

## 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 GROOVED/ENDLINED, 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 COVERINGS 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, CATALOGS, QUTS, 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 CONSIDERED AS LIMITED TO THE MANUFACTURER, 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 DEVELOPED FOR 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 TO THE SIGNATORY 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 ARE 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, RINSE, AND DISINFECTED 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.
- H. PLUMBING:
- A. PROVIDE AN APPROVED WATER HAMMER ARRESTOR FOR EACH PLUMBING FIXTURE SUPPLY AS REQUIRED BY FIXTURE MANUFACTURER.
- B. ALL EXPOSED WATER 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 44140, OR EQUAL.
- 2) QUARRY TILE FLOOR: JR SMITH 44200, OR EQUAL.
- 3) CARPETED FLOOR: JR SMITH 442021, OR EQUAL.
- 4) UNFINISHED FLOOR: JR SMITH 44202, OR EQUAL.
- 5) WALL: JR SMITH 44412, OR EQUAL, 2" ABOVE THE FLOOR.
- 6) GARAGE: JR SMITH 44286, 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 PREVENT SPILLAGE OF WATER HEATER OR TANK.
- 2) BOTTOM FED WATER HEATERS AND TANKS CONNECT TO TANK HEATERS SHALL HAVE A VACUUM 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 (ABOVE/GROUND):
- 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 AFPM P5-111 OR ASME B16.51.
- 2) PEK 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) PEK-A AND PEK-B MEETING ANSISF61 AND ANSISF312 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) PEK MECHANICAL GRIMP/INSERT OR EXPANSION FITTINGS INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS. PIPE SIZES GIVEN ON THE DRAWINGS ARE NOMINAL COPPER PIPE SIZE. INCREASE PEK 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.
- 1) TYES.
1. GATE VALVE: JOMAR T/S-3016 OR EQUAL, LEAD-FREE NSF 61, ANSI B120.1.
2. GLOBE VALVE: JOMAR TSS OR EQUAL.
3. BALL VALVE: JOMAR JF009P OR EQUAL, COMPACT LEAD FREE BRASS BALL VALVE, UL242, CSA 331-12 & 331-12, FM, CALIFORNIA CODE AB193, NSF61 ANNEX G APPROVED.
4. BALL VALVE: JOMAR T-100NE OR EQUAL, UL242, FM, CSA NSF 61-5, 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 AFPM P5-111 OR ASME B16.51.
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- a) PEK-A AND PEK-B MEETING ANSISF61 AND ANSISF312 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) PEK MECHANICAL GRIMP/INSERT OR EXPANSION FITTINGS INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS. PIPE SIZES GIVEN ON THE DRAWINGS ARE NOMINAL COPPER PIPE SIZE. INCREASE PEK PIPING SIZE TO EQUAL OR EXCEED COPPER PIPE INSIDE DIAMETER FOR SUPPLY MAINS.
- 3) HDPE, PIGMENTED BLUE THROUGHOUT, CTS SIZES: 1"-2" ANNA C201 4110 DR11 PC250 IPS SIZES 2"-3", ANNA C201 4110 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:
- 1) HDPE, PIGMENTED BLUE THROUGHOUT, CTS SIZES: 1"-2" ANNA C201 4110 DR11 PC250 IPS SIZES 2"-3", ANNA C201 4110 DR11 PC200 MATERIAL AND INSTALLATION MUST CONFORM TO WATER DEPARTMENT REQUIREMENTS.
- D. WATER (FIRE) SERVICE, 3" OR LARGER:
- 1) DUCTILE IRON PIPE 4 FITTINGS, ANNA C151 CLASS 50, CEMENT LINING, SEALCOATED, ANNA C104, THRUST BLOCKS IN ACCORDANCE WITH NFPA 24.
- 2) HDPE IPS SIZES PIGMENTED BLUE THROUGHOUT, 3" ANNA C201 4110 DR11 PC200 4" AND LARGER, ANNA C208 3408 4110 DR15 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, ANNA C200, CLASS 200, WITH BELL END AND ELASTOMERIC GASKET, WITH IRON END FOR CAST-IRON OR DUCTILE-IRON FITTINGS, OR PVC ELASTOMERIC GASKET FITTINGS.
- a) PVC COUPLINGS AND FITTINGS: ANNA C200, WITH ASTM F 411 ELASTOMERIC SEAL, GASKETS, ASTM F 411, ELASTOMERIC SEAL.
- b) DUCTILE-IRON AND CAST-IRON FITTINGS: ANNA C110, DUCTILE-IRON OR CAST-IRON, 250-PSI PRESSURE RATING, OR ANNA C105, DUCTILE-IRON CAST FITTINGS, 150-PSI PRESSURE RATINGS, OF DIMENSION TO MATCH PIPE OUTSIDE DIAMETER. ANNA C104, CEMENT MORTAR LINING, GASKETS PER ANNA 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 5% LEAD CONTENT.
- 2) PIPE, PIPE FITTINGS, JOINTS, VALVES, FAUCETS, AND FIXTURE FITTINGS UTILIZED TO SUPPLY WATER FOR DRINKING OR COOKING PURPOSES SHALL COMPLY WITH NSF 312 AND SHALL HAVE A HEIGHTED AVERAGE LEAD CONTENT OF 0.25% OR LESS.
- F. STORM SEWER, SANITARY SEWER, AND VENTS (UNDERGROUND, INTERIOR TO BUILDINGS):
- 1) POLYVINYLCHLORIDE (PVC) DWV PIPE, SCHEDULE 40, SOLVENT JOINT (WHERE APPROVED BY LOCAL CODES).
- 2) SERVICE HEIGHT, BELL-AND-SPIGOT, COATED CAST IRON, ASTM A-14.
- 3) ACRYLONITRILE-BUTADIENE-STYRENE (ABS) SEWER PIPE, ASTM D 2751-83S.
- 4) "NO-HUB" CAST IRON, NEOPRENE GASKETS, STAINLESS STEEL CLAMPS.
- G. STORM SEWER AND SANITARY SEWER (EXTERIOR TO BUILDINGS):
- 1) SERVICE HEIGHT, BELL-AND-SPIGOT, COATED CAST IRON, ASTM A-14.
- 2) DUCTILE IRON GRAVITY SEWER PIPE 4 FITTINGS, ASTM A146/141, CLASS 50 OR B1, SEALCOATED, MECHANICAL OR PUSH-ON JOINTS, DIP COATING, NEOPRENE OR SYNTHETIC RUBBER GASKETS.
- 3) ACRYLONITRILE-BUTADIENE-STYRENE (ABS) SEWER PIPE, SDR-25 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 (ABOVE/GROUND):
- 1) SERVICE HEIGHT, BELL-AND-SPIGOT, COATED CAST IRON, ASTM A-14.
- 2) DWV, WROUGHT COPPER, ANSI B-16.22.
- 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 FLEAM).
- I. CONDENSATE DRAINS & INDIRECT WASTE (ABOVE/GROUND):
- 1) DWV, WROUGHT COPPER, ANSI B-16.24 (CONDENSATE INSIDE BUILDINGS).
- 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, AYS A 5.0, CLASSIFICATION 100 (S) (S) (S).
- 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/IN. MALLEABLE IRON, THREADED FITTINGS.
- b) PIPE 4" AND SMALLER: VESGA MEGA PRESS 6 FOR WATER AND GAS, CSA L64, T86A/ASME B31 FOR USE WITH ASTM A53 SCHEDULE 40 BLACK IRON PIPE.
- c) PIPE 2-1/2" AND LARGER, WELDED.
- 2) FLUG VALVE: ROCKWELL NORDSTROM FIGURE NO. 142 OR 143.
- 3) BALL VALVE: JOMAR T-100NE, APPROVALS: UL242, FM, CSA NSF 61-5, MSS SP-110.
- L. GAS PIPING LABELING:
- a) ALL ELEVATED PRESSURE GAS PIPING SHALL BE LABELED EVERY 40 FEET WITH SIGNS INDICATING "ELEVATED PRESSURE".
- b) GAS PIPING PAINTING:
- a) ALL BLACK STEEL GAS PIPING LOCATED EXTERIOR TO THE BUILDINGS SHALL BE PRIME AND PAINTED TO EITHER MATCH ADJACENT EXTERIOR WHERE LOCATED OR ON NEAR EXTERIOR WALL AND PAINTED SAFFETY YELLOW WHERE LOCATED ON THE ROOF.
- M. SLEEVES
- 1) PROVIDE SET, AND PROPERLY LOCATE PIPE SLEEVES AS REQUIRED FOR THIS WORK. ALL SLEEVES SHALL BE OF SUFFICIENT STRENGTH TO PERMIT PIPE MOVEMENT DUE TO EXPANSION AND CONTRACTION AND TO ACCOMMODATE PIPE INSULATION.
- 2) INTERIOR PARTITIONS: 16-GAUGE GALVANIZED STEEL, PACK BETWEEN PIPE AND SLEEVE 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 OTHER 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 .005, AND THE SHEATHING SHALL BE BUILT UP TO THE POINT WHERE THE PIPE PASSES THROUGH A FOUNDATION WALL OR FOOTING SHALL BE PROVIDED WITH A RELIEVING ARCH, OR A PIPE SLEEVE BE BUILT INTO THE FOUNDATION WALL. THE SLEEVE SHALL BE TWO SIZES GREATER THAN THE PIPE PASSING THROUGH THE WALL OR FOOTING.
- 5) PLUMBING VENTS: FLASH ROOF VENT INTO ROOFING SYSTEM AS REQUIRED BY THE ROOFING CONTRACTOR. PROVIDE ROOFING 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.
- O. WATER HEATERS
- A. COMMERCIAL, LIGHT-DUTY, STORAGE, ELECTRIC, DOMESTIC-WATER HEATERS:
1. STANDARD: UL 174
2. STORAGE-TANK CONSTRUCTION: STEEL, VERTICAL ARRANGEMENT.
3. PRESSURE RATINGS: 150 PSIG.
4. INTERIOR FINISH: COMPLY WITH NSF 61 AND NSF 312 BARRIER MATERIALS FOR POTABLE-WATER TANK LININGS, INCLUDING EXTENDING LINING MATERIAL INTO TAPPINGS.
5. 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-RAP 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, SHUTOFF 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 SETTINGS LESS THAN WORKING-PRESSURE RATINGS 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 B120.1 PIPE THREAD.
- b. INTERIOR FINISH: COMPLY WITH NSF 61 AND NSF 312 BARRIER MATERIALS FOR POTABLE-WATER TANK LININGS, INCLUDING EXTENDING LINING MATERIAL INTO THROUGH TANK FITTINGS AND OUTLETS.
- c. AIR-CHARGING VALVE: FACTORY INSTALLED.
3. CAPACITY AND CHARACTERISTICS:
- a. WORKING-PRESSURE RATINGS: 150 PSIG.
- b. FIRE PROTECTION (NET PIPE SPRINKLER SYSTEM):
