MECHANICAL SPECIFICATIONS

1. GENERAL PROVISIONS:
   A. PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, NECESSARY FOR THE COMPLETE INSTALLATION OF THE PLUMBING AND MECHANICAL SYSTEMS OUTLINED.
   B. OBTAIN ALL PERMITS, FEES, LICENSES, INSPECTIONS, AND CERTIFICATES OF COMPLIANCE OR APPROVAL AS REQUIRED BY THE AUTHORITIES.
   C. ALL WORK SHALL BE PERFORMED IN ACCORDANCE WITH ALL APPLICABLE LAWS, CODES AND REGULATIONS OF THE GOVERNMENTAL BODIES HAVING JURISDICTION OVER THE SITE.
   D. ALL TESTING REQUIRED BY AUTHORITIES SHALL BE CONSIDERED PART OF THIS WORK.
   E. DURING CONSTRUCTION, ALL FIXTURES, EQUIPMENT, PIPE, DUCT, ETC. SHALL BE COVERED, PLUGGED, OR CAPPED AS REQUIRED TO KEEP CLEAN AND UNDAMAGED. ALL DAMAGED ITEMS SHALL BE RESTORED TO ORIGINAL CONDITION OR REPLACED. ALL PROTECTIVE COVERING SHALL BE REMOVED BEFORE FINAL ACCEPTANCE.
   F. PROVIDE ALL NECESSARY CUTTING AND PATCHING OF WALLS, FLOORS, CEILINGS, AND ROOFS AS NECESSARY. PATCH AROUND ALL OPENINGS SHALL MATCH ADJACENT AREA. COORDINATE ALL ROOFING WORK WITH OWNER OR RESPONSIBLE PARTY, SO THAT THE EXISTING ROOFING WARRANTY WILL BE MAINTAINED.
   G. CONTRACTOR SHALL GUARANTEE ALL WORK AND MATERIALS AGAINST DEFECTS FOR A PERIOD OF ONE YEAR FROM FINAL ACCEPTANCE.
2. OPERATION AND MAINTENANCE MANUALS:
   A. DURING THE COURSE OF CONSTRUCTION, COLLECT AND COMPILE OPERATING INSTRUCTIONS, WIRING DIAGRAMS, CATALOG CUTS, LUBRICATION AND PREVENTIVE MAINTENANCE INSTRUCTIONS, PARTS LISTS, ETC. FOR ALL EQUIPMENT FURNISHED UNDER THIS CONTRACT.
   B. ALL LITERATURE AND INSTRUCTIONS SHIPPED WITH THE EQUIPMENT SHALL BE SAVED FOR INCLUSION IN THE OPERATION AND MAINTENANCE MANUALS.
   C. ALL LITERATURE LISTED ABOVE AND ALL PAPERS LISTING WARRANTIES, ETC. SHALL BE BOUND IN A 3-RING BINDER AND LABELED WITH THE PROJECT NAME, ADDRESS, ARCHITECT, ENGINEER, CONTRACTORS, ETC.
3. MANUFACTURERS:
   A. MANUFACTURERS, MODEL NUMBERS, ETC. INDICATED OR SCHEDULED ON THE DRAWINGS SHALL BE INTERPRETED AS HAVING ESTABLISHED A STANDARD OF QUALITY AND SHALL NOT BE CONSTRUED AS LIMITING COMPETITION. ARTICLES, FIXTURES, ETC. OF EQUAL QUALITY BY MANUFACTURERS SHALL BE ACCEPTABLE, SUBJECT TO STRUCTURAL AND ELECTRICAL CONSTRAINTS OF THE PROJECT DESIGN, UNLESS NOTED OTHERWISE.
4. MOTORS:
   A. PROVIDE THERMAL OVERLOAD PROTECTION FOR EACH MOTOR PROVIDED BY THIS WORK.
5. TESTING, BALANCING, AND CLEANING:
   A. ALL PIPING SHALL BE TESTED FOR LEAKS BEFORE BEING CONCEALED IN WALL CONSTRUCTION OR COVERED WITH INSULATION.
   B. SEWER AND VENT PIPING SHALL BE HYDROSTATICALLY TESTED WITH NO LESS THAN 10 FEET OF HEAD FOR A PERIOD OF NOT LESS THAN 15 MINUTES, PER THE LOCAL PLUMBING CODE, WITH NO LEAKS.
   C. FIRE PROTECTION PIPING SHALL BE TESTED IN ACCORDANCE WITH THE REQUIREMENTS OF NFPA.
   D. DOMESTIC WATER PIPING SHALL BE HYDROSTATICALLY TESTED AT A PRESSURE OF NOT LESS THAN 1-1/2 TIMES THE OPERATING PRESSURE, BUT NOT LESS THAN 60 PSI, FOR A PERIOD OF NOT LESS THAN 2 HOURS, WITH NO LEAKS.
   E. NATURAL GAS PIPING SHALL BE PNEUMATICALLY TESTED AT A PRESSURE OF NOT LESS THAN 1-1/2 TIMES THE OPERATING PRESSURE, BUT NOT LESS THAN 50 PSI, FOR A PERIOD OF NOT LESS THAN 2 HOURS, WITH NO LEAKS.
   F. DUCTWORK AND PIPING SHALL BE BALANCED BY QUALIFIED INDEPENDENT BALANCING PERSONNEL WHO HAVE PREVIOUS EXPERIENCE WITH BALANCING PROCEDURES AND ARE CERTIFIED BY THE ASSOCIATED AIR BALANCE COUNCIL (AABC) OR NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB).
      1) BALANCING SHALL INCLUDE THE BALANCING OF THE EQUIPMENT AND AIR DISTRIBUTION SYSTEMS TO PROVIDE DESIGN QUANTITIES INDICATED AND VERIFICATION OF PERFORMANCE OF ALL EQUIPMENT AND AUTOMATIC CONTROLS.
      2) WITH IN 30 DAYS OF THE COMPLETION OF THE TESTING AND BALANCING WORK, SUBMIT THE TEST AND BALANCING REPORT BEARING THE SIGNATURE OF THE TEST AND BALANCE ENGINEER. THE REPORTS SHALL BE CERTIFIED PROOF THAT THE SYSTEMS HAVE BEEN TESTED, ADJUSTED, AND BALANCED IN ACCORDANCE WITH THE REFERENCED STANDARDS; ARE AN ACCURATE REPRESENTATION OF HOW THE SYSTEMS HAVE BEEN INSTALLED AND ARE OPERATING. REPORTS SHALL BE BOUND IN A VINYL BINDER AND THE BINDER LABELED OR MAY BE AN ELECTRONIC PDF SUBMITTAL.
   G. BEFORE DOMESTIC WATER PIPING IS PLACED IN SERVICE, ALL DOMESTIC WATER DISTRIBUTION SYSTEMS, INCLUDING THOSE FOR COLD WATER AND HOT WATER SYSTEMS, SHALL BE FLUSHED, STERILIZED AND CHLORINATED IN ACCORDANCE WITH HEALTH DEPARTMENT REGULATIONS. THE SYSTEMS SHALL BE THOROUGHLY FLUSHED OF ALL DIRT AND FOREIGN MATTER, THEN FILLED WITH WATER TREATED WITH 50 PPM OF CHLORINE. DURING THE FILLING PROCESS, VALVES AND FAUCETS SHALL BE OPENED SEVERAL TIMES TO ASSURE TREATMENT OF THE ENTIRE SYSTEM. THE TREATED WATER SHALL BE LEFT IN THE SYSTEM FOR 24 HOURS AFTER WHICH TIME THE SYSTEM SHALL BE FLUSHED; IF THE RESIDUAL CHLORINE IS NOT LESS THAN 10 PPM, THE FLUSHING SHALL BE REPEATED. AFTER STERILIZATION, SAMPLES OF WATER IN THE SYSTEM SHALL BE APPROVED BY THE BOARD OF HEALTH.
6. PLUMBING:
   A. PROVIDE AN APPROVED WATER HAMMER ARRESTOR FOR EACH PLUMBING FIXTURE SUPPLY AS REQUIRED BY FIXTURE MANUFACTURER.
   B. ALL EXPOSED WASTE PIPE SHALL BE CHROME PLATED BRASS PIPE, NO FERROUS PIPE.
   C. PROVIDE CLEANOUTS AT EACH CHANGE OF DIRECTION AND AT 100 FOOT INTERVALS IN STRAIGHT RUNS.
   D. PROVIDE ACCESS PANELS FOR ALL CONCEALED VALVES AND TRAPS.
   E. CLEANOUTS:
      1) VINYL TILE FLOOR: JR SMITH #4140, OR EQUAL.
      2) QUARRY TILE FLOOR: JR SMITH #4200, OR EQUAL.
      3) CARPETED FLOOR: JR SMITH #4020-Y, OR EQUAL.
      4) UNFINISHED FLOOR: JR SMITH #4020, OR EQUAL.
      5) WALL: JR SMITH #4472, OR EQUAL, 24" ABOVE THE FLOOR.
      6) GRADE: JR SMITH #4256, OR EQUAL, WITH HEAVY DUTY CAST IRON BODY AND COVER.
   F. PROVIDE DIELECTRIC UNIONS WITH APPROPRIATE END CONNECTIONS TO MATCH THE PIPE SYSTEM IN WHICH INSTALLED (SCREWED, SOLDERED, OR FLANGED). PROVIDE DIELECTRIC UNIONS ON ALL PIPING CONNECTIONS TO HOT WATER HEATERS AND EXPANSION TANKS.
   G. WATER HEATERS:
      1) EVERY WATER HEATER SHALL HAVE AN APPROVED MEANS INSTALLED ON THE COLD WATER SUPPLY LINE ABOVE THE EQUIPMENT TO PREVENT SIPHONING OF A STORAGE WATER HEATER OR TANK.
      2) BOTTOM FED WATER HEATERS AND TANKS CONNECT TO WATER HEATERS SHALL HAVE A VACCUM RELIEF VALVE INSTALLED. ANSI Z21.22.
      3) STORAGE HEATERS OPERATING ABOVE ATMOSPHERIC PRESSURE SHALL HAVE AN APPROVED PRESSURE RELIEF VALVE AND/OR TEMPERATURE RELIEF VALVE.
   H. ALL SEWER PIPING LOCATED INSIDE THE BUILDING SHALL BE INSTALLED WITH THE FOLLOWING SLOPES.
      1) INSTALL 2-1/2" AND SMALLER PIPE AT 1/4" PER FOOT FALL.
      2) INSTALL 3" AND LARGER PIPE AT 1/8" PER FOOT FALL.
   I. ALL SEWER PIPING LOCATED EXTERIOR TO THE BUILDING SHALL BE INSTALLED WITH THE FOLLOWING SLOPES.
      1) INSTALL 4" AND SMALLER PIPE AT A MINIMUM OF 2% SLOPE.
7. PIPING:
   A. DOMESTIC COLD AND HOT WATER (ABOVEGROUND).
      1) TYPE L HARD DRAWN COPPER TUBING, ASTM B-88.
         a) WROUGHT COPPER SOLDERED FITTINGS, ASTM B75 ALLOY C12200. ANSI B16.22. MSS SP-104.
         b) MECHANICAL PRESS COPPER FITTINGS FOR USE IN PLUMBING OR MECHANICAL APPLICATIONS. ASME B16.22, ASME B16.51, or ASME B16.18. MECHANICAL PRESS COPPER FITTINGS SHALL CONFORM TO IAPMO PS-117 OR ASME B16.51.
      2) PEX, HIGH-DENSITY CROSS-LINKED POLYETHYLENE TUBING SHALL BE MANUFACTURED TO THE REQUIREMENTS OF ASTM F876 AND MEET THE STANDARD GRADE HYDROSTATIC PRESSURE RATINGS FROM PLASTIC PIPE INSTITUTE IN ACCORDANCE WITH TR-4/03.
         a) PEX-A AND PEX-B MEETING ANSI/NSF61 AND ANSI/NSF372 STANDARDS FOR POTABLE WATER SAFETY AND LEAD-FREE STANDARDS AND MUST BE MARKED WITH "PW-G", "NSF-61-G" OR OTHER NSF-APPROVED MARKING. ASTM F2023 FOR USE WITH CHLORINATED WATER.
         b) PEX MECHANICAL, CRIMP/INSERT OR EXPANSION FITTINGS INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. PIPE SIZES GIVEN ON THE DRAWINGS ARE NOMINAL COPPER PIPE SIZE, INCREASE PEX PIPING SIZE TO EQUAL OR EXCEED COPPER PIPE INSIDE DIAMETER FOR SUPPLY MAINS.
      3) VALVES
         a) TO BE INSTALLED ON THE FIXTURE SUPPLY TO EACH PLUMBING FIXTURE.
         b) TO BE INSTALLED ON THE WATER SUPPLY SIDE TO EACH APPLIANCE OR MECHANICAL EQUIPMENT.
         c) TYPES:
            1. GATE VALVE: JOMAR T/S-301G OR EQUAL. LEAD-FREE NSF 61, ANSI B1.20.1.
            2. GLOBE VALVE: JOMAR TGG OR EQUAL.
            3. BALL VALVE: JOMAR JP100PxP OR EQUAL COMPACT LEAD FREE BRASS BALL VALVE. UL842, CSA 3371-12 & 3371-92, FM, CALIFORNIA CODE AB1953, NSF61 ANNEX G APPROVED.
            4. BALL VALVE: JOMAR T-100NE OR EQUAL. UL842, FM, CSA, NSF 61-8, MSS SP-110
   B. DOMESTIC COLD WATER (UNDERGROUND).
      1) TYPE L HARD DRAWN COPPER TUBING, ASTM B-88.
         a) WROUGHT COPPER SOLDERED FITTINGS, ASTM B75 ALLOY C12200. ANSI B16.22. MSS SP-104.
         b) MECHANICAL PRESS COPPER FITTINGS FOR USE IN PLUMBING OR MECHANICAL APPLICATIONS. ASME B16.22, ASME B16.51, or ASME B16.18. MECHANICAL PRESS COPPER FITTINGS SHALL CONFORM TO IAPMO PS-117 OR ASME B16.51.
      2) PEX, HIGH-DENSITY CROSS-LINKED POLYETHYLENE TUBING SHALL BE MANUFACTURED TO THE REQUIREMENTS OF ASTM F876 AND MEET THE STANDARD GRADE HYDROSTATIC PRESSURE RATINGS FROM PLASTIC PIPE INSTITUTE IN ACCORDANCE WITH TR-4/03.
         a) PEX-A AND PEX-B MEETING ANSI/NSF61 AND ANSI/NSF372 STANDARDS FOR POTABLE WATER SAFETY AND LEAD-FREE STANDARDS AND MUST BE MARKED WITH "PW-G", "NSF-61-G" OR OTHER NSF-APPROVED MARKING. ASTM F2023 FOR USE WITH CHLORINATED WATER.
         b) PEX MECHANICAL, CRIMP/INSERT OR EXPANSION FITTINGS INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. PIPE SIZES GIVEN ON THE DRAWINGS ARE NOMINAL COPPER PIPE SIZE, INCREASE PEX PIPING SIZE TO EQUAL OR EXCEED COPPER PIPE INSIDE DIAMETER FOR SUPPLY MAINS.
         c) HDPE, PIGMENTED BLUE THROUGHOUT, CTS SIZES 1"-2" AWWA C901 4710 DR9 PC250 IPS SIZES 2"-3", AWWA C901 4710 DR11 PC200.
   C. DOMESTIC WATER SERVICE, 1"-3"
      1) TYPE K SOFT DRAWN COPPER TUBING, ASTM B-88.
         a) Cast Copper Alloy Fittings for Flared Copper Tube, ASME/ANSI B16.26:
      2) HDPE, PIGMENTED BLUE THROUGHOUT, CTS SIZES 1"-2" AWWA C901 4710 DR9 PC250 IPS SIZES 2"-3", AWWA C901 4710 DR11 PC200 MATERIAL AND INSTALLATION MUST CONFORM TO WATER DEPARTMENT REQUIREMENTS.
   D. WATER (FIRE) SERVICE, 3" OR LARGER.
      1) DUCTILE IRON PIPE & FITTINGS, AWWA C151, CLASS 50, CEMENT LINING, SEALCOATED, AWWA C104. THRUST BLOCKS IN ACCORDANCE WITH NFPA 24.

