

Pump Schedule													
NO.	SERVICE	LOCATION	MODEL / SIZE	CAP. (gpm) (l/s)	HEAD (ft) (m)	MTR. (HP) (kW)	REMARKS						
P-1	Source Pump	Mech Rm(s)	Bell & Gossett Series 90 90-1 1/2 A	20 1.26	80 24.38	2 1.49							
P-2	Load Pump Pump	Mech Rm(s)	Bell & Gossett Series 90 90-1 AA	20 1.26	50 15.24	1.5 1.12							
P-3	Gylcol Tank Pump	Mech Rm(s)	Axiom MF200 Packaged Unit	-	-	-							
P-4	Secondary Pump	Mech Rm(s)	Bell & Gossett Series PL	18 1.14	35 10.67	0.17 0.13							

HEAT PUMP													REMARK								
Unit Heating																					
				Electrical			Condenser Coil							Sou	ırce	Load					
				MCA (Amps)	Max. Rec. Fuse (Amps)	Source				Load							Total	Heat of		C/W ANTI	
TAG	Qty	Model	Voltage			Fluid Flow Rate (gpm)	WPD (ft H₂O)	Glycol Type	Glycol (%)	Huid How Rate (gpm)	WPD (ft H₂O)	Glycol Type	Glycol (%)	EWT (°F)	LWT (°F)	EWT (°F)	LWT (°F)	Capacity (Btu/hr)	Absorp. (Btu/hr)	СОР	CYCLING
HP 001	1	WWHA107	2 208-230/60/3	28.10	50.0	17.00	18.92	Water	0.0	17.00	25.73	Propylene	40.0	43.0	38.6	104.0	108.4	50950	34537	2.92	

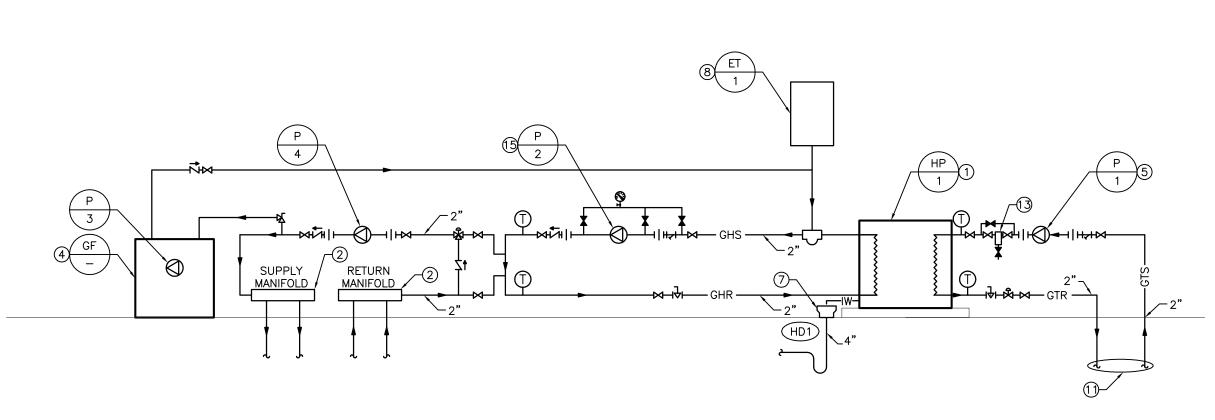
GENERAL NOTES

A. CONTRACTOR TO COORDINATE THE INSTALLATION WITH SUPPLIER AND ELECTRICAL DIVISION.

KEYNOTES

- 1. WATER TO GLYCOL HEAT PUMP C/W 4" CONCRETE PAD.
- 2. MANIFOLD FOR IN-FLOOR HEATING.
- 3. FIRE EXTINGUISHER.
- 4. GLYCOL FILL TANK C/W INTEGRAL PUMP.
- 5. GROUND WATER SUPPLY PUMP.
- 6. GLYCOL IN-FLOOR HEATING CIRCULATION PUMP.
- 7. 4" HUB DRAIN.
- 8. EXPANSION TANK.
- 9. 3kW ELECTRIC FORCE FLOW UNIT HEATER SUSPENDED FROM CEILING BY ELECTRICAL. REFER TO ELECTRICAL DIVISION
- 10. IN-FLOOR HEATING ZONE FOR BUS SHELTER (TYPICAL).11. GROUND WATER LOOP S AND R TO CIRCULATING PUMP.12. 24" SERVICE SPACE IN FRONT AND ON ONE SIDE FOR HEAT PUMP.
- 13. INLINE WATER FILTER, LAKOS MODEL ILB-0100. LAKOS MODEL ABV2 C/W AUTOMATED ELECTRIC PURGE VALVE WITH INDICATOR DRAINING OVER HD1.
- 14. 12"X12" AIR LOUVERS 1500A LOUVER WITH SECURITY GRILLE, GALVANIZED SHEET METAL FOR EXTERIOR USE AND CORROSION—RESISTANCE AND MESH INSECT SCREEN. INSTALL LOUVER AT HIGH LEVEL IN DOOR. COORDINATE COLOR WITH OWNER.
- 15. PRIMARY GLYCOL PUMP.
- 16. CONNECT SANITARY DRAIN LINE TO THE SITE SERVICE
 SANITARY DRAIN WITHIN 3 FT. OF THE BUILDING. REFER TO
 SITE LAYOUT SERVICE DRAWING FOR MORE INFORMATION.

LOCATION APPROVED UNDERGROUND STRUCTURES ORIGINAL SIGNED BY MM/DD/YYY		1			DESIGNED JY BY	CONSU	ULTANT SENGINEERING	CONSULTANT'S SEAL	THE CITY OF WINNIPES TRANSIT DEPARTMENT	
x					DRAWN DL BY	13-173-0	SMS Engineering Ltd. Consulting Engineers 770 Bradford Street Winnipeg MB Canada R3H 0N3 Telephone 204.775.0291 Fax 204.772.2153	J. Ya cous 6 Sep. 29, 2014	Winnipeg EQUITIES INC.	
NOTE LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED ON THE BEST INFORMATION AVAILABLE. BUT NO GUARANTEE IS GIVEN THAT ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATIONS ARE	5	ISSUED FOR CONSTRUCTION	09/29/14	JY	CHECKED JY BY	73-773-0	APEGN Certificate of Authorization	J. YACOUB Member 33894	SOUTHWEST RAPID TRANSIT CORRIDOR	
EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF ALL SERVICES MUST BE OBTAINED FROM THE INDIVIDUAL UTILITIES BEFORE PROCEEDING WITH CONSTRUCTION.	4	ISSUED FOR 99% REVIEW ISSUED FOR 95% REVIEW	08/22/14 07/28/14	GZ CJH	APPROVED BY HW		SMS Engineering Ltd. No. 166 Expiry: April 30, 2015	33894 ESTONAL	JUBILEE STATION STATION CONSTRUCTION, LANDSCAPING & ASSOCIATED WORKS SHEET OF 2 4	
<u>DISCLAIMER</u> This drawing must not be scaled.	2	ISSUED FOR 90% REVIEW	04/15/14	CJH	SCALE AS SHOWN		ASED FOR TRUCTION	CONSULTANT PROJECT NO.	CONSULTANT SHEET TITLE CONSULTANT DRAWING NUMBER	
VARIATIONS AND MODIFICATIONS TO WORK SHOWN ON THESE DRAWINGS SHALL NOT BE CARRIED OUT WITHOUT WRITTEN PERMISSION OF GEM EQUITIES INC	1 NO.	ISSUED FOR REVIEW REVISIONS	01/03/14 DATE	CJH BY	DATE 09/29/2014	DATE	09/29/2014	13-173-01	INFLOOR HEATING MECHANICAL ROOM LAYOUT M1.2	



