

PLUMBING SPECIFICATIONS

1. GENERAL PROVISIONS

- A. THE PROVISIONS OF THE INSTRUCTIONS TO BIDDERS, GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, ALTERNATES, ADDENDAS', AND DIVISION 1 ARE A PART OF THIS SPECIFICATION. CONTRACTORS AND SUBCONTRACTORS SHALL EXAMINE SAME AS WELL AS OTHER DIVISIONS OF THE SPECIFICATIONS WHICH AFFECT WORK UNDER THIS DIVISION.
B. THIS CONTRACTOR SHALL PROVIDE ALL LABOR, EQUIPMENT, SUPPLIES, SERVICES, AND SHALL PERFORM ALL WORK COMPLETE AND IN STRICT ACCORDANCE WITH THIS SPECIFICATION AND APPLICABLE DRAWINGS. ANY DEVIATIONS SHALL BE CLEARLY DEFINED AND ITEMIZED IN ACCORDANCE WITH SECTION 10.F OF THIS SPECIFICATION.
C. THIS CONTRACTOR IS INSTRUCTED TO READ CAREFULLY THE SPECIFICATIONS FOR ALL PARTS OF THE WORK, WHICH INCLUDE THE ARCHITECTURAL, ELECTRICAL, MECHANICAL, PLUMBING, FIRE PROTECTION, CIVIL, STRUCTURAL AND ALL OTHER DRAWINGS AS WELL AS THE SPECIFICATIONS FOR ALL THE DIVISIONS THAT ARE PART OF THE CONTRACT DOCUMENTS.
D. ALL ITEMS OF LABOR, MATERIAL AND EQUIPMENT NOT SPECIFICALLY MENTIONED HEREIN OR SHOWN ON PLANS, BUT INCIDENTAL TO, OR REQUIRED FOR THE COMPLETE INSTALLATION AND PROPER OPERATION OF THE WORK, SHALL BE FURNISHED AS IF CALLED FOR IN DETAIL BY THE SPECIFICATIONS OR DRAWINGS.
E. AS USED IN THIS SPECIFICATION, "PROVIDE" MEANS "FURNISH AND INSTALL," "FURNISH" MEANS "TO PURCHASE AND DELIVER TO THE PROJECT SITE COMPLETE WITH EVERY NECESSARY APPURTENANCE AND SUPPORT," AND "INSTALL" MEANS "TO UNLOAD AT THE DELIVERY POINT AT THE SITE AND PERFORM EVERY OPERATION NECESSARY FOR PROPER INSTALLATION PER CODES AND MANUFACTURERS REQUIREMENTS, TO ESTABLISH SECURE MOUNTING AND CORRECT OPERATION AT THE PROPER LOCATION IN THE PROJECT.

2. PERMITS, CODES, INSPECTIONS, AND TESTS

- A. THE PLUMBING CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND INSPECTIONS REQUIRED FOR THE PROSECUTION OF PLUMBING WORK. ALL PERMITS AND CERTIFICATES OF INSPECTION AND APPROVAL SIGNED BY THE CONTROLLING BUILDING DEPARTMENT SHALL BECOME PROPERTY OF THE OWNER.
B. DRAWINGS INDICATE THE MINIMUM DESIGN REQUIREMENTS. NATIONAL, STATE, AND LOCAL CODES SHALL BE FOLLOWED. COMPLY WITH THE LATEST EDITIONS OF THE LOCAL GOVERNING PLUMBING CODE, LOCAL GOVERNING MECHANICAL CODE, AND NFPA STANDARDS. THE CONTRACTOR SHALL INCLUDE THE COST OF SATISFYING SUCH CODES AND STANDARDS IN HIS BIDDING. FOLLOWING COMPLETION OF THE PLUMBING WORK, FURNISH TO THE OWNER, IN DUPLICATE, CERTIFICATES OF INSPECTION AND APPROVAL BY REGULATORY AGENCIES HAVING JURISDICTION.

- (1) DEMONSTRATE TO THE OWNER'S SATISFACTION THE PROPER OPERATION OF EACH OF THE SYSTEMS COMPRISING THIS CONTRACT BEFORE FINAL PAYMENT.
(2) IMMEDIATELY CORRECT ANY WORK FOUND AT VARIANCE WITH THESE SPECIFICATIONS, THE NATIONAL, STATE, AND LOCAL CODES, AND REQUIREMENTS OF GOVERNING REGULATORY AGENCIES.
(3) TEST PIPING FOR LEAKS; REPAIR LEAKS IN COPPER TUBING BY SWEATING OUT JOINTS, THOROUGHLY CLEANING BOTH TUBE AND FITTING, AND RE-SOLDERING OR RE-BRAZING; CORRECT LEAKS IN SCREWED JOINTS BY REPLACING THREAD OR FITTING OR BOTH.
a. DOMESTIC WATER SHALL BE TESTED WITH WATER AT A PRESSURE OF 125 PSI FOR 6 HOURS.
b. NATURAL GAS SHALL BE TESTED WITH COMPRESSED AIR AT A PRESSURE OF 1-1/2 TIMES THE PROPOSED MAXIMUM WORKING PRESSURE (BUT NOT LESS THAN 3 PSI) FOR 24 HOURS. TESTING PROCEDURE SHALL CONFORM TO NFPA 54 "NATIONAL FUEL GAS CODE" AND ICC FUEL GAS CODE REQUIREMENTS.
c. SANITARY DRAIN AND VENT AND STORM PIPING SHALL BE TESTED WITH WATER PER GOVERNING PLUMBING CODE AND THE LOCAL AUTHORITY.

3. VISIT TO THE SITE

- A. THE CONTRACTOR SHALL VISIT THE SITE OF THE WORK AND BECOME FAMILIAR WITH ALL CONDITIONS AFFECTING THE WORK. THE SUBMISSION OF A PROPOSAL SHALL PRESUPPOSE KNOWLEDGE OF ALL SUCH CONDITIONS AND NO ADDITIONAL COMPENSATION SHALL BE ALLOWED WHERE EXTRA LABOR OR MATERIALS ARE REQUIRED BECAUSE OF IGNORANCE OF THESE CONDITIONS.

4. PROTECTION

- A. THE PLUMBING CONTRACTOR SHALL PROVIDE ALL NECESSARY PROTECTION FROM DIRT AND WATER DURING CONSTRUCTION. NECESSITATED BY PLUMBING WORK. PROTECTION METHODS ARE SUBJECT TO APPROVAL BY THE ARCHITECT.

5. EQUIPMENT AND MATERIALS

- A. ALL EQUIPMENT AND MATERIALS SHALL BE NEW AND SHALL CONFORM TO UNDERWRITERS' LABORATORIES STANDARDS, WHERE APPLICABLE. WHERE SPECIFICATIONS DESCRIBE, OR PLANS SHOW, MATERIALS OR EQUIPMENT OF HIGHER QUALITY THAN REQUIRED BY CODE AND LOCAL RULING, THE DRAWINGS AND SPECIFICATIONS SHALL GOVERN THE QUALITY OF THE MATERIAL OR EQUIPMENT.
B. THE CONTRACTOR SHALL SUBMIT PROOF, IF REQUESTED BY THE OWNER THAT THE MATERIALS, APPLIANCES, EQUIPMENT OR DEVICES FURNISHED AND INSTALLED UNDER THIS CONTRACT, MEET THE REQUIREMENTS OF THE UNDERWRITERS' LABORATORIES, INC., AS REGARDS FIRE AND CASUALTY HAZARDS. THE LABEL OF OR LISTING BY THE UNDERWRITERS' LABORATORIES, INC. WILL BE ACCEPTED AS CONFORMING WITH THIS REQUIREMENT. IN LIEU OF THE LABEL OR LISTING, THE CONTRACTOR MAY SUBMIT INDEPENDENT PROOF SATISFACTORY TO THE ARCHITECT THAT THE MATERIALS, APPLIANCES OR DEVICES CONFORM TO THE PUBLISHED STANDARDS, INCLUDING METHODS OF TEST OF THE UNDERWRITERS' LABORATORIES, INC. UNDERWRITERS' LABORATORIES, INC. AND ITS PUBLICATIONS WILL BE REFERRED TO HEREINAFTER BY THE ABBREVIATION UL, WITH OR WITHOUT ADDITIONAL IDENTIFYING SYMBOLS.

6. GUARANTEE

- A. THE PLUMBING CONTRACTOR SHALL GUARANTEE FOR A PERIOD OF ONE YEAR THAT ALL WORK AND EQUIPMENT WILL REMAIN FREE FROM ALL DEFECTS IN WORKMANSHIP AND MATERIALS, AND THAT IT WILL COMPLY WITH ALL THE SPECIFIC REQUIREMENTS OF THE SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS GOVERNING THE WORK.
B. ALL WORK FOUND BY THE ENGINEER TO BE DEFECTIVE WILL BE REPLACED WITH NEW WORK MEETING ALL THE REQUIREMENTS OF THE CONTRACT. THE PLUMBING CONTRACTOR WILL BEAR ALL COSTS OF SUPPLYING SUCH NEW WORK, AND INSTALLING AND FINISHING SAME, AND WILL ASSUME ALL COSTS FOR REPLACING OTHER WORK DAMAGED BY THE REMOVAL AND REPLACEMENT OF ANY OF THE WORK. THE PLUMBING CONTRACTOR WILL BEAR ALL COSTS FOR FREIGHT, DRAYAGE AND DEMURRAGE, AND ALL LABOR IN CONNECTION THEREWITH.