MECHANICAL SPECIFICATIONS (CONTINUED)

      2) HDPE IPS SIZES PIGMENTED BLUE THROUGHOUT, 3" AWWA C901 4710 DR11 PC200 4" AND LARGER AWWA C906 3408/4710 DR13.5 PC160
         a) STIFFENERS MUST BE USED IN THE ENDS OF THE HDPE, APPROVED TRACE WIRE MUST BE USED. # 12 AWG COPPERHEAD REINFORCED TRACE WIRE (BLUE IN COLOR)
         b) MATERIAL AND INSTALLATION MUST CONFORM TO WATER DEPARTMENT REQUIREMENTS.
      3) POLYVINYL CHLORIDE (PVC) PIPE; AWWA C900; CLASS 200; WITH BELL END AND ELASTOMERIC GASKET, WITH PLAIN END FOR CAST-IRON OR DUCTILE-IRON FITTINGS, OR PVC ELASTOMERIC GASKET FITTINGS.
         a) PVC COUPLINGS AND FITTINGS: AWWA C900, WITH ASTM F 477 ELASTOMERIC SEAL GASKETS, ASTM F 477, ELASTOMERIC SEAL.
         b) DUCTILE-IRON AND CAST-IRON FITTINGS: AWWA C110, DUCTILE-IRON OR CAST-IRON, 250-PSI PRESSURE RATING; OR AWWA C153, DUCTILE-IRON COMPACT FITTINGS, 350-PSI PRESSURE RATING; OF DIMENSION TO MATCH PIPE OUTSIDE DIAMETER. AWWA C104, CEMENT MORTAR LINING; GASKETS PER AWWA C111, RUBBER.
      4) THRUST BLOCKS IN ACCORDANCE WITH NFPA 24.
   E. LEAD CONTENT OF WATER SUPPLY PIPE AND FITTINGS:
      1) PIPE AND PIPE FITTINGS, INCLUDING VALVES AND FAUCETS, UTILIZED IN THE WATER SUPPLY SYSTEM SHALL NOT HAVE MORE THAN 8% LEAD CONTENT.
      2) PIPE, PIPE FITTINGS, JOINTS, VALVES, FAUCETS, AND FIXTURE FITINGS UTILIZED TO SUPPLY WATER FOR DRINKING OR COOKING PURPOSES SHALL COMPLY WITH NSF 372 AND SHALL HAVE A WEIGHTED AVERAGE LEAD CONTENT OF 0.25% OR LESS.
   F. STORM SEWER, SANITARY SEWER, AND VENTS (UNDERGROUND, INTERIOR TO BUILDING).
      1) POLYVINYLCHLORIDE (PVC) DWV PIPE, SCHEDULE 40, SOLVENT JOINT (WHERE APPROVED BY LOCAL CODES).
      2) SERVICE WEIGHT, BELL-AND-SPIGOT, COATED CAST IRON, ASTM A-74.
      3) ACRYLONITRILE-BUTADIENE-STYRENE (ABS) SEWER PIPE, ASTM D 2751-83a SDR 23.5, SOLVENT-CEMENTED JOINTS.
      4) "NO-HUB" CAST IRON, NEOPRENE GASKETS, STAINLESS STEEL CLAMPS.
   G. STORM SEWER AND SANITARY SEWER (EXTERIOR TO BUILDING).
      1) SERVICE WEIGHT, BELL-AND-SPIGOT, COATED CAST IRON, ASTM A-74.
      2) DUCTILE IRON GRAVITY SEWER PIPE & FITTINGS, ASTM A746/747, CLASS 50 OR 51, SEALCOATED, MECHANICAL OR PUSH-ON JOINTS, DIP COATING, NEOPRENE OR SYNTHETIC RUBBER GASKETS.
      3) ACRYLONITRILE-BUTADIENE-STYRENE (ABS) SEWER PIPE, SDR-23.5 OR SCHEDULE 40, SOLVENT JOINT (WHERE APPROVED BY LOCAL CODES).
      4) POLYVINYLCHLORIDE (PVC) PIPE, SDR-26, SOLVENT OR ELASTOMERIC JOINT (WHERE APPROVED BY LOCAL CODES).
   H. STORM SEWER, SANITARY SEWER, AND VENTS (ABOVEGROUND).
      1) SERVICE WEIGHT, BELL-AND-SPIGOT, COATED CAST IRON, ASTM A-74.
      2) DWV, WROUGHT COPPER, ANSI B-16.29.
      3) GALVANIZED STEEL PIPE, WITH MALLEABLE IRON, THREADED FITTINGS, DRAINAGE PATTERN FOR SEWERS.
      4) "NO-HUB" CAST IRON, NEOPRENE GASKETS, STAINLESS STEEL CLAMPS.
      5) POLYVINYLCHLORIDE (PVC) DWV PIPE, SCHEDULE 40, SOLVENT JOINT (WHERE APPROVED BY LOCAL CODES). (NOT FOR USE IN A RETURN AIR PLENUM)
   I. CONDENSATE DRAINS & INDIRECT WASTE (ABOVEGROUND).
      1) DWV, WROUGHT COPPER, ANSI B-16.29 (CONDENSATE INSIDE BUILDING).
      2) POLYVINYLCHLORIDE (PVC) DWV PIPE, SCHEDULE 40, SOLVENT JOINT (INDIRECT WASTE).
   J. REFRIGERANT.
      1) ASTM B 280, TYPE ACR, HARD-DRAWN STRAIGHT LENGTHS, AND SOFT-ANNEALED COILS, SEAMLESS COPPER TUBING.
      2) WROUGHT COPPER, ANSI B16.22, STREAMLINED PATTERN, FITTINGS. BRAZED JOINTS, AWS A 5.8, CLASSIFICATION BAG-1 (SILVER).
      3) TUBING SHALL BE FACTORY CLEANED, READY FOR INSTALLATION, AND HAVE ENDS CAPPED TO PROTECT CLEANLINESS OF PIPE INTERIORS PRIOR TO SHIPPING.
      4) SIZE AND INSTALLATION OF PIPE SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
   K. NATURAL GAS.
      1) BLACK STEEL PIPE, SCHEDULE 40, ASTM A53.
         a) PIPE 3" AND SMALLER; 150 LB. MALLEABLE IRON, THREADED FITTINGS.
         b) PIPE 4" AND SMALLER; VIEGA MEGAPRESS G FOR WATER AND GAS. CSA LC4, TSSA/ASME B31 FOR USE WITH ASTM A53 SCHEDULE 40 BLACK IRON PIPE.
         c) PIPE 2-1/2" AND LARGER, WELDED.
         d) PLUG VALVE: ROCKWELL NORDSTROM FIGURE NO. 142 OR 143.
         e) BALL VALVE: JOMAR T-100NE. APPROVALS- UL842, FM, CSA, NSF 61-8, MSS SP-110
      2) GAS PIPING LABELING:
         a) ALL ELEVATED PRESSURE GAS PIPING SHALL BE LABELED EVERY 40 FEET WITH SIGNS INDICATING "ELEVATED PRESSURE".
      3) GAS PIPING PAINTING:
         a) ALL BLACK STEEL GAS PIPING LOCATED EXTERIOR TO THE BUILDING SHALL BE PRIMED AND PAINTED TO EITHER MATCH ADJACENT EXTERIOR WHERE LOCATED ON OR NEAR EXTERIOR WALL AND PAINTED SAFETY YELLOW WHERE LOCATED ON THE ROOF.
   L. ALL PIPE HANGERS AND SUPPORTS SHALL BE STANDARD PRODUCTS OF GRINNELL, FEE AND MASON, OR ELCEN. HANGER SPACING SHALL BE IN ACCORDANCE WITH MSS-SP-69.
   M. SLEEVES
      1) PROVIDE, SET, AND PROPERLY LOCATE PIPE SLEEVES AS REQUIRED FOR THIS WORK. ALL SLEEVES SHALL BE OF SUFFICIENT SIZE TO PERMIT PIPE MOVEMENT DUE TO EXPANSION AND CONTRACTION AND TO ACCOMMODATE PIPE INSULATION.
      2) INTERIOR PARTITIONS: 16 GAGE GALVANIZED STEEL, PACK BETWEEN PIPE AND SLEEVE WITH FIRE SAFING AND CAULK AT EACH END WITH FIRE RESISTANT SEALANT.
      3) ROOF: PROSET OR EQUAL, MANUFACTURED PVC SCHEDULE 40 PIPE SLEEVE WITH WATERPROOF SEAL. COORDINATE WITH ROOFING CONTRACTOR AND FLASH AS REQUIRED TO MAINTAIN ROOF WARRANTY.
      4) PROTECTION AGAINST CONTACT: METALLIC PIPING, EXCEPT FOR CAST IRON, DUCTILE IRON AND GALVANIZED STEEL SHALL NOT BE PLACED IN DIRECT CONTACT WITH STEEL FRAMING MEMBERS, CONCRETE, OR CINDER WALLS AND FLOORS OR OTHER MASONRY. METALLIC PIPING SHALL NOT BE PLACED IN DIRECT CONTACT WITH CORROSIVE SOIL. SHEATHING USED TO PREVENT DIRECT CONTACT SHALL HAVE A THICKNESS OF GREATER THAN .008: AND THE SHEATHING SHALL BE MADE OF PLASTIC. ANY PIPE THAT PASSES THROUGH A FOUNDATION WALL OR FOOTING SHALL BE PROVIDED WITH A RELIEVING ARCH, OR A PIPE SLEEVE SHALL BE BUILT INTO THE FOUNDATION WALL. THE SLEEVE SHALL BE TWO SIZES GREATER THAN THE PIPE PASSING THOUGH THE WALL OR FOOTING.
      5) PLUMBING VENTS: FLASH ROOF VENT INTO ROOFING SYSTEM AS REQUIRED BY THE ROOFING CONTRACTOR TO MAINTAIN EXISTING ROOF WARRANTY. ALL PLUMBING VENT TERMINALS SHALL TERMINATE A MINIMUM OF 12" ABOVE ROOF OR EQUAL TO HEIGHT OF PARAPET, WHICHEVER IS GREATER.
   N. PROVIDE CHROME PLATED ESCUTCHEONS ON ALL PIPE ENTERING FINISHED AREAS.
8. WATER HEATERS
   A. COMMERCIAL, LIGHT-DUTY, STORAGE, ELECTRIC, DOMESTIC-WATER HEATERS:
      1. STANDARD: UL 174
      2. STORAGE-TANK CONSTRUCTION: STEEL, VERTICAL ARRANGEMENT.
         a. PRESSURE RATING: 150 PSIG.
         b. INTERIOR FINISH: COMPLY WITH NSF 61 AND NSF 372 BARRIER MATERIALS FOR POTABLE-WATER TANK LININGS, INCLUDING EXTENDING LINING MATERIAL INTO TAPPINGS.
      3. FACTORY-INSTALLED, STORAGE-TANK APPURTENANCES:
         a. ANODE ROD: REPLACEABLE MAGNESIUM.
         b. DIP TUBE: REQUIRED UNLESS COLD-WATER INLET IS NEAR BOTTOM OF TANK.
         c. DRAIN VALVE: CORROSION-RESISTANT METAL WITH HOSE-END CONNECTION.
         d. INSULATION: COMPLY WITH ASHRAE/IES 90.1
         e. JACKET: STEEL WITH ENAMELED FINISH OR HIGH-IMPACT COMPOSITE MATERIAL.
         f. HEAT-TRAP FITTINGS: INLET TYPE IN COLD-WATER INLET AND OUTLET TYPE IN HOT-WATER OUTLET.
         g. HEATING ELEMENTS: ELECTRIC, SCREW-IN IMMERSION TYPE.
         h. TEMPERATURE CONTROL: ADJUSTABLE THERMOSTAT.
         i. SAFETY CONTROL: HIGH-TEMPERATURE-LIMIT CUTOFF DEVICE OR SYSTEM.
         j. RELIEF VALVE: ASME RATED AND STAMPED FOR COMBINATION TEMPERATURE-AND-PRESSURE RELIEF VALVES. INCLUDE RELIEVING CAPACITY AT LEAST AS GREAT AS HEAT INPUT, AND INCLUDE PRESSURE SETTING LESS THAN WORKING-PRESSURE RATING OF DOMESTIC-WATER HEATER. SELECT RELIEF VALVE WITH SENSING ELEMENT THAT EXTENDS INTO STORAGE TANK.
   B. DOMESTIC-WATER EXPANSION TANKS:
      1. DESCRIPTION: STEEL, PRESSURE-RATED TANK CONSTRUCTED WITH WELDED JOINTS AND FACTORY-INSTALLED, BUTYL-RUBBER DIAPHRAGM. INCLUDE AIR PRECHARGE TO MINIMUM SYSTEM-OPERATING PRESSURE AT TANK.
      2. CONSTRUCTION:
         a. TAPPINGS: FACTORY-FABRICATED STEEL, WELDED TO TANK BEFORE TESTING AND LABELING. INCLUDE ASME B1.20.1 PIPE THREAD.
         b. INTERIOR FINISH: COMPLY WITH NSF 61 AND NSF 372 BARRIER MATERIALS FOR POTABLE-WATER TANK LININGS, INCLUDING EXTENDING FINISH INTO AND THROUGH TANK FITTINGS AND OUTLETS.
         c. AIR-CHARGING VALVE: FACTORY INSTALLED.
      3. CAPACITY AND CHARACTERISTICS:
         a. WORKING-PRESSURE RATING: 150 PSIG .
9. FIRE PROTECTION (WET PIPE SPRINKLER SYSTEM):
   A. PROVIDE A "WET-PIPE" SPRINKLER SYSTEM WITH AUTOMATIC SPRINKLERS AND CONNECTED TO A SUFFICIENT WATER SUPPLY.
   B. THE SYSTEM DESIGN SHALL BE BASED ON LIGHT HAZARD CLASSIFICATION, NFPA 13.
   C. THE WET PIPE SPRINKLER SYSTEM SHALL CONFORM TO ALL REQUIREMENTS OF THE OWNER'S INSURANCE CARRIER AND LOCAL AUTHORITIES. PROVIDE SYSTEM DRAWINGS WITH A PROFESSIONAL ENGINEERS STAMP ON THE DRAWINGS FOR REVIEW BY THE OWNER'S INSURANCE CARRIER AND LOCAL AUTHORITIES PRIOR TO INSTALLATION OF PIPING.
   D. THE WET PIPE SPRINKLER SYSTEM SHALL BE HYDRAULICALLY DESIGNED, BASED ON A WATER FLOW DATA OBTAINED FROM THE LOCAL WATER OR FIRE DEPARTMENT.
   E. PIPE AND TUBING MATERIALS:
      1) STEEL PIPE, SMALLER THAN 2".
         a) ASTM A 53/A 53M STANDARD, SCHEDULE 40, SEAMLESS, BLACK STEEL PIPE.
         b) ASTM A 135;L ASTM A 795/A 795M; OR ASME B36.10M, WALL THICKNESS GREATER THAN OR EQUAL TO SCHEDULE 30 AND LESS THAN SCHEDULE 40, BLACK STEEL PIPE.
         c) ASTM A 135 OR ASTM 795/A 795M, THREADABLE, WALL THICKNESS LESS THAN SCHEDULE 30 AND GREATER THAN SCHEDULE 10, BLACK-STEEL PIPE.
         d) ASTM A 135 OR ASTM A 795/A 795M SCHEDULE 5 STEEL PIPE.

