

MECHANICAL LEGEND	
---	EXISTING PIPING TO BE REMOVED
---	EXISTING PIPING TO REMAIN
G	NATURAL GAS
HGS	HEATING GLYCOL SUPPLY
HGR	HEATING GLYCOL RETURN
⊘	SHUT-OFF VALVE
⊘	NATURAL GAS VALVE
⊘	PRESSURE REGULATING VALVE
⊘	BACKFLOW PREVENTER
→	DIRECTION OF FLOW
→	REDUCER
T&P	TEMPERATURE AND PRESSURE GAUGE
⊘	SAFETY RELIEF VALVE
⊘	AIR VENT
⊘	PRESSURE GAUGE
⊘	TEMPERATURE GAUGE
⊘	LOW WATER CUT OUT
TDV	TRIPLE DUTY VALVE
SD	SUCTION DIFFUSER
A	AIR PURGE
⊘	PUMP
TS	TEMPERATURE SENSOR
⊘	SWITCH
⊘	OUTSIDE / COMBUSTION AIR DUCT UP / DOWN
⊘	EXHAUST / RELIEF AIR DUCT UP / DOWN
⊘	EQUIPMENT DESIGNATION

* PLEASE NOTE *
ALL MATERIAL SHOWN "FADED BACK" IS EXISTING TO REMAIN UNLESS OTHERWISE NOTED.
ALL EQUIPMENT SHOWN "DASHED" IS EXISTING TO BE DEMOLISHED.

MECHANICAL SPECIFICATION

- 1.0 GENERAL
 1. CONTRACTOR TO VISIT JOBSITE DURING BID OPPORTUNITY. DRAWINGS INDICATE APPROXIMATE LOCATION OF EXISTING MECHANICAL EQUIPMENT AND SERVICES. VERIFY EXACT LOCATIONS OF EXISTING MECHANICAL EQUIPMENT AND SERVICES AND ALLOW FOR NECESSARY RELOCATING OF NOTED SERVICES (OR RECONNECTION TO EXISTING SERVICES) TO SUIT NEW CONSTRUCTION.
 2. ALL WORK SHALL CONFORM TO MANITOBA BUILDING CODE AND LOCAL AUTHORITIES. APPLY FOR, OBTAIN AND PAY FOR ALL NECESSARY PERMITS.
 3. INSTALLATION OF WORK SHALL BE COORDINATED AND SHALL BE SCHEDULED SO AS NOT TO ENDANGER OR DISTURB THE CITY OR USERS OF THE BUILDING. SHUTDOWN OF EXISTING BUILDING SYSTEMS SHALL BE COORDINATED WITH THE CITY'S REPRESENTATIVE.
 4. CONTRACTOR SHALL PERFORM COORDINATION OF MECHANICAL DIVISION INSTALLATION WITH ALL RELATED CONTRACTORS. VERIFY ALL DIMENSIONS AND LOCATIONS OF EXISTING EQUIPMENT AND SERVICES PRIOR TO PROCEEDING WITH WORK.
 5. BID OPPORTUNITY QUOTATIONS SHALL BE BASED ON THE USE OF SPECIFIED EQUIPMENT, UNLESS ACCEPTANCE FOR THE USE OF EQUAL MANUFACTURERS IS OBTAINED FROM THE CONTRACT ADMINISTRATOR PRIOR TO SUBMISSION OF BID OPPORTUNITY'S. ALTERNATE MANUFACTURERS MAY BE QUOTED AS AN INCREASE OR DECREASE AMOUNT TO THE BID OPPORTUNITY PRICE, WITHOUT PRIOR ACCEPTANCE OF THE CONTRACT ADMINISTRATOR.
 6. SUBMIT SHOP DRAWINGS FOR ALL EQUIPMENT TO CONTRACT ADMINISTRATOR. FOR SHOP DRAWINGS SUBMITTED ELECTRONICALLY, INCLUDE CONTRACT ADMINISTRATOR PROJECT NAME AND NUMBER IN SUBJECT LINE OF E-MAIL TO CONTRACTADMIN@SMSSENG.COM.
 7. REQUEST FOR INTERPRETATION (RFI)
 1. FOR RFIS SUBMITTED ELECTRONICALLY, INCLUDE CONTRACT ADMINISTRATOR PROJECT NAME AND NUMBER IN THE SUBJECT LINE OF E-MAIL TO CONTRACTADMIN@SMSSENG.COM.
 2. CONTENT OF THE RFI INCLUDE A DETAILED DESCRIPTION OF THE ITEM NEEDING INTERPRETATION AND PROPOSED SOLUTION.
 8. UNLESS NOTED OTHERWISE, CONTRACTOR SHALL OBTAIN A WRITTEN GUARANTEE (FROM PROJECT SUBSTANTIAL COMPLETION) FOR ALL EQUIPMENT AND WORKMANSHIP.