7. CUTTING, PATCHING, FIRESTOPPING AND PAINTING

- A. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR CUTTING ALL HOLES REQUIRED FOR INSTALLATION OF PLUMBING WORK. HOLES SHALL BE CUT IN A NEAT MANNER SATISFACTORY TO THE ARCHITECT.
B. CONTRACTOR SHALL EMPLOY AN BUILDING OWNER APPROVED ROOFING CONTRACTOR FOR ALL ROOF PENETRATIONS. ROOF SHALL BE REPAIRED SO AS NOT TO VOID ROOF WARRANTY.
C. UNLESS NOTED OTHERWISE, ALL HOLES OR DAMAGE CAUSED BY THE REMOVAL OF EXISTING WORK OR THE INSTALLATION OF NEW WORK SHALL BE PROPERLY PATCHED BY THIS CONTRACTOR. HOLES SHALL BE NEATLY PATCHED AND PAINTED WITH SUITABLE MATERIAL TO MATCH EXISTING SURFACES. HOLES THROUGH FLOORS OR FIRE WALLS SHALL BE SEALED WITH THE APPROPRIATE INTUMESCENT CAULK, PUTTY, STRIP OR SHEET TYPE FIRE BARRIER PRODUCT.
D. FIRESTOP SYSTEM (REQUIRED FIRESTOPPING MATERIALS) SHALL BE DETERMINED BY THE WALL OR FLOOR/CEILING ASSEMBLY AND PENETRATION TYPE AND SHALL BE UL LISTED AND TESTED IN ACCORDANCE WITH ASTM E814. FIRE RATING OF THE FIRESTOP SYSTEM SHALL BE EQUIVALENT TO THE ASSEMBLY WHICH IS PENETRATED.

- E. ACCEPTABLE FIRE BARRIER PRODUCTS: HILTI 'FS-ONE', NELSON 'FLAMESEAL' OR APPROVED EQUAL AS MANUFACTURED BY 3M.

8. EXCAVATING, TRENCHING, AND BACKFILLING:

- A. FURNISH MATERIALS, TOOLS, LABOR AND SUPERVISION NECESSARY TO PROVIDE ALL EXCAVATING, TRENCHING AND BACKFILLING REQUIRED FOR THE PROPER INSTALLATION OF EQUIPMENT AND PIPING.
B. EXACT ROUTING OF TRENCHING SHALL BE DETERMINED BY THE CONTRACTOR AND APPROVED, IN ADVANCE, BY THE OWNER.
C. ALL WORK SHALL COMPLY WITH THE REQUIREMENTS OF THE GOVERNING AUTHORITIES.
D. WHERE TRENCHES ARE EXCAVATED SUCH THAT THE BOTTOM OF THE TRENCH FORMS THE BED FOR THE PIPE, SOLID AND CONTINUOUS LOAD-BEARING SUPPORT SHALL BE PROVIDED BETWEEN JOINTS. BELL HOLES, HUB HOLES AND COUPLED HOLES SHALL BE PROVIDED AT POINTS WHERE THE PIPE IS JOINED. SUCH PIPE SHALL NOT BE SUPPORTED ON BLOCKS TO GRADE.

9. CLEANING AND PAINTING

- A. CLEAN NEW PIPING AFTER WORK IS COMPLETE TO REMOVE PIPE DOPE, LOOSE MILK SCALE AND OTHER EXTRANEOUS MATERIALS.
B. TOUCH UP AND REPAIR ANY DAMAGED FACTORY FINISHES ON EQUIPMENT AND MATERIALS FURNISHED. OTHER PAINTING WILL BE DONE UNDER THE PAINTING DIVISION OF THE SPECIFICATIONS.

10. COORDINATION AND CONDUCT OF WORK

- A. PLUMBING CONTRACTOR SHALL COORDINATE ALL NEW (GAS, DOMESTIC WATER, SANITARY) UTILITY CONNECTIONS AND METERING REQUIREMENTS WITH LOCAL UTILITY COMPANY.
B. PLUMBING DRAWINGS ARE DIAGRAMMATIC, INDICATING GENERAL ARRANGEMENT, APPROXIMATE SIZES, GENERAL LOCATIONS OF EQUIPMENT, AND PIPING. VERIFY DIMENSIONS IN FIELD; ADJUST TO MANUFACTURER'S SHOP DRAWINGS. DO NOT SCALE DRAWINGS.
C. ALL REQUESTS FOR INFORMATION SUPPLEMENTAL TO THE CONSTRUCTION DOCUMENTS SHALL BE SUBMITTED IN WRITING TO THE ARCHITECT FOR DISTRIBUTION TO THE APPROPRIATE PARTY(S).
D. DRAWINGS AND SPECIFICATIONS ARE TO BE CONSIDERED AS SUPPLEMENTING EACH OTHER. WORK SPECIFIED BUT NOT SHOWN, OR SHOWN BUT NOT SPECIFIED, SHALL BE PERFORMED OR FURNISHED AS THOUGH MENTIONED IN BOTH SPECIFICATIONS AND DRAWINGS.
E. ARCHITECTURAL AND STRUCTURAL DRAWINGS SUPERSEDE PLUMBING DRAWINGS. DETERMINE THAT WORK OF THIS DIVISION CAN BE ACCOMMODATED WITHIN SPACES PROVIDED. NOTIFY ARCHITECT OF ANY INTERFERENCES BEFORE STARTING INSTALLATION.
F. DETERMINE SIZES, LOCATIONS FOR CHASES AND OPENINGS NECESSARY FOR INSTALLATION OF PLUMBING WORK. COOPERATE WITH OTHER TRADES IN SETTING SLEEVES, INSERTS AND HANGERS.
G. COORDINATE THIS WORK WITH ALL TRADES. ARRANGE OPERATIONS SO AS NOT TO DELAY INSTALLATION OR COMPLETION OF ANY PARTS OF INTERRELATED WORK SO THAT CONSTRUCTION MAY PROCEED ON SCHEDULE.
H. COOPERATE WITH ALL TRADES IN PREPARING INTERFERENCE DRAWINGS FOR AREAS WHERE THERE IS POSSIBLE CONFLICT BETWEEN TRADES. EXACT LOCATION OF PIPES, AND EQUIPMENT SHALL BE BASED ON FIELD MEASUREMENTS WITH FINAL ARRANGEMENT DETERMINED BY INTRA-TRADE AGREEMENTS SUBJECT TO ARCHITECT'S APPROVAL.
I. ARCHITECT RESERVES THE RIGHT TO MAKE REASONABLE CHANGES IN INDICATED LOCATIONS WITHOUT EXTRA COST TO THE OWNER.

- J. ALL WORK SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER BY FIRST-CLASS MECHANICS. THE CONTRACTOR SHALL PROVIDE ADEQUATE AND COMPETENT SUPERVISION OF THE JOB AS REQUIRED.
K. PIPING AND EQUIPMENT SHALL BE ARRANGED SUBSTANTIALLY AS INDICATED. ANY CHANGE RESULTING IN A SAVINGS IN LABOR OR MATERIAL SHALL BE MADE ONLY IN ACCORDANCE WITH A CONTRACT CHANGE ORDER. DEVIATIONS SHALL BE MADE ONLY WHERE NECESSARY TO AVOID INTERFERENCES AND ONLY AFTER DRAWINGS SHOWING THE PROPOSED DEVIATIONS HAVE BEEN SUBMITTED TO AND APPROVED BY THE ARCHITECT.

- L. COORDINATE ALL SHUTDOWNS OF THE PLUMBING SYSTEM IN ADVANCE WITH THE OWNER.
11. SUBMITTALS
A. PROVIDE A MINIMUM OF SIX (6) SUBMITTAL DRAWINGS FOR PLUMBING FIXTURES, EQUIPMENT, AND ALL OTHER SPECIFIED COMPONENTS FOR APPROVAL BY THE ARCHITECT AND ENGINEER.
B. WHERE ONLY ONE MAKE OF EQUIPMENT IS NAMED, IT SHALL BE PROVIDED AS SPECIFIED.
C. VERBAL REQUESTS OF APPROVALS FOR ANY SUBSTITUTION WILL NOT BE BINDING ON THE ARCHITECT AND OWNER.
D. THIS CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR ALL COSTS FOR REDESIGN CHANGES NECESSARY BY ALL TRADES TO ACCOMMODATE THE USE OF EQUIPMENT NOT SPECIFIED ON PROJECT DOCUMENTS.