MECHANICAL SPECIFICATIONS (CONTINUED)

   F. FITTINGS:
      1) CAST-IRON THREADED FITTINGS: ANSI B16.4, CLASS 125, STANDARD PATTERN, FOR THREADED JOINTS. THREADS SHALL CONFORM TO ANSI B1.20.1.
      2) MALLEABLE-IRON THREADED FITTINGS: ANSI B16.3, CLASS 150, STANDARD PATTERN, FOR THREADED JOINTS. THREADS SHALL CONFORM TO ANSI B1.20.1.
      3) STEEL FITTINGS: ASTM A 234, SEAMLESS OR WELDED, FOR WELDED JOINTS.
      4) GROOVED MECHANICAL FITTINGS: ASTM A 536, GRADE 65-45-12 DUCTILE IRON; ASTM A 47 GRADE 32510 MALLEABLE IRON; OR ASTM A53, TYPE F, E, OR S; GRADE B FABRICATED STEEL FITTINGS WITH GROOVES OR SHOULDERS DESIGNED TO ACCEPT GROOVED END COUPLINGS, IN ACCORDANCE WITH ITS LISTING.
   G. HANGERS AND SUPPORTS:
      1) HANGERS, ANCHORS, AND SUPPORTS FOR FIRE PROTECTION PIPING AND EQUIPMENT SHALL BE IN ACCORDANCE WITH NFPA 13. HANGERS, ANCHORS, SUPPORTS, AND COMPONENTS SHALL BE LISTED BY UL AND ANY OTHER AGENCIES REQUIRED BY THE LOCAL FIRE AUTHORITIES AND THE OWNER'S INSURANCE CARRIER.
   H. AUTOMATIC SPRINKLERS:
      1) SPRINKLER HEADS: TYPE AS INDICATED OR REQUIRED BY THE APPLICATION. UNLESS OTHERWISE REQUIRED, PROVIDE QUICK RESPONSE HEADS WITH NOMINAL 1/2 INCH DISCHARGE ORIFICE, FOR "LIGHT HAZARD" TEMPERATURE RANGE.
      2) SPRINKLER HEADS SHALL BE OF THE FOLLOWING CONSTRUCTION, CONFIGURATIONS, AND FINISH FOR THE AREAS INDICATED:
         a) FINISHED AREAS; SEMI-RECESSED PENDANT, CHROME PLATED, CHROME ESCUTCHEON CUP.
         b) UNFINISHED AREAS; UPRIGHT, ROUGH BRASS.
      3) FURNISH THREE EXTRA SPRINKLER HEADS OF EACH TYPE INCLUDED IN THE PROJECT, AND PROVIDE A SPRINKLER HEAD CABINET AND ANY SPECIAL WRENCHES TO REMOVE OR INSTALL SPRINKLER HEADS.
      4) FURNISH QUICKSTOP TALON SPRINKLER TOOL. QUICKSTOP TALON SHALL STOP ½" AND ¾" HEADS. THE TOOL SHALL FEATURE A FUSIBLE LINK TO RELEASE THE TOOL IF HEATED AND SHALL BE 100% WATER TIGHT UP TO 350 PSI.
   I. ALARM DEVICES:
      1) WATER FLOW INDICATORS: VANE TYPE WATERFLOW DETECTOR, RATED TO 250 PSIG; DESIGNED FOR HORIZONTAL OR VERTICAL INSTALLATION; HAVE 2-SPDT CIRCUIT SWITCHES TO PROVIDE ISOLATED ALARM AND AUXILIARY CONTACTS, 7 AMPERE 125 VOLTS AC AND 0.25 AMPERE 24 VOLTS DC; COMPLETE WITH FACTORY-SET, FIELD-ADJUSTABLE RETARD ELEMENT TO PREVENT FALSE SIGNALS, AND TAMPER-PROOF COVER WHICH SENDS A SIGNAL WHEN COVER IS REMOVED.
      2) SUPERVISORY SWITCHES: SPST, NORMALLY CLOSED CONTACTS, DESIGNED TO SIGNAL VALVE IS IN OTHER THAN FULL OPEN POSITION.
10. INSULATION AND DUCT LINING:
   A. ALL INSULATIONS AND ACCESSORIES SHALL HAVE A FIRE HAZARD CLASSIFICATION WITH A FLAME SPREAD RATING OF NOT OVER 25, A FUEL CONTRIBUTION RATING OF NOT OVER 50, AND A SMOKE DEVELOPED RATING OF NOT OVER 50, IN ACCORDANCE WITH NFPA.
   B. PIPE INSULATION - ABOVE GRADE:
      1) THE PIPING INSULATION USED SHALL HAVE A THERMAL CONDUCTIVITY OF 0.27 Btu PER in/hr*sqft*F° OR LESS.
      2) FIBERGLASS INSULATION WITH FACTORY APPLIED VAPOR BARRIER, ASJ JACKET, FACTORY APPLIED PRESSURE SEALING LONGITUDE LAP JOINT, NO STAPLES, ZESTON PREMOLDED PVC FITTING COVERS. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
      3) FLEXIBLE CLOSED CELL ELASTOMERIC THERMAL INSULATION, UNSLIT OR PRESLIT WITH PRESSURE SENSITIVE ADHESIVE SYSTEM FOR CLOSURE AND VAPOR SEALING, EQUAL TO ARMSTRONG AP ARMAFLEX OR ARMAFLEX 2000.
      4) FOR NON CIRCULATING SYSTEMS, THE FIRST 8 FEET OF INLET AND OUTLET PIPING BETWEEN THE TANK AND THE HEAT TRAP (INCLUDING THE HEAT TRAP) MUST BE INSULATED.
      5) FOR CIRCULATING SYSTEMS, ALL HOT WATER PIPING IN THE CIRCULATION LOOP MUST BE INSULATED AS SPECIFIED BELOW.
      6) INSULATION SCHEDULE:

a) DOMESTIC COLD WATER	1/2"
b) DOMESTIC HOT WATER	1" FOR PIPING UP TO 1-1/4"Φ, & 1-1/2" FOR PIPING 1-1/2"Φ AND LARGER
c) CONDENSATE DRAINS INSIDE BUILDING	1/2"
d) REFRIGERANT SUCTION	3/4" FOR PIPING UP TO 1-1/4"Φ, & 1" FOR PIPING 1-1/2"Φ AND LARGER
e) HORIZONTAL STORM PIPE	1/2"
f) ROOF DRAINS	1" INSULATION SHALL BE PROVIDED AT ROOF DRAIN BODY AND A MINIMUM OF 10' OF HORIZONTAL PIPING OR A MINIMUM OF 5' IF COMBINATION OF HORIZONTAL AND VERTICAL STORM PIPING DOWNSTREAM OF ROOF DRAIN BODY.

   C. EQUIPMENT INSULATION:
      1) FLEXIBLE FIBERGLASS: GLASS FIBER INSULATION, ASTM C 553, TYPE 1, CLASS B-4, SEMI-RIGID BOARD, WITH FACTORY LAMINATED KRAFT ALUMINUM FOIL (ALL SERVICE JACKET), VAPOR BARRIER, OWENS/CORNING PIPE AND TANK INSULATION.
   D. DUCTWORK: ACOUSTICAL INSULATION.
      1) DUCT LINING: 2 LB/CF, THICKNESS AS SCHEDULED, AIR STREAM SIDE COATED, INSTALL PER SMACNA STANDARDS.
         a) DUCT LINING SCHEDULE:

(1) RECTANGULAR SUPPLY DUCT	1/2" : THROUGHOUT THE FIRST 10 FEET OF DUCT.
(2) RETURN AIR DUCT	1/2" : THROUGHOUT THE FIRST 10 FEET OF DUCT.

   E. DUCTWORK: THERMAL INSULATION.
      1) DUCT COVERING: 3/4 LB/CF, FIBERGLASS BLANKET WITH FACTORY APPLIED VAPOR BARRIER AND FACING, THICKNESS AS SCHEDULED, INSTALLATION IN ACCORDANCE WITH MANUFACTURERS RECOMMENDATIONS.
         a) DUCT COVERING SCHEDULE: MINIMUM R-6

(1) ROUND SUPPLY DUCT	2"
(2) RECTANGULAR SUPPLY DUCT	2"
(3) RETURN AIR DUCT	2"
(4) OUTDOOR AIR	2"

11. DUCTWORK:
   A. ALL DUCTWORK, UNLESS OTHERWISE INDICATED, SHALL BE FABRICATED FROM GALVANIZED SHEET STEEL COMPLYING WITH ASTM A 527, LOCKFORMING QUALITY, WITH G 90 ZINC COATING IN ACCORDANCE WITH ASTM A 525; AND MILL PHOSPHATIZED FOR EXPOSED LOCATIONS.
   B. WHERE DUCTWORK IS INDICATED TO BE EXPOSED TO VIEW IN OCCUPIED SPACES, PROVIDE MATERIALS WHICH ARE FREE FROM VISUAL IMPERFECTIONS INCLUDING PITTING, SEAM MARKS, ROLLER MARKS, STAINS AND DISCOLORATIONS, AND OTHER IMPERFECTIONS, INCLUDING THOSE WHICH WOULD IMPAIR PAINTING.
   C. DUCTWORK, METAL GAUGES, REINFORCING, ETC. SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS," LATEST EDITION FOR A 2 INCH WATER GAUGE STATIC PRESSURE.
      1) RECTANGULAR DUCT:
         a) ELBOWS, UNLESS INDICATED OTHERWISE SHALL BE CONSTRUCTED WITH CENTERLINE RADIUS OF NOT LESS THAN 1.5 DUCT WIDTH OR SQUARE ELBOW WITH DOUBLE WALL STREAMLINE VANES.
         b) RETURN AIR ACOUSTICAL ELBOWS AND SOUND BOOTS SHALL BE A SQUARE ELBOW WITH NO TURNING VANES.
         c) SLOPES FOR TRANSITIONS OR OTHER CHANGES IN DIMENSIONS SHALL BE MINIMUM 1 TO 3.
      2) ROUND DUCT:
         a) PROVIDE RADIUS TYPE FITTINGS FABRICATED OF MULTIPLE SECTIONS WITH MAXIMUM 15 DEGREE CHANGE OF DIRECTION PER SECTION. UNLESS SPECIFICALLY DETAILED OTHERWISE, USE 45 DEGREE LATERALS FOR BRANCH TAKEOFF CONNECTIONS. WHERE 90 DEGREE BRANCHES ARE INDICATED PROVIDE CONICAL TYPE TEES.
         b) SLOPES FOR TRANSITIONS OR OTHER CHANGES IN DIMENSIONS SHALL BE MINIMUM 1 TO 3.
         c) AS AN OPTION, PROVIDE FACTORY-FABRICATED DUCT AND FITTINGS, IN LIEU OF SHOP-FABRICATED DUCT AND FITTINGS.
            (1) ELBOWS: ONE PIECE CONSTRUCTION FOR 90 DEGREES AND 45 DEGREE ELBOW 14" AND SMALLER. PROVIDE MULTIPLE GORE CONSTRUCTION FOR LARGER DIAMETERS WITH STANDING SEAM CIRCUMFERENTIAL JOINT.
            (2) DIVIDED FLOW FITTINGS: 90 DEGREE TEES, CONSTRUCTED WITH SADDLE TAP SPOT WELDED AND BONDED TO DUCT FITTING BODY.
         d) ROUND LONGITUDINAL SEAM DUCT. USE FOR RIGID METAL DUCT ON LEAVING SIDE OF DUCT IN CONCEALED LOCATIONS FOR EXTENSION TO FLEX FOR DIFFUSERS, UNLESS OTHERWISE INDICATED.
   D. DUCT SIZES SHOWN ON THE DRAWINGS ARE SHEETMETAL SIZES, ALLOWANCE FOR DUCT LINER HAS BEEN MADE WHERE APPLICABLE.
   E. INSTALLATION OF METAL DUCTWORK:
      1) GENERAL: ASSEMBLE AND INSTALL DUCTWORK IN ACCORDANCE WITH RECOGNIZED INDUSTRY PRACTICES WHICH WILL ACHIEVE AIR-TIGHT SYSTEMS (MAXIMUM 5% LEAKAGE), WITH NO OBJECTIONABLE NOISE, AND CAPABLE OF PERFORMING INDICATED SERVICE. INSTALL EACH RUN WITH MINIMUM NUMBER OF JOINTS. ALIGN DUCTWORK ACCURATELY WITH INTERNAL SURFACES SMOOTH. SUPPORT DUCTS RIGIDLY WITH SUITABLE STRAPS, BRACES, HANGERS AND ANCHORS IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS" LATEST EDITION. DUCT HANGERS SHALL BE OF THE TYPE WHICH WILL HOLD DUCTS TRUE-TO-SHAPE AND TO PREVENT BUCKLING. SUPPORT VERTICAL DUCTS AT EVERY FLOOR.
      2) AUXILIARY STEEL: PROVIDE AUXILIARY STEEL AS REQUIRED TO ADEQUATELY SUPPORT DUCTWORK.
      3) ROUTING: LOCATE DUCTWORK RUNS, EXCEPT AS OTHERWISE INDICATED, VERTICALLY AND HORIZONTALLY AND AVOID DIAGONAL RUNS WHEREVER POSSIBLE. LOCATE RUNS AS INDICATED BY DIAGRAMS, DETAILS AND NOTATIONS OR, IF NOT OTHERWISE INDICATED, RUN DUCTWORK IN SHORTEST ROUTE WHICH DOES NOT OBSTRUCT USABLE SPACE OR BLOCK ACCESS FOR SERVICING BUILDING AND ITS EQUIPMENT. HOLD DUCTS CLOSE TO WALLS, OVERHEAD CONSTRUCTION, COLUMNS, AND OTHER STRUCTURAL AND PERMANENT ENCLOSURE ELEMENTS OF BUILDING. WHEREVER POSSIBLE IN FINISHED AND OCCUPIED SPACES, CONCEAL DUCTWORK FROM VIEW, BY LOCATING IN MECHANICAL SHAFTS, HOLLOW WALL CONSTRUCTION OR ABOVE SUSPENDED CEILINGS. DO NOT ENCASE HORIZONTAL RUNS IN SOLID PARTITIONS, EXCEPT AS SPECIFICALLY SHOWN. COORDINATE LAYOUT WITH SUSPENDED CEILING AND LIGHTING LAYOUTS AND SIMILAR FINISHED WORK.
      4) DO NOT ROUTE DUCTWORK THROUGH ELECTRICAL EQUIPMENT SPACES AND ENCLOSURES, UNLESS INDICATED OTHERWISE.
      5) PENETRATIONS:
         a) WHERE DUCTS PASS THROUGH INTERIOR PARTITIONS OR EXTERIOR WALLS, AND ARE EXPOSED TO VIEW, CONCEAL SPACE BETWEEN OPENING AND DUCT OR DUCT INSULATION WITH SHEET METAL FLANGES OF SAME GAGE AS DUCT. OVERLAP OPENING ON 4 SIDES BY AT LEAST 1-1/2". FASTEN TO DUCT AND WALL.
         b) WHERE DUCTS PASS THROUGH FIRE-RATED FLOORS, WALLS, OR PARTITIONS, PROVIDE FIRESTOPPING BETWEEN DUCT AND WALL.
      6) COORDINATION: COORDINATE DUCT INSTALLATIONS WITH INSTALLATION OF ACCESSORIES, DAMPERS, COIL FRAMES, EQUIPMENT, CONTROLS, AND OTHER ASSOCIATED WORK OF THE DUCTWORK SYSTEM.
      7) INSTALLATION: INSTALL METAL DUCTWORK IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS", LATEST EDITION.