2 MECHANICAL ROOM SCHEMATIC

MECHANICAL SPECIFICATION

- .1 ALL WORK SHALL CONFORM TO MANITOBA BUILDING CODE AND LOCAL AUTHORITIES. WINNIPEG TRANSIT TO APPLY FOR, OBTAIN AND PAY FOR ALL NECESSARY
- .2 COORDINATE INSTALLATION WITH ALL RELATED TRADES. ARCHITECTURAL DRAWINGS. VERIFY ALL DIMENSIONS AND LOCATIONS OF EQUIPMENT AND SERVICES PRIOR TO PROCEEDING WITH WORK
- .3 SUBMIT SHOP DRAWINGS FOR ALL EQUIPMENT TO CONSULTANT
- .4 PROVIDE ONE YEAR GUARANTEE FOR ALL EQUIPMENT. .5 ALL NECESSARY CUTTING AND PATCHING SHALL BE PERFORMED BY COMPETENT SUB-TRADES EMPLOYED BY MECHANICAL CONTRACTOR TO SATISFACTION OF
- OWNER'S REPRESENTATIVE .6 TENDER QUOTATIONS SHALL BE BASED ON THE USE OF SPECIFIED EQUIPMENT, UNLESS ACCEPTANCE FOR THE USE OF EQUAL MANUFACTURERS IS OBTAINED FROM THE ENGINEER PRIOR TO SUBMISSION OF TENDERS ALTERNATE MANUFACTURERS MAY BE QUOTED AS AN INCREASE OR DECREASE AMOUNT TO THE TENDER PRICE, WITHOUT PRIOR ACCEPTANCE OF THE ENGINEER.
- .7 FURNISH TO THE OWNER THREE (3) COMPLETE SETS OF MANUFACTURER'S OPERATING AND MAINTENANCE INSTRUCTIONS FOR ALL EQUIPMENT REQUIRING MAINTENANCE. REVIEW INSTRUCTIONS WITH OWNER'S REPRESENTATIVE TO ENSURE A THOROUGH UNDERSTANDING OF THE EQUIPMENT AND ITS
- .8 PROVIDE A MARK-UP OF THE CONTRACT DRAWINGS FOR RECORD "AS-BUILT" DRAWINGS, REVISED AS REQUIRED TO SHOW ANY CHANGES FROM THAT
- ORIGINALLY SHOWN. .9 PROVIDE AS-BUILT DRAWING IN AUTOCAD FORMAT. COMPLETE WITH DISK PAID FOR BY MECHANICAL
- CONTRACTOR .10 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 .11 PIPE HANGERS SHALL BE GRINNELL FIG. 65 FOR STEEL PIPE AND FIG. CT65 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.
- .12 FIRE STOPPING PROVIDED UNDER ARCHITECTURAL SECTION. COORDINATE WITH ARCHITECTURE. .13 INSTALLATION OF WORK SHALL BE COORDINATED WITH THE PRIME CONTRACTOR AND SHALL BE SCHEDULED .14 ALL WIRING FOR EQUIPMENT SPECIFIED HEREIN SHALL BE BY THE ELECTRICAL CONTRACTOR, UNLESS
- OTHERWISE NOTED. .15 CONTRACTOR SHALL REVIEW ALL EQUIPMENT REQUIRING ELECTRICAL HOOK-UP WITH ELECTRICAL CONTRACTOR AND ELECTRICAL DRAWINGS PRIOR TO ORDERING EQUIPMENT. ENSURE PROPER ELECTRICAL CHARACTERISTICS ARE DETERMINED FOR ALL AFFECTED AND RELATED WORK.
- 2.0 INSULATION .1 INSULATE ALL HEATING PIPING WITH 1" FIBERGLAS 5 1/2 LB. DENSITY PIPING INSULATION WITH ASJ AS PER MANF. RECOMMENDATIONS. SEAL ALL BREAKS, JOINTS WITH ASJ TAPF
- .2 INSULATION ON PIPING IN FINISHED AREAS TO BE RECANVASSED OR COVERED WITH WHITE P.V.C.
- INSULATION COVER. .3 MINERAL FIBRE SPECIFIED INCLUDES GLASS FIBRE ROCK WOOL, SLAG WOOL.
- .4 THERMAL CONDUCTIVITY ("K" FACTOR) NOT TO EXCEED SPECIFIED VALUES AT 24 DEGREES C MEAN TEMPERATURE WHEN TESTED IN ACCORDANCE WITH .5 TIAC CODE A_1: RIGID MOULDED MINERAL FIBRE
- WITHOUT FACTORY APPLIED VAPOUR RETARDER JACKET. MINERAL FIBRE: TO CAN/ULC_S702 ASTM C547. MAXIMUM "K" FACTOR: TO CAN/ULC_S702. .6 VAPOUR RETARDER LAP ADHESIVE
- .1 WATER BASED, FIRE RETARDANT TYPE, COMPATIBLE WITH INSULATION .7 INDOOR VAPOUR RETARDER FINISH VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH
- .8 OUTDOOR VAPOUR RETARDER FINISH .1 VINYL EMULSION TYPE ACRYLIC, COMPATIBLE WITH
- INSULATION. .2 REINFORCING FABRIC: FIBROUS GLASS, UNTREATED 305 G/M2. .9 JACKETS
- .1 POLYVINYL CHLORIDE (PVC):
- .1 ONE_PIECE MOULDED TYPE TO CAN/CGSB_51.53 WITH PRE_FORMED SHAPES AS REQUIRED COLOURS: TO MATCH ADJACENT FINISH PAINT.

.3 MINIMUM SERVICE TEMPERATURES: _20

- .4 MAXIMUM SERVICE TEMPERATURE: 65 DEGREES MOISTURE VAPOUR TRANSMISSION: 0.02 PERM.
- .6 FASTENINGS: .1 USE SOLVENT WELD ADHESIVE COMPATIBLE WITH INSULATION TO SEAL LAPS AND 7 TACKS
- 3 PRESSURE SENSITIVE VINYL TAPE OF MATCHING COLOUR .7 SPECIAL REQUIREMENTS:
- .2 OUTDOOR: UV RATED MATERIAL AT LEAST 0.5 MM THICK. .2 ALUMINUM:

DEGREES (

TO ASTM B209. THICKNESS: 0.50 MM SHEET. FINISH: SMOOTH

INDOOR: NONE.

- JOINING: LONGITUDINAL AND CIRCUMFERENTIAL SLIP JOINTS WITH 50 MM LAPS. .5 FITTINGS: 0.5 MM THICK DIE_SHAPED FITTING
- COVERS WITH FACTORY_ATTACHED PROTECTIVE .6 METAL JACKET BANDING AND MECHANICAL SEALS: STAINLESS STEEL, 19 MM WIDE, 0.5 MM
- .10 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS .1 CAULKING TO: SECTION 07 92 10 - JOINT SEALING.

THICK AT 300 MM SPACING

- .11 EXECUTION
- .1 MANUFACTURER'S INSTRUCTIONS .1 COMPLIANCE: COMPLY WITH MANUFACTURER'S WRITTEN RECOMMENDATIONS OR SPECIFICATIONS INCLUDING PRODUCT TECHNICAL BULLETINS, HANDLING, STORAGE AND INSTALLATION INSTRUCTIONS. AND DATASHEET
- PRE_INSTALLATION REQUIREMENT PRESSURE TESTING OF PIPING SYSTEMS AND ADJACENT EQUIPMENT TO BE COMPLETE, WITNESSED AND CERTIFIED .2 SURFACES CLEAN, DRY, FREE FROM FOREIGN
- .3 INSTALLATION .1 INSTALL IN ACCORDANCE WITH TIAC NATIONAL
- **STANDARDS** .2 APPLY MATERIALS IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS AND THIS
- SPECIFICATION. .3 USE TWO LAYERS WITH STAGGERED JOINTS WHEN REQUIRED NOMINAL WALL THICKNESS
- EXCEEDS 75 MM. .4 MAINTAIN UNINTERRUPTED CONTINUITY AND INTEGRITY OF VAPOUR RETARDER JACKET AND
- .1 INSTALL HANGERS, SUPPORTS OUTSIDE VAPOUR RETARDER JACKET. .5 SUPPORTS, HANGERS: APPLY HIGH COMPRESSIVE STRENGTH INSULATION, SUITABLE FOR SERVICE, AT

OVERSIZED SADDLES AND SHOES WHERE

INSULATION SADDLES HAVE NOT BEEN

- PROVIDED. .4 REMOVABLE, PRE_FABRICATED, INSULATION AND FNCLOSURES .1 APPLICATION: AT VALVES, PRIMARY FLOW
- MEASURING ELEMENTS FLANGES AND UNIONS AT EQUIPMEN1 .2 DESIGN: TO PERMIT MOVEMENT OF EXPANSION JOINT AND TO PERMIT PERIODIC REMOVAL AND
- REPLACEMENT WITHOUT DAMAGE TO ADJACENT INSULATION. .3 INSULATION:

- .1 INSULATION, FASTENINGS AND FINISHES: SAME AS SYSTEM .2 JACKET: ALUMINUM OR PVC AS SPECIFIED OR NOTED ON DRAWINGS.
- .5 INSTALLATION OF ELASTOMERIC INSULATION .1 INSULATION TO REMAIN DRY. OVERLAPS TO MANUFACTURERS INSTRUCTIONS. ENSURE TIGHT
- .2 PROVIDE VAPOUR RETARDER AS RECOMMENDED BY MANUFACTURER. .6 PIPING INSULATION SCHEDULES .1 INCLUDES VALVES, VALVE BONNETS, STRAINERS,

FLANGES AND FITTINGS UNLESS OTHERWISE

- .2 TIAC CODE: A 1 .1 SECUREMENTS: TAPE AT 300 MM ON
- .2 SEALS: LAP SEAL ADHESIVE, LAGGING
- ADHESIVE .3 INSTALLATION: TIAC CODE 1501_F .3 THICKNESS OF INSULATION AS LISTED IN THE
- FOLLOWING TABLE. TIAC Pipe sizes (NPS) and insulation thickness degrees code (mm) to 2 to 4 6 over Hot Water 60 - 94 A-1 25 25 25 38 38 38
 - .1 EXPOSED INDOORS: PVC JACKET.
 - .2 EXPOSED IN MECHANICAL ROOMS: PVC .3 CONCEALED, INDOORS: CANVAS ON VALVES, FITTINGS. NO FURTHER FINISH. .4 USE VAPOUR RETARDER JACKET ON TIAC

CODE A_3 INSULATION COMPATIBLE WITH

- INSULATION. .5 OUTDOORS: WATER_PROOF ALUMINUM
- .6 FINISH ATTACHMENTS: SS SCREWS BANDS AT 300 MM ON CENTRE. SEALS: CLOSED .7 INSTALLATION: TO APPROPRIATE TIAC CODE CRF/1 THROUGH CPF/5.
- .1 PROCEED IN ACCORDANCE WITH SECTION 01 74 11 CLEANING .2 UPON COMPLETION AND VERIFICATION OF PERFORMANCE OF INSTALLATION, REMOVE SURPLUS MATERIALS, EXCESS MATERIALS, RUBBISH, TOOLS
- AND EQUIPMENT. .1 PROVIDE LABOUR. MATERIAL, EQUIPMENT AND SERVICES NECESSARY FOR AND INCIDENTAL TO SUPPLY AND INSTALLATION OF SYSTEMS SHOWN ON DRAWINGS. GENERALLY THIS SHALL INCLUDE: I DRAINAGE SYSTEM
- .2 DRAINAGE SYSTEMS .1 PROVIDE COMPLETE SYSTEMS OF DRAINAGE AND VENTING TO SERVE ALL FIXTURES, EQUIPMENT, ETC AS NOTED ON DRAWINGS AND IN ACCORDANCE WITH LOCAL CODES. .2 CLEANOUTS:
- .1 INSTALL CLEANOUTS AT ALL CHANGES OF DIRECTION, AT INTERVALS OF NOT OVER FIFTY FFFT (50) IN HORIZONTAL RUNS, AT ALL POINTS WHERE OBSTRUCTIONS MIGHT BE FORMED AND AT ALL POINTS REQUIRED BY .3 DRAIN AND VENT PIPING
- .1 PIPE AND FITTINGS SHALL CONFORM TO STANDARDS LISTED IN APPLICABLE BUILDING CODE (LATEST .2 ALL CAST IRON SOIL PIPE SHALL BE CLASS 4000.
- .3 NO PLASTIC, ASBESTOS OR ALUMINUM PIPE WILL BE ACCEPTED UNLESS SPECIFICALLY CALLED FOR. .4 CLEANOUTS .1 CLEANOUTS IN CAST IRON SOIL PIPE SHALL
- CONSIST OF CAST IRON FERRULE WITH BRASS PLUG HAVING RAISED HEAD. .2 CLEANOUTS IN COPPER DRAINAGE TUBE SHALL BE BRASS SCREWED PLUGS WITH RAISED HEAD.
- .5 CLEANOUT ACCESS COVER .1 ZURN ZANB-1460-13-7" DIAM. POLISHED NICKEL BRONZE FRAME AND COVER. CLEANOUT ACCESS COVERS IN AREAS HAVING FLOOR FINISH SUCH AS V.A. TILE, TERRAZZO, OR CARPET, SHALL B SELECTED TO SUIT FINISH, COOPERATE WITH APPROPRIATE TRADES TO APPLY FINISH TO CLEANOUT COVERS SO THAT THEY WILL BE FLUSH WITH FLOOR, INCONSPICUOUS, AND ACCESSIBLE.
- .2 CLEANOUTS IN WALLS SHALL BE LOCATED ADJACENT TO AN ACCESS DOOR, OR SHALL HAVE SUITABLY FINISHED ACCESS COVER FLUSH WITH WALL SO AS TO PRESENT NEAT FINISHED APPEARANCE AND LEAVE CLEANOUT EASILY ACCESSIBLE. .6 JOINTING
- .1 MAKE ALL JOINTS IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. .2 BRACE FITTINGS NECESSARY TO PREVENT JOINTS FROM COMING APART UNDER PRESSURE .3 MAKE JOINTS IN DOMESTIC WATER AND DRAINAGE SYSTEMS WITH SOLDER CONTAINING NO LEAD.
- SOLDER MATERIAL SHALL BE SILVERBRITE 100 OR EQUAL CONSISTING OF COMBINATION OF TIN, COPPER AND SILVER. .7 CLEANING AND FLUSHING
- .1 ON COMPLETION, FLUSH OUT PIPING SYSTEM TO REMOVE ANY FOREIGN MATERIAL IN PIPING. .8 TESTING
- .1 PRESSURE TEST ALL PIPING SYSTEMS AS FOLLOWS: 1. PLUMBING SYSTEM - IN ACCORDANCE WITH LOCAL REGULATIONS. 2. CONSULTANT'S REPRESENTATIVE SHALL WITNESS TESTS. GIVE 48 HOURS NOTICE IN ADVANCE OF
- .9 HANGERS .1 DRAINAGE - GRINNELL 260 CLEVIS. .2 INSTALL HANGERS 6 FT. ON CENTRE FOR PIPES UP TO 1", 8 FT. ON CENTRE FOR PIPES 1 1/4" AND .10 EQUIPMENT
- .1 FLOOR DRAIN HD1: WATTS FD-100-C-DD. 4.0 LIQUID HEAT TRANSFER
- 1 GENERAL: .1 RUN PIPING PARALLEL TO WALLS AS UNOBTRUSIVE AS POSSIBLE.
- .2 WHERE PIPE CHANGE IN DIRECTION IS SHOWN TO TAKE UP EXPANSION, SPRING PIPING COLD. .3 USE WELDED PIPING IN CONCEALED AREAS AND AS

A RESULT INACCESSIBLE; I.E. PLASTERED CEILINGS,

- .2 PIPE FOR PRIMARY LOOP AND LOAD LOOP .1 SCHEDULE 40 CARBON STEEL, CONTINUOUS WELD OR ELECTRIC RESISTANCE WELD PIPE CONFORMING TO ASTM, A53, GRADE B. .2 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
- .3 INSIDE OF ALL PIPE, FITTINGS, VALVES AND ALL OTHER EQUIPMENT TO BE SMOOTH, CLEAN AND FREE FROM BLISTERS, LOOSE MILL SCALE, SAND AND DIRT. .4 PIPING UP TO AND INCLUDING 50MM (2") TO BE SCREW JOINTED WITH SCREWED FITTINGS. MAKE SCREW JOINTS IRON TO IRON, WITH GRAPHITE AND
- OIL FILLER OR JOINT COMPOUND. PIPING OVER 2" TO BE WELDED. .5 USE LONG ELBOWS. FOR PIPE REDUCTIONS USE ECCENTRIC REDUCING SOCKETS.
- .6 PROVIDE UNIONS OR FLANGED CONNECTIONS AT ALL PIECES OF EQUIPMENT. .7 PROVIDE DIELECTRIC COUPLINGS WHERE PIPES OF DISSIMILAR METALS ARE JOINED.
- .8 GRADE UP IN FLOW DIRECTION SO AIR MAY PASS THROUGH CONNECTING RISERS, ETC. MINIMUM GRADE TO BE 1" IN 40'-0". .9 PROVIDE AIR VENTS AT HIGH POINTS OF HYDRONIC
- .10 PIPE FOR SOURCE SHALL MATCH THE PIPE MATERIAL FOR GEOTHERMAL PIPE LOOP. .3 VALVES BUTTERFLY VALVES - KEYSTONE FIG. ARI

2. BALL VALVES - TOYO FIG. 5044A

- 3. CHECK VALVES TOYO FIG. 263T, CHEK-RITE MODEL 12-CET 4. DRAIN VALVES - SEDIMENT FAUCET WITH CAP. STRAINER
- .1 STRAINERS SHALL BE ERWEL TYPE 'YS', SCREWED ENDS. .2 SCREENS SHALL BE STAINLESS STEEL WITH
- 1/8" PERFORATIONS. PRESSURE GAUGES .1 ASHCROFT TYPE 1010 4-1/2" DIAL. ACCURACY

PULSATION DAMPENER ON PUMP GAUGES.