- A. PROVIDE A "NET-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 NET PIPE SPRINKLER SYSTEM SHALL CONFORM TO ALL REQUIREMENTS OF THE OWNER'S INSURANCE CARRIER AND LOCAL AUTHORITIES. PROVIDE SYSTEM DRAWINGS WITH A PROFESSIONAL ENGINEER'S STAMP ON THE DRAWINGS FOR REVIEW BY THE OWNER'S INSURANCE CARRIER AND LOCAL AUTHORITIES PRIOR TO INSTALLATION OF PIPING.
- D. THE NET 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, ASTM A 786/A 786M, OR ASME B36.10M, WALL THICKNESS GREATER THAN OR EQUAL TO SCHEDULE 50 AND LESS THAN SCHEDULE 40, BLACK STEEL PIPE.
- c) ASTM A 135 OR ASTM A 786/A 786M, THREADED, WALL THICKNESS LESS THAN SCHEDULE 50 AND GREATER THAN SCHEDULE 10, BLACK-STEEL PIPE.
- d) ASTM A 135 OR ASTM A 786/A 786M SCHEDULE 5 STEEL PIPE.
- 2) FIBERGLASS INSULATION WITH FACTORY APPLIED VAPOR BARRIER, ASJ JACKET, FACTORY APPLIED PRESSURE SEALING LONGITUDE LAP JOINT, NO STAPLES, ZEPSTON PREMOLDED PVC FITTING COVERS. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- 3) FLEXIBLE CLOSED CELL ELASTOMERIC THERMAL INSULATION, UNSUT OR PRESUT WITH PRESSURE SENSITIVE ADHESIVE SYSTEM FOR GLOUSE AND VAPOR SEALING, EQUAL TO ARMBONEX AP ARMAFLEX OR ARMAFLEX 2000.
- 4) FOR NON CIRCULATING SYSTEMS, THE FIRST 5 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", 1-1/2" FOR PIPING 1-1/2" AND LARGER
- c) CONDENSATE DRAINS 3/4" FOR PIPING UP TO 1-1/4", 1" FOR PIPING 1-1/2" AND LARGER
- d) REFRIGERANT SUCTON 1/2"
- 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.
- G. EQUIPMENT INSULATION:
- 1) FLEXIBLE FIBERGLASS GLASS FIBER INSULATION, ASTM C 553, TYPE I, CLASS B-4, SEMI-RIGID BOARD, WITH FACTORY LAMINATED KRAFT ALUMINUM FOL (ALL SERVICE JACKET), VAPOR BARRIER, OVENS/GORINGS PIPE AND TANK INSULATION.
- D. DUCTWORK: ACoustICAL INSULATION
- 1) DUCT LINING: 2 LEVEL 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 COVERINGS: 3/4" LEV OF, FIBERGLASS BLANKET WITH FACTORY APPLIED VAPOR BARRIER AND FACINS, 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 CONFORMING WITH ASTM A137, WITH 90 DEGREE ELBOWS WITH DOUBLE WALL, STREAMLINE VANES.
- B. WHERE DUCTWORK IS INDICATED TO BE EXPOSED TO VIEW IN OCCUPIED SPACES, PROVIDE MATERIALS WHICH ARE FREE FROM DISCOLORATIONS AND OTHER IMPERFECTIONS, INCLUDING THOSE WHICH WOULD IMPAIR PAINTING.
- C. DUCTWORK, METAL GAUGES, REINFORCEMENTS, ETC. SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS", LATEST EDITION FOR A 2 INCH WATER VAPOR STATIC PRESSURE.
- 1) RECTANGULAR DUCT:
- a) ELBOWS, UNLESS OTHERWISE INDICATED, SHALL BE CONSTRUCTED WITH CENTERLINE RADIUS OF NOT LESS THAN 15 DIAMETER WITH 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 DETAIL 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, N LIEU OF SHOP-FABRICATED DUCT AND FITTINGS.
- (1) ELBOWS: ONE PIECE CONSTRUCTION FOR 90 DEGREES AND 45 DEGREE ELBOWS 14" AND SMALLER, PROVIDE MULTIPLE GORE CONSTRUCTION FOR LARGER DIAMETERS WITH STANDING SEAM/CONFERENTIAL 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 MINIMUM OBJECTABLE NOISE, AND CAPABLE OF PERFORMING INDICATED SERVICE. INSTALL EACH RUN WITH MINIMUM NUMBER OF JOINTS. ALIGN DUCTWORK ACCURATELY WITH INTERNAL SURFACES. SMOOTH, SUPPORT DUCTS REGULARLY 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 THE DUCT TRUE TO TADUE-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 PERMANENT ENCLOSURE ELEMENTS OF BUILDING, WHEREVER POSSIBLE IN FINISHED AND OCCUPIED SPACES, CONCEAL DUCTWORK FROM VIEW BY LOCATING IN MECHANICAL SHUTTLER, CONCEAL DUCTWORK ABOVE SUSPENDED CEILING, DO NOT ENCASE HORIZONTAL RUNS IN SOLID PARTITIONS, EXCEPT AS SPECIFICALLY SHOWN. COORDINATE LAYOUT WITH SUSPENDED CEILINGS 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 VIBRA, CONCEAL SPACE BETWEEN OPENING AND DUCT OR DUCT INSULATION WITH SHEET METAL FLANGES OF SAME GAUGE AS DUCT. OVERLAP OPENINGS ON 4 SIDES BY AT LEAST 1-1/2".
- 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, COLL TRAVEL, EXHAUST, 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. 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 MEDIUM WALL END FITTINGS: ASTM A 856, GRADE 45-45-12, WITH 1/2" OR 3/4" GRADE 32510 MALLEABLE IRON, OR ASTM A83, 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 DESIGN, AND PROVIDE A SPRINKLER HEAD CABINET AND ANY SPECIAL KRENCHES TO REMOVE OR INSTALL SPRINKLER HEADS.
- 4) FURNISH QUICKSTOP TALON SPRINKLER TOOL, QUICKSTOP TALON SHALL STOP 1/2" AND 3/4" 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, 1 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 RATINGS AND ACCESSORIES SHALL HAVE A FIRE HAZARD CLASSIFICATION WITH A FLAME SPREAD RATINGS OF NOT OVER 25, A FUEL CONTRIBUTION RATING OF NOT OVER 50, AND A SMOKE DEVELOPED RATING OF NOT OVER 10, IN ACCORDANCE WITH NFPA.
- B. PIPE INSULATION - ABOVE GRADE:
- 1) THE PIPING INSULATION USED SHALL HAVE A THERMAL CONDUCTIVITY OF 0.2 BTU PER (IN^2\*HR\*FT) OR LESS.
- 2) FIBERGLASS INSULATION WITH FACTORY APPLIED VAPOR BARRIER, ASJ JACKET, FACTORY APPLIED PRESSURE SEALING LONGITUDE LAP JOINT, NO STAPLES, ZEPSTON PREMOLDED PVC FITTING COVERS. INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.
- 3) FLEXIBLE CLOSED CELL ELASTOMERIC THERMAL INSULATION, UNSUT OR PRESUT WITH PRESSURE SENSITIVE ADHESIVE SYSTEM FOR GLOUSE AND VAPOR SEALING, EQUAL TO ARMBONEX AP ARMAFLEX OR ARMAFLEX 2000.
- 4) FOR NON CIRCULATING SYSTEMS, THE FIRST 5 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", 1-1/2" FOR PIPING 1-1/2" AND LARGER
- c) CONDENSATE DRAINS 3/4" FOR PIPING UP TO 1-1/4", 1" FOR PIPING 1-1/2" AND LARGER
- d) REFRIGERANT SUCTON 1/2"
- 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.
- G. EQUIPMENT INSULATION:
- 1) FLEXIBLE FIBERGLASS GLASS FIBER INSULATION, ASTM C 553, TYPE I, CLASS B-4, SEMI-RIGID BOARD, WITH FACTORY LAMINATED KRAFT ALUMINUM FOL (ALL SERVICE JACKET), VAPOR BARRIER, OVENS/GORINGS PIPE AND TANK INSULATION.
- D. DUCTWORK: ACoustICAL INSULATION
- 1) DUCT LINING: 2 LEVEL 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 COVERINGS: 3/4" LEV OF, FIBERGLASS BLANKET WITH FACTORY APPLIED VAPOR BARRIER AND FACINS, 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"
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11. DUCTWORK:
- A. ALL DUCTWORK, UNLESS OTHERWISE INDICATED, SHALL BE FABRICATED FROM GALVANIZED SHEET STEEL CONFORMING WITH ASTM A137, WITH 90 DEGREE ELBOWS WITH DOUBLE WALL, STREAMLINE VANES.
- B. WHERE DUCTWORK IS INDICATED TO BE EXPOSED TO VIEW IN OCCUPIED SPACES, PROVIDE MATERIALS WHICH ARE FREE FROM DISCOLORATIONS AND OTHER IMPERFECTIONS, INCLUDING THOSE WHICH WOULD IMPAIR PAINTING.
- C. DUCTWORK, METAL GAUGES, REINFORCEMENTS, ETC. SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS", LATEST EDITION FOR A 2 INCH WATER VAPOR STATIC PRESSURE.
- 1) RECTANGULAR DUCT:
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- 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 DETAIL 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, N LIEU OF SHOP-FABRICATED DUCT AND FITTINGS.
- (1) ELBOWS: ONE PIECE CONSTRUCTION FOR 90 DEGREES AND 45 DEGREE ELBOWS 14" AND SMALLER, PROVIDE MULTIPLE GORE CONSTRUCTION FOR LARGER DIAMETERS WITH STANDING SEAM/CONFERENTIAL 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 MINIMUM OBJECTABLE NOISE, AND CAPABLE OF PERFORMING INDICATED SERVICE. INSTALL EACH RUN WITH MINIMUM NUMBER OF JOINTS. ALIGN DUCTWORK ACCURATELY WITH INTERNAL SURFACES. SMOOTH, SUPPORT DUCTS REGULARLY 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 THE DUCT TRUE TO TADUE-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 PERMANENT ENCLOSURE ELEMENTS OF BUILDING, WHEREVER POSSIBLE IN FINISHED AND OCCUPIED SPACES, CONCEAL DUCTWORK FROM VIEW BY LOCATING IN MECHANICAL SHUTTLER, CONCEAL DUCTWORK ABOVE SUSPENDED CEILING, DO NOT ENCASE HORIZONTAL RUNS IN SOLID PARTITIONS, EXCEPT AS SPECIFICALLY SHOWN. COORDINATE LAYOUT WITH SUSPENDED CEILINGS 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 VIBRA, CONCEAL SPACE BETWEEN OPENING AND DUCT OR DUCT INSULATION WITH SHEET METAL FLANGES OF SAME GAUGE AS DUCT. OVERLAP OPENINGS ON 4 SIDES BY AT LEAST 1-1/2".
- 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, COLL TRAVEL, EXHAUST, 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