MECHANICAL SPECIFICATIONS (CONTINUED)

   F. EQUIPMENT CONNECTIONS:
      1) CONNECT METAL DUCTWORK TO EQUIPMENT AS INDICATED, PROVIDE FLEXIBLE CONNECTION FOR EACH DUCTWORK CONNECTION TO EQUIPMENT MOUNTED ON VIBRATION ISOLATORS, AND/OR EQUIPMENT CONTAINING ROTATING MACHINERY. PROVIDE ACCESS DOORS AS REQUIRED.
   G. SEAL ALL CONCEALED DUCTWORK JOINTS WITH NON-HARDENING, NON-MIGRATING MASTIC SEALANT, AS RECOMMENDED FOR SEALING SEAMS AND JOINTS IN DUCTWORK. OIL BASE CAULKING AND GLAZING COMPOUNDS SHALL NOT BE ACCEPTABLE. DUCTS SHALL BE SEALED TO THE CLASS LEVEL LISTED BELOW.

1) UNCONDITIONED SPACES	CLASS B	CLASS A	CLASS C	CLASS B
2) CONDITIONED SPACES (PLENUM)	CLASS C	CLASS B	CLASS B	CLASS C
	SUPPLY ≤ 2" W.C.	SUPPLY > 2" W.C.	EXHAUST	RETURN

12. FLEXIBLE DUCT:
   A. ATCO #086 (R-6), OR EQUAL.
   B. FACTORY APPLIED INSULATION AND VAPOR BARRIER, 1-1/2" THICK.
   C. MAXIMUM LENGTH OF 5'-0".
13. FLUES AND ACCESSORIES:
   A. FLUE FOR GAS FIRED CONDENSING WATER HEATER OR FURNACE SHALL BE AS RECOMMENDED BY THE GAS APPLIANCE MANUFACTURER. FLUES SHALL BE SCHEDULE 40, PVC OR CPVC PIPE PER THE MANUFACTURERS INSTALLATION REQUIREMENTS.
   B. PROVIDE MANUFACTURER'S STANDARD ACCESSORY ITEMS INCLUDING BIRD PROOF TOP, STORM COLLAR, ROOF THIMBLE, ETC. AS REQUIRED FOR A COMPLETE INSTALLATION. ROOF THIMBLES THROUGH THE BUILDING ROOF SHALL BE SUITABLE FOR USE WITH THE ROOF PROVIDED.
14. EXHAUST FANS:
   A. CENTRIFUGAL TYPE FAN WITH CHARACTERISTICS AND CAPACITY AS SCHEDULED, ELECTRICALLY POWERED, SUITABLE FOR MOUNTING ON ROOF CURB, DIRECT OR BELT DRIVEN, HEAVY GAUGE SPUN-ALUMINUM WEATHERPROOF HOUSINGS OF THE HOODED DOME OR UPBLAST TYPE. PROVIDE PERMANENT SPLIT-CAPACITOR TYPE MOTOR FOR DIRECT DRIVEN FANS, AND CAPACITOR-START, INDUCTION-RUN TYPE MOTOR FOR BELT DRIVEN FANS.
   B. CENTRIFUGAL CEILING EXHAUSTERS SHALL BE ELECTRICALLY POWERED CENTRIFUGAL TYPE FAN SUITABLE FOR MOUNTING IN THE CEILING WITH A PERFORATED OFF-WHITE METAL GRILLE WITH A THUMBSCREW ATTACHMENT FOR EASY ACCESS TO FAN HOUSING. UNIT SHALL CONSIST OF A GALVANIZED STEEL HOUSING LINED WITH ACOUSTICAL INSULATION AND SHALL INCLUDE AN INTEGRAL BACKDRAFT DAMPER ON FAN DISCHARGE. MOTOR SHALL BE A PERMANENT SPLIT-CAPACITOR TYPE MOTOR, PERMANENTLY LUBRICATED, WITH THERMAL OVERLOAD PROTECTION. PROVIDE DISCONNECT SWITCH OR OTHER MEANS OF DISCONNECT AT MOTOR IN FAN HOUSING.
15. FURNACE AND CONDENSING UNIT:
   A. CONDENSING FURNACES:
      1) GAS FIRED FURNACE SHALL BE FACTORY ASSEMBLED, PRE-WIRED UNIT CONSISTING OF SHEETMETAL CASING, SUPPLY FAN, GAS FIRED HEAT EXCHANGER, AND CONTROLS. CAPACITY SHALL BE AS SCHEDULED.
      2) THE PRIMARY HEAT EXCHANGER SHALL BE ALUMINIZED STEEL CONSTRUCTION WITH A STAINLESS STEEL SECONDARY HEAT EXCHANGER.
      3) THE FURNACE SHALL BE OF THE CONDENSING TYPE, UTILIZING A SEALED COMBUSTION CHAMBER. UNIT SHALL INCLUDE FINNED CAST IRON HEAT EXCHANGER, ALUMINIZED STEEL EXHAUST DECOUPLER SECTION, AND FINNED STAINLESS STEEL TUBE CONDENSER SECTION.
      4) THE UNIT SHALL BE EQUIPPED WITH THE MANUFACTURER'S STANDARD CONTROLS INCLUDING 24 VOLT CONTROL TRANSFORMER, AUTOMATIC SPARK IGNITION, AUTOMATIC GAS VALVE TRAIN, HIGH TEMPERATURE LIMIT SWITCH, AND FAN TIMED DELAY RELAY.
      5) RETURN AIR INLET ON UNIT SHALL BE PROVIDED WITH A 1" THROWAWAY TYPE FILTER AND SLIDE IN FRAME, MOUNTED ON THE UNIT.
      6) FAN SHALL BE A DIRECT DRIVE MULTI-SPEED BLOWER, RESILIENTLY MOUNTED IN THE CASING. MOTOR SHALL BE PROVIDED WITH AUTOMATIC THERMAL OVERLOAD PROTECTION.
      7) FURNACE SHALL BE AGA APPROVED.
   B. CONDENSING UNIT SHALL BE FACTORY-ASSEMBLED AND TESTED AIR-COOLED CONDENSING UNIT, CONSISTING OF COMPRESSOR, CONDENSER COIL, FAN, MOTOR, REFRIGERANT RESERVOIR, OPERATING CONTROLS, ETC. CAPACITY AND ELECTRICAL CHARACTERISTICS SHALL BE AS SCHEDULED.
      1) COMPRESSOR: HERMETICALLY SEALED WITH BUILT-IN OVERLOADS AND VIBRATION ISOLATION. COMPRESSOR MOTOR, SHALL HAVE THERMAL AND CURRENT SENSITIVE OVERLOAD DEVICES, INTERNAL HIGH-PRESSURE PROTECTION, HIGH AND LOW PRESSURE CUTOUT SWITCHES, START CAPACITOR AND RELAY, 2-POLE CONTACTOR, CRANKCASE HEATER, AND TEMPERATURE ACTUATED SWITCH AND TIMER TO PREVENT COMPRESSOR RAPID CYCLE.
      2) COIL SHALL BE COPPER TUBING WITH ALUMINUM FINS; COMPLETE WITH LIQUID ACCUMULATOR AND LIQUID SUBCOOLER. UNIT SHALL INCLUDE FILTER DRYER, SIGHT GLASS, COMPRESSOR SERVICE VALVE, LIQUID LINE SERVICE VALVE, AND REFRIGERANT PIPING EXTENDED TO EXTERIOR OF CASING.
16. CONTROL WIRING:
   A. ELECTRICAL WIRING AND WIRING CONNECTIONS REQUIRED FOR THE INSTALLATION OF THE TEMPERATURE CONTROL SYSTEM, SHALL BE PROVIDED BY THIS CONTRACTOR, UNLESS SPECIFICALLY SHOWN ON THE ELECTRICAL DRAWINGS OR SPECIFICATIONS.
   B. INSTALL CONTROL WIRING, WITHOUT SPLICES BETWEEN TERMINAL POINTS, COLOR CODED. INSTALL IN NEAT WORKMANLIKE MANNER, SECURELY FASTENED. INSTALL IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE AND THE ELECTRICAL SPECIFICATIONS.
      1) INSTALL CIRCUITS OVER 25 VOLT WITH COLOR CODED NUMBER 12 WIRE.
      2) INSTALL CIRCUITS UNDER 25 VOLT WITH COLOR CODED NUMBER 18 WIRE WITH 0.031 INCH HIGH TEMPERATURE 105 DEGREES F PLASTIC INSULATION ON EACH CONDUCTOR AND PLASTIC SHEATH OVER ALL.
      3) INSTALL ELECTRONIC CIRCUITS WITH COLOR CODED NUMBER 22 WIRE WITH 0.023 INCH POLYETHYLENE INSULATION ON EACH CONDUCTOR WITH PLASTIC JACKETED COPPER SHIELD OVER ALL.
      4) INSTALL LOW VOLTAGE CIRCUITS, LOCATED IN CONCRETE SLABS AND MASONRY WALLS, OR EXPOSED IN OCCUPIED AREAS, IN ELECTRIC CONDUIT.
      5) ALL WIRING IN AREAS USED AS AIR PLENUMS SHALL BE IN ELECTRIC CONDUIT EXCEPT THAT LOW VOLTAGE WIRING MAY BE TEFLON COATED, ALUMINUM SHEATHED CABLE OR OTHER WIRE SPECIFICALLY APPROVED FOR INSTALLATION IN AIR PLENUMS, WHERE ACCEPTABLE BY LOCAL CODES.
      6) ALL WIRING IN AREAS NOT USED FOR AIR MOVEMENT SHALL BE IN ELECTRIC METALLIC TUBING EXCEPT LOW VOLTAGE WIRING MAY BE IN APPROVED SIGNAL CABLE WHERE ACCEPTED BY LOCAL CODES.
   C. THERMOSTATIC CONTROLS TO HAVE A 5°F DEADBAND AND SETPOINT OVERLAP RESTRICTIONS.
      1) TEMPERATURE CONTROLS SETBACK TO BE 55°F (HEAT) AND 85° (COOL), 2-HOUR OCCUPANT OVERRIDE, 10-HOUR BACKUP.

STRICKLAND
CONSTRUCTION COMPANY

LAKEWOOD STORAGE
4101 NE PORT DRIVE
LEE'S SUMMIT, MO

10/25/2022
ERIK B. KNUDSEN
NUMBER
PE-2004026504

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BC PROJECT #: 22573
MISSOURI PE COA #2009003629

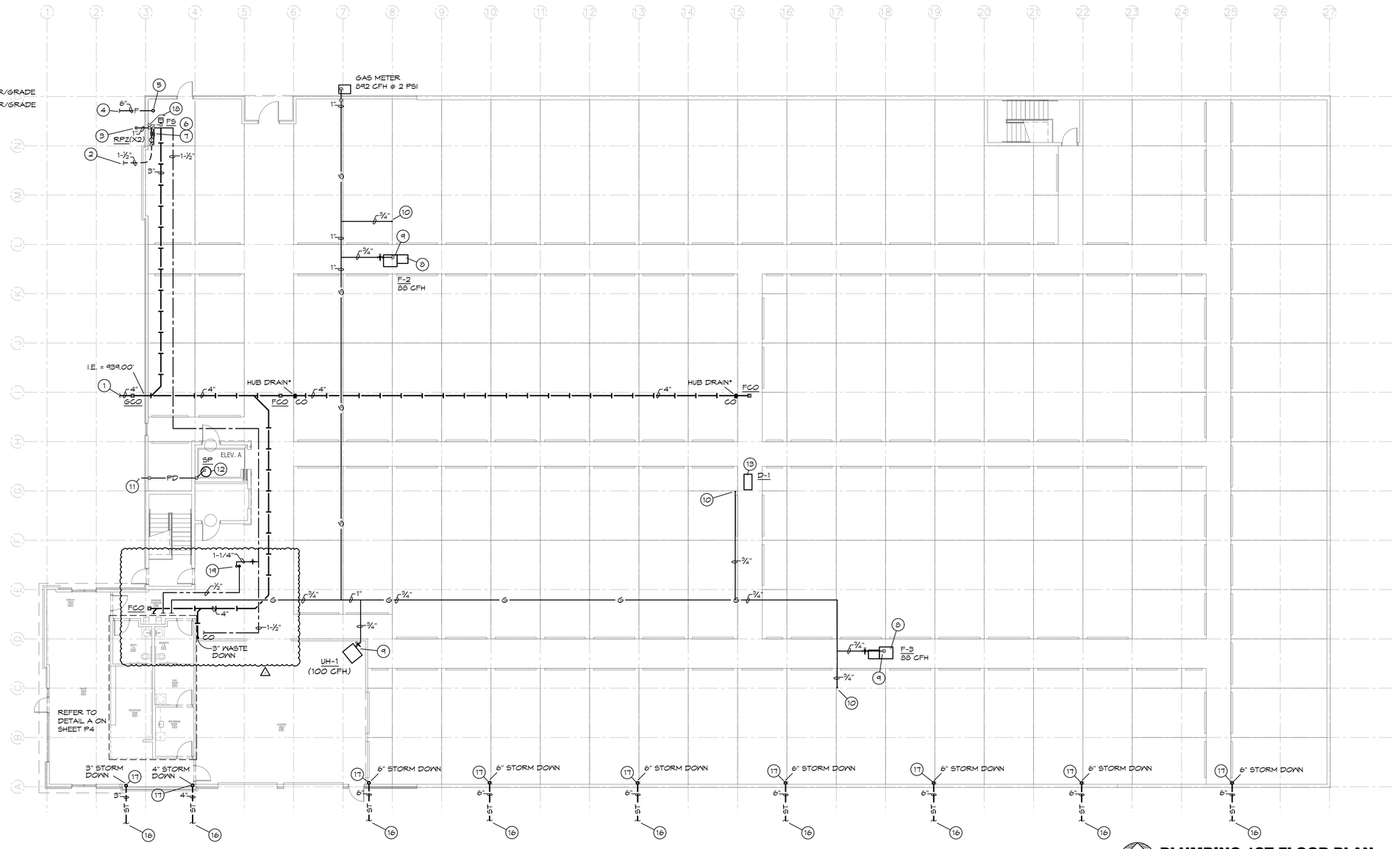
BC ENGINEERS
INCORPORATED
5720 Reeder Shawnee, KS 66203 (913)262-1772

Date: 2022/10/25
Drawn by : DS/LC
Checked by : DS/EK
Revisions :