- E. BIDS SHALL BE BASED UPON THE SPECIFIED PRODUCTS OR LISTED ALTERNATIVES. DRAWINGS AND SPECIFICATIONS ARE BASED ON THE PRODUCTS SPECIFIED BY TYPE, MODEL, AND SIZE AND THUS ESTABLISH MINIMUM QUALITIES, WHICH SUBSTITUTES MUST MEET TO QUALIFY FOR REVIEW.
F. SHOULD THE CONTRACTOR PROPOSE TO FURNISH MATERIALS, EQUIPMENT, AND DEVICES, OTHER THAN THOSE SPECIFIED AND LISTED, THE CONTRACTOR SHALL SUBMIT A WRITTEN REQUEST FOR SUBSTITUTIONS, TO THE ENGINEER, AT LEAST FOURTEEN (14) CALENDAR DAYS PRIOR TO BID OPENING. THE REQUEST SHALL BE AN ALTERNATE TO THE ORIGINAL BID AND SHALL INCLUDE AND BE ACCOMPANIED WITH COMPLETE SPECIFICATIONS CUT SHEET SUBMITTAL AS OUTLINED IN SECTION 11.A OF THIS SPECIFICATION SECTION, COMPLETE WITH DESCRIPTIVE (MANUFACTURER, BRAND NAME, CATALOG NUMBER, ETC.) AND TECHNICAL DATA FOR ALL ITEMS. INDICATE ANY ADDITIONS OR DEDUCTIONS TO THE CONTRACT PRICE WITH THE SUBSTITUTION SUBMITTAL AND ON THE BID FORM. FAILURE TO PERFORM THESE ACTIONS EQUATES TO ACKNOWLEDGEMENT THAT THE PROJECT HAS BEEN BID WITH STRICT ACCORDANCE TO THIS SPECIFICATION AND APPLICABLE DRAWINGS.
G. ACCEPTANCE OR REJECTION OF THE PROPOSED SUBSTITUTIONS SHALL BE SUBJECT TO APPROVAL OF THE ARCHITECT AND ENGINEER. IF REQUESTED, THE CONTRACTOR SHALL SUBMIT INSPECTION SAMPLES OF BOTH THE SPECIFIED AND THE PROPOSED SUBSTITUTE ITEMS.
H. IF ANY SUBSTITUTIONS ARE APPROVED, AN ADDENDUM LISTING THE APPROVED ITEM(S) WILL BE ISSUED TO ALL BIDDING CONTRACTORS PRIOR TO THE BID DATE.

- I. IN ALL CASES WHERE SUBSTITUTIONS ARE PERMITTED, THE CONTRACTOR SHALL BEAR ANY EXTRA COST OF EVALUATING THE EQUALITY OF THE MATERIAL AND EQUIPMENT TO BE INSTALLED.
J. WHERE ONLY ONE MAKE IS NAMED IN THE SPECIFICATIONS OR ON THE DRAWINGS, IT SHALL BE PROVIDED.
K. VERBAL REQUESTS OR APPROVALS SHALL NOT BE BINDING ON THE ENGINEER OR OWNER.
12. EQUIPMENT AND PIPING IDENTIFICATION
A. LABEL ALL PIPING SYSTEMS WITH PIPE MARKERS INSTALLED ADJACENT TO VALVES, WHERE PIPES PASS THROUGH WALLS OR FLOORS, NEAR ALL BRANCHES AND CHANGES OF DIRECTION, AT 20 FEET INTERVALS ON STRAIGHT RUNS OF PIPE, AND AT ACCESS DOOR LOCATIONS. ALL PIPE MARKERS SHALL CONFORM TO ANSI A13.1 "SCHEME FOR THE IDENTIFICATION OF PIPING SYSTEMS".
B. THE CONTRACTOR SHALL FURNISH AND INSTALL A SYSTEM OF NAMEPLATES DESIGNED TO IDENTIFY EACH PIECE OF EQUIPMENT.

- (1) NAMEPLATE LETTER AND NUMBERS SHALL MATCH EQUIPMENT DESIGNATION AS INDICATED ON THE DRAWINGS.

- (2) NAMEPLATES SHALL BE LAMINATED PHENOLIC WITH BLACK SURFACE AND WHITE CORE. USE 1/16" THICK MATERIAL FOR PLATES UP TO 2" BY 4". FOR LARGER SIZES USE 1/8" THICK. LETTERS AND NUMBERS SHALL BE A MINIMUM OF 1/2" HIGH.
(3) FASTEN NAMEPLATES TO ALL EQUIPMENT BY THE USE OF STAINLESS STEEL SHEET METAL SCREWS.

13. AS-BUILT DRAWINGS

- A. AS WORK PROGRESSES, RECORD ON A SET OF "AS-BUILT" PRINTS ANY DEVIATIONS FROM DESIGN DRAWINGS. DELIVER TO THE OWNER BEFORE SUBMITTING REQUEST FOR FINAL PAYMENT. THE "AS-BUILT" PRINTS SHALL BE AN ACCURATE DEPICTION OF THE PROJECT AS COMPLETED.

14. OPERATING AND MAINTENANCE MANUALS

- A. PROVIDE TO OWNER, AT PROJECT TURNOVER, THREE (3) HARDBOUND COPIES OF OPERATING AND MAINTENANCE MANUALS FOR ALL EQUIPMENT AND SYSTEMS INSTALLED. MANUALS SHALL INCLUDE ALL RELEVANT INFORMATION NEEDED FOR DAY-TO-DAY OPERATION AND MANAGEMENT OF EACH SYSTEM, AS WELL AS EQUIPMENT MAINTENANCE INFORMATION REQUIRED TO SUPPORT THE MAINTENANCE PROGRAM.

15. OPERATING INSTRUCTIONS

- A. PROVIDE TO OWNER AFTER ALL EQUIPMENT IS IN OPERATION AND AT AN AGREABLE TIME, INSTRUCTIONS FOR THE PURPOSE OF TRAINING OWNER'S PERSONNEL IN ALL PHASES OF OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS. SCHEDULE TRAINING WITH OWNER, PROVIDE AT LEAST SEVEN DAYS PRIOR NOTICE. PROVIDE THIS TRAINING TO ALL PERSONNEL AND ON ALL SHIFTS.

16. INSULATION

- A. PROVIDE ALL INSULATION MATERIALS (INSULATION, JACKETS, FITTING COVERS, ADHESIVES, CEMENTS, MASTICS, SEALERS AND FINISHES) WITH A FLAME-SPREAD INDEX OF 25 OR LESS AND SMOKE DEVELOPED INDEX OF 50 OR LESS, AS TESTED UNDER PROCEDURE ASTM E-84 (NFPA 255).

- B. ALL INSULATION SHALL BE INSTALLED OVER CLEAN, DRY SURFACES. INSULATION MUST BE DRY AND IN GOOD CONDITION. WET OR DAMAGED INSULATION IS NOT ACCEPTABLE. NO INSULATION SHALL BE APPLIED PRIOR TO PRESSURE TEST COMPLETION OF THE RESPECTIVE PIPING SYSTEM.

- C. ALL INSULATION SHALL BE CONTINUOUS (INCLUDING VAPOR BARRIER) THROUGH WALL AND CEILING OPENINGS, SLEEVES, AND PIPE HANGER LOCATIONS.

- D. ALL INSULATION PRODUCTS SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN RECOMMENDATIONS. THE WORKMANSHIP SHALL BE FIRST CLASS AND ALL JOINTS SHALL BE MADE TIGHT.

- E. INSULATE VALVE BONNETS AND UNIONS ON DOMESTIC WATER PIPING WITH INSULATION MATCHING PIPE INSULATION.

- F. INSULATE DOMESTIC COLD WATER PIPING AND FITTINGS WITH OWENS-CORNING ONE-PIECE FIBERGLASS PIPE INSULATION WITH ALL SERVICE JACKET, 1/2" THICKNESS FOR PIPING LESS THAN OR EQUAL TO 1.5", 1" THICKNESS FOR PIPES LARGER THAN 1.5". INSULATE DOMESTIC HOT WATER PIPING AND FITTINGS WITH THE SAME INSULATION, 1" THICKNESS FOR PIPING LESS THAN OR EQUAL TO 1.5", 2" THICKNESS FOR PIPING LARGER THAN 1.5".

- G. INSULATE ELECTRIC WATER COOLER TRAP AND WASTE PIPING WITHIN CABINET WITH 1/2" THICK ARMAFLEX AP PIPING INSULATION.

- H. REPAIR EXISTING INSULATION WHERE REMOVED FOR NEW CONNECTION. INSULATION SHALL BE THE SAME AS SPECIFIED FOR NEW SERVICE.