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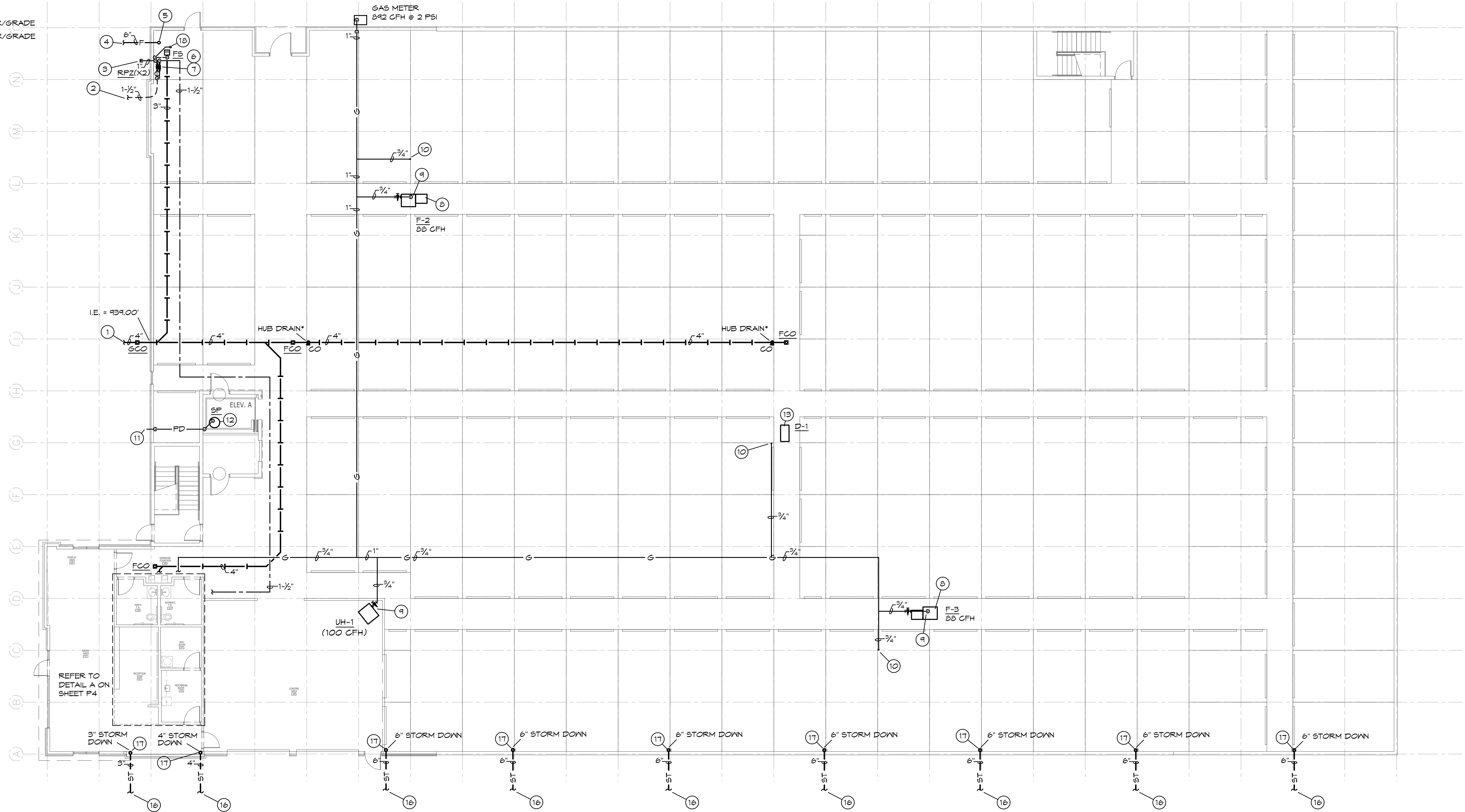
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Date: 2022/10/25  
Drawn by: DS/LC  
Checked by: DS/EK  
Revisions:

P1

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
	FLOOR DRAIN
	FLOOR CLEAN OUT
	WALL CLEAN OUT
	GRADE CLEAN OUT
	VALVE
	PRESSURE REGULATOR
	CHECK VALVE
	I.E.
	MATCH MARKS ON PLUMBING RISER DIAGRAM



**PLUMBING 1ST FLOOR PLAN**  
SCALE: 3/32" = 1'-0"  
F.F.E. = 942.00'

PLUMBING PLAN NOTES:

- SEE CIVIL PLAN FOR CONTINUATION OF 4" SANITARY SEWER. MAINTAIN MIN 30" COVER.
- SEE CIVIL PLAN FOR CONTINUATION OF 1-1/2" DOMESTIC C.W. MAINTAIN MIN 48" COVER.
- STUB OUT 1" LINE AND CAP FOR FUTURE CONNECTION BY IRRIGATION CONTRACTOR.
- 6" FIRE LINE. SEE CIVIL PLANS FOR CONTINUATION. MAINTAIN A MINIMUM 48" BURY FOR FREEZE PROTECTION.
- 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.
- PROVIDE 1-1/2" 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.
- 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.
- 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):

- CONNECT GAS TO EQUIPMENT AS REQUIRED AND AS DETAILED.
- ROUTE 3/4" GAS PIPING UP TO FLOOR ABOVE. SEE SHEET P2 FOR CONTINUATION.
- 2" PUMP DISCHARGE TO DAYLIGHT. SEAL PENETRATION WEATHERTIGHT.
- 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.
- CONNECT CONDENSATE TO DEHUMIDIFIER AS REQUIRED AND AS DETAILED. ROUTE TO NEAREST DRAIN WITH AIR GAP OR TO DAYLIGHT.
- SEE CIVIL PLAN FOR CONTINUATION OF STORM PIPING. MAINTAIN MIN 24" COVER.
- INSTALL CLEANOUT AT BASE OF RISER.
- SEE CIVIL PLAN FOR CONTINUATION OF STORM PIPING. MAINTAIN MIN 24" COVER.
- INSTALL CLEANOUT AT BASE OF RISER.
- ROUTE 2" VENT PIPING UP TO FLOOR ABOVE. REFER TO SHEET P2 FOR CONTINUATION.

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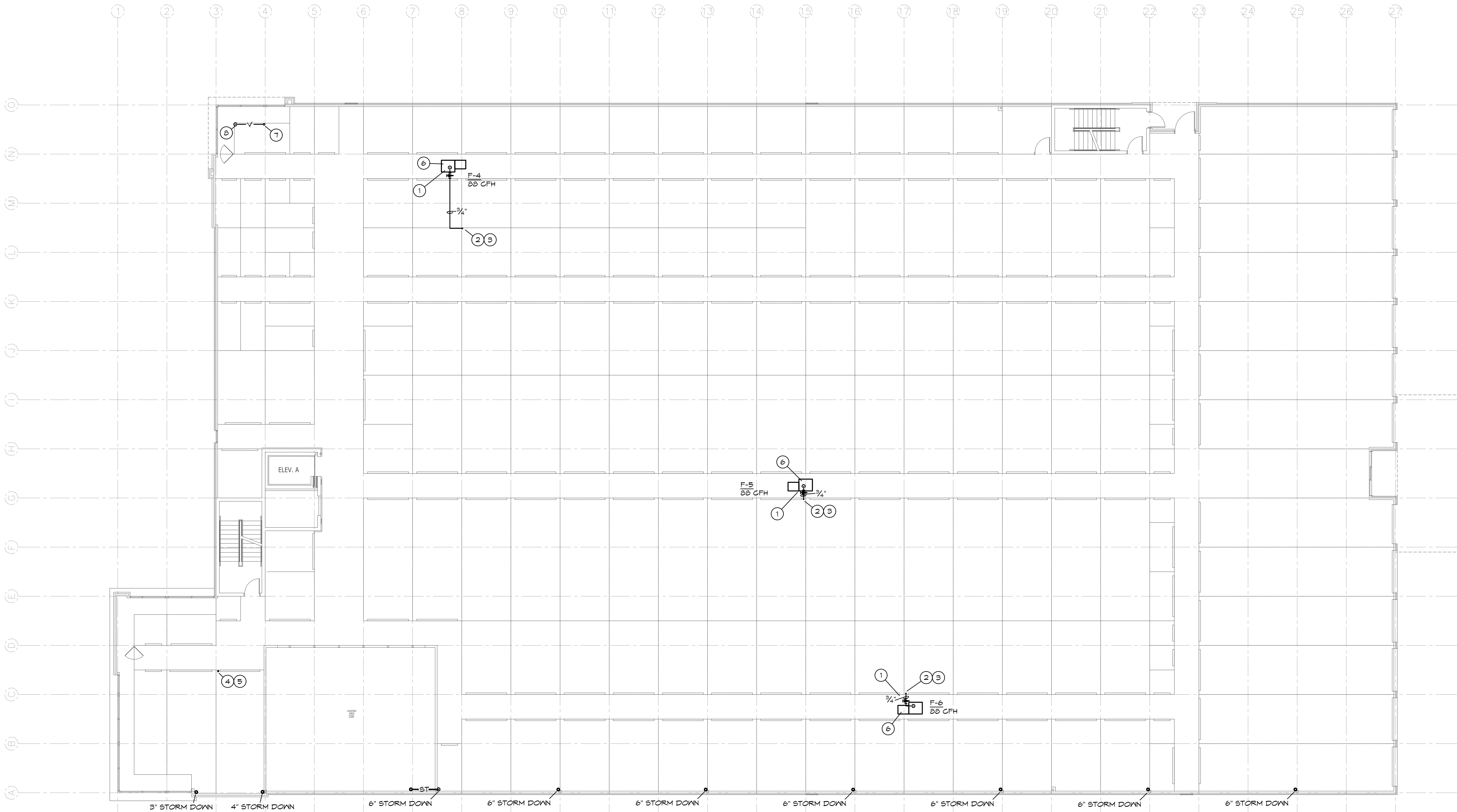
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Checked by: DS/EK  
Revisions:

P2



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 P1 FOR CONTINUATION.
3. ROUTE 3/4" 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.

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

PLUMBING 2ND FLOOR PLAN



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4101 NE PORT DRIVE  
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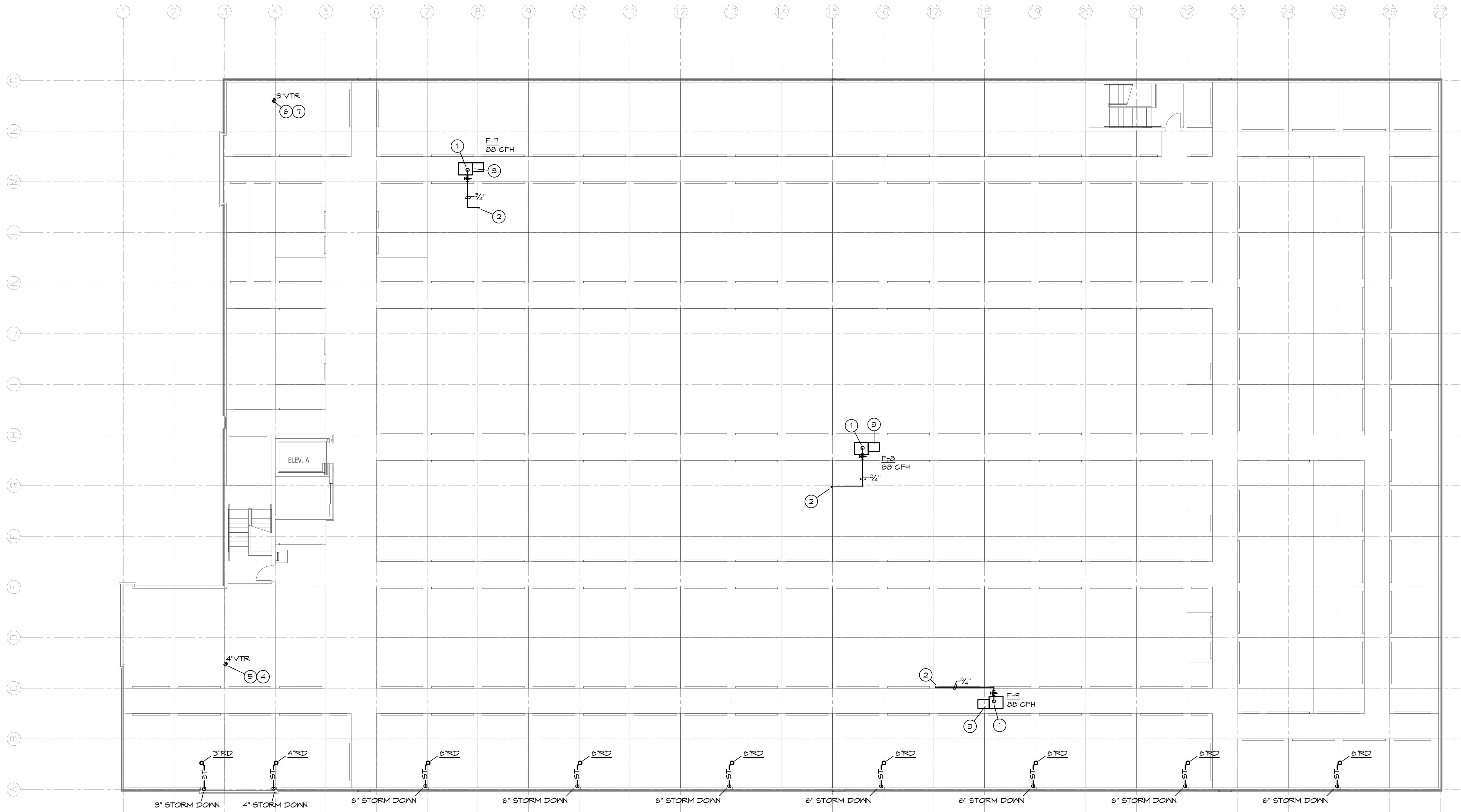
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Revisions:

P3

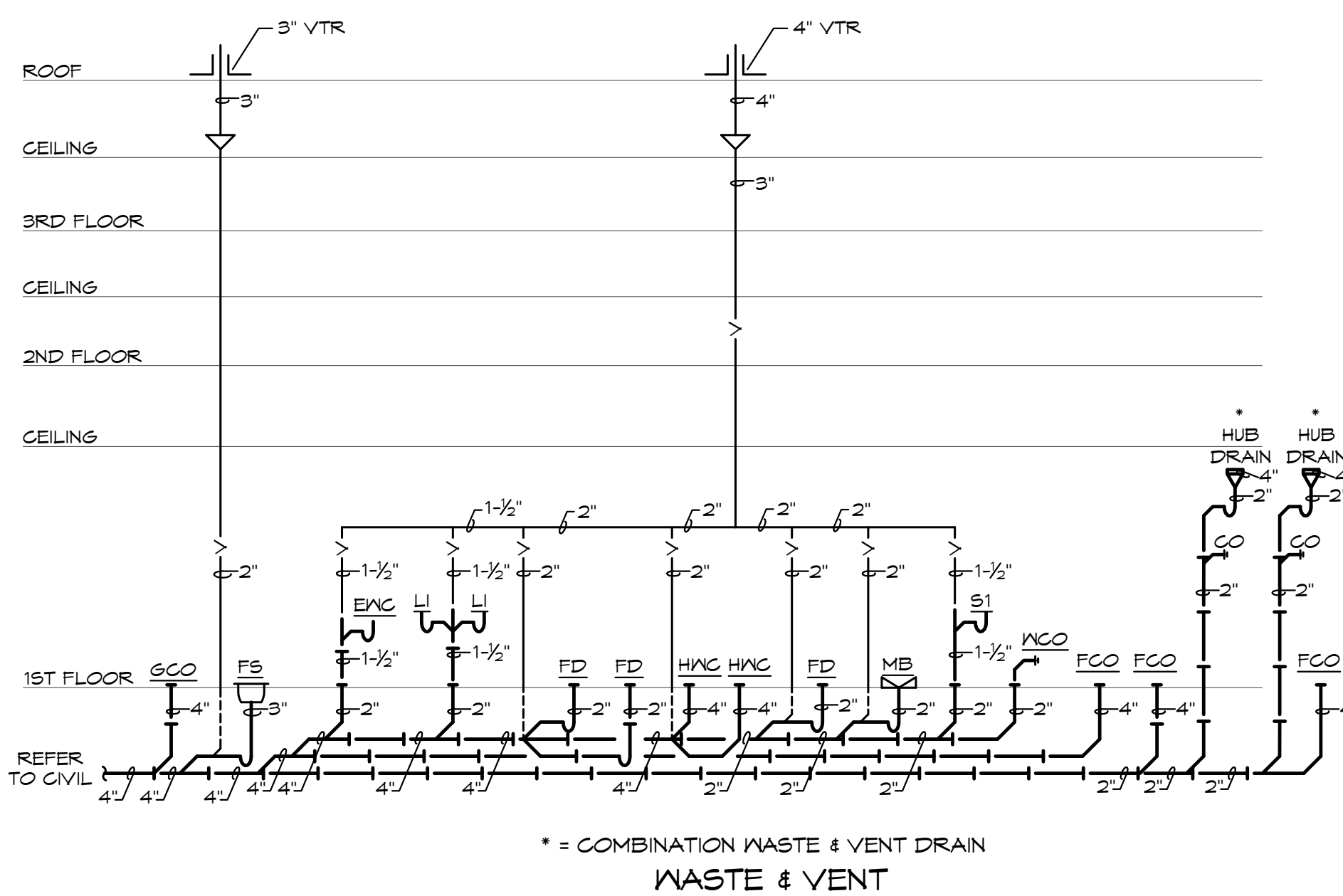
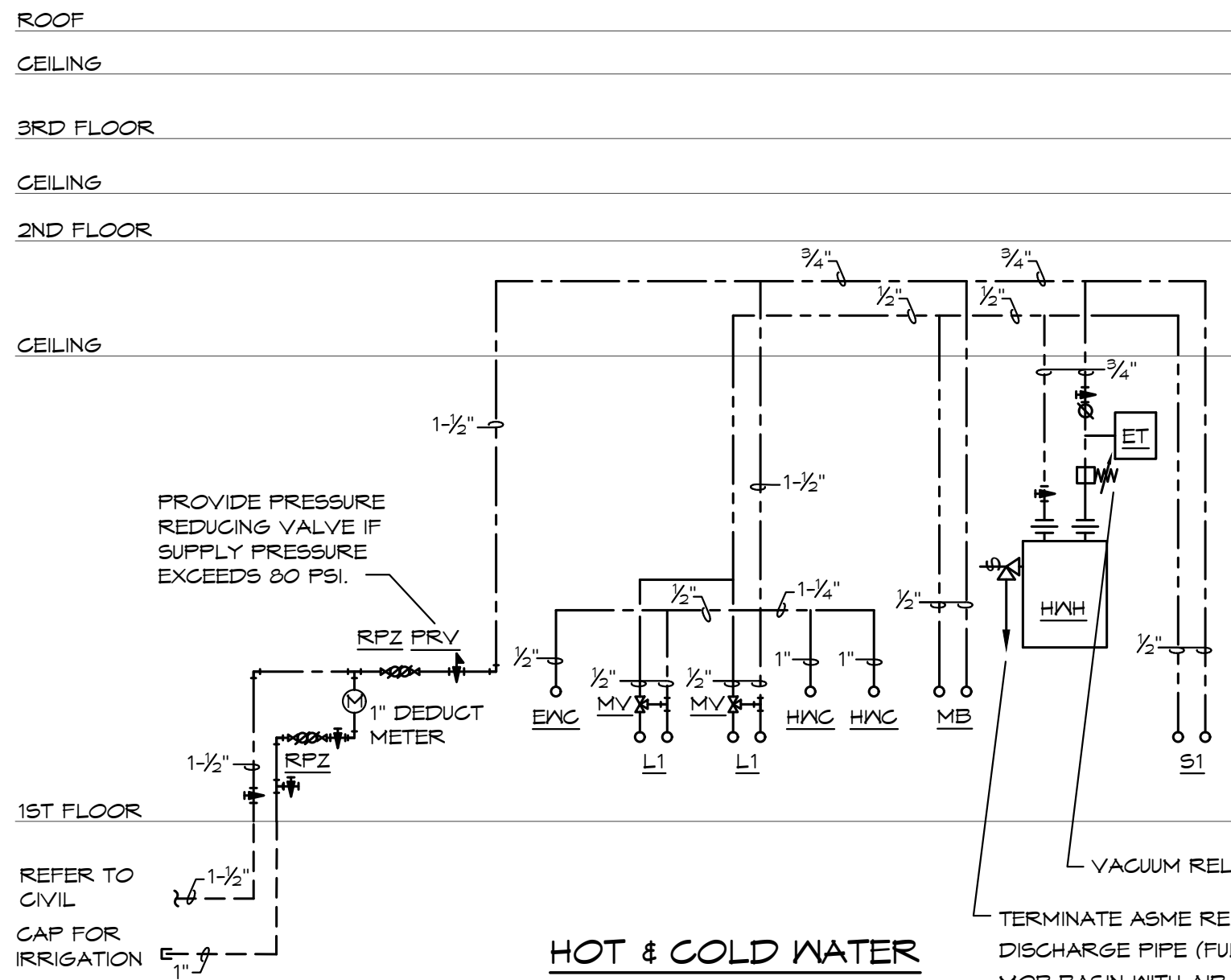