MP0

PLUMBING SYMBOLS

- SOIL AND WASTE PIPING BELOW FLOOR/GRADE
- SOIL AND WASTE PIPING ABOVE FLOOR/GRADE
- SANITARY VENT PIPING ABOVE GRADE
- SANITARY VENT PIPING BELOW GRADE
- DOMESTIC COLD WATER PIPING
- DOMESTIC HOT WATER PIPING
- GAS PIPING
- FIRE LINE
- PIPING TURNING DOWN
- PIPING TURNING UP
- TEE TOP CONNECTION
- UNION
- BACKFLOW PREVENTER
- FD — FLOOR DRAIN
- FCO — FLOOR CLEAN OUT
- WCO — WALL CLEAN OUT
- GCO — GRADE CLEAN OUT
- VALVE
- PRESSURE REGULATOR
- CHECK VALVE
- I.E. — INVERT ELEVATION OF PIPE
- MATCH MARKS ON PLUMBING RISER DIAGRAM



NORTH

PLUMBING 1ST FLOOR PLAN

SCALE: 3/32" = 1'-0"

F.F.E. = 942.00'

PLUMBING PLAN NOTES:

1. SEE CIVIL PLAN FOR CONTINUATION OF 4" SANITARY SEWER. MAINTAIN MIN 30" COVER.
2. SEE CIVIL PLAN FOR CONTINUATION OF 1-½" DOMESTIC C.W. MAINTAIN MIN 48" COVER.
3. STUB OUT 1" LINE AND CAP FOR FUTURE CONNECTION BY IRRIGATION CONTRACTOR.
4. 6" FIRE LINE, SEE CIVIL PLANS FOR CONTINUATION. MAINTAIN A MINIMUM 48" BURY FOR FREEZE PROTECTION.
5. 6" FIRE LINE THRU FLOOR. PROVIDE DOUBLE CHECK VALVE ASSEMBLY (DCVA) AND THE MAIN DRAIN VENTED TO DAYLIGHT. SEAL EXTERIOR WALL PENETRATION WEATHER TIGHT AS REQUIRED. COORDINATE WITH SPRINKLER CONTRACTOR FOR PROPER INSTALLATION. COORDINATE WITH WATER DEPARTMENT FOR SERVICE FLUSHING REQUIREMENTS. CAP LINE FOR FUTURE CONTINUATION BY SPRINKLER CONTRACTOR.
6. PROVIDE 1-½" DOMESTIC RPZ BACKFLOW PREVENTER AND INSTALL 24" A.F.F. & 6" FROM WALL. ROUTE DRAIN FROM RPZ BFP TO FLOOR SINK WITH AN AIR GAP.
7. PROVIDE 1" DEDUCT METER AND 1" IRRIGATION RPZ BACKFLOW PREVENTER AND INSTALL BELOW DOMESTIC BACKFLOW. ROUTE DRAIN FROM RPZ BFP TO FLOOR DRAIN WITH AIR GAP.
8. CONNECT CONDENSATE TO FURNACE FLUE AND COIL AS REQUIRED AND AS DETAILED. ROUTE TO NEAREST DRAIN WITH AIR GAP OR TO DAYLIGHT.

PLUMBING PLAN NOTES (CONTINUED):

9. CONNECT GAS TO EQUIPMENT AS REQUIRED AND AS DETAILED.
10. ROUTE ¾" GAS PIPING UP TO FLOOR ABOVE. SEE SHEET P2 FOR CONTINUATION.
11. 2" PUMP DISCHARGE TO DAYLIGHT. SEAL PENETRATION WEATHERTIGHT.
12. IN THE EVENT OF A RELEASE OF ANY QUANTITY OF HYDRAULIC FLUID OR OTHER FLUIDS PROHIBITED FROM DISCHARGE, THE RELEASED MATERIAL SHOULD BE IMMEDIATELY CONTAINED, CAPTURED AND DISPOSED OF AT AN EPA-APPROVED TREATMENT STORAGE AND DISPOSAL FACILITY.
13. CONNECT CONDENSATE TO DEHUMIDIFIER AS REQUIRED AND AS DETAILED. ROUTE TO NEAREST DRAIN WITH AIR GAP OR TO DAYLIGHT.
14. SEE CIVIL PLAN FOR CONTINUATION OF STORM PIPING. MAINTAIN MIN 24" COVER.
15. INSTALL CLEANOUT AT BASE OF RISER.
16. SEE CIVIL PLAN FOR CONTINUATION OF STORM PIPING. MAINTAIN MIN 24" COVER.
17. INSTALL CLEANOUT AT BASE OF RISER.
18. ROUTE 2" VENT PIPING UP TO FLOOR ABOVE. REFER TO SHEET P2 FOR CONTINUATION.
19. ROUTE 1-1/4" CW & 1/2" HW PIPING UP TO FLOOR ABOVE. REFER TO SHEET P2 FOR CONTINUATION.

△

STRICKLAND CONSTRUCTION COMPANY

LAKEWOOD STORAGE

4101 NE PORT DRIVE
LEE'S SUMMIT, MO

1/12/2023

STATE OF MISSOURI
ERIK B. KNUDSEN
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PE-2009026504
REGISTERED PROFESSIONAL ENGINEER

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Revisions : △	2023/1/12

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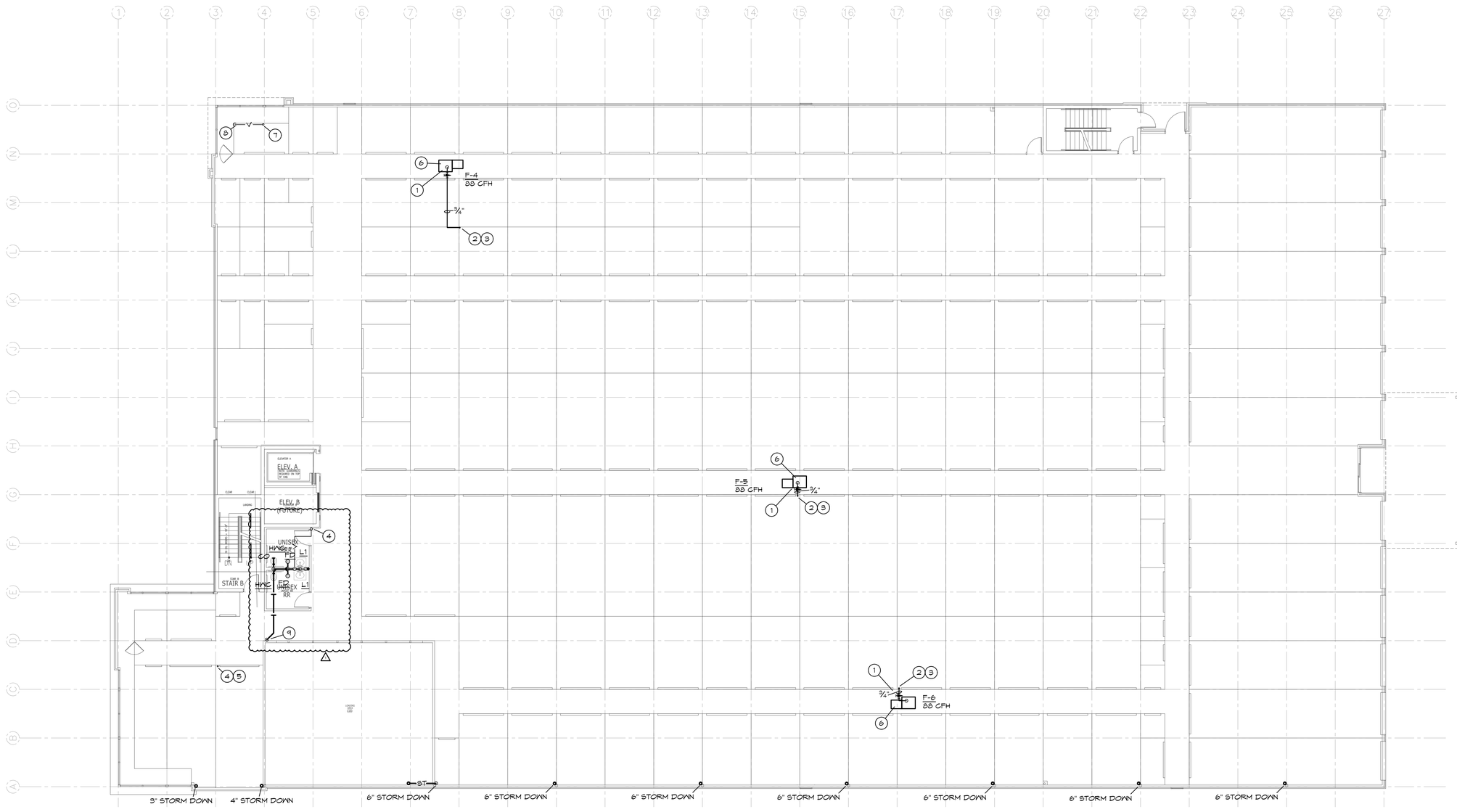
P1



NORTH

PLUMBING 2ND FLOOR PLAN

SCALE: 3/32" = 1'-0"

PLUMBING PLAN NOTES:

1. CONNECT GAS TO EQUIPMENT AS REQUIRED AND AS DETAILED.
2. ROUTE ¾" GAS PIPING UP FROM FLOOR BELOW. REFER TO SHEET P1 FOR CONTINUATION.
3. ROUTE ¾" GAS PIPING UP TO FLOOR ABOVE. REFER TO SHEET P3 FOR CONTINUATION.
4. ROUTE 3" VENT PIPING UP TO FLOOR ABOVE. REFER TO SHEET P3 FOR CONTINUATION.
5. ROUTE 3" VENT PIPING UP FROM FLOOR BELOW. REFER TO SHEET P1 FOR CONTINUATION.
6. CONNECT CONDENSATE TO FURNACE FLUE AND COIL AS REQUIRED AND AS DETAILED. ROUTE TO NEAREST DRAIN WITH AIR GAP OR TO DAYLIGHT.
7. ROUTE 2" VENT PIPING UP TO FLOOR ABOVE. REFER TO SHEET P3 FOR CONTINUATION.
8. ROUTE 2" VENT PIPING UP FROM FLOOR BELOW. REFER TO SHEET P1 FOR CONTINUATION.
9. ROUTE 3" WASTE PIPING DOWN TO FLOOR BELOW. REFER TO SHEET P1 FOR CONTINUATION.

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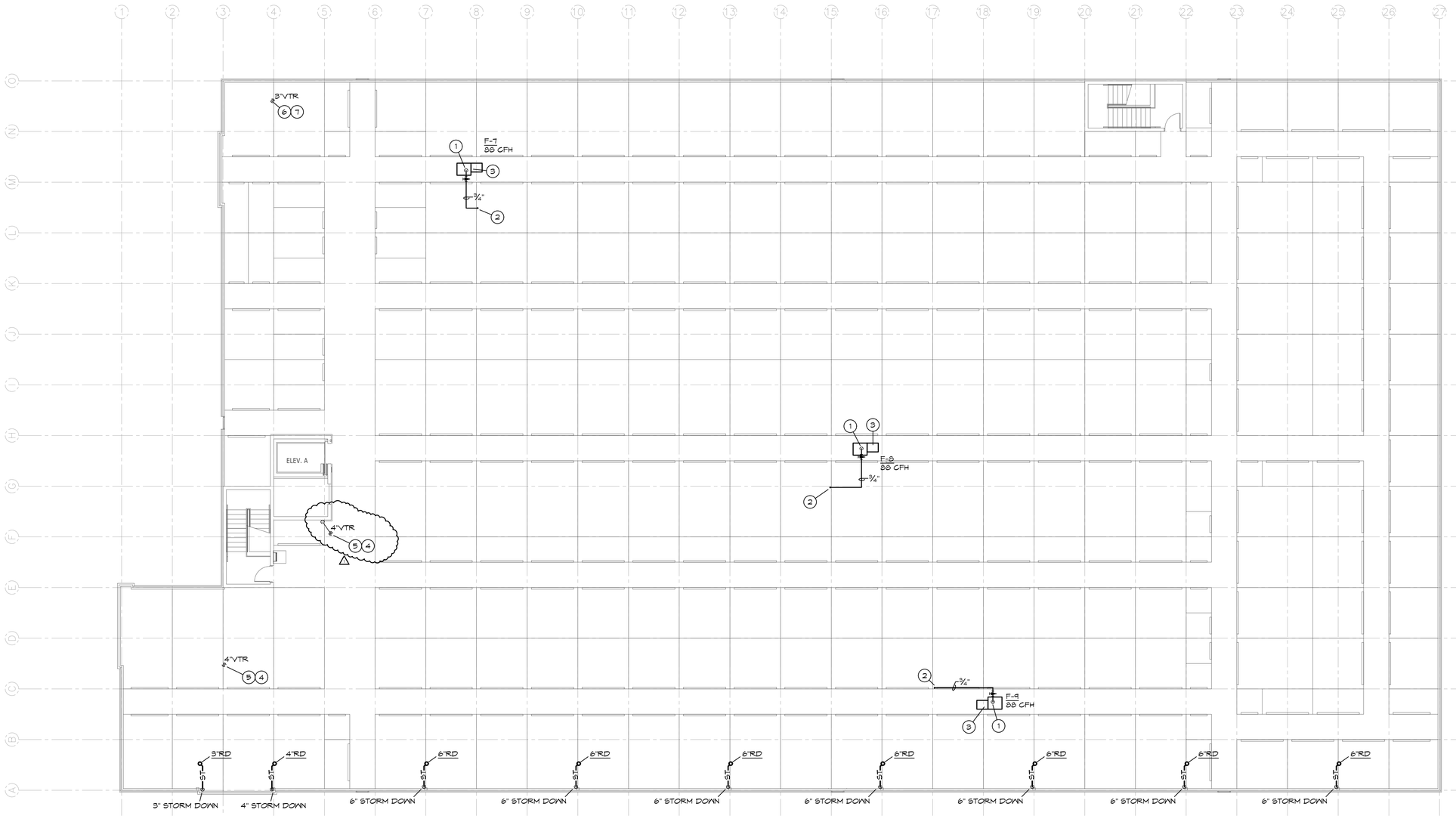

NORTH

PLUMBING 3RD FLOOR PLAN

SCALE: 3/32" = 1'-0"

PLUMBING PLAN NOTES:

1. CONNECT GAS TO EQUIPMENT AS REQUIRED AND AS DETAILED.
2. ROUTE 3/4" GAS PIPING UP FROM FLOOR BELOW. REFER TO SHEET P2 FOR CONTINUATION.
3. CONNECT CONDENSATE TO FURNACE FLUE AND COIL AS REQUIRED AND AS DETAILED. ROUTE TO NEAREST DRAIN WITH AIR GAP OR TO DAYLIGHT.
4. ROUTE 3" VENT PIPING UP FROM FLOOR BELOW. REFER TO SHEET P2 FOR CONTINUATION.
5. LOCATION OF 4" VTR. VERIFY 10' CLEARANCE FROM ALL OUTDOOR AIR INTAKES. SEAL PENETRATION WEATHERTIGHT.
6. ROUTE 2" VENT PIPING UP FROM FLOOR BELOW. REFER TO SHEET P2 FOR CONTINUATION.
7. LOCATION OF 3" VTR. VERIFY 10' CLEARANCE FROM ALL OUTDOOR AIR INTAKES. SEAL PENETRATION WEATHERTIGHT.