- K. ALL INSULATION USED AS PLENUM WRAP COVERING FOR COMBUSTIBLE MATERIALS IN A PLENUM SPACE SHALL BE 3M PLENUM PROTECTION SYSTEM (PP-100-P), ONE LAYER OF 3M FIRE BARRIER DUCT WRAP 5A, IN ACCORDANCE WITH UL910 & UL1887.

17. MATERIALS

\*\* SANITARY \*\*

A. PIPE AND FITTINGS

- (1) DOMESTIC WATER SHALL BE TYPE "L" COPPER.
(2) DOMESTIC WATER BELOW FLOOR SHALL BE TYPE "K" SOFT COPPER.
(3) NATURAL GAS SHALL BE SCHEDULE 40 BLACK STEEL.
(4) SANITARY DRAIN AND VENT SHALL BE SCHEDULE 40 PVC PLASTIC PIPE (TYPE DWV) WHERE POSSIBLE.

- (5) SANITARY DRAIN AND VENT PIPING LOCATED IN PLENUM RETURN OR RATED WALLS SHALL BE SERVICE WEIGHT NO HUB CAST IRON PIPE. ALL CAST IRON PIPE AND FITTINGS SHALL COMPLY WITH ASTM A 888 (OR A 74) AND BE MARKED WITH THE COLLECTIVE TRADEMARK OF THE CAST IRON SOIL PIPE INSTITUTE (CISPI) AND BE LISTED BY THE NSF INTERNATIONAL.

- (6) FITTINGS FOR COPPER PIPE SHALL BE WROUGHT COPPER SOLDER JOINT TYPE. ONLY LEAD FREE SOLDER IS ACCEPTABLE.

- (7) FITTINGS FOR BLACK STEEL PIPE 2" AND SMALLER SHALL BE 150 PSIG SWP MALLEABLE IRON SCREWED FITTINGS. FOR 2-1/2" AND LARGER, FITTINGS SHALL BE FACTORY FORMED WELDING FITTINGS.

- (8) FITTINGS FOR SANITARY DRAIN AND VENT PIPING SHALL BE SCHEDULE 40 PVC PLASTIC PIPE (TYPE DWV) WITH SOLVENT CEMENT PVC (DWV) FACTORY FORMED FITTINGS.

- (9) FITTINGS FOR SANITARY DRAIN AND VENT PIPING LOCATED IN PLENUM RETURN OR RATED WALLS SHALL BE SERVICE WEIGHT NO HUB CAST IRON PIPE WITH STAINLESS STEEL MECHANICAL JOINT COUPLINGS. COUPLINGS SHALL COMPLY WITH "CISPI 310": THE ELASTOMERIC SEALING SLEEVE SHALL CONFORM TO "ASTM C 564" AND SHALL BE PROVIDED WITH A CENTER STOP. MECHANICAL JOINT COUPLINGS SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.

B. DOMESTIC WATER VALVES

- (1) DOMESTIC WATER SHUT-OFF VALVES SHALL BE BRONZE BODY, TWO PIECE, FULL PORT, LEVER HANDLE BALL VALVES WITH TEFLOON SEATS, CHROME PLATED BRASS BALL, BRASS STEM AND SOLDER ENDS. 600 PSI WOG. ACCEPTABLE MANUFACTURERS: MILWAUKEE, HAMMOND, APOLLO

- (2) HORIZONTAL CHECK VALVES SHALL BE BRONZE BODY, SWING TYPE DESIGN, BRONZE DISC, STAINLESS STEEL LEVER WITH SOLDER ENDS. 200 PSI WOG. ACCEPTABLE MANUFACTURERS: MILWAUKEE, HAMMOND, APOLLO

- (3) MANUAL BALANCING VALVES SHALL BE BRONZE BODY, COMBINATION VENTURI AND BALL VALVE WITH TWO PRESSURE/TEMPERATURE TEST PORTS, MEMORY STOP, INLET UNION CONNECTION AND THREADED ENDS, 400 PSI AT 250F. ACCEPTABLE MANUFACTURERS: FLOW DESIGN INC. "FLOWSET".

C. NATURAL GAS VALVES

- (1) 2" AND SMALLER - WRENCH-OPERATED, RECTANGULAR PORT, CYLINDRICAL LUBRICATED PLUG VALVES WITH CAST IRON BODY, PLUG AND BASEPLATE, TFE GASKET, STAINLESS STEEL BASEPLATE SPRING, STEEL SEALANT SCREW AND FLANGED ENDS. 200 PSI WOG. U.L. LISTED.

- (2) 2-1/2" AND LARGER - WRENCH-OPERATED, RECTANGULAR PORT, CYLINDRICAL LUBRICATED PLUG VALVES WITH CAST IRON BODY, PLUG AND BASEPLATE, TFE GASKET, STAINLESS STEEL BASEPLATE SPRING, STEEL SEALANT SCREW AND FLANGED ENDS. 200 PSI WOG. U.L. LISTED.

- (3) PROVIDE ALL VALVES WITH A REMOVABLE WRENCH TO MATCH OPERATOR SQUARE HEAD SIZE. WRENCHES SHALL BE LOCKED IN PLACE WITH A SET SCREW.

18. PIPING INSTALLATION

- A. PROVIDE MACHINE CUT STEEL PIPE SLEEVE 1" LARGER THAN OUTSIDE DIAMETER OF PIPE. WHERE FLOORS ARE CORE DRILLED, STEEL SLEEVES ARE NOT REQUIRED. SEAL OPENINGS TO MAINTAIN THE INTEGRITY OF THE FIRE RATING.

- B. PROVIDE ALL INSERTS, FASTENERS AND SUPPORTS TO PROPERLY SUPPORT AND RETAIN PIPING; TO CONTROL EXPANSION, CONTRACTION, ANCHORAGE, DRAINAGE, AND PREVENT SWAY AND VIBRATION. PIPING SHALL BE SO SUPPORTED AS NOT TO PLACE A STRAIN ON VALVES, FIXTURES OR EQUIPMENT.

- C. THE DRAWINGS INDICATE THE GENERAL LOCATION AND ARRANGEMENT OF THE PIPING SYSTEMS. SO FAR AS PRACTICAL, INSTALL PIPING AS INDICATED MAKING CONNECTIONS TO ALL EQUIPMENT AND FIXTURES. INSTALL PIPING AS DIRECT AS POSSIBLE AVOIDING UNNECESSARY OFFSETS. HOWEVER, IF OFFSETS ARE REQUIRED IN ORDER TO OBTAIN MAXIMUM HEADROOM OR TO AVOID CONFLICT WITH OTHER WORK, THEY SHALL BE MADE AS REQUIRED OR AS REQUESTED BY THE ARCHITECT WITHOUT ADDITIONAL COST TO THE OWNER. THE ARCHITECT RESERVES THE RIGHT TO MAKE MINOR CHANGES IN THE LOCATION OF PIPING AND EQUIPMENT DURING THE ROUGHING-IN, WITHOUT ADDITIONAL COST TO THE OWNER. ALL CHANGES PROPOSED BY OTHERS SHALL BE APPROVED BY THE ARCHITECT.

- D. INSTALL PIPING FREE OF SAGS OR BENDS

- E. ALL PIPING SYSTEMS MUST BE INSTALLED SO THEY CAN BE COMPLETELY DRAINED. PROVIDE TEE FITTING, BALL VALVE WITH HOSE THREAD FITTING AND CAP AT ALL LOW POINTS, TRAPPED SECTIONS, BASES OF RISERS, AND ON EQUIPMENT SIDE OF SHUT OFF VALVES TO PERMIT DRAINING. PROVIDE BALL VALVES AT ALL HIGH POINTS TO ALLOW VENTING. ALL DRAIN VALVES AND VENTS SHALL BE ACCESSIBLE

- F. TERMINATE PLUMBING VENT PIPES AT LEAST 12 INCHES ABOVE ROOF.

- G. BUILDING DRAINS SHALL BE PITCHED A MINIMUM SLOPE OF 1/4 INCH PER FOOT FOR PIPES UP TO 2-1/2 INCH AND 1/8 INCH PER FOOT FOR PIPES GREATER THAN 2-1/2 INCHES.

- H. PROVIDE WATER HAMMER ARRESTERS WHERE QUICK-CLOSING VALVES ARE UTILIZED, AND INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS.

- J. PROVIDE CHECK VALVES WHERE BACKFLOW PROTECTION IS REQUIRED, AND INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS. PROVIDE AT FIXTURES SUCH AS, BUT NOT LIMITED TO; DISHWASHERS, COFFEE MAKERS, ICE MACHINES, BEVERAGE DISPENSERS, REFRIGERATORS. PROVIDE WATTS 007 OR EQUIVALENT.