NEEDLE VALVE. USE ASHCROFT FIG. 1/4-1106B

- 1% OF FULL SCALE .2 GAUGES TO HAVE ASHCROFT FIG. DH-11 BRASS
- .6 HEAT PUMP .1 GENERAL
 - .1 WORK INCLUDED: .1 FURNISH AND INSTALL DAIKIN APPLIED PRODUCT WHA MODEL PACKAGED WATER-TO-WATER HEAT PUMP. SIZES TYPES AND PERFORMANCE SHALL BE AS INDICATED IN THE UNIT SCHEDULE. EACH UNIT SHALL BE COMPLETE WITH FACTORY FURNISHED COMPONENTS AND ACCESSORIES AS SHOWN IN THE PLANS AND AS HEREIN
 - .2 PROVIDE LABOR, MATERIALS, AND EQUIPMENT AND SERVICES TO PERFORM OPERATIONS REQUIRED FOR THE COMPLETE INSTALLATION AND RELATED WORK AS REQUIRED IN CONTRACT DOCUMENTS. .3 ELECTRICAL WORK REQUIRED AS AN
 - INTEGRAL PART OF THE TEMPERATURE CONTROL WORK IS INDICATED ON THE MECHANICAL DRAWINGS, AND IS THE RESPONSIBILITY OF THIS CONTRACTOR TO PROVIDE THE COMPLETE SYSTEM TO PERFORM THE FULL SEQUENCE OF OPERATION SHOWN, OR AS DESCRIBED IN THIS SPECIFICATION.
 - .2 SUBSTITUTIONS: .1 THIS IS A PERFORMANCE SPECIFICATION WHICH USES THE FIRST NAMED MANUFACTURER'S EQUIPMENT AS BASIS OF DESIGN. OTHER MANUFACTURERS ARE NAMED AS ACCEPTABLE, PROVIDING THE OTHER NAMED MANUFACTURERS COMPLY FULLY WITH ALL CONSTRUCTION DETAILS, SCHEDULED PERFORMANCE REQUIREMENTS, AND THE FULL SCOPE OF THESE SPECIFICATIONS. THIS DOES NOT NECESSARILY MEAN THAT THE OTHER NAMED MANUFACTURERS EQUIPMENT WILL FIT THE AVAILABLE SPACE OR DESIGN REQUIREMENTS. IT SHALL BE THE RESPONSIBILITY OF THIS CONTRACTOR TO BE SURE THAT THE SYSTEM PROVIDED FULLY MEETS OR EXCEEDS THE SPECIFIED REQUIREMENTS, AND SHOULD ANY CHANGES OR ADDITIONAL APPARATUS BE REQUIRED FOR OTHER NAMED MANUFACTURERS, THIS CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE MATERIAL AND INSTALLATION COST (INCLUDING CLAIMS BY ALL OTHER TRADES WHICH MAY BE EFFECTED BY THE SUBSTITUTION), TO COMPLETE THE INSTALLATION TO COMPLY FULLY WITH THE SYSTEMS AS OUTLINED IN THESE PLANS
 - AND SPECIFICATIONS. A REQUEST FOR A SUBSTITUTION SHALL CONSTITUTE A REPRESENTATION THAT THE CONTRACTOR .1 HAS INVESTIGATED THE PROPOSED PRODUCT AND DETERMINED THAT IT IS
 - EQUAL TO OR SUPERIOR IN ALL RESPECTS TO THAT SPECIFIED. .2 WILL PROVIDE THE SAME WARRANTIES OR BONDS FOR THE SUBSTITUTION AS FOR THE PRODUCT SPECIFIED.
 - AN ACCEPTED SUBSTITUTION IN THE WORK, AND MAKE SUCH OTHER CHANGES IN THE WORK AS MAY BE REQUIRED FOR INSTALLATION TO MAKE THE WORK COMPLETE AND EQUAL TO THE BASIS OF DESIGN IN ALL RESPECTS. .2 ANY MANUFACTURER NOT NAMED IN THESE
 - SPECIFICATIONS SHALL BE SUBMITTED TO THE ENGINEER FOR TECHNICAL REVIEW NOT LESS THAN FOURTEEN DAYS PRIOR TO THE PUBLISHED BID DATE. THE SOLICITATION FOR CONSIDERATION OF ALTERNATE MANUFACTURERS SHALL INCLUDE, BUT NOT BE LIMITED TO, FULL SUBMITTAL DATA ON UNIT CONSTRUCTION, PERFORMANCE, AND SHALL INCLUDE:
 - .1 DRAWINGS AND SAMPLES TO DEMONSTRATE THE PRODUCTS COMPLIANCE.
 - .2 OUTLINE ANY CHANGES REQUIRED IN OTHER ELEMENTS OF THE WORK BECAUSE OF THE SUBSTITUTION. .3 AVAILABILITY OF LOCAL SERVICE AND
 - SOURCE OF REPLACEMENT MATERIAL AND PARTS. .4 A COMPARISON OF THE PROPOSED MANUFACTURER'S EQUIPMENT WITH THAT SPECIFIED. A COMPLETE COPY OF THESE SPECIFICATIONS, WITH A NOTATION WRITTEN IN THE RIGHT MARGIN OF THE SPECIFICATION; "C" FOR FULL COMPLIANCE, OR "D" FOR DEVIATION, FOR EACH SPECIFICATION
 - LINE ITEM. FOR EVERY INSTANCE OF DEVIATION, A FULL EXPLANATION SHALL BE ATTACHED, IDENTIFIED BY SPECIFICATION NUMBER. .5 A LIST OF LOCAL INSTALLATIONS WHERE EQUIPMENT OF LIKE AND KIND HAVE BEEN INSTALLED, WITH NAMES AND TELEPHONE NUMBERS OF PERSONNEL FOR EACH INSTALLATION, THAT MAY BE
 - CONTACTED AS REFERENCES. .3 THE ENGINEER SHALL DETERMINE COMPLIANCE WITH THE SPECIFICATION AND WHETHER OR NOT THE PROPOSED MANUFACTURER'S EQUIPMENT IS ACCEPTABLE FOR BID SUBMISSION. ANY DEVIATION FROM THIS PROCEDURE IS NOT ACCEPTABLE AND SHALL DISQUALIFY THE PROPOSED MANUFACTURER. ACCEPTANCE AND APPROVAL OF ANY PROPOSED EQUIPMENT BY THE ENGINEER FOR BID SUBMISSION SHALL NOT BE INTERPRETED TO IMPLY THAT THE PROPOSED EQUIPMENT WILL FIT THE AVAILABLE SPACE OR THE DIMENSIONAL OR DESIGN REQUIREMENTS. THE ENGINEER WILL REVIEW REQUESTS FOR SUBSTITUTIONS WITH REASONABLE PROMPTNESS. AND THE DECISION TO ACCEPT OR REJECT THE REQUESTED SUBSTITUTION WILL BE RESPONDED TO ONLY BY ADDENDUM. THE ENGINEER MAY REQUEST ADDITIONAL INFORMATION, WHICH MUST BE PROVIDED AND REVIEWED BEFORE DETERMINING COMPLIANCE. IF THE ENGINEER FINDS THE PRODUCT TO BE OF GENERAL ACCEPTANCE, AN ADDENDUM WILL

