominal capacity: ((757) L (200) gal).
- .4 Working pressure: (1000 kPa150 psi) ASME labelled.
- .5 Support: mounted on (50 mm2 inch) pipe stand with minimum four cross braced legs.

.7 Manufacturer:

- .1 A.O Smith model TJV-200A

.8 Alternate equal Manufacturers:

- .1 Lochinvar, Allied -Super Hot, LAARS

33 IN-LINE CIRCULATOR PUMP (PHP-1)

.1 Circulator Pump between Desuperheater and tank: Bronze casing and impeller, rated for (860 kPa125 psig) working pressure with stainless steel rotor assembly, alloy steel shaft with integral thrust collar and two (2) oil lubricated bronze sleeve bearings, carbon seal rotating against a stationary ceramic seat, and flexible coupling.

.2 Performance:

- .1 Flow: (60) L/m (16) usgpm, at (39) kPa (13) ft head.
- .2 Electrical Characteristics:
  - .1 (80) W (0.108) hp) and rated load amperes.
  - .2 (120) volts, (single phase), 60 Hz, (2800) RPM)
- .3 Manufacturers: Bell & Gosset Model ESP systemwise:WIZE-23C76414
- .4 Alternate Equal Manufacturers: Armstrong, Taco, Grundfos.

34 CONTROLS GENERAL

34.1 Acceptable Manufacturers

- .1 Automated Logic (Care Systems Service LTD.)

34.2 Control system shall be an electronic system and BACnet compatible. The new equipment shall connect to the existing Automated logic BMS. The system architecture shall utilize

intelligent distributed control modules located at each piece of equipment, which will communicate on a peer-to-peer LAN trunk.

34.3 The system shall provide direct digital control, energy management, and building automation for the heating, ventilating, and air conditioning systems based on heating and cooling demands as per the sequence of operations described herein.

34.4 The installation shall be performed by Contractors specializing in this type of control system installation and setup.

34.5 Acceptable manufacturers: Automated Logic

34.6 The Contractor shall be responsible for the following items:

.1 All conduit and wiring for the low voltage control system.

.2 Supply of control valves and external control dampers and operators to the Mechanical Contractor.

.3 All programming, commissioning and tuning of the complete control system.

.4 Shop drawings, as-built diagrams and operating manuals.

.5 Demonstration and instruction for the Owner.

34.7 Pump Status Indication

.1 Water flow switch shall have stainless steel paddles.

34.8 Controllers

.1 Field programmable using either Operators Control Language or Eikon programming. Pre-programmed or "canned" programming is not acceptable.

.2 Each controller shall be capable of operating stand alone without adversely affecting the remainder of the control system.

.3 Should any controller fail, the remainder of the control system shall not be affected.

35 CONTROLS SEQUENCE OF OPERATION

35.1 Section includes

35.2 Hot water preheat pump PHP-1

.1 The BMS shall control this unit and operate it on/off. Turn the pump off if the Aquastat in the storage tanks reaches 60°C (140°). The pump shall also turn off if the Ice rink plant is not operating.

.2 A current sensor shall monitor the status of this pump.

36 CONTROLS INPUT/OUTPUT POINTS LIST

LEGEND: DI = DIGITAL INPUT, DO = DIGITAL OUTPUT, AI = ANALOG INPUT
AO = ANALOG OUTPUT, H = HIGH ALARM, L = LOW ALARM, S = STATUS ALARM

36.1 System: Hot Water Preheat Circulating pump PHP-1

UNIT NO	POINT DESCRIPTION	INPUT		OUTPUT		ALARM	NOTES
		DI	AI	DO	AO		
PHP1	Pump P-4 on/off			X		L	
PHP1ST	Pump Status	X				L	
PHPAQAST	Aquastat				X		2 required

END OF SPECIFICATION