- K. PROVIDE DIELECTRIC UNIONS AT COUPLING OF DISSIMILAR METALS

19. DISINFECTION

- A. CHLORINATE ALL DOMESTIC WATER SYSTEMS AS FOLLOWS. FIRST FLUSH SYSTEM WITH CLEAN POTABLE WATER UNTIL DIRTY WATER DOES NOT APPEAR AT OUTLETS. THEN FILL WITH A WATER/CHLORINE SOLUTION (50PPM CHLORINE) AND ALLOW TO STAND FOR 24 HOURS. FOLLOWING STANDING TIME, FLUSH THE SYSTEM WITH CLEAN POTABLE WATER UNTIL CHLORINE IS PURGED FROM THE SYSTEM. REPEAT CHLORINATION, IF NECESSARY, UNTIL NO BACTERIOLOGICAL CONTAMINATION IS PRESENT IN THE SYSTEM. PROCEDURE SHALL CONFORM TO ANWA C651 AND BE ACCEPTED BY THE LOCAL HEALTH DEPARTMENT.

20. PLUMBING FIXTURES AND EQUIPMENT

A. GENERAL

- (1) PROVIDE FIXTURES OF TYPE, STYLE AND MATERIAL AS SCHEDULED ON THE DRAWINGS. INCLUDE ALL TRIM, CARRIERS, SEATS, ETC. AS INDICATED OR RECOMMENDED BY MANUFACTURER AS REQUIRED FOR A COMPLETE INSTALLATION.

- (2) PROVIDE VACUUM BREAKERS AS PART OF THE FIXTURE OR EQUIPMENT TRIM WHEREVER THERE IS A POSSIBILITY OF BACK SIPHONING.

- (3) PROVIDE DOUBLE CHECK VALVES FOR PLUMBING FIXTURE OR SPECIAL EQUIPMENT WHERE BACKFLOW PROTECTION IS REQUIRED, AND INSTALL IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATIONS, USE WAITS SERIES 7 BRONZE DUAL CHECK VALVE.

- (4) PROVIDE FIXTURES CONSTRUCTED OF VITREOUS CHINA WITH ALL VISIBLE SURFACES GLAZED. FURNISH ENAMELED CAST IRON FIXTURES CONSTRUCTED WITH NON-STAINING, ACID RESISTANT, PORCELAIN ENAMELED COAT THOROUGHLY FUSED ON THE SURFACES. FURNISH STAINLESS STEEL SINKS WITH SATIN FINISH, UNLESS NOTED OTHERWISE.

- (5) PROVIDE ALL STOPS, SUPPLIES, TRAPS AND ESCUTCHEONS NECESSARY FOR A COMPLETE INSTALLATION. ALL COMPONENTS SHALL BE CHROME PLATED BRASS.

- (6) STOPS SHALL BE STRAIGHT OR ANGLE TYPE AS REQUIRED BY THE INSTALLATION, WITH LOOSE KEY, METAL STEM AND WASHER CUP WITH SET SCREW WASHER RETAINER.

- (7) SUPPLIES SHALL BE FLEXIBLE CHROME PLATED COPPER.

- (8) TRAPS SHALL BE 17 GAUGE CHROME PLATED BRASS WITH CLEAN-OUT PLUG. FURNISH WITH SLIP NUTS, WALL BEND AND ESCUTCHEON.

- (9) PROVIDE CARRIERS AND SUPPORTS AS REQUIRED FOR PROPER FIXTURE INSTALLATION. TYPE SHALL PERMIT FIELD ADJUSTMENT TO FIT VARIATIONS IN CONSTRUCTION. UNLESS NOTED OTHERWISE, SUPPORT ALL WALL MOUNTED PLUMBING FIXTURES ON CONCEALED CHAIR CARRIERS WITH FOOT SUPPORT.

- (10) PROVIDE FAUCET AERATORS AND OUTLETS OF TYPES APPROVED BY THE LOCAL HEALTH DEPARTMENT AND LOCAL PLUMBING CODE, REFER TO IPC TABLE 604.4.

- (11) INSULATE ALL EXPOSED WATER SUPPLIES AND TRAPS WHERE FIXTURES ARE INDICATED TO COMPLY WITH THE REQUIREMENTS OF THE AMERICANS WITH DISABILITIES ACT. INSULATION KITS SHALL BE 3/16" THICK MOLDED CLOSED CELL VINYL CONSTRUCTION WITH PVC SATIN WHITE COVER.



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## MECHANICAL SPECIFICATIONS

### 1. GENERAL PROVISIONS

A. THE PROVISIONS OF THE INSTRUCTIONS TO BIDDERS, GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS, ALTERNATES, ADDENDAS', AND DIVISION 1 ARE A PART OF THIS SPECIFICATION. CONTRACTORS AND SUBCONTRACTORS SHALL EXAMINE SAME AS WELL AS OTHER DIVISIONS OF THE SPECIFICATIONS WHICH AFFECT WORK UNDER THIS DIVISION.

B. THIS CONTRACTOR SHALL PROVIDE ALL LABOR, EQUIPMENT, SUPPLIES, SERVICES, AND SHALL PERFORM ALL WORK COMPLETE AND IN STRICT ACCORDANCE WITH THIS SPECIFICATION AND APPLICABLE DRAWINGS. ANY DEVIATIONS SHALL BE CLEARLY DEFINED AND ITEMIZED IN ACCORDANCE WITH SECTION 10.F OF THIS SPECIFICATION.

C. THIS CONTRACTOR IS INSTRUCTED TO READ CAREFULLY THE SPECIFICATIONS FOR ALL PARTS OF THE WORK, WHICH INCLUDE THE ARCHITECTURAL, ELECTRICAL, MECHANICAL, PLUMBING, FIRE PROTECTION, CIVIL, STRUCTURAL AND ALL OTHER DRAWINGS AS WELL AS THE SPECIFICATIONS FOR ALL THE DIVISIONS THAT ARE PART OF THE CONTRACT DOCUMENTS.

D. ALL ITEMS OF LABOR, MATERIAL, AND EQUIPMENT NOT SPECIFICALLY MENTIONED HEREIN OR SHOWN ON PLAN, BUT INCIDENTAL TO, OR REQUIRED FOR THE COMPLETE INSTALLATION AND PROPER OPERATION OF THE WORK, SHALL BE FURNISHED AS IF CALLED FOR IN DETAIL BY THE SPECIFICATIONS OR DRAWINGS.

E. AS USED IN THIS SPECIFICATION, "PROVIDE" MEANS "FURNISH AND INSTALL." "FURNISH" MEANS "TO PURCHASE AND DELIVER TO THE PROJECT SITE COMPLETE WITH EVERY NECESSARY APPURTENANCE AND SUPPORT," AND "INSTALL" MEANS "TO UNLOAD AT THE DELIVERY POINT AT THE SITE AND PERFORM EVERY OPERATION NECESSARY FOR PROPER INSTALLATION PER CODES AND MANUFACTURER'S REQUIREMENTS, TO ESTABLISH SECURE MOUNTING AND CORRECT OPERATION AT THE PROPER LOCATION IN THE PROJECT."

### 2. PERMITS, CODES, INSPECTIONS AND TESTS.

A. THE HVAC CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND INSPECTIONS REQUIRED FOR THE PROSECUTION OF HVAC WORK. ALL PERMITS AND CERTIFICATES OF INSPECTION AND APPROVAL SIGNED BY THE CONTROLLING BUILDING DEPARTMENT SHALL BECOME PROPERTY OF THE OWNER.

B. DRAWINGS INDICATE THE MINIMUM DESIGN REQUIREMENTS. NATIONAL, STATE, AND LOCAL CODES SHALL BE FOLLOWED, COMPLY WITH THE LATEST EDITIONS OF THE STATE MECHANICAL CODE, NFPA, SMACNA, AND ASHRAE STANDARDS. THE CONTRACTOR SHALL INCLUDE THE COST OF SATISFYING SUCH CODES AND STANDARDS IN THE BID.

C. FOLLOWING COMPLETION OF THE HVAC WORK, FURNISH TO THE OWNER, IN DUPLICATE, CERTIFICATES OF INSPECTION AND APPROVAL BY REGULATORY AGENCIES HAVING JURISDICTION.

(1) DEMONSTRATE TO THE OWNER'S SATISFACTION THE PROPER OPERATION OF EACH OF THE SYSTEMS COMPRISING THIS CONTRACT BEFORE FINAL PAYMENT.

(2) IMMEDIATELY CORRECT ANY WORK FOUND AT VARIANCE WITH THESE SPECIFICATIONS, THE NATIONAL, STATE, AND LOCAL CODES, AND REQUIREMENTS OF GOVERNING REGULATORY AGENCIES.

(3) TEST PIPING FOR LEAKS; REPAIR LEAKS IN COPPER TUBING BY SWEATING OUT JOINT; THOROUGHLY CLEANING BOTH TUBE AND FITTING, AND RESOLDERING. CORRECT LEAKS IN SCREWED JOINT BY REPLACING THREAD OR FITTING OR BOTH.

(4) PROVIDE SERVICES OF A CERTIFIED A.A.B.C. OR N.E.E.B. TEST AGENCY. CONDUCT ALL TESTS IN ACCORDANCE WITH ASSOCIATED AIR BALANCE COUNCIL STANDARDS. TEST AND ADJUST AIR HANDLING SYSTEM TO WITHIN 5% OF DESIGN REQUIREMENTS.