BE ISSUED ADDING THAT MANUFACTURER'S

NAME. IF NOT ADDED BY ADDENDUM, THAT

- MANUFACTURER'S EQUIPMENT WILL NOT BE ALLOWED OR CONSIDERED FOR THE PROJECT IF SUBMITTED .1 THE JUDGEMENT OF THE ENGINEER
- SHALL BE FINAL .4 SUBMITTALS: .1 SHOP DRAWINGS INCLUDING WEIGHTS,
- DIMENSIONS, AND REQUIRED CLEARANCES FOR SERVICE. .2 ELECTRICAL DATA, INCLUDING MINIMUM CIRCUIT AMPACITY AND MAXIMUM
- OVERCURRENT PROTECTION REQUIRED, TIME DELAY FUSE TYPE OR HACR CIRCUIT BREAKER REQUIRED. .3 COMPUTER GENERATED CERTIFIED PERFORMANCE DATA AT PROJECT APPLICATION CONDITIONS.
- .4 INSTALLATION DETAILS. .2 PRODUCTS .1 CABINET .1 ALL CABINET PARTS ARE CONSTRUCTED OF HOT DIPPED GALVANIZED G90 STEEL THAT IS CHEMICALLY TREATED WITH ZINC PHOSPHATE, COATED WITH 0.2 TO 0.3 MIL POLYURETHANE PRIMER THEN FINISHED WITH .07 TO .08 MIL POLYESTER TOP COAT. THESE ATTRACTIVE UNITS ARE SUITABLE FOR
- A VARIETY OF APPLICATIONS. FINISH MEETS OR EXCEEDS 1.000 HOUR SALT SPRAY TEST PER ASTM B117 97. ALL CABINET PANELS SHALL BE INSULATED WITH 1/2" THICK 1.5 POUND DENSITY GLASS FIBER INSULATION. CABINET SHALL BE CORNER POST CONSTRUCTION. .2 REFRIGERANT SYSTEM .1 EACH REFRIGERANT CIRCUIT SHALL
 - COMPRESSOR, HIGH PRESSURE CONTROL, LOW PRESSURE CONTROL, BIFLOW TXV, AND REFRIGERANT PRESSURE GAUGE CONNECTIONS. THE WATER-TO-REFRIGERANT HEAT EXCHANGER SHALL BE A COAXIAL TYPE WITH COPPER INNER TUBE AND STEEL OUTER TUBE. .3 ELECTRICAL .1 THE UNIT SHALL HAVE 24-VOLT ELECTROMECHANICAL CONTROLS AND INCLUDE COMPRESSOR CONTACTORS, 24-VOLT TRANSFORMER, TERMINAL

INCLUDE A HIGH-EFFICIENCY SCROLL

- STRIP, COMPRESSOR STAGGERED START, FAULT LOCKOUT CIRCUIT, COMPRESSOR ANTI-SHORT CYCLE, LOW PRESSURE SWITCH BY-PASS TIMER, LED FOR COMPRESSOR ON/OFF AND FAULT STATUS, AND THE NECESSARY RELAYS FOR COMPRESSOR AND REVERSING VALVE OPERATION. THE REVERSING VALVE IS ENERGIZED IN THE COOLING
- .4 ASSEMBLY AND TEST .1 THE UNIT SHALL BE COMPLETELY FACTORY ASSEMBLED, PRECHARGED AND WIRED. COMPLETE UNIT MUST BE TEST OPERATED AT FACTORY PRIOR TO
- SHIPMENT .2 BASIS OF DESIGN:
- .1 MODEL TYPE WHA BY DAIKIN APPLIED REFER TO SCHEDULE .3 EXECUTION
- .1 INSTALLATION: .1 INSTALL EQUIPMENT IN STRICT ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND TO AS TO BE COMPATIBLE WITH INTENT OF THE RESPECTIVE SYSTEM PERFORMANCE REQUIREMENTS.
- .2 NO FIELD PROVIDED APPARATUS ELECTRICAL OR MECHANICAL, SHALL BE FASTENED TO THE HEAT PUMP CABINET WITH SCREWS, WITHOUT THE PRIOR WRITTEN APPROVAL BY THE MANUFACTURER'S REPRESENTATIVE.
- .3 A DISCRETE GROUNDING CONDUCTOR SHALL BE PROVIDED, SIZED IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE, FOR EACH HEAT PUMP UNIT. THE USE OF CONDUIT OR WATER PIPING FOR GROUNDING
- PURPOSES SHALL NOT BE ALLOWED. .4 PIPING, ELECTRICAL CONDUITS, LIGHTING FIXTURES, ETC. SHALL NOT BE LOCATED UNDER ANY CEILING SUSPENDED UNIT, SO AS TO INTERFERE WITH UNIT REMOVAL FOR SERVICE OR REPLACEMENT.
- .5 PIPING AND ELECTRICAL CONNECTIONS SHALL BE LOCATED TO ELIMINATE ANY INTERFERENCE WITH REMOVAL AND REPLACEMENT OF THE FILTER. .6 CONTRACTOR SHALL CLEAN EACH UNIT OF
- CONSTRUCTION DUST AND DEBRIS AND/OR (SELECT): .7 INSTALL NEW FILTERS AT TIME OF COMMISSIONING,

.8 SHALL SUPPLY TO THE OWNER ONE

- COMPLETE SET OF SPARE FILTERS FOR EACH UNIT ON THE PROJECT. .2 HEAT PUMP UNITS SHALL NOT BE USED AS "CONSTRUCTION HEATERS" AT ANY TIME DURING ANY PHASE OF CONSTRUCTION. VERY LOW TEMPERATURES, HARMFUL VAPORS, GYPSUM DUST FROM DRY WALL FINISHING, MAY ALL DAMAGE THE UNIT AND AFFECT ITS EFFICIENCY AND USEFUL SERVICE LIFE. FAILURE TO PROPERLY PROTECT THE UNIT FROM CONSTRUCTION DIRT AND DEBRIS AND FROM CONDENSATION FORMING WITHIN THE UNIT MAY CAUSE ELECTRONIC COMPONENT FAILURE, AND
- .3 COORDINATE INSTALLATION WITH WORK AS PART OF "CONTROL SYSTEMS" SECTION. .4 MANUFACTURER'S FIELD SERVICE - ENGAGE THE SERVICES OF FACTORY AUTHORIZED SERVICE TECHNICIAN REPRESENTATIVE TO PROVIDE EQUIPMENT START UP TO VERIFY INSTALLATION FOR PROPER OPERATION AND COMPLIANCE WITH MANUFACTURER'S RECOMMENDATIONS, AND TO ASSIST THE CONTRACTOR IN MAKING ADJUSTMENTS, AND TO

LOCATION

UNDERGROUND

VOID THE MANUFACTURER'S WARRANTY.

- ASSIST IN FIELD TESTING AS FOLLOWS: .1 INSPECT FOR VISIBLE DAMAGE TO CASING. COILS AND INTERNAL PARTS. .2 INSPECT FOR VISIBLE TRACES OF
- REFRIGERANT LEAKS (OIL, ETC.) AND THEN LEAK CHECK .3 INSPECT ALL ELECTRICAL CONNECTIONS AND TORQUE TO MANUFACTURER'S
- RECOMMENDATIONS, , BOTH POWER AND CONTROL. VERIFY CORRECTNESS. .4 VERIFY THAT FILTERS ARE PROVIDED AS SPECIFIED AND ARE INSTALLED PROPERLY
- .5 VERIFY THAT PROPER CLEARANCES FOR BOTH OPERATION AND SERVICING HAVE BEEN PROVIDED. .6 VERIFY THAT THE UNIT HAS BEEN CLEANED
- OF ALL CONSTRUCTION DUST AND DEBRIS. .7 VERIFY PROPER FAN ROTATION AND V-BELT DRIVE ALIGNMENT AND TENSION WHERE APPLICABLE.
- .8 START UNIT ACCORDING TO THE MANUFACTURER'S WRITTEN INSTRUCTIONS. .9 OBSERVE INITIAL UNIT OPERATION TO VERIFY SUITABILITY FOR CONTINUOUS OPERATION FOR A PERIOD OF TIME OF SUFFICIENT DURATION TO PERMIT SYSTEM AIR
- .7 PUMPS .1 HORIZONTAL IN-LINE CIRCULATING PUMP .1 IN-LINE CIRCULATING PUMPS SHALL BE OF IRON BODY STANDARD CONSTRUCTION SUITABLE FOR WORKING PRESSURE OF 862 KPA (125 PSI). SHAFTS TO HAVE INTEGRAL THRUST COLLAR, SUPPORTED BY TWO OIL LUBRICATED BRONZE SLEEVE BEARINGS. PROVIDE WATERTIGHT ARM SEAL LONG LIFE MECHANICAL