 9. ALL CONNECTIONS TO EXISTING BUILDING MECHANICAL SERVICES SHALL BE COORDINATED WITH THE CITY'S REPRESENTATIVE.
 10. ALL NECESSARY CUTTING AND PATCHING SHALL BE PERFORMED BY COMPETENT SUBCONTRACTORS EMPLOYED BY MECHANICAL CONTRACTOR TO SATISFACTION OF CITY'S REPRESENTATIVE.
 11. ALL DUCTWORK AND PIPING TO BE INSTALLED STRAIGHT, PARALLEL TO THE BUILDING WALLS.
 12. WHERE PIPES OR DUCTS GO THROUGH AN EXTERIOR ROOF OR WALL, THEY SHOULD BE BOXED-IN, FLASHED AND WATERPROOFED. ALLOW FOR EXPANSION AND CONTRACTION OF PIPE.
 13. PIPING SHALL BE ANVIL FIG. 45 OR STEEL PIPE AND FIG. CTES FOR COPPER PIPE. ALL WITH FIG. 140 THREADED ROD ATTACHED TO FIG. 117 EXPANSION CASE SET IN HOLES DRILLED IN CONCRETE, OR ATTACHED TO FIG. 225 OR 227 CLAMP ATTACHED TO JOISTS OR BEAMS.
 14. PRIOR TO DRILLING OPENINGS IN EXISTING STRUCTURE, CONTRACTOR SHALL RETAIN SERVICES OF NATIONAL TESTING LABORATORIES LIMITED TO LOCATE AND MARK ALL STRUCTURAL REINFORCING STEEL LOCATED IN AREA WHERE CUTTING OR DRILLING IS PROPOSED. AT NO TIME SHALL REINFORCING STEEL BE CUT WITHOUT PRIOR WRITTEN APPROVAL FROM STRUCTURAL CONTRACT ADMINISTRATOR QUALIFIED AND LICENSED TO PRACTICE IN PROVINCE OF MANITOBA.
 15. FURNISH TO THE CITY THREE (3) COMPLETE SETS OF MANUFACTURER'S OPERATING AND MAINTENANCE INSTRUCTIONS FOR ALL EQUIPMENT REQUIRING REVIEW AND REVISION. REVIEW INSTRUCTIONS WITH THE CITY'S REPRESENTATIVE TO ENSURE A THOROUGH UNDERSTANDING OF THE EQUIPMENT AND ITS OPERATION.
 16. PROVIDE A MARKED SET OF THE CONTRACT DRAWINGS FOR RECORD "RECORD DRAWINGS", REVISED AS REQUIRED TO SHOW ANY CHANGES FROM THAT ORIGINALLY SHOWN. RECORD DRAWINGS TO BE KEPT ON SITE AND UPDATED WEEKLY. CONTRACT ADMINISTRATOR WILL REVIEW PROGRESS DURING SITE OBSERVATIONS.
 17. AT COMPLETION OF PROJECT PROVIDE RECORD DRAWINGS IN AUTOCAD 2019 FORMAT. COMPLETE WITH DISK PAID FOR BY MECHANICAL CONTRACTOR.
 18. ALL WIRING FOR EQUIPMENT SPECIFIED HEREIN SHALL BE BY THE ELECTRICAL CONTRACTOR, UNLESS OTHERWISE NOTED.
 19. PROVIDE THE CITY'S REPRESENTATIVE ORIENTATION ON OPERATION AND MAINTENANCE OF EQUIPMENT.
 20. MECHANICAL CONTRACTOR SHALL REVIEW ALL EQUIPMENT REQUIRING ELECTRICAL CONNECTION WITH ELECTRICAL CONTRACTOR AND ELECTRICAL DRAWINGS PRIOR TO ORDERING EQUIPMENT. ENSURE PROPER ELECTRICAL CHARACTERISTICS ARE DETERMINED FOR ALL AFFECTED AND RELATED WORK.
 21. WHERE MECHANICAL SERVICES ARE CONCEALED WITHIN WALLS, FLOORS OR CEILINGS AND CANNOT BE VISUALLY IDENTIFIED, PROVIDE ELECTRONIC SCANNING DEVICES OR OTHER APPROVED MEANS TO LOCATE AND IDENTIFY CONCEALED SERVICES PRIOR TO WORK START. MAKE GOOD ANY DAMAGE TO EXISTING MECHANICAL SERVICES AT NO COST TO THE CONTRACTOR.
 - 2.0 INSULATION
 1. INSULATE ALL HEATING PIPING WITH 1" FIBERGLAS 5 1/2 LB. DENSITY PIPING INSULATION WITH ASJ AS PER MANUFACTURER'S PRINTED RECOMMENDATIONS. SEAL ALL BREAKS, JOINTS WITH ASJ TAPE.