### 3. VISIT TO THE SITE

A. THE CONTRACTOR SHALL VISIT THE SITE OF THE WORK AND BECOME FAMILIAR WITH ALL CONDITIONS AFFECTING THE WORK. THE SUBMISSION OF A PROPOSAL SHALL PRESUPPOSE KNOWLEDGE OF ALL SUCH CONDITIONS AND NO ADDITIONAL COMPENSATION SHALL BE ALLOWED WHERE EXTRA LABOR OR MATERIALS ARE REQUIRED BECAUSE OF IGNORANCE OF THESE CONDITIONS.

### 4. PROTECTION

A. THE HVAC CONTRACTOR SHALL PROVIDE ALL NECESSARY PROTECTION FROM DIRT AND WATER DURING CONSTRUCTION NECESSITATED BY HVAC WORK. PROTECTION METHODS ARE SUBJECT TO APPROVAL BY THE ARCHITECT.

### 5. EQUIPMENT AND MATERIALS

A. ALL EQUIPMENT AND MATERIALS SHALL BE NEW AND SHALL CONFORM TO UNDERWRITERS' LABORATORIES STANDARDS, WHERE APPLICABLE. WHERE SPECIFICATIONS DESCRIBE, OR PLANS SHOW, MATERIALS OR EQUIPMENT OF HIGHER QUALITY THAN REQUIRED BY CODE AND LOCAL REGULATORY, THE DRAWINGS AND SPECIFICATIONS SHALL GOVERN THE QUALITY OF THE MATERIAL OR EQUIPMENT. USED EQUIPMENT OR MATERIALS ARE PROHIBITED UNLESS NOTED OTHERWISE.

B. NEW OR EXISTING TO REMAIN EQUIPMENT SHALL NOT BE OPERATED DURING CONSTRUCTION. HVAC CONTRACTOR SHALL COORDINATE WITH OTHER TRADES AND PROVIDE TEMPORARY SPACE CONDITIONING IN ORDER TO MAINTAIN TEMPERATURES AND HUMIDITY LEVELS AS REQUIRED FOR GENERAL CONSTRUCTION.

C. THE CONTRACTOR SHALL SUBMIT PROOF, IF REQUESTED BY THE OWNER, THAT THE MATERIALS, APPLIANCES, EQUIPMENT OR DEVICES FURNISHED AND INSTALLED UNDER THIS CONTRACT MEET THE REQUIREMENTS OF THE UNDERWRITERS' LABORATORIES, INC. IN REGARDS TO FIRE AND CASUALTY HAZARDS. THE LABEL OF OR LISTING BY THE UNDERWRITERS' LABORATORIES, INC. WILL BE ACCEPTED AS CONFORMING TO THIS REQUIREMENT IN LIEU OF THE LABEL OR LISTING. THE CONTRACTOR MAY SUBMIT INDEPENDENT PROOF SATISFACTORY TO THE ARCHITECT THAT THE MATERIAL, APPLIANCES OR DEVICES CONFORM TO THE PUBLISHED STANDARDS, INCLUDING METHODS OF TEST FOR THE UNDERWRITERS' LABORATORIES INCORPORATED. UNDERWRITERS' LABORATORIES, INC. AND ITS PUBLICATIONS WILL BE REFERRED TO HEREINAFTER BY THE ABBREVIATION UL WITH OR WITHOUT ADDITIONAL IDENTIFYING SYMBOLS.

### 6. GUARANTEE

A. THE HVAC CONTRACTOR SHALL GUARANTEE FOR A PERIOD OF ONE YEAR THAT ALL WORK AND EQUIPMENT WILL REMAIN FREE FROM ALL DEFECTS IN WORKMANSHIP AND MATERIALS, AND THAT IT WILL COMPLY WITH ALL THE SPECIFIC REQUIREMENTS OF THE SPECIFICATIONS AND OTHER CONTRACT DOCUMENTS GOVERNING THE WORK.

B. ALL WORK FOUND BY THE ENGINEER TO BE DEFECTIVE WILL BE REPLACED WITH NEW WORK MEETING ALL THE REQUIREMENTS OF THE CONTRACT. THE HVAC CONTRACTOR WILL BEAR ALL COSTS OF SUPPLYING SUCH NEW, AND INSTALLING AND FINISHING SAME, AND WILL ASSUME ALL COSTS FOR REPLACING OTHER WORK DAMAGED BY THE REMOVAL AND REPLACEMENT OF ANY OF THE WORK. THE HVAC CONTRACTOR WILL BEAR ALL COSTS FOR FREIGHT, DRAYAGE AND DEMURRAGE, AND ALL LABOR IN CONNECTION THEREWITH.

### 7. CUTTING, PATCHING, FIRESTOPPING AND PAINTING

A. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR CUTTING ALL HOLES REQUIRED FOR INSTALLATION OF HVAC WORK. HOLES SHALL BE CUT IN A NEAT MANNER SATISFACTORY TO THE ARCHITECT.

B. CONTRACTOR SHALL EMPLOY AN BUILDING OWNER APPROVED ROOFING CONTRACTOR FOR ALL ROOF PENETRATIONS. ROOF SHALL BE REPAIRED SO AS NOT TO VOID ROOF WARRANTY.

C. UNLESS NOTED OTHERWISE, ALL HOLES OR DAMAGE CAUSED BY THE REMOVAL OF EXISTING WORK OR THE INSTALLATION OF NEW WORK SHALL BE PROPERLY PATCHED BY THIS CONTRACTOR. HOLES SHALL BE NEATLY PATCHED AND PAINTED WITH SUITABLE MATERIAL TO MATCH EXISTING SURFACES. HOLES THROUGH FLOORS OR FIRE WALLS SHALL BE SEALED WITH THE APPROPRIATE INTUMESCENT CAULK, PUTTY, STRIP OR SHEET FIRE BARRIER PRODUCT.

D. FIRESTOP SYSTEM (REQUIRED FIRESTOPPING MATERIALS) SHALL BE DETERMINED BY THE WALL OR FLOOR/CEILING ASSEMBLY AND PENETRATION TYPE AND SHALL BE UL LISTED AND TESTED IN ACCORDANCE WITH ASTM E814, FIRE RATING OF THE FIRESTOP SYSTEM SHALL BE EQUIVALENT TO THE ASSEMBLY WHICH IS PENETRATED.

E. ACCEPTABLE FIRE BARRIER PRODUCTS: HILTI "FS-ONE" NELSON FLAMESEAL OR APPROVED EQUAL AS MANUFACTURED BY 3M.

### 8. CLEANING AND PAINTING

A. CLEAN NEW PIPING AFTER WORK IS COMPLETE TO REMOVE PIPE DOPE. LOOSE MILL SCALE, AND OTHER EXTRANEIOUS MATERIALS.

B. TOUCH UP AND REPAIR ANY DAMAGED FACTORY FINISHES ON EQUIPMENT AND MATERIALS FURNISHED. OTHER PAINTING WILL BE DONE UNDER THE PAINTING DIVISION OF THE SPECIFICATIONS.

### 9. COORDINATION AND CONDUCT OF WORK

A. HVAC DRAWINGS ARE DIAGRAMMATIC, INDICATING GENERAL ARRANGEMENT, APPROXIMATE SIZES, GENERAL LOCATIONS OF EQUIPMENT AND PIPING. VERIFY DIMENSIONS IN FIELD; ADJUST TO MANUFACTURER'S SHOP DRAWINGS. DO NOT SCALE DRAWINGS.

B. ALL REQUESTS FOR INFORMATION SUPPLEMENTAL TO THE CONSTRUCTION DOCUMENTS SHALL BE SUBMITTED IN WRITING TO THE ARCHITECT FOR DISTRIBUTION TO THE APPROPRIATE PARTY(S).

C. DRAWINGS AND SPECIFICATIONS ARE TO BE CONSIDERED AS SUPPLEMENTING EACH OTHER, WORK SPECIFIED BUT NOT SHOWN, OR SHOWN BUT NOT SPECIFIED, SHALL BE PERFORMED OR FURNISHED AS THOUGH MENTIONED IN BOTH SPECIFICATIONS AND DRAWINGS.

D. ANY DISCREPANCIES BETWEEN THE DRAWINGS AND SPECIFICATIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT AND ENGINEER.

E. ARCHITECTURAL AND STRUCTURAL DRAWINGS SUPERSEDE HVAC DRAWINGS. DETERMINE THAT WORK OF THIS DIVISION CAN BE ACCOMMODATED WITHIN SPACES PROVIDED. NOTIFY ARCHITECT OF ANY INTERFERENCE BEFORE STARTING INSTALLATION.