BALANCING

- .2 MECHANICAL SEALS SHALL BE SUITABLE FOR USE WITH GLYCOL SOLUTION SPECIFIED ELSEWHERE IN THIS SECTION .3 REFER TO PUMP SCHEDULE
- .2 VERTICAL IN-LINE PUMPS .1 PUMP TO BE CLOSE COUPLED OR SPLIT COUPLED, AS NOTED IN PUMP SCHEDULE, AND BE VERTICAL SHAFT, SINGLE STAGE, SINGLE SUCTION, RADIALLY SPLIT CASING IN-LINE MOUNTING CENTRIFUGAL TYPE, PUMP TO HAVE CAST IRON CASING, BRONZE FITTED WITH ALLOY STEEL SHAFT, BRONZE REMOVABLE SHAFT SLEEVES AND BRONZE CASING WEAR RINGS. WORKING PRESSURE TO BE 862 KPA (125 PSIG). IMPELLER TO BE MOUNTED ON MOTOR
- SHAFT EXTENSION. .2 PROVIDE MECHANICAL SEAL WITH CARBON ROTATING FACE, NI-RESIST STATIONARY SEAT EPDM SECONDARY SEAL AND STAINLESS STEEL SPRING, MECHANICAL SEAL TO HAVE LUBRICATION AND BE SUITABLE FOR USE WITH FLUID BEING PUMPED
- CONTINUOUSLY RATED, BALL BEARING, SQUIRREL CAGE INDUCTION TYPE WITH NEMA C FLANGE AND EXTENDED SHAFT. .8 IN-FLOOR HEATING SYSTEM .1 FURNISH AND INSTALL, IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER.

.3 MOTOR TO BE VERTICAL, SOLID SHAFT,

- HYDRONIC HEAT DISTRIBUTION SYSTEMS. SYSTEMS SHALL USE A NOMINAL 5/8" INSIDE DIAMETER CROSS-LINKED POLYETHYLENE TUBE MEETING ASTM STANDARD F876-877. TUBES SHALL BE RATED 180F/100 PSI AND SHALL HAVE AN INTEGRAL OXYGEN DIFFUSION BARRIER TO REDUCE THE POTENTIAL OF SYSTEM CORROSION. .2 SYSTEMS SHALL BE COMPLETE AND SHALL INCLUDE
- SYSTEM DESIGN, TUBES, TUBE BEND SUPPORTS TUBE TIE-WIRES, HEAT EMISSION SHEETS, VALVES FITTINGS, MANIFOLDS, MANIFOLD SUPPORTS. .1 INCLUDE ALL LABOUR, MATERIALS TRANSPORTATION, EQUIPMENT AND SERVICES TO INSTALL A HYDRONIC HEATING SYSTEM WHERE
- INDICATED ON THE SHOP DRAWINGS FOR THE PROJECT .2 EXAMINE ALL OTHER PORTIONS OF THE SUBCONTRACT DOCUMENTS FOR WORK OR OTHER TERMS AND CONDITIONS RELATED TO THE WORK OF THIS SECTION. PROVIDE ALL WORK HEREUNDER AS REQUIRED FOR THE SUPPORT AND ACCOMMODATION OF RELATED
- .3 ALL COMPONENTS OF SYSTEMS SHALL BE PROVIDED BY ONE MANUFACTURER INCLUDING TURING TURING FITTINGS, MANIFOLDS, MANIFOLD SUPPORT BRACKETS, WIRE TIES AND TUBING BEND SUPPORTS .4 THE IN-FLOOR HEATING SYSTEMS SHALL BE DESIGNED IN ACCORDANCE WITH A DESIGN CHECKLIST COMPLETED AND SIGNED BY THE
- MANUFACTURER'S CERTIFIED DESIGNER ACCORDING TO THE INSTRUCTIONS AND TESTING METHODS FURNISHED BY THE MANUFACTURER. .5 THE IN-FLOOR HEATING SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH APPLICABLE CODE REQUIREMENTS. AN ON-SITE INSTALLATION CHECKLIST SHALL BE COMPLETED AND SIGNED BY THE MANUFACTURER'S CERTIFIED ON-SITE INSTALLATION SUPERVISOR ACCORDING TO THE INSTRUCTIONS AND TESTING METHODS
- FURNISHED BY THE MANUFACTURER. .6 TUBING SHALL CARRY A TWENTY-FIVE (25) YEAR NON-PRORATED WARRANTY AGAINST FAILURE DUE TO MANUFACTURING DEFECT OR EXPOSURE TO STRESS CRACKING AGENTS. THIS WARRANTY IS TO INCLUDE TUBING EMBEDDED IN CONCRETE. MANIFOLDS AND OTHER ANCILLARY COMPONENTS SHALL BE WARRANTED FOR TWENTY-FOUR (24) MONTHS FROM DATE OF
- .7 TUBING .1 TUBING EMBEDDED IN CONCRETE SHALL BE CROSS-LINKED POLYETHYLENE, RATED AT 180F MAXIMUM WORKING TEMPERATURE AND UP TO 100 PSI WORKING PRESSURE IN ACCORDANCE WITH ASTM STANDARD F876-877, AS MANUFACTURED BY WIRSBO. .2 TUBING SHALL BE OF CROSS-LINKED
- "ENGEL METHOD". THE TUBING SHALL HAVE AN OXYGEN DIFFUSION BARRIER CAPABLE OF LIMITING OXYGEN DIFFUSION THROUGH THE TUBING TO NO GREATER THAN .005 G/M/DAY (AT 40F) .3 THE MINIMUM BEND RADIUS FOR COLD BENDING OF THE TUBING SHALL NOT BE LESS THAN EIGHT (8) TIMES THE OUTSIDE

DIAMETER. BENDS WITH A RADIUS LESS

THAN STATED WILL REQUIRE THE USE OF A

POLYETHYLENE MANUFACTURED BY THE

BEND SUPPORT AS SUPPLIED BY THE TUBING MANUFACTURER .4 TUBING EMBEDDED IN CONCRETE SHALL BE SECURED TO A WELDED WIRE FABRIC OR APPROVED ALTERNATE FABRIC (PROVIDED BY OTHERS) WITH WIRE TIES PROVIDED BY PIPE MANUFACTURER. SPACING OF WIRE TIES SHALL BE MAXIMUM OF THIRTY-SIX (36)

- INCHES FOR STRAIGHT LENGTHS OF TUBING AND A MINIMUM OF THREE (3) TIES PER
- .8 MANIFOLDS SHALL BE OF CAST BRONZE CONSTRUCTION AND SHALL HAVE INTEGRAL CIRCUIT BALANCING VALVES (AND INDIVIDUAL CIRCUIT CONTROL VALVES). SUPPLY AND RETURN MANIFOLDS SHALL BE ABLE TO VENT AIR FROM THE SYSTEM, MANIFOLDS SHALL BE PROVIDED WITH SUPPORT BRACKETS AND TUBE BEND SUPPORTS. MANIFOLDS SHALL BE ISOLATED FROM SUPPLY AND RETURN PIPING WITH VALVES THAT ARE SUITABLE FOR
- ISOLATION AND BALANCING .9 TUBE FITTINGS - SHALL BE MANUFACTURED OF DEZINCIFICATION RESISTANT BRASS. THESE FITTINGS MUST BE SUPPLIED BY THE TUBING MANUFACTURER. THE TUBE FITTING CONSISTS OF AN INSERT, A SERRATED COMPRESSION RING AND A NUT.
- .10 SUPPLY AND RETURN PIPING TO MANIFOLDS 1 PIPING SHALL BE METAL PIPE OR CROSS-LINKED POLYETHYLENE TUBING WITH AN INTEGRAL OXYGEN DIFFUSION BARRIER. 2 FITTINGS WILL BE COMPATIBLE TO THE