 2. INSULATION ON PIPING IN MECHANICAL ROOM TO BE COVERED WITH WHITE P.V.C. INSULATION COVER.
 - 3.0 PLUMBING
 1. PROVIDE LABOUR, MATERIAL, EQUIPMENT AND SERVICES NECESSARY FOR AND INCIDENTAL TO SUPPLY AND INSTALLATION OF SYSTEMS SHOWN ON DRAWINGS. GENERALLY THIS SHALL INCLUDE:
 1. SANITARY DRAINAGE SYSTEMS
 2. NATURAL GAS PIPING SYSTEMS
 3. SANITARY DRAINAGE SYSTEMS
 1. PROVIDE COMPLETE SYSTEMS OF DRAINAGE TO SERVE EQUIPMENT AS NOTED ON DRAWINGS AND IN ACCORDANCE WITH LOCAL CODES.
 2. SANITARY DRAINAGE PIPE AND FITTINGS:
 1. ALL PIPING AND FITTINGS TO BE MANUFACTURED IN EITHER CANADA OR THE USA.
 2. PIPE AND FITTINGS SHALL CONFORM TO STANDARDS LISTED IN APPLICABLE BUILDING CODE (LATEST REVISION).
 3. ALL PIPE AND FITTINGS SHALL TO BE IPEX SYSTEM XFR DRAIN, WASTE AND VENT PIPE AND FITTINGS SHALL BE CERTIFIED TO CSA B181.2, TESTED AND LISTED IN ACCORDANCE WITH CANULC-S102.2, TESTED TO CANULC-S102.2 AND CLEARLY MARKED WITH THE CERTIFICATION LOGO INDICATING A FLAME SPREAD RATING OF 0 AND A SMOKE DEVELOPED CLASSIFICATION NOT EXCEEDING 35.
 2. JOINTING
 1. MAKE ALL JOINTS IN ACCORDANCE WITH MANUFACTURER'S PRINTED RECOMMENDATIONS.
 2. ENSURE EACH JOINT IS MADE NEATLY WITH CHAMFERED EDGES AND NO ROUGH JOINTS INSIDE OF PIPE. FULLY INSERT EACH PIPE INTO JOINT.
 3. 4 NPS AND SMALLER: TWO STEP CEMENTING SYSTEM USING PRIMER AND CEMENT; OR ONE STEP CEMENTING SYSTEM WHEN ALLOWED BY MANUFACTURER.
 4. PRIMERS AND CEMENT SHALL BE SUPPLIED BY PIPE MANUFACTURER OR BE AS RECOMMENDED BY MANUFACTURER. THE SAME MANUFACTURER SHALL BE USED THROUGHOUT THE PROJECT.
 5. WHERE MECHANICAL JOINT COUPLINGS ARE REQUIRED FOR CONNECTION TO EQUIPMENT THEY SHALL HAVE A CORRUGATED STAINLESS STEEL SLEEVE OVER THE JOINT WITH STAINLESS STEEL WORM DRIVE SECURING BANDS TACK WELDED TO THE SLEEVE. TITAN OR APPROVED EQUAL.
 6. SOLVENT CEMENTS - SYSTEM XFR CEMENTS SHALL BE CSA CERTIFIED AND MEET THE REQUIREMENTS OF ASTM D2564. SYSTEM XFR ONE-STEP CEMENT MAY BE USED FOR SIZES FROM 38MM (1-1/2") TO 150MM (6") ONLY. SYSTEM XFR TWO-STEP CEMENT MUST BE USED IN CONJUNCTION WITH SYSTEM XFR PRIMER. PROPER SOLVENT CEMENTING
 3. HANGERS
 1. AFTER MANUFACTURER'S PRINTED RECOMMENDATIONS.
 2. INSTALL HANGERS 4 FT. ON CENTRE FOR PIPES UP TO 1" NPS.
 4. CLEANOUTS:
 1. INSTALL CLEANOUTS AT ALL CHANGES OF DIRECTION, AT INTERVALS OF NOT OVER FIFTY FEET (50') IN HORIZONTAL RUNS, AT ALL POINTS WHERE OBSTRUCTIONS MIGHT BE FORMED AND AT ALL POINTS REQUIRED BY PLUMBING REGULATIONS OR SHOWN ON DRAWINGS.
 2. CLEANOUTS IN IPEX SYSTEM XDR DWV SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S PRINTED INSTRUCTIONS.
 5. NATURAL GAS PIPING
 1. ALL WORK SHALL COMPLY WITH CAN/CSA, A NATIONAL STANDARD OF CANADA, NATURAL GAS AND PROPANE INSTALLATION CODE B149.1 (LATEST REVISION), COMPLETE WITH MANITOBA OFFICE OF THE FIRE COMMISSION GAS NOTICES, AND SHALL BE PERFORMED BY FULLY QUALIFIED GAS FITTERS AND/OR WELDERS LICENSED TO PRACTICE IN THE PROVINCE OF MANITOBA.