STRICKLAND CONSTRUCTION COMPANY

LAKEWOOD STORAGE

4101 NE PORT DRIVE
LEE'S SUMMIT, MO

1/12/2023

STATE OF MISSOURI
REGISTERED PROFESSIONAL ENGINEER
ERIK B. KNUDSEN
NUMBER PE-2004020504

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Date:	2022/10/25
Drawn by :	DS/LC
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Revisions :	1 2023/1/12

BC PROJECT #: 22573
MISSOURI PE COA #2009003629

BC ENGINEERS INCORPORATED
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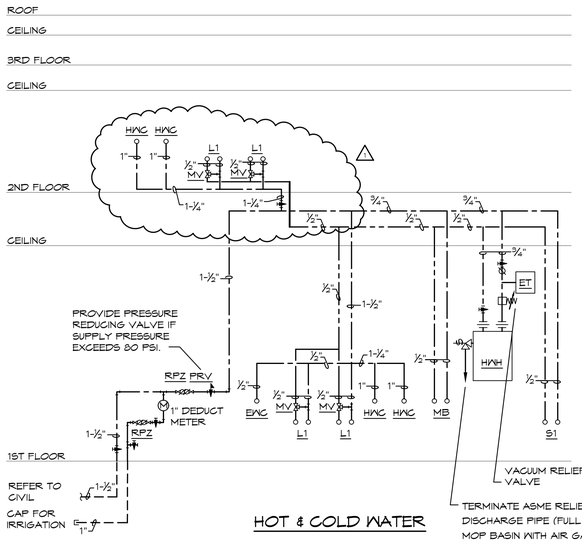
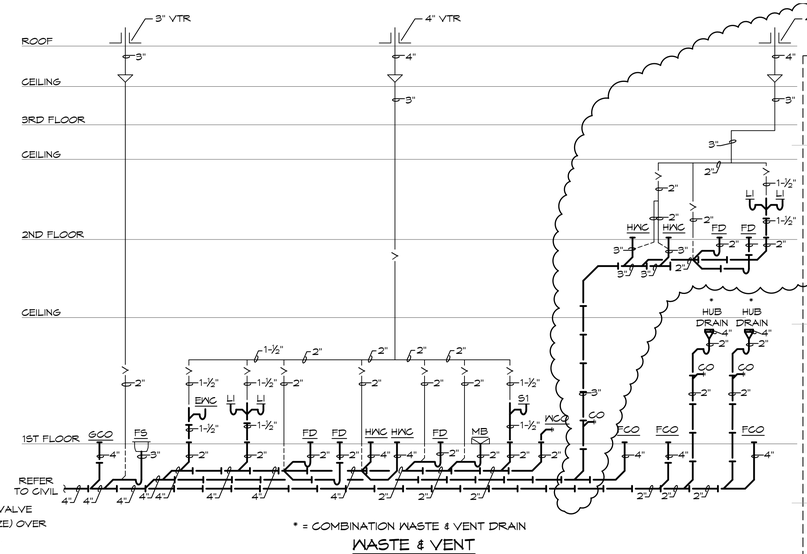
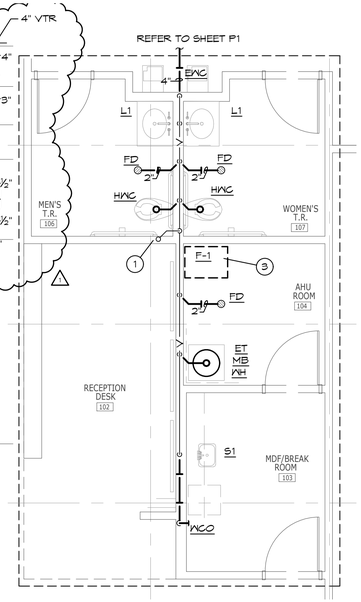
P3



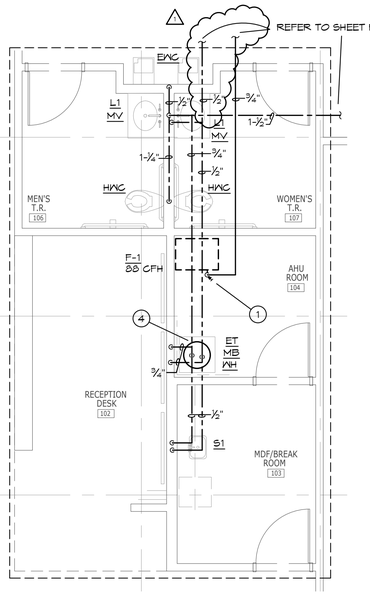
HOT & COLD WATER



WASTE & VENT

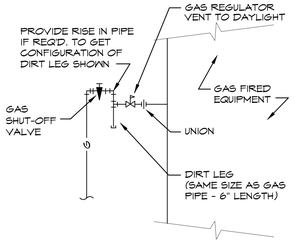


NORTH **DETAIL A WASTE AND VENT**
SCALE: 1/4" = 1'-0"



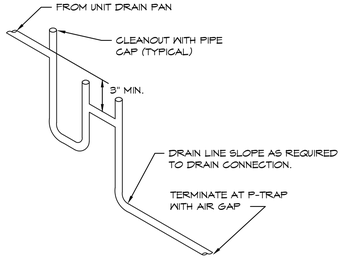
NORTH **DETAIL A WATER**
SCALE: 1/4" = 1'-0"

PLUMBING RISER DIAGRAMS
SCALE: NONE



GAS PRESSURE REGULATORS FOR FURNACES AND MAKE-UP AIR UNITS (MAU) SHALL BE SENSUS #143-80-2, 2 PSI INLET / 7" WC OUTLET PRESSURE WITH THE ORIFICE & SPRING SIZE AS RECOMMENDED BY THE MANUFACTURER.

GAS CONNECTION DETAIL
SCALE: NONE



CONDENSATE DRAIN DETAIL
SCALE: NONE

PLUMBING FIXTURE SCHEDULE: (OR EQUAL)

HVAC WATER CLOSET (HANDICAPPED): TOTO, #CT705ELN, VITREOUS CHINA, FLOOR MOUNTED, FLOOR OUTLET, 17-1/2" HIGH ELONGATED BOWL, SIPHON-JET ACTION, #TMT1LN-32 FLUSH VALVE, 1.28 GAL/FLUSH, #SC534 WHITE OPEN FRONT ELONGATED SEAT WITH CHECK HINGE. HANDLE ON WIDE SIDE OF FIXTURE.

L1 HANDICAP LAVATORY, WALL HUNG: TOTO #LT307, 20"x 18", VITREOUS CHINA,FRONT OVERFLOW, EQUIPMENT SUPPLIER PROVIDED FAUCET,OFFSET GRID ELBOW DRAIN AND 1-1/4" TAILPIECE, CHROME PLATED CAST BRASS P-TRAP WITH CLEANOUT (MOUNTED PARALLEL WITH WALL), CHROME PLATED LOOSE KEY ANGLE STOPS AND RISERS, FLOOR MOUNTED CONCEALED ARM LAVATORY SUPPORT, INSULATE EXPOSED DRAIN, WATER SUPPLIES, AND VALVES WITH PROWRAP SEAMLESS MOLDED CLOSED CELL VINYL INSULATION.

EWC ELECTRIC WATER COOLER: ELKAY, #EZSTL8C, BARRIER FREE TWO-STATION WATER COOLER, 8.0 GPH, 50 DEGREES F WATER WITH 90 DEGREES F AIR TEMPERATURE, 120 VOLT, COLOR TO BE SELECTED BY ARCHITECT AFTER AWARD OF CONTRACT, FRONT AND SIDE PUSH BARS, CHROME PLATED CAST BRASS P-TRAP WITH CLEANOUT, CHROME PLATED LOOSE KEY ANGLE STOP AND FLOOR MOUNTED CARRIER.

FD FLOOR DRAIN: SIOUX CHIEF, #842, PVC FLOOR DRAIN WITH ADJUSTABLE TOP AND CAST BRASS STRAINER. PROVIDE SURE SEAL PRE-ASSEMBLED INLINE FLOOR DRAIN TRAP SEALER. FLOOR RATING ASSE – 1072 AF-GN.

WH HOT WATER HEATER: RHEEM #EGSP20, 20 GALLON STORAGE, 208 VOLT, 1 PHASE, 4500 WATT ELEMENT, ASME TEMPERATURE AND PRESSURE RELIEF VALVE. SET TO 130°F.

ET HOT WATER EXPANSION TANK: AMTROL, #ST-5, 2 GALLON EXPANSION TANK WITH DIAPHRAGM.

MV MIXING VALVE: WATTS, #LFUSG-B, THERMOSTATIC CONTROLLED MIXING VALVE, LEAD FREE BRONZE BODY, LOCKED TEMPERATURE ADJUSTMENT CAP (VANDAL RESISTANT), COPPER ENCAPSULATED THERMOSTAT ASSEMBLY WITH BRASS SHUTTLE, STAINLESSSTEEL SPRINGS, INTEGRAL CHECK VALVES ON HOT AND COLD INLETS. (SET TO 110°F). ASSE 1070 LISTED.

RPZ REDUCED ZONE PRESSURE BACKFLOW PREVENTOR: WATTS #LF009, LEAD FREE BRONZE BODY CONSTRUCTION, TWO, IN-LINE INDEPENDENT CHECK VALVES, REPLACEABLE CHECK SEATS WITH AN INTERMEDIATE RELIEF VALVE, AND BALL VALVE TEST COCKS.

SP SUBMERSIBLE SUMP PUMP: ZOELLER, #1108, 100 GPM @ 42 FT HEAD, 1/2 HP, 200 VOLT, 16.5 AMPS, 3,450 RPM, FLOAT SWITCH, 20' CORD WITH PLUG AND CHECK VALVE. PROVIDE SIMPLEX OIL GUARD PANEL, OIL SMART LIQUID ALARM SWITCH, 115 VOLT, 30 AMP MOTOR START RELAY, TOP MOUNTED ALARM BEACON LIGHT, ALARM HORN. PUMP TO BE LOCATED IN SUMP PIT AS DEFIENED BY ARCHITECT.

MB MOP BASIN: FIAT, #MSB-2424, MOLDED STONE MOP BASIN, 2" DRAIN, 24"x 24" BASIN, VINYL BUMPER GUARD, STERN WILLIAMS #T-10-VB FAUCET, SPRING CHECKS, VACUUM BREAKER, INTEGRAL STOPS, WALL BRACE & PAIL HOOK, WALL BRACKET WITH 30" HOSE.

FS FLOOR SINK: SIOUX CHIEF:, #861 SQUARE PVC FLOOR SINK WITH STAINLESS STEEL MESH DEBRIS SCREEN, PVC HALF OPEN STRAINER.

PIPE HANGER SCHEDULE

PIPE MATERIAL	MAXIMUM HANGER SPACING	HANGER ROD DIAMETER
ABS (All sizes)	4'	3/8"
PVC (All Sizes)	4'	3/8"
CPVC, 1 inch and smaller	3'	1/2"
CPVC, 1-1/4 inches and larger	4'	1/2"
Cast Iron (All Sizes)	5'	5/8"
Cast Iron (All Sizes) with 10 foot length of pipe	10'	5/8"
Copper Tube, 1-1/4 inches and smaller	6'	1/2"
Copper Tube, 1-1/2 inches and larger	10'	1/2"
Steel, 3 inches and smaller	12'	1/2"
Steel, 4 inches and larger	12'	5/8"
Pex, 1" and below without support channel	32"	3/8"
Pex, 1-1/4" and above without support channel	48"	3/8"
Pex ¾" and below with support channel	6'	3/8"
Pex 1" and above with support channel	8'	3/8"

PLUMBING FIXTURE WATER COUNT

FIXTURE	QUANTITY	CW FU	CW TOTAL FU	HW FU	HW TOTAL FU	COMBINED FU	COMBINED TOTAL FU
WATER CLOSETS	2	10	20	0	0	10	20
SINKS	1	2.25	2.25	2.25	2.25	3	3
LAVATORIES	2	1.5	3	1.5	3	2	4
ELECTRIC WATER COOLER	2	0.25	0.5	0	0	0.25	0.5
MOP BASIN	1	2.25	2.25	2.25	2.25	3	3
			28 FU		7.5 FU		30.5 FU

COLD WATER MAIN = 1-½"
HOT WATER MAIN = 1"

PLUMBING FIXTURE BRANCH PIPING SCHEDULE

FIXTURE	WASTE	VENT	CW	HW
WATER CLOSET (FLUSH VALVE)	4"	2"	1"	" "
LAVATORY	1-1/4"	1-1/4"	1/2"	1/2"
FLOOR DRAIN	2"/3"	2"	" "	" "
ELECTRIC WATER COOLER	1-1/2"	1-1/2"	1/2"	" "
MOP BASIN	2"	2"	1/2"	1/2"

NOTE: INDIVIDUAL VENTS FOR FIXTURES ON PLANS AND RISER DIAGRAMS HAVE BEEN INCREASED WHERE HORIZONTAL VENT LENGTH IS IN EXCESS OF THE MAXIMUM DISTANCE INDICATED BY THE CODE.

PEX PIPING REQUIREMENTS

PIPE SIZES GIVEN ON THE DRAWINGS ARE NOMINAL COPPER PIPE SIZE. IF PEX PIPING IS USED, INCREASE PEX PIPING ONE SIZE ABOVE LISTED SIZES AS REQUIRED TO EQUAL OR EXCEED COPPER PIPE INSIDE DIAMETER.

PLUMBING PLAN NOTES:

1. ROUTE 3" VENT PIPING UP TO FLOOR ABOVE. SEE SHEET P2 FOR CONTINUATION.
2. CONNECT GAS TO EQUIPMENT AS REQUIRED AND AS DETAILED.
3. CONNECT CONDENSATE TO FURNACE FLUE AND COIL AS REQUIRED AND AS DETAILED. ROUTE TO FLOOR DRAIN WITH AIR GAP.
4. MOUNT WATER HEATER ABOVE MOP BASIN AND SUPPORT AS REQUIRED.