**PLUMBING 3RD FLOOR PLAN**  
NORTH  
SCALE: 3/32" = 1'-0"

PLUMBING PLAN NOTES:

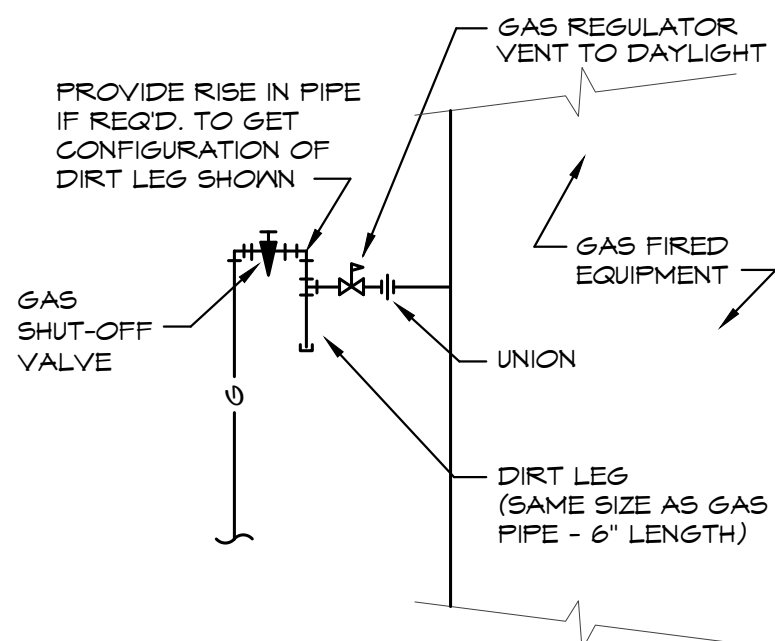
- CONNECT GAS TO EQUIPMENT AS REQUIRED AND AS DETAILED.
- ROUTE 3/4" GAS PIPING UP FROM FLOOR BELOW. REFER TO SHEET P2 FOR CONTINUATION.
- CONNECT CONDENSATE TO FURNACE FLUE AND COIL AS REQUIRED AND AS DETAILED. ROUTE TO NEAREST DRAIN WITH AIR GAP OR TO DAYLIGHT.
- ROUTE 3" VENT PIPING UP FROM FLOOR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





## PLUMBING RISER DIAGRAMS

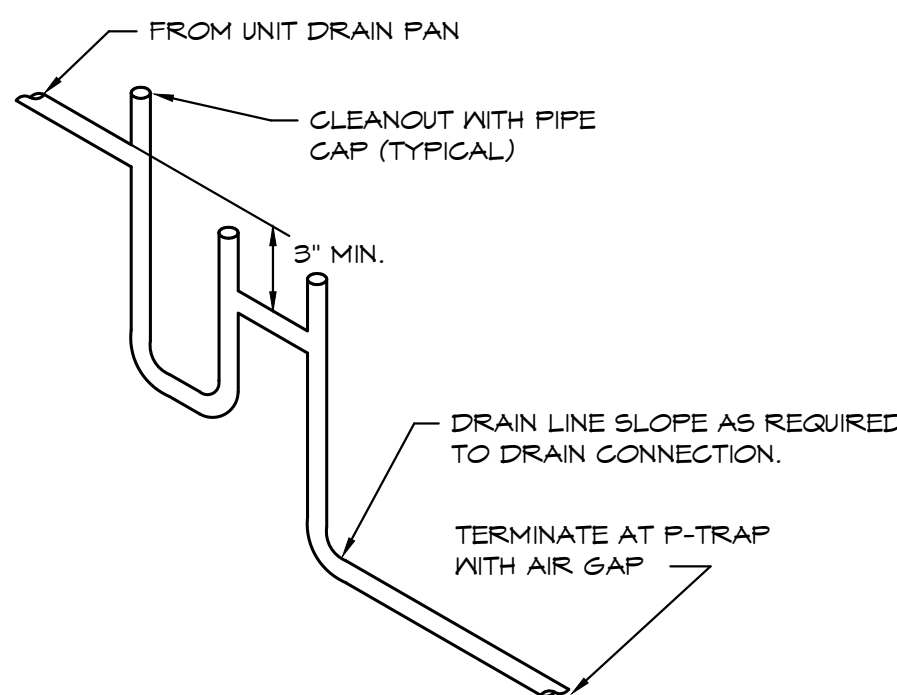
SCALE: NONE



GAS PRESSURE REGULATORS FOR FURNACES AND MAKE-UP AIR UNITS (MAU) SHALL BE SENSUS #143-80-2, 2 PSI INLET / 1" 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)

WC	WATER CLOSET: TOTO, #CST144E(R)/G/N, "DRAKE CLOSE COUPLED TOILET", 1.28 GALLON FLUSH, ELONGATED BOWL, FLOOR MOUNTED, FLOOR OUTLET, TANK TYPE, VITREOUS CHINA, SIPHON-JET ACTION, #SC534 OPEN FRONT SEAT WITH CHECK HINGE AND LESS COVER, CHROME PLATED ANGLE STOP AND RISER.
HWC	WATER CLOSET (HANDICAPPED): TOTO, #CT105ELN, VITREOUS CHINA, FLOOR MOUNTED, FLOOR OUTLET, 11-1/2" HIGH ELONGATED BOWL, SIPHON-JET ACTION, #MTMLN-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.
EW	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 #E66P20, 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: MATTS, #LFUS5-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: MATTS #F009, 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, #1185, 100 GPM @ 42 FT HEAD, 1/2 HP, 200 VOLT, 16.8 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 DEFINED 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 3/4" and below with support channel	6'	3/8"
Pex 1" and above with support channel	8'	3/8"

## PLUMBING PLAN NOTES:

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

PLUMBING FIXTURE WATER COUNT							
FIXTURE	QUANTITY	GW FU	CW TOTAL FU	HW FU	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

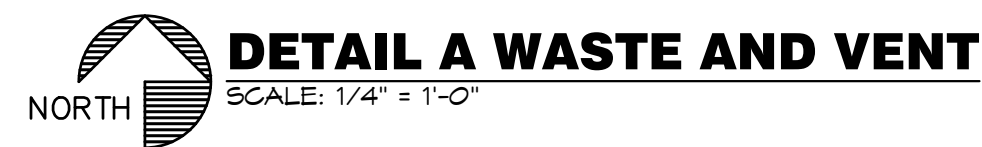
COLD WATER MAIN - 1-1/2"  
HOT WATER MAIN - 1"

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	2-1/8"	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 DIAGRAM 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.



## DETAIL A WASTE AND VENT

SCALE: 1/4" = 1'-0"



## DETAIL A WATER

SCALE: 1/4" = 1'-0"