 2. ALL PIPING AND FITTINGS TO BE MANUFACTURED IN EITHER CANADA OR THE USA.
 3. NATURAL GAS PIPING
 1. PIPE SHALL BE SCHEDULE 40 BLACK STEEL PIPE EQUAL TO ASTM A-53 GRADE B.
 4. FITTINGS
 1. UP TO 2" NPS:
 1. SCREWED FITTINGS - 150 PSI STANDARD BLACK MALLEABLE IRON, BANDED.
 2. SOCKET WELD FITTINGS - 2,000 PSI FORGED STEEL.
 3. UNIONS - 150 PSI BRASS TO IRON SEAT.
- 4.0 CLEANING AND FLUSHING
 1. ON SYSTEM INSTALLATION COMPLETION, FLUSH OUT PIPING SYSTEM TO REMOVE ANY FOREIGN MATERIAL IN PIPING.
- 5.0 TESTING
 1. PRESSURE TEST ALL PIPING SYSTEMS AS FOLLOWS:
 1. SANITARY DRAINAGE SYSTEMS - IN ACCORDANCE WITH LOCAL REGULATIONS.
 2. NATURAL GAS SYSTEMS - IN ACCORDANCE WITH LOCAL REGULATIONS.
 3. CONTACT ADMINISTRATOR'S REPRESENTATIVE SHALL WITNESS TESTS. CONTRACTOR TO GIVE MINIMUM 48 HOURS WRITTEN NOTICE IN ADVANCE OF TESTING.
- 6.0 LIQUID HEAT TRANSFER
 1. PROVIDE LABOUR, MATERIAL, EQUIPMENT AND SERVICES NECESSARY FOR AND INCIDENTAL TO MODIFICATION OF EXISTING GLYCOL HEATING SYSTEMS AS INDICATED ON DRAWINGS.
 2. RUN PIPING PARALLEL TO WALLS AS UNOBTRUSIVE AS POSSIBLE.
 3. WHERE PIPE CHANGE IN DIRECTION IS SHOWN TO TAKE UP EXPANSION, SPRING PIPING COLD.
 4. PIPE
 1. ALL PIPE AND FITTINGS TO BE MANUFACTURED IN EITHER CANADA OR THE USA.
 2. SCHEDULE 40 CARBON STEEL, CONTINUOUS WELD OR ELECTRIC RESISTANCE WELD PIPE CONFORMING TO ASTM A53, GRADE B.
 3. FITTINGS - UNIONS TO BE BRASS TO IRON GROUND JOINT TYPE. SCREWED FITTINGS ON STEEL PIPE TO BE BEST QUALITY 1034 KPA (150 PSI) BLACK MALLEABLE IRON, BANDED, NIPPLES TO SUIT PIPE TYPE. THREAD-O-LETS AND WELD-O-LETS TO BE MANUFACTURED TO ASTM A181, GRADE 1.
 4. INSIDE OF ALL PIPE, FITTINGS, VALVES AND ALL OTHER EQUIPMENT TO BE SMOOTH, CLEAN AND FREE FROM BUSTERS, LOOSE MILL SCALE, SAND AND DIRT.
 5. PIPING UP TO AND INCLUDING 50MM (2") TO BE SCREW JOINED WITH SCREWED FITTINGS. MAKE SURE JOINTS IRON TO IRON, WITH GRAPHITE AND OIL FILLER OR JOINT COMPOUND. PIPING OVER 2" TO BE GROOVED FITTINGS MANUFACTURED BY VICTAULIC.
 6. GROOVED COUPLINGS SHALL BE STYLE 01, 77, 72, 750, 90, 95 AND USED WHERE APPLICABLE. SUPPLY PIPE GROOVED IN ACCORDANCE WITH VICTAULIC SPECIFICATIONS. FOR GROOVING ON-SITE, PREPARE PIPE IN ACCORDANCE WITH SAME SPECIFICATIONS USING SPECIALTY DESIGNED TOOLS.
 7. USE LONG ELBOWS, FOR PIPE REDUCTIONS USE ECCENTRIC REDUCING SOCKETS.
 8. PROVIDE UNIONS OR FLANGED CONNECTIONS AT ALL PIECES OF EQUIPMENT.
 9. PROVIDE DIELECTRIC COUPLINGS WHERE PIPES OF DISSIMILAR METALS ARE JOINED.
 10. GRADE UP IN FLOW DIRECTION SO AIR MAY PASS THROUGH CONNECTING RISERS, ETC. MINIMUM GRADE TO BE 1" IN 40'-0".
 11. REVISE EXISTING HOT GLYCOL HEATING SYSTEMS AS INDICATED ON THE DRAWINGS.
 12. PROVIDE AIR VENTS AT HIGH POINTS OF GLYCOL HEATING SYSTEMS AND PIPE TO FILL TANK.
- 7.0 VALVES
 1. GLOBE VALVES - TOYO FIG. 221, TOYO FIG. 409A
 2. GATE VALVES - TOYO FIG. 293, TOYO FIG. 421E
 3. BALL VALVES - TOYO FIG. 5044A
 4. DRAIN VALVES - SEDIMENT FAUCET WITH CAP.
- 8.0 GLYCOL HEATING SYSTEMS CLEANOUT
 1. UTILIZE SERVICES OF EXISTING CHEMICAL TREATMENT SUPPLIER. TREATMENT IS FOR CLEANING AND TREATMENT OF NEW PIPING AND EQUIPMENT. THE EXISTING HYDRONIC PIPING SHALL NOT BE AFFECTED. CONDUCT WATER ANALYSIS, SUPERVISE INSTALLATION OF EQUIPMENT AND INITIAL START UP PROCEDURES.