F. DETERMINE SIZES, LOCATIONS FOR CHASES AND OPENINGS NECESSARY FOR INSTALLATION OF HVAC WORK, COOPERATE WITH OTHER TRADES IN PROVIDING SLEEVES, INSERTS AND HANGERS.

G. COORDINATE THIS WORK WITH ALL TRADES. ARRANGE OPERATIONS SO AS NOT TO DELAY COMPLETION OF INSTALLATION OF ANY PARTS OF INTERRELATED WORK SO THAT CONSTRUCTION MAY PROCEED ON SCHEDULE.

H. COOPERATE WITH ALL TRADES IN PREPARING INTERFERENCE DRAWINGS FOR AREAS WHERE THERE IS POSSIBLE CONFLICT BETWEEN TRADES. EXACT LOCATION OF PIPES, DUCTS AND EQUIPMENT SHALL BE BASED ON FIELD MEASUREMENT WITH FINAL ARRANGEMENT DETERMINED BY INTRA-TRADE AGREEMENTS SUBJECT TO ARCHITECT'S APPROVAL.

I. ARCHITECT RESERVES THE RIGHT TO MAKE REASONABLE CHANGES IN INDICATED LOCATIONS WITHOUT EXTRA COST TO THE OWNER.

J. ALL WORK SHALL BE INSTALLED IN NEAT AND WORKMANLIKE MANNER BY FIRST-CLASS MECHANICS. THE CONTRACTOR SHALL PROVIDE ADEQUATE AND COMPETENT SUPERVISION OF THE JOB AS REQUIRED.

K. DUCTWORK, PIPING AND EQUIPMENT SHALL BE ARRANGED SUBSTANTIALLY AS INDICATED. ANY CHANGE RESULTING IN A SAVINGS IN LABOR OR MATERIAL SHALL BE MADE ONLY IN ACCORDANCE WITH A CONTRACT CHANGE ORDER. DEVIATIONS SHALL BE MADE ONLY WHERE NECESSARY TO AVOID INTERFERENCES AND ONLY AFTER DRAWINGS SHOWING THE PROPOSED DEVIATIONS HAVE BEEN SUBMITTED TO AND APPROVED BY THE ARCHITECT.

L. COORDINATE ALL SHUTDOWNS OF ANY HVAC SYSTEM IN ADVANCE WITH THE OWNER.

### 10. SUBMITTALS

A. PROVIDE A MINIMUM OF SIX (6) SETS OF SHOP DRAWINGS/SUBMITTALS FOR ALL SCHEDULED AND/OR SPECIFIED EQUIPMENT FOR APPROVAL BY THE ARCHITECT AND ENGINEER. INFORMATION SHALL INCLUDE, BUT IS NOT LIMITED TO; CFM, HP, GPM, MBH, EER, COP, %EFF, VOLTAGE/PHASE, MCA, CONNECTION SIZES, WEIGHT, DIMENSIONS, SCHEDULED EQUIPMENT, DIFFUSERS, DAMPERS, LISTED ACCESSORIES, ETC. AND OTHER COMPONENTS REQUIRED FOR A COMPLETE INSTALLATION.

B. WHERE ONLY ONE MAKE OF EQUIPMENT IS NAMED, IT SHALL BE PROVIDE AS SPECIFIED.

C. VERBAL REQUESTS OF APPROVALS FOR ANY SUBSTITUTION WILL NOT BE BINDING ON THE ARCHITECT, ENGINEER AND OWNER.

D. THIS CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR ALL COSTS FOR REDESIGN AND CHANGES NECESSARY BY ALL TRADES TO ACCOMMODATE THE USE OF EQUIPMENT NOT SPECIFIED ON PROJECT DOCUMENTS.

E. BIDS SHALL BE BASED UPON THE SPECIFIED PRODUCTS OR LISTED ALTERNATIVES. DRAWINGS AND SPECIFICATIONS ARE BASED ON THE PRODUCTS SPECIFIED BY TYPE, MODEL, AND SIZE, AND THUS ESTABLISH MINIMUM QUALITIES, WHICH SUBSTITUTES MUST MEET TO QUALIFY FOR REVIEW.

F. SHOULD THE CONTRACTOR PROPOSE TO FURNISH MATERIALS, EQUIPMENT, AND DEVICES, OTHER THAN THOSE SPECIFIED AND LISTED, THE CONTRACTOR SHALL SUBMIT A WRITTEN REQUEST FOR SUBSTITUTIONS TO THE ENGINEER AT LEAST FOURTEEN (14) CALENDAR DAYS PRIOR TO BID OPENING. THE REQUEST SHALL BE AN ALTERNATE TO THE ORIGINAL BID AND SHALL INCLUDE AND BE ACCOMPANED WITH COMPLETE SPECIFICATION CUT SHEET SUBMITTALS AS OUTLINED IN SECTION 10.A OF THIS SPECIFICATION SECTION, COMPLETE WITH DESCRIPTIVE (MANUFACTURER, BRAND NAME, CATALOG NUMBER, ETC) AND TECHNICAL DATA FOR ALL ITEMS, INDICATE ANY ADDITIONS OR DEDUCTIONS TO THE CONTRACT PRICE ON BOTH THE SUBSTITUTION SUBMITAL AND THE BID FORM. FAILURE TO PERFORM THESE ACTIONS EQUATES TO ACKNOWLEDGEMENT THAT THE PROJECT HAS BEEN BID WITH STRICT ACCORDANCE TO THIS SPECIFICATION AND APPLICABLE DRAWINGS.

G. ACCEPTANCE OR REJECTION OF THE PROPOSED SUBSTITUTIONS SHALL BE SUBJECT TO APPROVAL OF THE ARCHITECT AND ENGINEER. IF REQUESTED, THE CONTRACTOR SHALL SUBMIT INSPECTION SAMPLES OF BOTH THE SPECIFIED AND THE PROPOSED SUBSTITUTE ITEMS.

H. IF ANY SUBSTITUTIONS ARE APPROVED, AN ADDENDUM LISTING THE APPROVED ITEM(S) WILL BE ISSUED TO ALL BIDDING CONTRACTORS PRIOR TO THE BID DATE.

I. IN ALL CASES WHERE SUBSTITUTIONS ARE PERMITTED, THE CONTRACTOR SHALL BEAR ANY EXTRA COST OF EVALUATING THE EQUALITY OF THE MATERIAL AND EQUIPMENT TO BE INSTALLED.

### 11. EQUIPMENT IDENTIFICATION

A. THE CONTRACTOR SHALL FURNISH AND INSTALL A SYSTEM OF NAMEPLATES DESIGNED TO IDENTIFY EACH PIECE OF EQUIPMENT.

(1) NAMEPLATE LETTERS AND NUMBERS SHALL MATCH EQUIPMENT DESIGNATION AS INDICATED ON THE DRAWINGS.

(2) NAMEPLATES SHALL BE LAMINATED PHENOLIC WITH BLACK SURFACE AND WHITE CORE. USE 1/16" THICK MATERIAL FOR PLATES UP TO 2" BY 4". FOR LARGER SIZES USE 1/8" THICK. LETTERS AND NUMBERS SHALL BE A MINIMUM OF 1/2" HIGH.

(3) FASTEN NAMEPLATES TO ALL EQUIPMENT BY THE USE OF STAINLESS STEEL SHEET METAL SCREWS.

### 12. AS-BUILT DRAWINGS

A. AS WORK PROGRESSES, RECORD ON A SET OF "AS-BUILT" PRINTS ANY DEVIATIONS FROM DESIGN DRAWINGS. DELIVER THIS SET TO THE OWNER BEFORE SUBMITTING REQUEST FOR FINAL PAYMENT. "AS-BUILT" PRINTS SHALL BE AN ACCURATE DEPICTION OF THE PROJECT AS COMPLETED.

### 13. OPERATING AND MAINTENANCE MANUALS

A. PROVIDE TO OWNER AT PROJECT TURNOVER, THREE (3) HARDBOUND COPIES OF OPERATING AND MAINTENANCE MANUALS FOR ALL EQUIPMENT AND SYSTEMS INSTALLED.

B. MANUALS SHALL INCLUDE ALL RELEVANT INFORMATION NEEDED FOR DAY-TO-DAY OPERATION AND MANAGEMENT OF EACH SYSTEM AND EQUIPMENT MAINTENANCE INFORMATION REQUIRED TO SUPPORT THE MAINTENANCE PROGRAM.

C. MANUALS SHALL INCLUDE THE SEQUENCE OF OPERATION FOR EACH SYSTEM WHICH DESCRIBES THE CONTROL COMPONENTS AND HOW THE SYSTEM WILL START, STOP AND OPERATE.