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

10/25/2022



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

P4

BC PROJECT #: 22573  
MISSOURI PE COA #2009003629  
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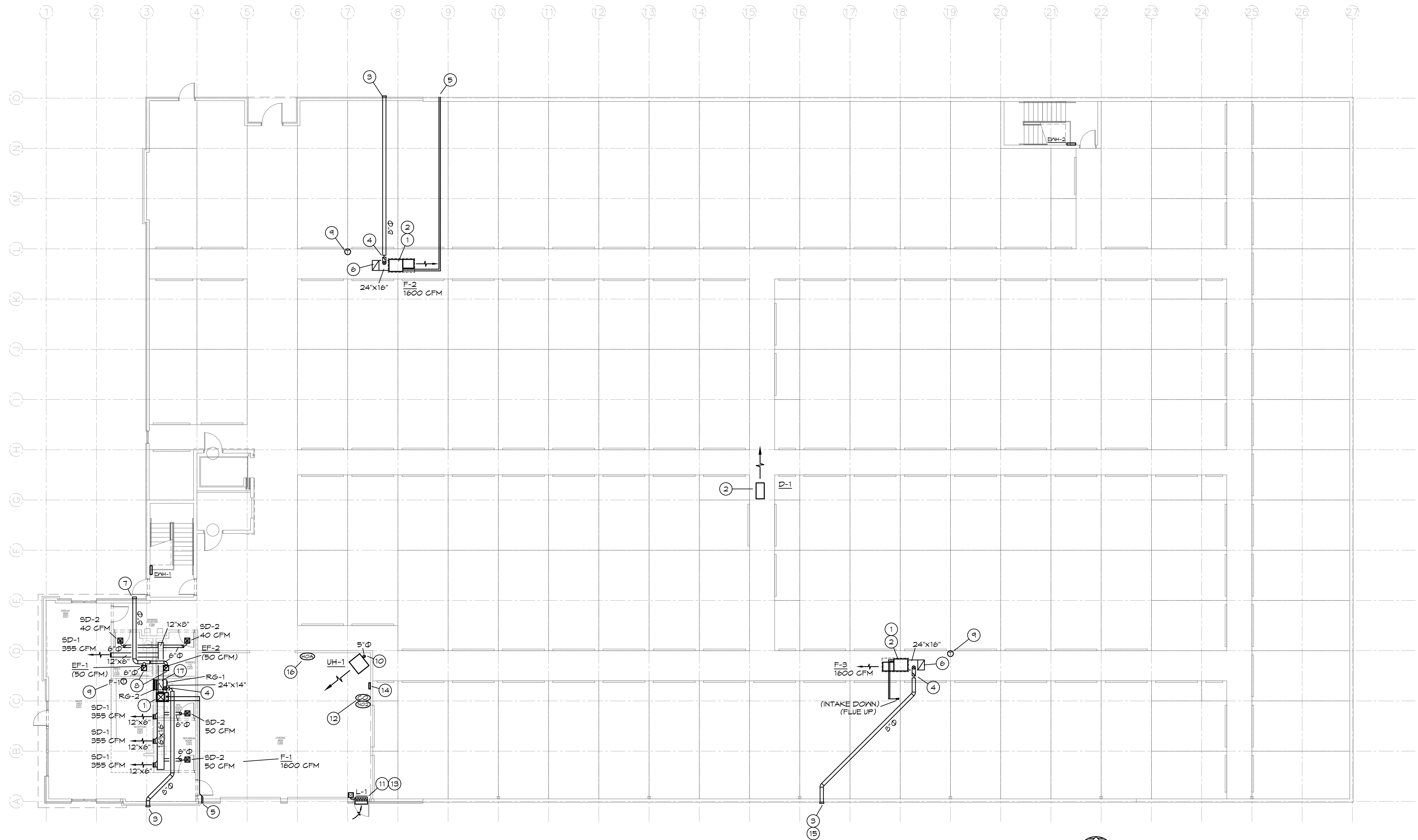




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# M1



**MECHANICAL 1ST FLOOR PLAN**  
SCALE: 3/32" = 1'-0"

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MISSOURI	PE COA #2009003629

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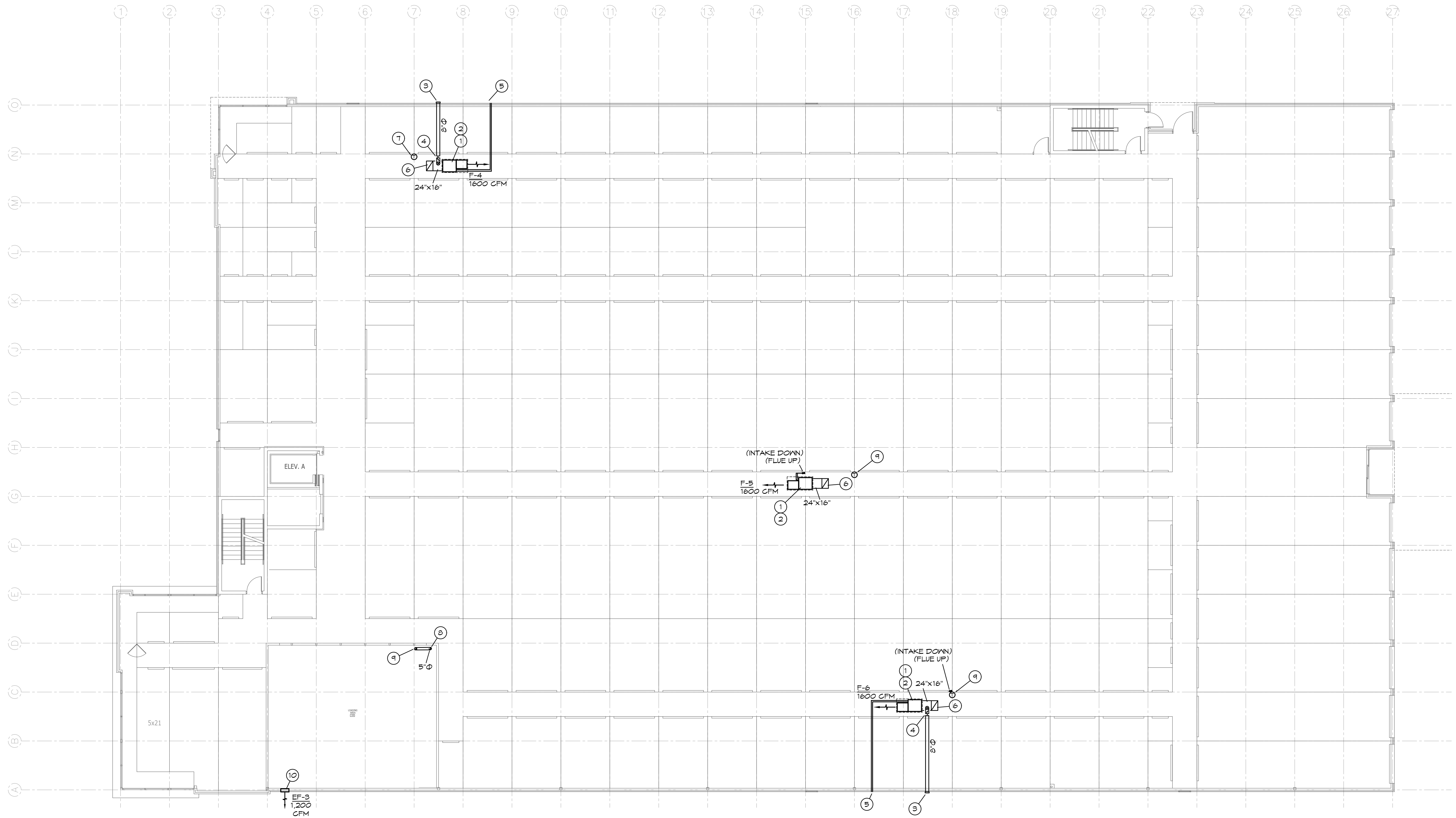


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Date: 2022/10/25  
Drawn by: DS/LC  
Checked by: DS/EK  
Revisions:

M2



**MECHANICAL 2ND FLOOR PLAN**  
NORTH  
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 PENETRATIONS WEATHER TIGHT.
- ⑥ OPEN RA DUCT WITH BIRD SCREEN OVER OPENING.
- ⑦ PROVIDE T-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.G. TO INTERLOCK WITH CO/ NO2 SYSTEM AND L-1.