 2. ISOLATE THE NEW PIPING SYSTEM FROM THE EXISTING. PROVIDE ALL NECESSARY FITTINGS, APPURTENANCES, AND EQUIPMENT (PUMPS) TO CIRCULATE CLEANING SOLUTION THROUGH NEW PIPING ONLY.
 3. FLUSH OUT NEW PIPING TO REMOVE ANY FOREIGN MATERIAL. FLUSH TO INCLUDE EXISTING TDV AND SUCTION DIFFUSER.
 4. NEW PIPING TO BE CLEANED OUT. PROVIDE TEMPORARY JOCKEY PUMP TO CIRCULATE CLEANING SOLUTION. CLEANER TO BE INTRODUCED FROM 48 TO 72 HOURS AND REMOVED FROM SYSTEM BY CONTRACTOR.
 5. MONITOR SYSTEM PH AND NEUTRALIZER AS REQUIRED. BRING PH INTO THE 6.5-7.0 RANGE.
 6. FLUSH EACH SYSTEM UNTIL CONDUCTIVITY OF WATER IN SYSTEM IS BACK TO CONDUCTIVITY OF MAKE-UP WATER. IF GLAND PACKED OR MECHANICAL SEAL PUMPS OF PERMANENT SYSTEM ARE USED DURING CLEANING PERIOD, REPLACE PACKING AND MECHANICAL SEALS WITH NEW MATERIAL.
 7. CLEAN ALL STRAINERS.
 8. SYSTEMS TO BE REFILLED AND REQUIRED AMOUNT OF CHEMICAL TREATMENT ADDED TO PROVIDE IMMEDIATE PROTECTION AGAINST CORROSION.
 9. WATER TREATMENT SPECIALIST TO CONDUCT CONDUCTIVITY TESTS BEFORE, DURING, AND AFTER CLEANING EACH SYSTEM, AND REPORT PROCEDURES FOLLOWED AND CONDUCTIVITY READINGS TO CONTRACT ADMINISTRATOR AND CONTRACTOR IN WRITING.
- 9.0 CHEMICAL TREATMENT
 1. GLYCOL HEATING SYSTEM CHEMICAL TREATMENT SHALL BE PROVIDED VIA EXISTING POT FEEDER.
- 10.0 GLYCOL
 1. 50% AQUEOUS SOLUTION BY VOLUME PROPYLENE GLYCOL SHALL BE USED IN THE HYDRONIC HEATING SYSTEM. GLYCOL SHALL BE PRE-MIXED OR MIXED ON SITE. THE FOLLOWING CRITERIA SHALL BE MET:
 1. 50% AQUEOUS SOLUTION BY VOLUME SHALL BE MADE FROM PROPYLENE GLYCOL (MINIMUM 99.9% PURE BY WEIGHT) AND DISTILLED WATER, DEIONIZED WATER, OR SOFT WATER CONTAINING LESS THAN 25 PPM EACH OF CHLORIDE AND SULFATE IONS AND 50 PPM EACH OF HARD WATER IONS (CALCIUM AND MAGNESIUM AS CALCIUM CARBONATE) WITH TOTAL HARDNESS NOT TO EXCEED 100 PPM.
 2. FOR SITE MIXING CITY OF WINNIPEG WATER MAY BE USED WITHOUT SOFTENING.
 3. PROVIDE CONTRACT ADMINISTRATOR WITH WRITTEN REPORT INDICATING METHODOLOGY AND TYPE OF TREATED WATER USED PRIOR TO MIXING SOLUTION.
 4. PURE GLYCOL SHALL HAVE THE FOLLOWING PHYSICAL PROPERTIES:
 1. MOLECULAR WT = 76.10
 2. SPECIFIC GRAVITY AT +20 DEG. C = 1.0381
 3. BOILING POINT AT 760MM HG = 187.4 DEG. C
 4. FREEZING POINT = -40 DEG. C
 5. VISCOSITY AT +20 DEG. C = 60.5 CENTIPOISES
 6. SPECIFIC HEAT AT 20 DEG. C = 0.593 BTU/LB./DEG. F
 2. GLYCOL SHALL CONTAIN SUCH INHIBITORS AS DEEMED NECESSARY BY MANUFACTURER TO PROVIDE MAXIMUM CORROSION PROTECTION TO SYSTEM. MANUFACTURER SHALL ENSURE THAT THE GLYCOL USED TO MANUFACTURE THE HEAT TRANSFER FLUID IS OF HIGH QUALITY GRADE AND IS NOT RECYCLED OR RECLAIMED MATERIAL. THE MANUFACTURER OF THE FLUID MUST PROVIDE WRITTEN DOCUMENTATION STATING THE FLUID PASSES ASTM D1384 STANDARDS (LESS THAN 0.5 MIL PENETRATION PIER YEAR FOR ALL SYSTEM METALS).