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1/12/2023

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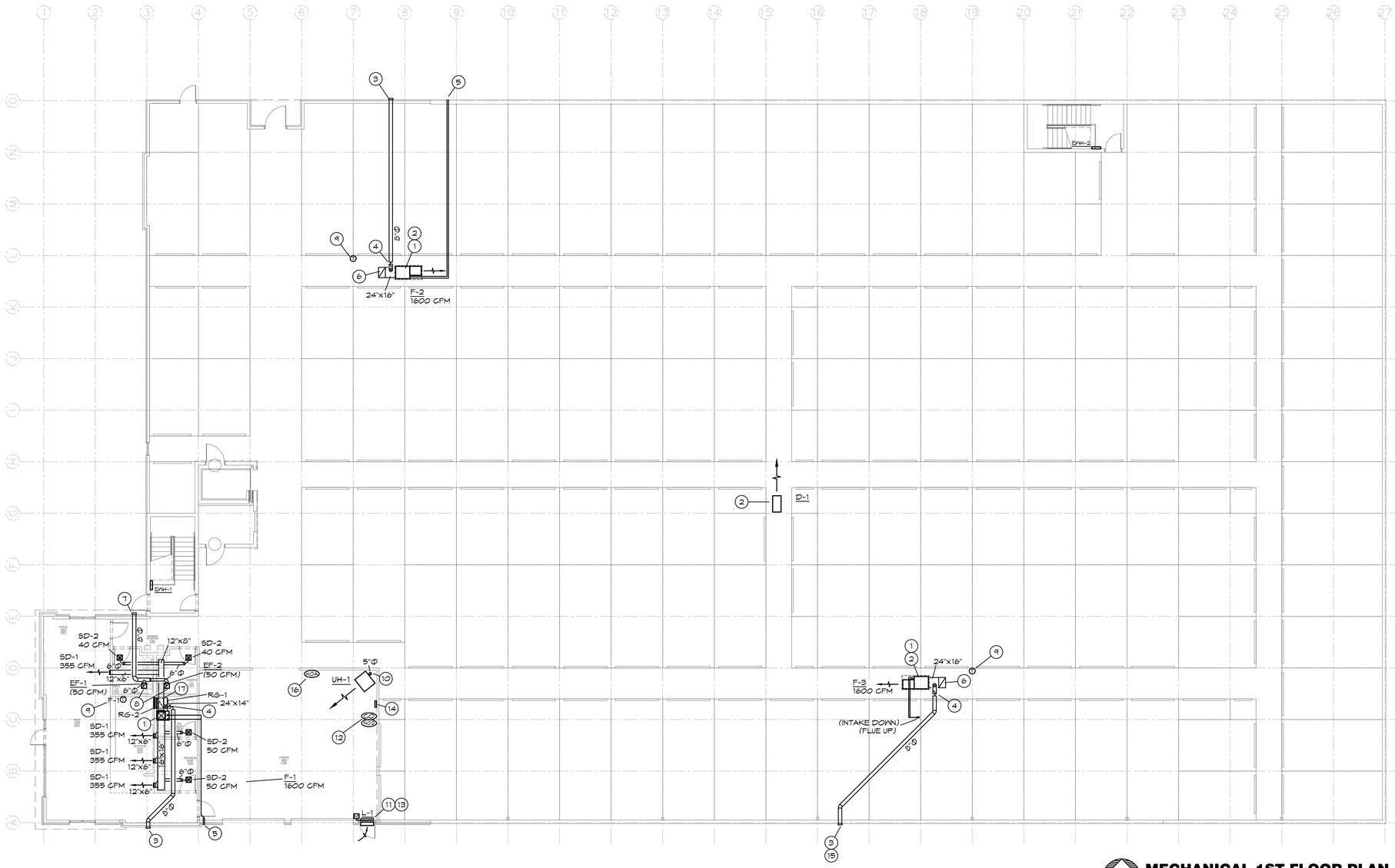
P4

MECHANICAL SYMBOLS

	NEW SUPPLY DIFFUSER
	EXHAUST GRILLE/FAN
S	REMOTE TEMPERATURE SENSOR
T	THERMOSTAT, MOUNTED AT 48" AFF
DSD	DUCT-MOUNTED SMOKE DETECTOR
AQS	AIR QUALITY SENSOR - CO/ NO2
HOA	HAND/OFF/AUTO SWITCH
	MOTORIZED DAMPER/LOUVER
	NEW DUCTWORK
32"x14"	SIZE OF RECTANGULAR DUCT
6"Φ	SIZE OF ROUND DUCT
	FLEXIBLE DUCTWORK
—③	FLOOR PLAN NOTE DESIGNATION
S.A.	SUPPLY AIR
R.A.	RETURN AIR
EXH.	EXHAUST AIR
	TRANSITION IN DUCT SIZE
	MANUAL VOLUME DAMPER
	MANUAL VOLUME DAMPER
M	MOTORIZED CONTROL DAMPER
	SUPPLY AIR DUCT UP/DOWN
	RETURN AIR DUCT UP/DOWN
	EXHAUST AIR DUCT UP/DOWN
RTU-1	SCHEDULED MECHANICAL EQUIPMENT



MECHANICAL 1ST FLOOR PLAN

SCALE: 3/32" = 1'-0"

MECHANICAL GENERAL NOTES:

1. COORDINATE ALL WORK WITH OTHER TRADES AND EXISTING CONDITIONS AS REQUIRED TO PROPERLY INSTALL ALL SYSTEMS AS INTENDED, WITHIN THE CONFINES OF THE SPACES AVAILABLE, AND WITHOUT INTERFERENCES.
2. THIS CONTRACTOR SHALL PERFORM ALL WORK INDICATED AND/OR AS REQUIRED FOR THE PROPER INSTALLATION AND OPERATION OF THE MECHANICAL SYSTEMS.
3. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATIONS OF DIFFUSERS.
4. INSTALL ALL DUCT, PIPE, ETC. AS HIGH AS POSSIBLE.
5. DUCT SIZES SHOWN ARE ACTUAL SHEET METAL SIZES AND INCLUDE AN ALLOWANCE FOR DUCT LINER WHERE APPLICABLE.
6. PROVIDE FLEXIBLE CONNECTION BETWEEN DUCTWORK AND ROOFTOP UNITS, EXHAUST FANS, AND OTHER MOTORIZED EQUIPMENT.
7. NO DUCT SHALL BE ROUTED OVER THE TOP OF ELECTRICAL PANELS.

MECHANICAL PLAN NOTES:

1. CONNECT REFRIGERANT PIPING TO CONDENSING UNIT & COIL AS REQUIRED BY THE MANUFACTURER. PROVIDE AND INSTALL REFRIGERANT PIPING FOR CONDENSING UNIT AS REQUIRED BY MANUFACTURER. SEAL WALL / ROOF PENETRATION WEATHERTIGHT.
2. SUPPORT UNIT FROM STRUCTURE AND PROVIDE VIBRATION ISOLATION AS REQUIRED BY THE MANUFACTURER. PROVIDE ADDITIONAL SUPPORT STEEL AS REQUIRED.
3. PROVIDE WALL VENT CAP FOR OUTDOOR INTAKE WITH BIRD SCREEN. CAULK PENETRATIONS WEATHERTIGHT.
4. CONNECT OUTDOOR AIR DUCT WITH BALANCING DAMPER TO RETURN AIR DUCT. REFER TO OUTDOOR AIR CALCULATIONS FOR MINIMUM OUTDOOR AIR VOLUME.
5. 3"Φ CPVC FLUE & COMBUSTION AIR INTAKE THROUGH SIDEWALL TO MANUFACTURE'S VENT TERMINATION AS REQUIRED. OFFSET AS REQUIRED TO MAINTAIN 10' CLEARANCE FROM ALL OUTDOOR AIR INTAKES. SEAL PENTRATIONS WEATHER TIGHT.
6. OPEN RA DUCT WITH BIRD SCREEN OVER OPENING.
7. PROVIDE WALL VENT CAP WITH BACKDRAFT DAMPER FOR EXHAUST FAN. CAULK PENETRATIONS WEATHERTIGHT.
8. SUPPORT FAN FROM STRUCTURE AS REQUIRED BY THE MANUFACTURER.
9. PROVIDE 7-DAY COOL/HEAT/AUTO CHANGEOVER THERMOSTAT MOUNTED AT 48" A.F.F.

MECHANICAL PLAN NOTES: (CONT.)

10. 5"Φ FLUE UP TO SECOND FLOOR, SEE SHEET M2 FOR CONTINUATION.
11. NORMALLY CLOSED MOTORIZED DAMPER ON L-1, TO OPEN WHEN EF-7 IS ENERGIZED. COORDINATE WITH E.C. TO INTERLOCK WITH CO/NO2 SYSTEM AS REQUIRED. PROVIDE AND MOUNT TX-D-ND NO SENSOR 12"-18" BELOW DECK AS REQUIRED. PROVIDE AND MOUNT CM-6 CO SENSOR 5' AFF AS REQUIRED.
12. LOCATION OF AIR QUALITY SENSOR FOR GAS SENSING SYSTEM. INSTALL PER THE MANUFACTURERS REQUIREMENTS. INTERLOCK WITH EF-3 AND L-1.
13. INSTALL BOTTOM OF LOUVER 8' ABOVE GRADE.
14. PROVIDE MACURCO #DVP-120 CONTROLLER FOR CM-6 CARBON MONOXIDE AND TX-6-ND NITROGEN DIOXIDE FIXED SENSORS FOR THE DETECTION OF CARBON MONOXIDE AND NITROGEN DIOXIDE IN SPACE.
15. INSTALL 8"Φ OUTDOOR AIR DUCT MINIMUM 18" ABOVE GRADE.
16. LOCATION OF HAND/OFF/AUTO SWITCH, MOUNT AT 48" AFF.
17. 24"x14" RETURN DUCT BELON 12"x8" SUPPLY DUCT. ROUTE 24"x14" RETURN DUCT UP AS HIGH AS POSSIBLE.

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STRICKLAND CONSTRUCTION COMPANY

LAKEWOOD STORAGE

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10/25/2022

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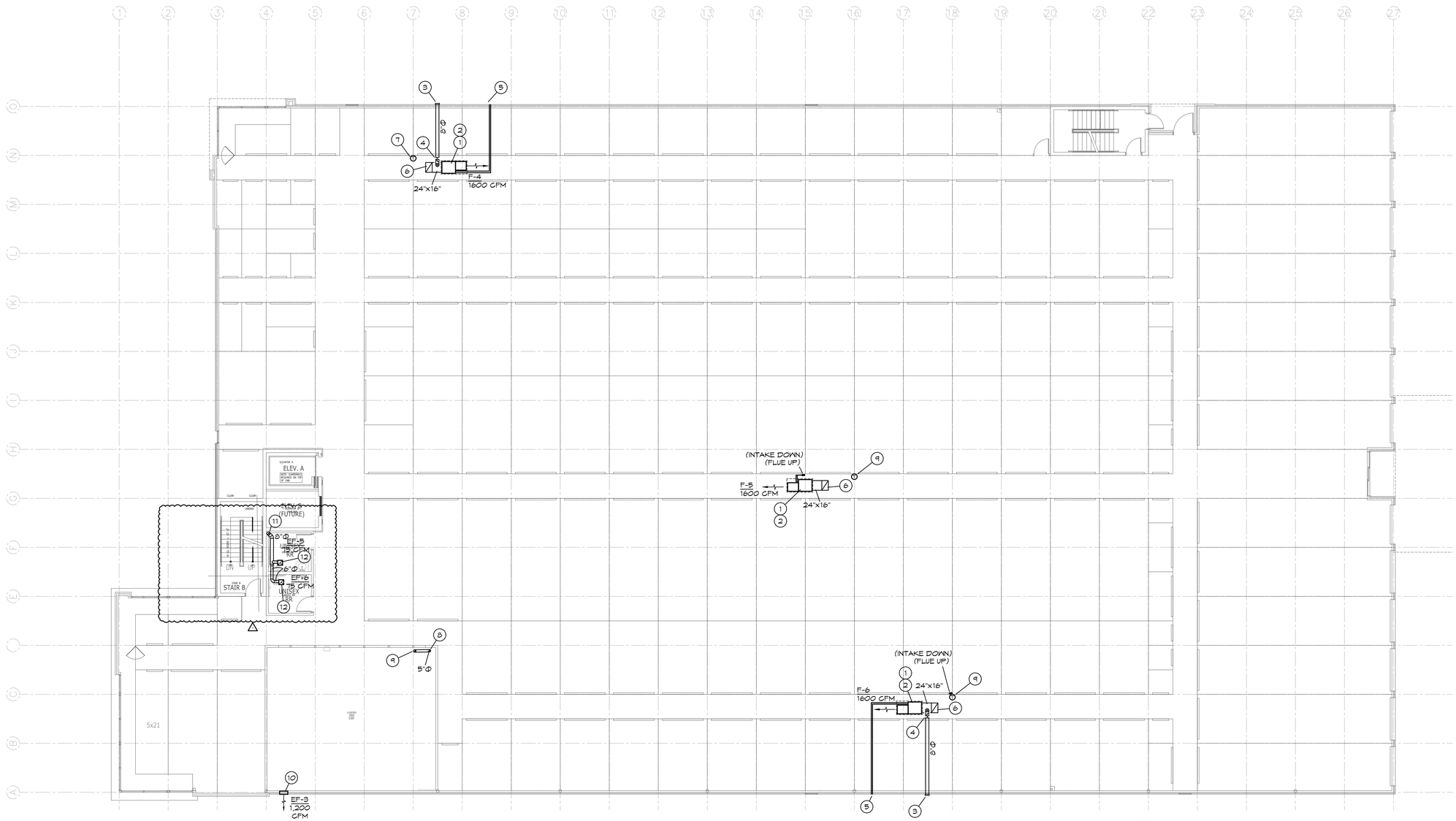
M1



NORTH

MECHANICAL 2ND FLOOR PLAN

SCALE: 3/32" = 1'-0"

MECHANICAL PLAN NOTES:

1. CONNECT REFRIGERANT PIPING TO CONDENSING UNIT & COIL AS REQUIRED BY THE MANUFACTURER. PROVIDE AND INSTALL REFRIGERANT PIPING FOR CONDENSING UNIT AS REQUIRED BY MANUFACTURER. SEAL WALL / ROOF PENETRATION WEATHERTIGHT.
2. SUPPORT UNIT FROM STRUCTURE AND PROVIDE VIBRATION ISOLATION AS REQUIRED BY THE MANUFACTURER. PROVIDE ADDITIONAL SUPPORT STEEL AS REQUIRED.
3. PROVIDE WALL VENT CAP FOR OUTDOOR INTAKE WITH BIRD SCREEN. CAULK PENETRATIONS WEATHERTIGHT.
4. CONNECT OUTDOOR AIR DUCT WITH BALANCING DAMPER TO RETURN AIR DUCT. REFER TO OUTDOOR AIR CALCULATIONS FOR MINIMUM OUTDOOR AIR VOLUME.
5. 3"Ø CPVC FLUE & COMBUSTION AIR INTAKE THROUGH SIDEWALL TO MANUFACTURE'S VENT TERMINATION AS REQUIRED. OFFSET AS REQUIRED TO MAINTAIN 10' CLEARANCE FROM ALL OUTDOOR AIR INTAKES. SEAL PENTRATIONS WEATHER TIGHT.
6. OPEN RA DUCT WITH BIRD SCREEN OVER OPENING.
7. PROVIDE 7-DAY COOL/HEAT/AUTO CHANGEOVER THERMOSTAT MOUNTED AT 48" A.F.F.
8. 5"Ø TYPE 'B' DOUBLE FLUE UP FROM FLOOR BELOW, SEE SHEET M1 FOR CONTINUATION.
9. 5"Ø TYPE 'B' DOUBLE FLUE UP TO FLOOR ABOVE. SEE SHEET M3 FOR CONTINUATION.
10. INSTALL EF AS HIGH AS POSSIBLE. COORDINATE WITH E.C. TO INTERLOCK WITH CO/ NO2 SYSTEM AND L-1.
11. ROUTE 8" EXHAUST DUCT UP TO 3RD FLOOR
12. SUPPORT FAN FROM STRUCTURE AS REQUIRED BY THE MANUFACTURER.