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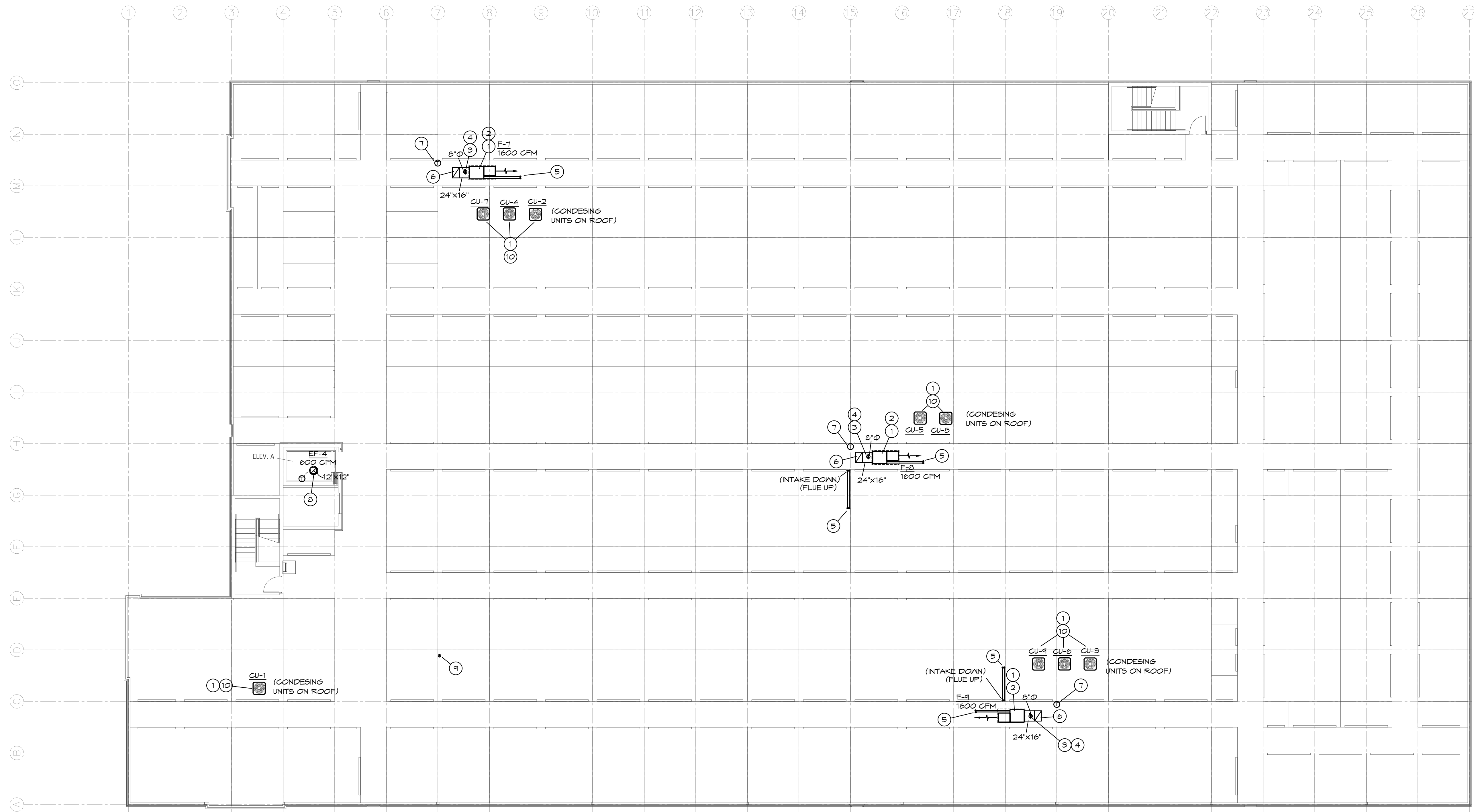


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Drawn by: DS/LC  
Checked by: DS/EK  
Revisions:

M3



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 8" Ø 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 MANUFACTURER'S VENT TERMINATION AS REQUIRED. OFFSET AS REQUIRED TO MAINTAIN 10' CLEARANCE FROM ALL OUTDOOR AIR INTAKES. SEAL PENETRATIONS 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.
- 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.

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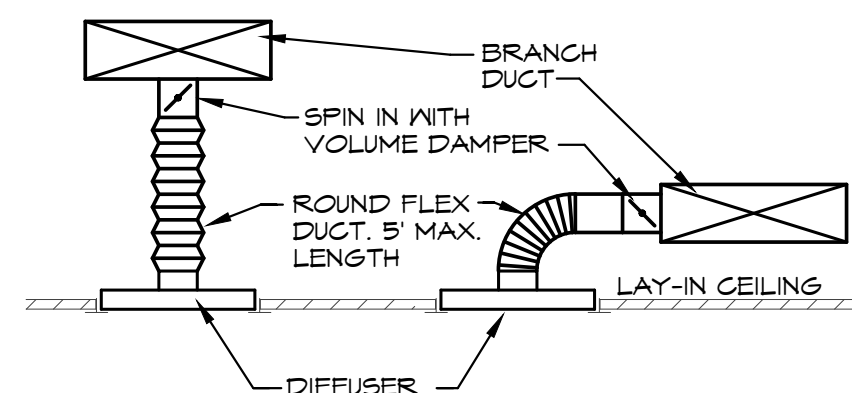
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## OUTDOOR AIR CALCULATIONS

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) cfm/sqft	Zone air effectiveness (Ez)	Zone outdoor airflow (cfm)
F-1	750	Office spaces	5	5	0.06		64	0.8	80
	78	Break Room	25	5	0.06		14	0.8	18
	132	Toilet rooms public	0	0	0	50%	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									747



**DIFFUSER DETAIL**  
SCALE: NONE

## GAS FIRED UNIT HEATER SCHEDULE

MARK	MFG	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.

## ELECTRIC WALL HEATER SCHEDULE

MARK	MFG	MODEL NO.	BTUH	ELECTRICAL		NOTES
				VOLT/Ø/HZ	WATTS	
EW-1	RAYMALL	AFG8130T	10,239	208/1/60	3 KW	1,2
EW-2						

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

## LOUVER SCHEDULE

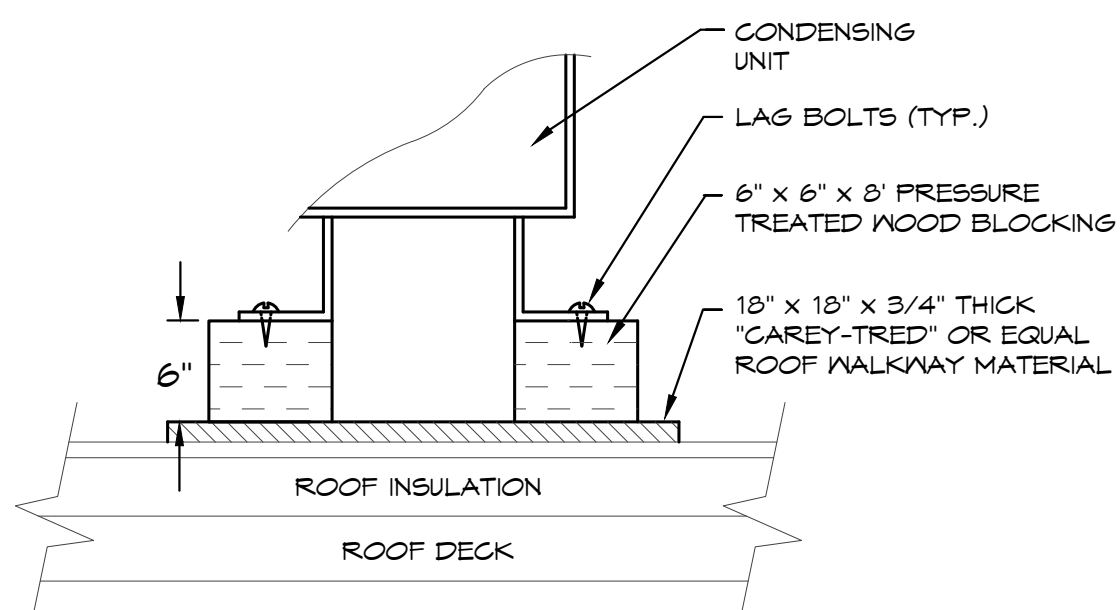
MARK	MFG	MODEL	FRAME	SIZE	NOTES
L-1	RUSKIN	ELF375X	STD	24"x18"	1,2

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

## DIFFUSER SCHEDULE

MARK	MFG	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.



SET SUPPORT BLOCKS IN MASTIC ON WALKWAY MATERIAL.  
**CONDENSING UNIT SUPPORT DETAIL**  
SCALE: NONE

## FURNACE SCHEDULE

MARK	MFG	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	MFG	MODEL NO.	COOLING		ELECTRICAL		MIN. MCA (AMPS)	MIN. MOCP (AMPS)	EVAP. COIL MODEL NO.	SEER	NOTES
			TOTAL BTUH	AMB. DB/WB	EVAP. EAT DB/WB	VOLT/Ø/HZ					
CU-1	LENNOX	TS4048S4	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	MFG	MODEL	CFM	EXTERNAL STATIC P. IN. WG.	RPM	ELECTRICAL		FAN TYPE	CONTROLS	NOTES
						VOLT/Ø/HZ	PAW			
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		10XW40D15	780		1,550		1/8 HP	SIDEWALL EXH.	SENSOR	4
EF-4		90C150DH	600		1,268		1/8 HP	ROOF EXH.	THERMOSTAT	2,3

- 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 LINE VOLTAGE THERMOSTAT FOR CONTROL OF FAN. SET TO TURN FAN ON AT 50°F AND 80°F.
  4. PROVIDE WALL SLEEVE, REAR GUARD HOUSING, BACKDRAFT DAMPER, BIRD SCREEN, AND HAND/OFF/AUTO SWITCH.

## DEHUMIDIFIER SCHEDULE

MARK	MFG	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.

BC PROJECT #: 22573  
MISSOURI PE COA #2009003629  
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Date: 2022/10/25  
Drawn by: DS/ILC  
Checked by: DS/EK  
Revisions:

M4