 3. COMPATIBILITY OF ALL GLYCOL, VERIFY PROPYLENE GLYCOL SOLUTION (INCLUDING CORROSION INHIBITORS) IS SUITABLE FOR USE WITH SYSTEM MATERIALS, PRODUCTS, AND EQUIPMENT. SOLUTION SHALL MEET ALL REQUIREMENTS OF, AND BE COMPATIBLE WITH, ANY COMPONENT OF THE HYDRONIC SYSTEM INCLUDING, BUT NOT LIMITED TO, BOILER, HEAT EXCHANGER MATERIAL, COUPLINGS, SEALS, FLEX CONNECTORS, ETC. AND HYDRONIC SYSTEM COMPONENTS SELECTED FOR THE PROJECT (I.E. PH. FREEZING POINT, ETC.). COORDINATE WITH FINAL REVIEWED SYSTEM COMPONENT SHOP DRAWINGS.
 4. PROVIDE TWO ADDITIONAL DRUMS OF THE HEAT TRANSFER FLUID OVER AND ABOVE QUANTITY REQUIRED TO FILL SYSTEMS.
 5. AFTER THE SOLUTION HAS BEEN CIRCULATED FOR 24 HOURS, A SAMPLE SHALL BE TESTED BY THE MANUFACTURER AND A WRITTEN REPORT SUBMITTED TO CONTRACT ADMINISTRATOR.
- 11.0 TESTING
 1. PRESSURE TEST ALL PIPING SYSTEMS AS FOLLOWS:
 1. GLYCOL HEATING SYSTEM - TEST WITH WATER TO 100 PSIG AT HIGHEST POINT OF SYSTEM OR TO TWICE PUMPED PRESSURE, WHICH EVER IS GREATEST, FOR 12 HOURS.
 2. CONTRACT ADMINISTRATOR'S REPRESENTATIVE SHALL WITNESS TESTS. CONTRACTOR TO GIVE MINIMUM 48 HOURS WRITTEN NOTICE IN ADVANCE OF TESTING.
- 12.0 EQUIPMENT
 1. BOILER, B-1
 1. LOCHINVAR CREST HIGH EFFICIENCY COMMERCIAL CONDENSING BOILER, FB2001, 1,923 MBTU OUTPUT, 98.2% THERMAL EFFICIENCY, 25:1 TURNDOWN RATIO, 316L STAINLESS STEEL FIRE TUBES
 2. WARRANTY
 1. STANDARD WARRANTY: BOILERS SHALL INCLUDE MANUFACTURER'S STANDARD FORM IN WHICH MANUFACTURER AGREES TO REPAIR OR REPLACE COMPONENTS OF BOILERS THAT FAIL IN MATERIALS OR WORKMANSHIP WITHIN SPECIFIED WARRANTY PERIOD.
 1. WARRANTY PERIOD FOR FIRE-TUBE CONDENSING BOILERS:
 1. HEAT EXCHANGER, PRESSURE VESSEL AND CONDENSATION COLLECTION BASIN SHALL CARRY A 10 YEAR LIMITED WARRANTY AGAINST DEFECTS IN MATERIALS OR WORKMANSHIP.

2. HEAT EXCHANGERS/PRESSURE VESSEL ARE WARRANTED AGAINST THERMAL SHOCK FOR THE LIFETIME OF THE BOILER.
 3. THE BURNER SHALL CARRY A FIVE (5) YEAR LIMITED WARRANTY AGAINST DEFECTIVE MATERIAL OR WORKMANSHIP FROM THE DATE OF SHIPMENT.
 4. ALL OTHER COMPONENTS SHALL CARRY A ONE YEAR LIMITED WARRANTY FROM DATE OF BOILER START UP OR 18 MONTHS FROM SHIPMENT IF START UP CANNOT BE PROVEN.
3. MANUFACTURERS
 1. BASIS-OF-DESIGN PRODUCT. LOCHINVAR CREST BOILER AS SPECIFIED ON DRAWINGS. ALL OTHERS MUST BE SUBMITTED BY VOLUNTARY ALTERNATE.
 2. MANUFACTURER SHALL HAVE THE CAPABILITY TO DESIGN, CONTRACT ADMINISTRATOR, AND BUILD PACKAGE SYSTEMS FOR THE ABOVE-MENTIONED BOILERS. DESIGN OF SUCH SYSTEMS SHALL BE COLLABORATIVE BETWEEN THE CUSTOMER AND THE MANUFACTURER.
 4. CONSTRUCTION
 1. DESCRIPTION: BOILER SHALL BE NATURAL GAS FIRED, FULLY CONDENSING, AND FIRE TUBE DESIGN. THE BOILER SHALL BE FACTORY-FABRICATED. THE HEAT EXCHANGER SHALL BE CONSTRUCTED OF A FULLY WELDED 316L STAINLESS STEEL INTERIOR WITH A CARBON STEEL SHELL AND OF FIRE TUBE DESIGN. FIRE TUBE SHALL BE OF THE WAVE FIRE TUBE DESIGN AND CAPABLE OF TRANSFERRING 16,000 TO 20,000 BTUS PER HOUR. THE WAVE FIRE TUBE SHALL BE MANUFACTURED VIA A LIQUID IMPACT PROCESS. THE WAVE FIRE TUBE SHALL HAVE AN OD = 1.654" AND A WALL THICKNESS = 0.039". THE TOP AND BOTTOM TUBESHEETS SHALL HAVE A MINIMUM THICKNESS = 3/16". THERE SHALL BE NO OVERLAPPING WELDS WITH THE WAVE FIRE TUBE TO TUBESHEET WELDS. THE HEAT EXCHANGER SHALL BE DESIGNED FOR A SINGLE-PASS WATER FLOW TO LIMIT THE WATER SIDE PRESSURE DROP. THERE SHALL BE NO BANDING MATERIAL, BOLTS OR GAS DESIGN. CAST IRON, ALUMINUM, OR COPPER TUBE OR WATER TUBE BOILERS WILL NOT BE ACCEPTED.