TUBING MATERIALS USED. FITTINGS USED

WITH THE CROSS-LINKED POLYETHYLENE

- SHALL NOT PERMIT EXCESSIVE OXYGEN PERMEATION .11 ACCEPTABLE MANUFACTURER: UPONOR .9 EXECUTION
- .1 PIPING INSTALLATION .1 HYDRONIC HEAT TUBING THAT IS EMBEDDED IN CONCRETE SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
- .2 INSTALLATION SHALL FOLLOW THE SHOP DRAWING FOR TUBING LAYOUT AND SPACING. ALL NOTES ON THE DRAWING WILL RE FOLLOWED .3 PRIOR TO THE INSTALLATION OF CONCRETE AROUND THE TUBING, THE SYSTEM SHALL BE CHARGED WITH WATER TO A PRESSURE OF 276 KPA (40 PSIG). THE SYSTEM SHALL REMAIN AT THIS PRESSURE FOR A
- MINIMUM OF 24 HOURS TO ENSURE SYSTEM .4 DURING INSTALLATION OF CONCRETE THAT IS TO EMBED THE TUBING, THE TUBING SHALL REMAIN CHARGED WITH WATER TO A MINIMUM PRESSURE OF 276 KPA (40 PSIG
- UNTIL THE CONCRETE HAS SET. .5 THE SUBCONTRACTOR SHALL PROVIDE WATER FOR PRESSURIZING THE TUBING. .2 CLEANING, FLUSHING AND START-UP .1 IN ACCORDANCE WITH SECTION 23 08 02
- MECHANICAL PIPING SYSTEMS .3 TESTING .1 TEST SYSTEM IN ACCORDANCE WITH SECTION 23 05 00 - COMMON WORK RESULTS -

CLEANING AND START_UP OF

- MECHANICAL .4 BALANCING .1 BALANCE WATER SYSTEMS TO WITHIN PLUS OR MINUS 5 % OF DESIGN OUTPUT .2 REFER TO SECTION — TESTING, ADJUSTING AND BALANCING FOR HVAC FOR
- APPLICABLE PROCEDURES. 5.0 CONTROLS PROVIDE THREE HARD COVER COPIES OF INFORMATION PERTAINING TO TEMPERATURE CONTROL SYSTEM FOR OWNER'S PERMANENT RECORD. INCLUDE SCHEMATIC DRAWINGS AND CONTROL SEQUENCE WRITE-UPS OF
- ALL CONTROL SYSTEMS: 2 PROVIDE ALL LABOUR, MATERIAL, PLANT, TOOLS, EQUIPMENT, AND SERVICES NECESSARY AND REASONABLY INCIDENTAL TO COMPLETION OF TEMPERATURE CONTROLS SYSTEMS AS NOTED HEREIN AND/OR SHOWN ON DRAWINGS.

.3 ALL NEW WORK RELATED TO NEW CONTROLS SHALL BE

- PERFORMED BY A QUALIFIED CONTROLS SUBCONTRACTOR .4 PROVIDE COMPLETE SYSTEM OF JOHNSON AUTOMATIC CONTROLS FOR SYSTEMS INDICATED. .5 PROVIDE ALL NECESSARY THERMOSTATS, VALVES, VALVE OPERATORS, CONTROLLERS, INDICATION, RELAYS, CUMULATORS, POSITIONERS, PNEUMATIC ELECTRI-SWITCHES, SOLENOID VALVES, SWITCHES, CLOCKS, TRANSFORMERS, ETC., TO MAKE COMPLETE AND OPERABLE SYSTEM.CONTROL SYSTEM WILL BE
- SUPPLIED/INSTALLED BY DYNAMIC BUILDING CONTROL INC. (JOHNSON ABCS). CONTACT GORD CASSELL AT 204 774-3581 .6 MECHANICAL SUB-CONTRACTOR TO DISTRIBUTE AND MOUNT ALL PIPE CONNECTED EQUIPMENT. .7 ELECTRICAL TO SUPPLY AND INSTALL ALL CONDUIT, WIRE AND CONNECTIONS FROM DISTRIBUTION PANELS TO LINE SIDE OF MAGNETIC STARTERS AND THERMAL
- STARTERS AND SWITCHES TO MOTORS. .8 FLECTRICAL TO SUPPLY AND INSTALL ALL CONDUIT. WIRE AND CONNECTIONS FROM DISTRIBUTION PANELS TO LINE SIDE OF MAGNETIC STARTERS AND THERMAL OVERLOAD SWITCHES , AND FROM LOAD SIDE OF STARTERS AND SWITCHES TO MOTORS. .9 CONTROL CONTRACTOR TO SUPPLY AND INSTALL ALL CONDUIT, WIRE, ELECTRIC RELAYS, CONNECTIONS AND

OVERLOAD SWITCHES, AND FROM LOAD SIDE OF

- OTHER DEVICES REQUIRED FOR CONTROL CIRCUIT WIRING FOR SYSTEMS AS SPECIFIED HEREIN WHETHER LINE OR LOW VOLTAGE. ELECTRICAL WIRING SHALL BE INSTALLED IN CONFORMANCE WITH CSA, ULC, MANITOBA BUILDING CODE AND DIVISION 16 ELECTRICAL REQUIREMENTS .10 PROVIDE FX6021 WEB CONTROLLER TO ALLOW FUTURE
- MONITORING/ALARMS VIA THE INTERNET. THE FX6021 WILL BE LOCATED IN THE MECHANICAL ROOM OF THE .11 HEATING SYSTEM WILL CONTROL FROM A JOHNSON FX-PCG CONTROLLER WITH THE REQUIRED EXPANSION BOARDS TO ACCOMMODATE THE CONTROL POINTS BEING CONNECTED
- .12 THE HEAT PUMP HP-1 WILL BE COMMANDED "ON" WITH THE OUTDOOR TEMPERATURE BELOW SET POINT. PROVIDE PROGRAMMING TO PREVENT THE SYSTEM FROM SHORT CYCLING. PROVIDE INTERLOCKS TO ENSURE P-1 AND P-2 ARE ON PRIOR TO ACTIVATING HP-1 .13 UTILIZE CSR'S OR FLOW SWITCHES TO PROVE FLOW.
- PUMP START/STOP AND STATUS WILL BE CONNECTED TO THE FX-PCG CONTROLLER. .14 PROVIDE TEMPERATURE SENSORS ON BOTH THE WELL SUPPLY/RETURN AND THE BUILDING LOOP SUPPLY/RETURN FOR CONNECTION TO THE FX-PCG CONTROLLER.
- THE STAGES ON THE HEAT PUMP TO MAINTAIN THE PRIMARY HEATING LOOP TEMPERATURE AT A SET POINT OF 108 DEGREES F ADJUSTABLE .16 THE IN-FLOOR LOOP P-4 WILL ACTIVATE WHEN THERE IS A CALL FOR HEAT FROM THE IN-FLOOR SLAB

.17 PROVIDE TEMPERATURE SENSORS ON BOTH THE

.15 THE PCG CONTROLLER WILL PROVIDE AN OUTPUT TO

TEMPERATURE WILL BE CONTROLLED FROM A 3-WAY VALVE ON THE IN-FLOOR LOOP SUPPLY/RETURN TO MAINTAIN THE SLAB TEMPERATURE AT NO GREATER THAN 35 DEGREES F (ADJUSTABLE) .18 THE TEMPERATURE SENSOR ON THE IN-FLOOR LOOP