△

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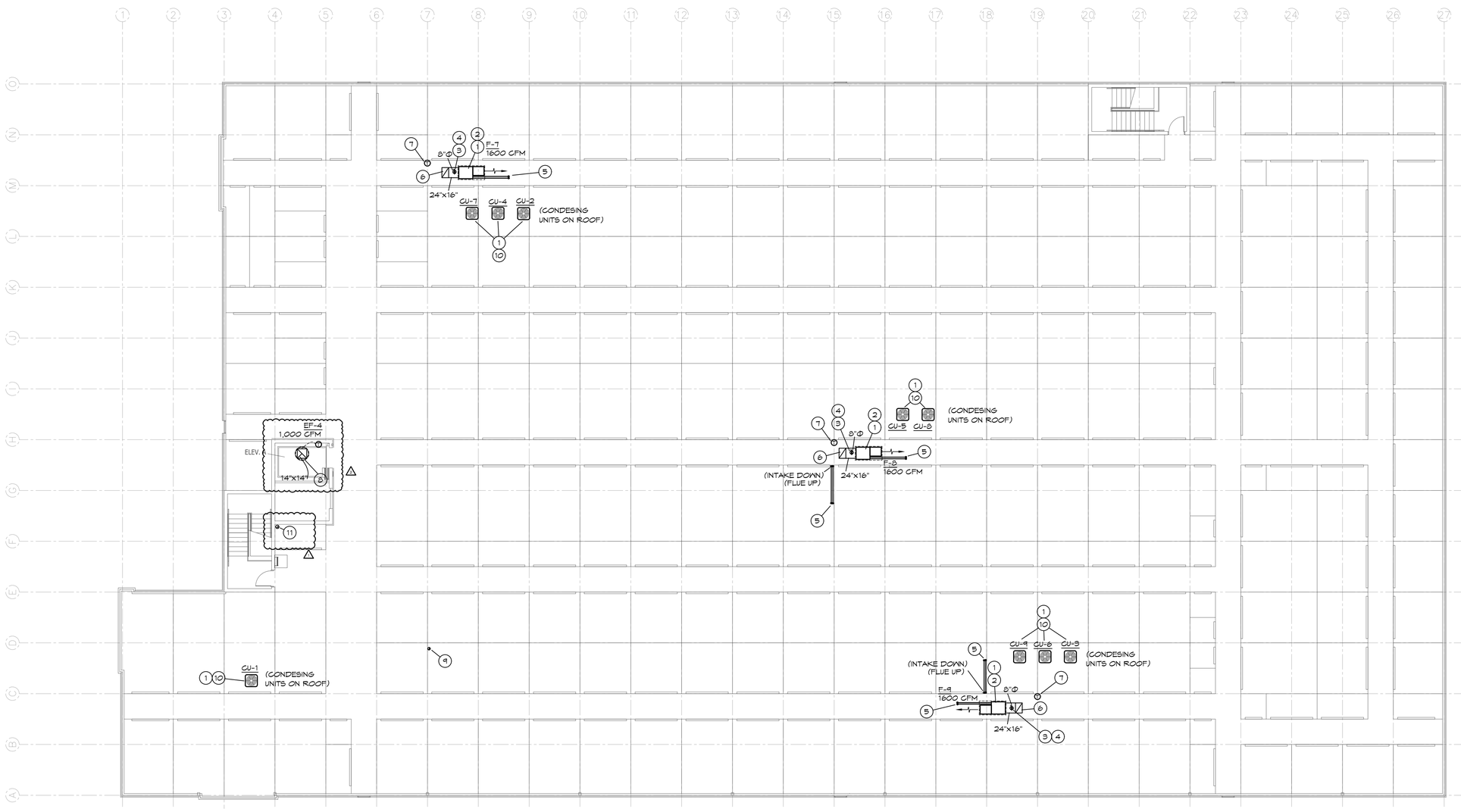

NORTH

MECHANICAL 3RD FLOOR PLAN

SCALE: 3/32" = 1'-0"

MECHANICAL PLAN NOTES:

1. CONNECT REFRIGERANT PIPING TO CONDENSING UNIT & COIL AS REQUIRED BY THE MANUFACTURER. PROVIDE AND INSTALL REFRIGERANT PIPING FOR CONDENSING UNIT AS REQUIRED BY MANUFACTURER. SEAL WALL / ROOF PENETRATION WEATHERTIGHT.
2. SUPPORT UNIT FROM STRUCTURE AND PROVIDE VIBRATION ISOLATION AS REQUIRED BY THE MANUFACTURER. PROVIDE ADDITIONAL SUPPORT STEEL AS REQUIRED.
3. ROUTE 8Ø OUTDOOR AIR DUCT UP THROUGH ROOF TO ROOF VENT CAP WITH BIRD SCREEN. SEAL PENETRATIONS WEATHERTIGHT.
4. CONNECT OUTDOOR AIR DUCT WITH BALANCING DAMPER TO RETURN AIR DUCT. REFER TO OUTDOOR AIR CALCULATIONS FOR MINIMUM OUTDOOR AIR VOLUME.
5. 3"Ø CPVC FLUE & COMBUSTION AIR INTAKE THROUGH ROOF TO MANUFACTURE'S VENT TERMINATION AS REQUIRED. OFFSET AS REQUIRED TO MAINTAIN 10' CLEARANCE FROM ALL OUTDOOR AIR INTAKES. SEAL PENTRATIONS WEATHER TIGHT.
6. OPEN RA DUCT WITH BIRD SCREEN OVER OPENING.
7. PROVIDE 7-DAY COOL/HEAT/AUTO CHANGEOVER THERMOSTAT MOUNTED AT 48" A.F.F.
8. ROOF MOUNTED EXHAUST FAN IS TO BE DUCTED INTO ELEVATOR HOISTWAY AND TIED TO THERMOSTAT FOR HOISTWAY TEMPERATURE CONTROL. △1
9. 5"Ø TYPE 'B' DOUBLE FLUE UP FROM FLOOR BELOW, SEE SHEET M2 FOR CONTINUATION. ROUTE UP THROUGH ROOF TO MANUFACTURER'S VENT TERMINATION AS REQUIRED. OFFSET AS REQUIRED TO MAINTAIN 10' CLEARANCE FROM ALL OUTDOOR AIR INTAKES. SEAL PENETRATION WEATHER TIGHT.
10. REFRIGERANT PIPING THROUGH ROOF. SEAL PENETRATION WEATHERTIGHT. ROUTE TO UNITS.
11. 8" UP FROM FLOOR BELOW, ROUTE 8" EXHAUST DUCT UP THRU ROOF TO WEATHER HEAD WITH BACK DRAFT DAMPER, SEAL PENETRATION WETHER TIGHT. △1

△1

STRICKLAND CONSTRUCTION COMPANY

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2/16/2023

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M3

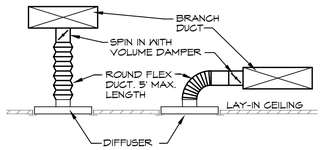
OUTDOOR AIR CALCULATIONS

UNIT	Area (sqft)	OCCUPANCY CLASSIFICATION	Occupant Density #/1000 sqft	People outdoor airflow rate in breathing zone, (Rp) cfm/person	Area outdoor airflow rate in breathing zone, (Ra) cfm/sqft	Exhaust airflow rate cfm/sqft	Breathing zone outdoor airflow (Vbz)	Zone air distribution effectiveness (Ez)	Zone outdoor airflow (cfm)
F-1	750	Office spaces	5	5	0.06		64	0.8	80
	70	Break Room	25	5	0.06		14	0.8	18
	132	Toilet rooms public	0	0	0	50/0	0	0.8	0
	63	Storage rooms	0	0	0.12		8	0.8	9
								Total	107
F-2,3	5858	Corridors	0	0	0.06		351	0.8	439
								Total	439
F-4,5,6	6312	Corridors	0	0	0.06		379	0.8	473
								Total	473
F-7,8,9	7720	Corridors	0	0	0.06		463	0.8	579
								Total	579
EF-3/L-1	996	Repair garages, enclosed parking garages	0	0	0	.75	0	0.8	747
EF-3 780 CFM								Total	747

GAS FIRED UNIT HEATER SCHEDULE

MARK	MFGR	MODEL	CFM	HEATING (GAS)		ELECTRICAL		NOTES
				BTUH INPUT	BTUH OUTPUT	VOLT/Ø/HZ	HP	
UH-1	LENNOX	LF24-100A	1,900	100,000	80,500	120/1/60	1/8	1,2

NOTES: 1. PROVIDE EACH UNIT ELECTRONIC PILOT IGNITION & ALUMINIZED STEEL HEAT EXCHANGER.
2. PROVIDE EACH UNIT WITH UNIT MOUNTED THERMOSTAT & CONTROL VOLTAGE TRANSFORMER.



DIFFUSER DETAIL
SCALE: NONE

ELECTRIC WALL HEATER SCHEDULE

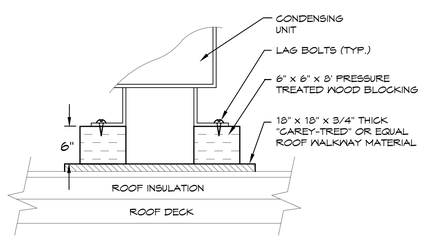
MARK	MFGR	MODEL NO.	BTUH	ELECTRICAL		NOTES
				VOLT/Ø/HZ	WATTS	
EWH-1	RAYWALL	AFC8130T	10,239	208/1/60	3 KW	1,2
EWH-2						

NOTES: 1. UNITS SHALL BE SURFACE MOUNTED.
2. PROVIDE INTEGRAL DISCONNECT & INTEGRAL THERMOSTAT FOR EACH UNIT.

LOUVER SCHEDULE

MARK	MFGR	MODEL	FRAME	SIZE	NOTES
L-1	RUSKIN	ELF375X	STD	24"x18"	1,2

NOTES: 1. PROVIDE WITH BIRDSCREEN.
2. PROVIDE 120 VOLT, NORMALLY CLOSED MOTORIZED DAMPER TO OPEN WHEN ENERGIZED. SEE PLAN NOTE 8 ON SHEET M1.



SET SUPPORT BLOCKS IN MASTIC ON WALKWAY MATERIAL.

CONDENSING UNIT SUPPORT DETAIL
SCALE: NONE

DIFFUSER SCHEDULE

MARK	MFGR	MODEL	NECK SIZE	FACE SIZE	FINISH	NOTES
SD-1	TITUS	300RS	12"x6"	-	WHITE	1
SD-2		TMS/3	6"Ø	12"x12"		-
						-
RG-1		350RL	6"x6"	-		-
RG-2			24"x14"	-		-

NOTES: 1. PROVIDE O.B. DAMPER IN NECK.

FURNACE SCHEDULE

MARK	MFGR	MODEL NO.	CFM	EXT. STATIC P. IN. WG.	HEATING (GAS)		ELECTRICAL		OUTSIDE AIR (CFM)	NOTES
					BTUH INPUT	BTUH OUTPUT	VOLT/Ø/HZ	HP		
F-1	LENNOX	ML196UH090X60C	1,600	0.5	88,000	85,600	120/1/60	1	150	1,2,3,4
F-2									225	1,2,3,4,5
F-3									225	1,2,3,4,5
F-4									225	1,2,3,4,5
F-5									-	1,2,3,4,5
F-6									225	1,2,3,4,5
F-7									200	1,2,3,4,5
F-8									200	1,2,3,4,5
F-9									200	1,2,3,4,5

NOTES: 1. PROVIDE 1" THICK THROWAWAY TYPE FILTER WITH HOLDING FRAME FOR EACH UNIT.
2. PROVIDE EACH UNIT WITH 7-DAY PROGRAMMABLE HEAT/COOL/AUTO CHANGEOVER THERMOSTAT.
3. CONDENSING UNITS, COOLING COILS, AND FURNACES SHALL ALL BE OF THE SAME MANUFACTURER.
4. EXTERNAL STATIC PRESSURE LISTED REPRESENTS STATIC PRESSURE REQUIRED FOR DUCTWORK AND DIFFUSERS OUTSIDE THE HVAC UNIT COMPLETELY INDEPENDENT OF ANY PRESSURE DROP THROUGH THE HVAC EQUIPMENT INCLUDING BUT NOT LIMITED TO FILTERS AND COILS.
5. PROVIDE GALVANIZED WATERTIGHT DRAIN PAN AND CONDENSATE FLOAT SWITCH TO DE-ENERGIZE THE FURNACE IF THE DRAIN PAN FILLS WITH WATER.

CONDENSING UNIT SCHEDULE

MARK	MFGR	MODEL NO.	COOLING			ELECTRICAL			EVAP. COIL MODEL NO.	SEER	NOTES
			TOTAL BTUH	AMB.	EVAP. EAT DB/WB	VOLT/Ø/HZ	MIN. MCA (AMPS)	MIN. MOCP (AMPS)			
CU-1	LENNOX	TSA048B4	48,000	95	80/67	480/3/60	8.8	15	CH35-48C	14	1,2,3
CU-2											
CU-3											
CU-4											
CU-5											
CU-6											
CU-7											
CU-8											
CU-9											

NOTES: 1. PROVIDE TIME DELAY ON COMPRESSOR RE-START, CRANKCASE HEATER, AND COMPRESSOR LOCK-OUT WITH AMBIENT BELOW 35 °F. PROVIDE INDOOR COIL WITH THERMAL EXPANSION VALVE (TXV).
2. MECHANICAL CONTRACTOR SHALL COORDINATE ALL UNIT MOCP'S OF ACTUAL INSTALLED EQUIPMENT WITH ELECTRICAL CONTRACTOR.
3. PROVIDE HAIL GUARDS FOR EACH UNIT.

EXHAUST FAN SCHEDULE

MARK	MFGR	MODEL	CFM	EXTERNAL STATIC P. IN. WG.	RPM	ELECTRICAL		FAN TYPE	CONTROLS	NOTES
						VOLT/Ø/HZ	PWR			
EF-1	COOK	GC-126	50	0.1	550	120/1/60	21 W	CEILING EXH.	INTERLOCK WITH LIGHTS	1
EF-2					550					1
EF-3		10XM40D15	780		1,550		1/8 HP	SIDEWALL EXH.	SENSOR	4
EF-4		12QC15D	1,000	0.15	1047		1/4 HP	ROOF EXH.	THERMOSTAT	2,3
EF-5		GC-146	75	0.2	900		36 W	CEILING EXH.	SWITCH	5
EF-6		GC-146	75	0.2	900		36 W	CEILING EXH.	SWITCH	5

NOTES: 1. PROVIDE CEILING GRILLE, INTEGRAL BACK DRAFT DAMPER, VARI-SPEED CONTROLLER (NEAR FAN AND ABOVE CEILING), AND WEATHER HEAD.
2. PROVIDE INSULATED 18" HIGH (AT LOWEST POINT) PREFABRICATED ROOF CURB, BACKDRAFT DAMPER, BIRD SCREEN, UNIT MOUNTED VARIABLE SPEED CONTROLLER.
3. PROVIDE XFMR, HEAT & COOL THERMOSTAT WITH AUTO CHANGE OVER FOR CONTROL OF FAN. SET TO TURN FAN ON AT 50°F AND 80°F. COORDINATE WITH ELECTRICAL FOR POSSIBLE CONTRACTORS OR RELAY REQUIRED.
4. PROVIDE WALL SLEEVE, REAR GUARD HOUSING, BACKDRAFT DAMPER, BIRD SCREEN, AND HAND/OFF/AUTO SWITCH.
5. PROVIDE CEILING GRILLE, INTEGRAL BACK DRAFT DAMPER, VARI-SPEED CONTROLLER (NEAR FAN AND ABOVE CEILING), AND WALL CAP.

DEHUMIDIFIER SCHEDULE

MARK	MFGR	MODEL NO.	WATER REMOVAL	CFM	ELECTRICAL		NOTES
					VOLT/Ø/HZ	AMP	
D-1	LENNOX	WHD-3-130	130 PINTS/DAY	270	208/1/60	15	1,2,3

NOTES: 1. PROVIDE WITH HUMIDISTAT SET TO 45% RH.
2. INSTALL PER MANUFACTURER'S REQUIREMENTS FOR HANGING FROM STRUCTURE.
3. PROVIDE AND INSTALL ANY/ALL COMPONENTS FOR COMPLETE INSTALLATION.

STRICKLAND CONSTRUCTION COMPANY

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LEE'S SUMMIT, MO

2/16/2023

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Date: 2022/10/25
Drawn by : DS/LC
Checked by : DS/EK
Revisions : 2023/1/12
2023/2/10

M4