 2. HEAT EXCHANGER: THE HEATER EXCHANGER SHALL BEAR THE ASME "H" STAMP FOR 180 PSI WORKING PRESSURE AND SHALL BE NATIONAL BOARD LISTED. THE HEAT EXCHANGER SHALL BE CONSTRUCTED OF A FULLY WELDED 316L STAINLESS STEEL INTERIOR WITH A CARBON STEEL SHELL AND OF FIRE TUBE DESIGN. FIRE TUBE SHALL BE OF THE WAVE FIRE TUBE DESIGN AND CAPABLE OF TRANSFERRING 16,000 TO 20,000 BTUS PER HOUR. THE WAVE FIRE TUBE SHALL BE MANUFACTURED VIA A LIQUID IMPACT PROCESS. THE WAVE FIRE TUBE SHALL HAVE AN OD = 1.654" AND A WALL THICKNESS = 0.039". THE TOP AND BOTTOM TUBESHEETS SHALL HAVE A MINIMUM THICKNESS = 3/16". THERE SHALL BE NO OVERLAPPING WELDS WITH THE WAVE FIRE TUBE TO TUBESHEET WELDS. THE HEAT EXCHANGER SHALL BE DESIGNED FOR A SINGLE-PASS WATER FLOW TO LIMIT THE WATER SIDE PRESSURE DROP. THERE SHALL BE NO BANDING MATERIAL, BOLTS OR GAS DESIGN. CAST IRON, ALUMINUM, OR COPPER TUBE OR WATER TUBE BOILERS WILL NOT BE ACCEPTED.
 3. CONDENSATE COLLECTION BASIN: FULLY WELDED 316L STAINLESS STEEL.
 4. INTAKE FILTER AND DIRTY FILTER SWITCH: BOILER SHALL INCLUDE AN INTAKE AIR FILTER WITH A FACTORY RATED AIR PRESSURE SWITCH. THE PRESSURE SWITCH WILL ALERT THE END USER ON THE SCREEN OF THE BOILER THAT THE INTAKE FILTER IS DIRTY AND NEEDS TO BE CHANGED.
 5. PRESSURE VESSEL: THE PRESSURE VESSEL SHALL BE IN ACCORDANCE WITH ASME SECTION VIII. THE PRESSURE VESSEL CODE. THE PRESSURE VESSEL SHALL BE DESIGNED FOR A SINGLE-PASS WATER FLOW TO LIMIT THE WATER SIDE PRESSURE DROP. PRESSURE DROP SHALL BE NO GREATER THAN 6.5 PSI AT 180 GPM. THE PRESSURE VESSEL SHALL CONTAIN A VOLUME OF WATER NO LESS THAN:

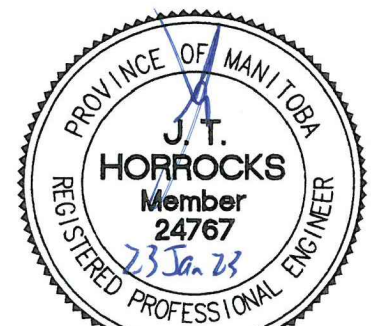
INPUT MBH	WATER CONTENT
1,999	111 GALLONS
 6. BURNER: NATURAL GAS, FORCED DRAFT SINGLE BURNER PREMIX DESIGN. OPERATION OF THE BURNER SHALL NOT EXCEED THAT OF 5.7% OXYGEN LEVEL OR 40% EXCESS AIR. THE BURNER SHALL BE HIGH TEMPERATURE STAINLESS STEEL WITH A WOVEN FERRALLOY OUTER COVERING TO PROVIDE MODULATING FIRING RATES. THE BURNER SHALL BE CAPABLE OF THE STATED GAS TRAIN TURNDOWN WITHOUT LOSS OF COMBUSTION EFFICIENCY. THE BURNER SHALL BE REMOVABLE FROM THE BOILER WITHOUT REMOVING THE GAS/AIR MANIFOLD. THE BURNER SHALL HAVE AN INDEPENDENT LABORATORY RATING FOR OXIDES OF NITROGEN (NOX) TO MEET REQUIREMENTS OF SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) AS COMPLIANT WITH RULE 1146.2 (FB 0751 - FB 2001), BAY AREA QUALITY MANAGEMENT DISTRICT AS COMPLIANT WITH REGULATION 9.17 (FB 2001 - FB 001) AND TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (FB 0751 - FB 2001) AS BEING COMPLIANT WITH SECTION 117.465.