SUPPLY WILL PREVENT THE IN-FLOOR SECONDARY

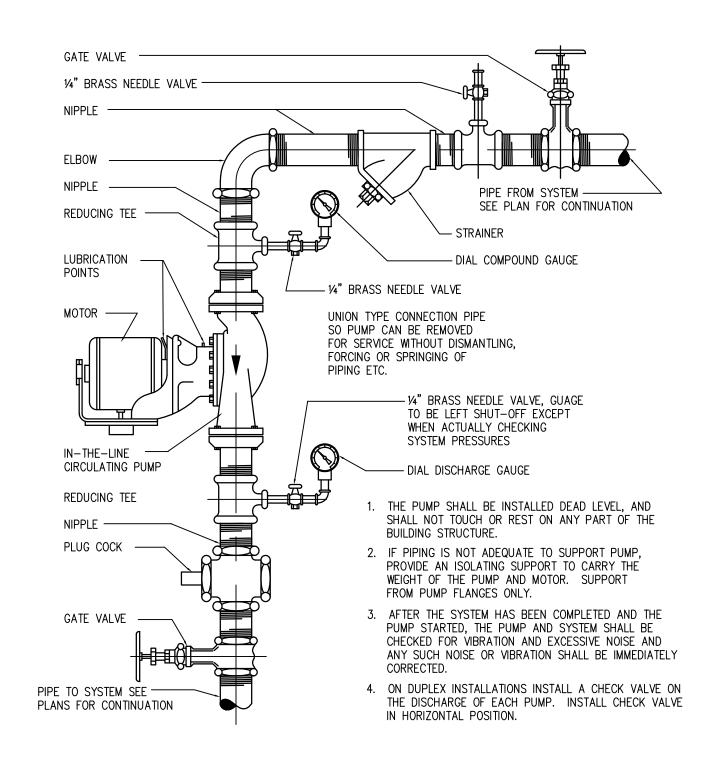
THE FX-PCG CONTROLLER. THE IN-FLOOR LOOP

IN-FLOOR SUPPLY AND RETURN FOR CONNECTION TO

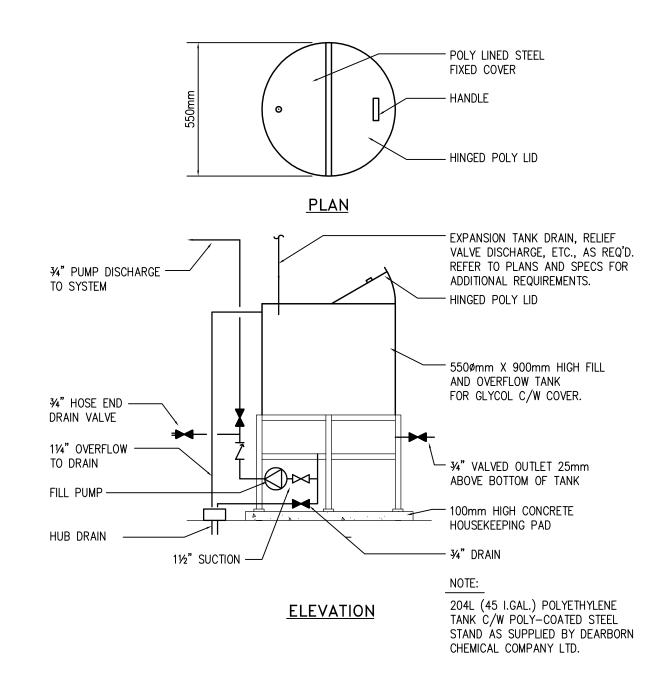
- LOOP FROM GOING ABOVE 100 DEGREES F ADJUSTABLE.
- .19 ALL PUMPS WILL ALARM IN THE EVENT OF A FAILURE
- AT THE FX-PCG CONTROLLER. .20 ALL TEMPERATURE SENSOR SET POINTS WILL DISPLAY
- THE FX-PCG CONTROLLER. .21 THE SYSTEM WILL HAVE THE CAPABILITY FOR
- CONNECTION OF THE FX-6021 TO THE INTERNET TO ALLOW FOR REMOTE ALARMS/MONITORING, THE SYSTEM WILL ALSO BE CAPABLE FOR SENDING ALARMS TO A DESIGNATED EMAIL ADDRESS.
- .22 PROVIDE TRAINING AS REQUIRED.

APPROVED STRUCTURES					DESIGNED JY BY	CONSU	JLTANT AS ENGINEERING	CONSULTANT'S SEAL		CITY OF WINNIPEG	CEM
MM/DD/YYY //2014 EE					DRAWN DL BY		SMS Engineering Ltd. Consulting Engineers 770 Bradford Street Winnipeg MB Canada R3H 0N3 Telephone 204.775.0291 Fax 204.772.2153	501 J. Ya coub Page 509.29,2014	Winnipeg	ANSIT DEPARTMENT	GEM EQUITIES INC.
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LED.	2	ISSUED FOR 90% REVIEW	04/15/14	CJH	SCALE AS SHOWN		RUCTION	CONSULTANT PROJECT NO.	CONSULTANT SHEET TITLE		CONSULTANT DRAWING NUMBER
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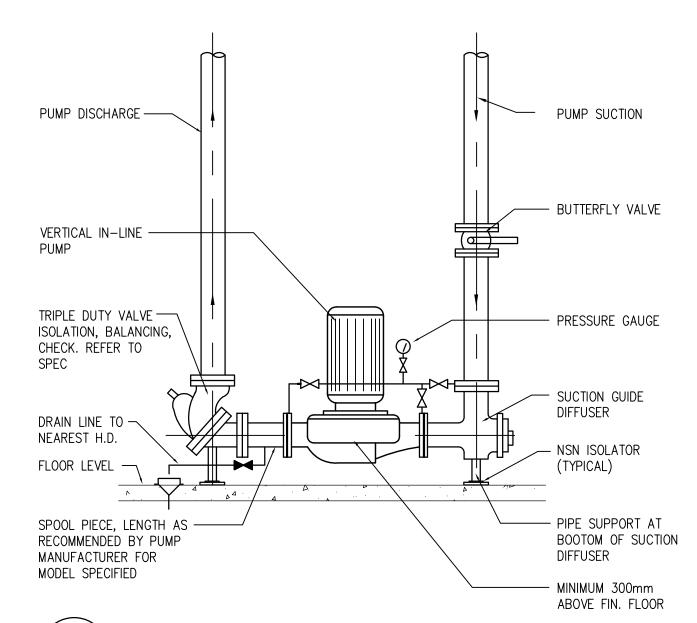
ORIGINAL SIGNED BY SUPV. U/G STRUCTURES COMMITTEE LOCATION OF UNDERGROUND STRUCTU THE BEST INFORMATION AVAILABLE. BI EXISTING UTILITIES ARE SHOWN SERVICES MUST BE OBTAINED FROM 1 PROCEEDING WITH CONSTRUCTION. THIS DRAWING MUST NOT BE SCALED. VARIATIONS AND MODIFICATIONS TO WO SHALL NOT BE CARRIED OUT WITHOUT EQUITIES INC











1 VERTICAL IN-LINE PUMP DETAIL FLOOR SUPPORT

M2.2 SCALE: NTS

LOCATION APPROUND STRUCTU	RES					DESIGNED JY BY	CONSUL	TANT SENGINEERING	CONSULTANT'S SEAL	OWNERS	THE CITY OF WINNIPEG	GEM
ORIGINAL SIGNED BY X SUPV. U/G STRUCTURES COMMITTEE MM/DD,						DRAWN DL BY	- 13-173-01	SMS Engineering Ltd. Consulting Engineers 770 Bradford Street Winnipeg MB Canada R3H 0N3 Telephone 204.775.0291 Fax 204.772.2153	529,2014	Winnipeg	TRANSIT DEPARTMENT	EQUITIES INC.
NOTE LOCATION OF UNDERGROUND STRUCTURES AS SHOWN ARE BASED THE BEST INFORMATION AVAILABLE. BUT NO GUARANTEE IS GIVEN ALL EXISTING UTILITIES ARE SHOWN OR THAT THE GIVEN LOCATION EXACT. CONFIRMATION OF EXISTENCE AND EXACT LOCATION OF AL	THAT S ARE	_	ISSUED FOR CONSTRUCTION ISSUED FOR 99% REVIEW	09/29/14 08/22/14	JY G7	CHECKED JY BY APPROVED HW		APEGIN Certificate of Authorization SMB Engineering Ltd.	J. YACOUB Member 33894		ST RAPID TRANSIT CORRIDOR JUBILEE STATION	SHEET . OF .
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THIS DRAWING MUST NOT BE SCALED. VARIATIONS AND MODIFICATIONS TO WORK SHOWN ON THESE DRA'S SHALL NOT BE CARRIED OUT WITHOUT WRITTEN PERMISSION OF GEOUTIES INC	м -		ISSUED FOR REVIEW REVISIONS	01/03/14 DATE	CJH	SCALE AS SHOWN DATE 09/29/2014	DATE	09/29/2014	consultant project no. 13-173-01	MECHANICAL DE		M2.2