 7. BLOWER: BOILER SHALL BE EQUIPPED WITH A PULSE WIDTH MODULATING BLOWER SYSTEM, CONTROL TO PRESELECT THE FUELAIR MIXTURE TO PROVIDE MODULATING BOILER FIRING RATES FOR MAXIMUM EFFICIENCY. THE BURNER FIRING SEQUENCE OF OPERATION SHALL INCLUDE PRE-PURGE, FIRING, MODULATION, AND POST-PURGE OPERATION.
 8. GAS TRAIN: THE BOILER SHALL BE SUPPLIED WITH TWO GAS VALVES DESIGNED WITH NEGATIVE PRESSURE REGULATION AND SHALL BE CAPABLE OF THE FOLLOWING MINIMUM TURNDOWNS:

INPUT MBH	TURNDOWN	MINIMUM INPUT	MAXIMUM INPUT
1,999	25:1	80,000	1,999,000
 9. IGNITION: SPARK IGNITION WITH 100 PERCENT MAIN-VALVE SHUTOFF WITH ELECTRONIC FLAME SUPERVISION. BOILERS USING A PILOT FOR IGNITION AND/OR UV SCANNERS FOR FLAME SUPERVISION SHALL BE DEEMED UNACCEPTABLE.
 10. CASING:
 1. JACKET: HEAVY GAUGE PRIMED AND PAINTED STEEL JACKET WITH SNAP-IN CLOSURES. JACKET PANELS SHALL BE FULLY REMOVAL. THE FRONT DOOR AND SIDE PANELS SHALL NOT REQUIRE TOOLS FOR REMOVAL. THE JACKET SHALL BE MOUNTED ON A STEEL BASE WITH A MINIMUM THICKNESS = 1/2".
 2. CONTROL COMPARTMENT ENCLOSURES: NEMA 250, TYPE 1A.
 3. INSULATION: MINIMUM 1/2" INCH THICK, MINERAL FIBER INSULATION SURROUNDING THE HEAT EXCHANGER.
 4. COMBUSTION-AIR CONNECTIONS: INLET AND VENT DUCT COLLARS.
 5. CLEARANCES: BOILERS SHALL FEATURE ZERO (0) CLEARANCE TO COMBUSTIBLES. BOILERS SHALL HAVE THE ABILITY TO BE PLACED SIDE BY SIDE IN MULTIPLES WITH NO CLEARANCE IN BETWEEN IF NECESSARY. LOCAL CODES SHOULD BE CONSIDERED.
 11. OUTDOOR CAPABILITY: MANUFACTURER SHALL OFFER AN OUTDOOR CERTIFIED BOILER TO ALL OUTDOOR INSTALLATIONS.
 12. RIGGING AND PLACEMENT: BOILER SHALL INCLUDE LIFTING LUGS AND FORK TRUCK ACCESSIBILITY FOR RIGGING.
 13. CHARACTERISTICS AND CAPACITIES:
 1. HEATING MEDIUM: 50% PROPYLENE GLYCOL.
 2. DESIGN WATER PRESSURE RATING: 180 PSI WORKING PRESSURE.
 3. SAFETY RELIEF VALVE SETTING: 50 PSIG
 4. MINIMUM WATER FLOW RATE:

INPUT MBH	MINIMUM FLOW
1,999	25 GPM
 5. DESIGN FLOW RATE: 140 GPM
5. TRIM
 1. SAFETY RELIEF VALVE:
 1. SIZE AND CAPACITY: 50 LB.
 2. SYSTEM PRESSURES TO BE CONFIRMED PRIOR TO ORDERING.
 3. DESCRIPTION: FULLY ENCLOSED STEEL SPRING WITH ADJUSTABLE PRESSURE RANGE AND POSITIVE SHUTOFF; FACTORY SET AND SEALED.
 2. PRESSURE GAGE: MINIMUM 3-1/2 INCH DIAMETER. GAGE SHALL HAVE NORMAL OPERATING PRESSURE ABOUT 50 PERCENT OF FULL RANGE.
 3. DRAIN VALVES: MINIMUM NPS 3/4 OR NOZZLE SIZE WITH HOSE-END CONNECTION.
 4. CONDENSATE TRAP: FACTORY SUPPLIED CONDENSATE TRAP WITH CONDENSATE TRIP SENSOR.
 5. CONDENSATE NEUTRALIZATION KIT: PROVIDE ACID NEUTRALIZERS AS REQUIRED.

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LETTER OR NUMBER	DESCRIPTION	BY	DDMMYY
0	ISSUED FOR CONSTRUCTION	JH	2301/23



Project Title	WINNIPEG TRANSIT BRANDON GARAGE BOILER REPLACEMENT	Drawing Title	SYMBOL LEGEND AND MECHANICAL SPECIFICATION	Drawn By	JH	Revision Number	0
Checked By	JH	Approved By	JH	Scale	AS NOTED	Drawing Number	M001
Date	OCTOBER 2022	Project No.	22-267-01	Sheet Order	1 OF 5		