### 14. INSULATION

A. PROVIDE ALL INSULATION MATERIALS (INSULATION, JACKETS, FITTING COVERS, ADHESIVES, CEMENTS, MASTICS, SEALERS AND FINISHES) WITH A FLAME-SPREAD INDEX OF 25 OR LESS AND SMOKE DEVELOPED INDEX OF 50 OR LESS, AS TESTED UNDER PROCEDURE ASTM E-84 (NFPA 255)

B. ALL INSULATION SHALL BE INSTALLED OVER CLEAN, DRY SURFACES. INSULATION MUST BE DRY AND IN GOOD CONDITION. WET OR DAMAGED INSULATION IS NOT ACCEPTABLE. NO INSULATION SHALL BE APPLIED PRIOR TO PRESSURE TEST COMPLETION OF THE RESPECTIVE SYSTEM.

C. ALL INSULATION SHALL BE CONTINUOUS (INCLUDING VAPOR BARRIER) THROUGH WALL AND CEILING OPENINGS AND SLEEVES. OVERLAP AT SEAMS PER MANUFACTURER'S RECOMMENDATIONS.

D. ALL INSULATION PRODUCTS SHALL BE APPLIED IN ACCORDANCE WITH MANUFACTURER'S WRITTEN RECOMMENDATION. THE WORKMANSHIP SHALL BE FIRST CLASS AND ALL JOINTS SHALL BE MADE TIGHT.

E. INSULATION MUST MEET ADOPTED ASHRAE 90.1 STANDARDS.

F. INSULATE CONCEALED SUPPLY AIR DUCTWORK WITH 2" THICK OWENS-CORNING FIBERGLASS DUCTWRAP WITH FOIL FACED ALL-SERVICE JACKET.

G. INSULATE SUPPLY AIR DUCTWORK LOCATED IN PLENUM SPACES WITH 1-1/2" THICK OWENS-CORNING FIBERGLASS DUCTWRAP WITH FOIL FACED ALL-SERVICE JACKET.

H. INSULATE OUTDOOR AIR DUCTWORK WITH 1-1/2" THICK OWENS-CORNING FIBERGLASS DUCTWRAP WITH FOIL FACED ALL-SERVICE JACKET.

I. INTERNAL DUCT INSULATION SHALL BE USED ON EXPOSED DUCTWORK.

J. INSULATE SUPPLY AIR DUCTWORK DOWNSTREAM OF DUCT TERMINAL UNITS WITH 1-1/2" THICK OWENS-CORNING FIBERGLASS DUCTWRAP WITH FOIL FACED ALL-SERVICE JACKET.

K. REPAIR EXISTING INSULATION WHERE REMOVED FOR NEW CONNECTIONS OR INSULATION DAMAGED DURING CONSTRUCTION. INSULATION SHALL BE THE SAME AS SPECIFIED FOR NEW SERVICE.

L. ALL INSULATION USED AS PLENUM WRAP COVERING FOR COMBUSTIBLE MATERIALS IN A PLENUM SPACE SHALL BE 3M PLENUM PROTECTION SYSTEM (PP-100-P), ONE LAYER OF 3M FIRE BARRIER DUCT WRAP SA, IN ACCORDANCE WITH UL910 & UL1897.

L. ACOUSTICAL DUCT LINING:

(1) INTERNALLY LINE FIRST TEN FEET OF DUCTWORK FROM AIR HANDLERS AND TERMINAL UNITS AND WHERE INDICATED ON PLANS.

(2) FIBROUS GLASS, COMPLYING WITH THERMAL INSULATION MANUFACTURERS ASSOCIATION (TIMA) AHC-101.

(3) ASTM C 1071, TYPE II, WITH COATED SURFACE EXPOSED TO AIRSTREAM TO PREVENT EROSION OF GLASS FIBERS 1" THICK, 1 - 1/2 LB. DENSITY. COATING MATERIAL SHALL BE ANTI-MICROBIAL AND COMPLY WITH NFPA 90A AND 90B.

(4) K-FACTOR EQUAL TO 0.28 OR BETTER, AT MEAN TEMPERATURE OF 75 DEG. F.

(5) FLAME SPREAD INDEX SHALL BE 25 OR LESS AND SMOKE DEVELOPED INDEX SHALL BE 50 OR LESS, AS TESTED IN ACCORDANCE WITH ASTM C 411.

(6) DUCT LINING ADHESIVE SHALL COMPLY WITH ASTM C 916 SPECIFICATIONS FOR ADHESIVES FOR "DUCT THERMAL INSULATION". DUCT LINING FASTENERS ALL COMPLY WITH SMACNA DUCT CONSTRUCTION STANDARDS, ARTICLE S2.11

(7) ALTERNATE DUCT LINING MATERIAL - ARMACELL AP ARMAFLEX SA BLACK DUCT LINER, 3/4" THICK, MICROBAN ANTI-MICROBIAL PROTECTION.

### 15. METAL DUCTWORK

A. HVAC CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO FABRICATION OF DUCTWORK. ANY CONFLICTS OR INTERFERENCES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER.

B. GALVANIZED DUCTWORK SHALL BE FABRICATED OF NO.1 PRIME GALVANIZED SHEET METAL OF LOCK FORMING QUALITY.

C. SEALING MATERIALS SHALL BE SUITABLE FOR; USE WITH AIR DISTRIBUTION DUCTWORK. ACCEPTABLE MANUFACTURERS ARE MONOCO INDUSTRIES, 3M, OR UNITED SHEET METAL.

D. PROVIDE ALL DUCTWORK AS INDICATED ON THE DRAWINGS, MAKING ALL NECESSARY OFFSETS (WHETHER OR NOT SPECIFICALLY INDICATED) AS REQUIRED TO MEET THE VARIOUS BUILDING CONDITIONS. DUCTWORK INSTALLATION SHALL NOT CONFLICT WITH EQUIPMENT OR PIPING.

E. EXPOSED DUCTWORK SHALL BE PRIMED AND PAINTED. COORDINATE WITH ARCHITECTURAL PLANS FOR COLOR SELECTION.

F. ALL CHANGES IN CROSS SECTION SHALL BE MADE WITHOUT REDUCING THE DESIGN AREA OF THE DUCT OR RAISING THE PRESSURE DROP PER 100 FEET OF DUCT SHOWN ON DOCUMENTS.

G. NO PIPE OR OTHER OBSTRUCTIONS SHALL PASS THROUGH AIR DUCTS, UNLESS SPECIFICALLY SHOWN ON PLANS.

H. CAP ALL OPEN ENDS TO DUCTWORK DURING CONSTRUCTION TO PREVENT ENTRANCE OF DUST, DEBRIS, MOISTURE ETC.

I. INSTALL DUCTWORK RUN ABOVE CEILING AS HIGH AS POSSIBLE SO AS TO MAINTAIN DESIGN CEILING HEIGHTS. EXPOSED DUCTWORK SHALL BE INSTALLED TO PROVIDE MAXIMUM HEADROOM OR AT HEIGHT SPECIFIED ON PLANS.

J. DUCTWORK SHALL NOT BE HUNG FROM EQUIPMENT, PIPING, CONDUIT, ROOF DECKING OR OTHER DUCTWORK.

K. ALL DUCTWORK JOINTS AND SEAMS SHALL BE AIR-TIGHT PER SMACNA TABLE 1.1. POORLY MADE JOINTS, SPLITS, VISIBLE HOLES AT CORNERS, ETC SHALL BE REWORKED AND REPAIRED. WHERE EXCESSIVE PULSATING OF DUCTWORK IS FOUND, ADDITIONAL STIFFENERS SHALL BE ADDED. ANY CRACKING IN THE SEALANT THAT IS APPARENT UPON INSPECTION SHALL BE SUFFICIENT TO WARRANT REJECTION.

L. IF THE INTERIOR OF SHEET METAL IS EXPOSED TO VIEW THROUGH AIR DISTRIBUTION DEVICES IN FINISHED AREAS OF THE BUILDING, IT SHALL BE COATED WITH PRIMER AND A FLAT BLACK FINISH COAT.

M. ALL DUCTWORK SHALL BE SUPPORTED PER SMACNA REQUIREMENTS.

N. RECTANGULAR DUCTWORK FITTINGS:

(1) BRANCH CONNECTIONS SHALL BE 45 DEGREES ENTRY. STRAIGHT TAPS ARE NOT PERMITTED.

(2) CHANGES IN DIRECTION SHALL BE MADE WITH FULL RADIUS ELBOWS WITH RADIUS EQUAL TO 1-1/2 TIMES THE HORIZONTAL WIDTH OF THE DUCT OR WITH SQUARE ELBOWS WITH TURNING VANES. TURNING VANES SHALL BE DOUBLE THICKNESS TYPE CONSTRUCTED OF THE SAME MATERIAL AS THE SURROUNDING DUCTWORK, PER SMACNA REQUIREMENTS.

O. ROUND DUCTWORK FITTINGS:

(1) BRANCH CONNECTIONS SHALL BE MADE WITH 45 DEGREE ENTRY TEES.

(2) CHANGE IN DIRECTION SHALL BE MADE WITH FULL RADIUS ELBOWS WITH RADIUS EQUAL TO 1-1/2 TIMES THE DIAMETER OF THE DUCT.

P. LOW PRESSURE DUCTWORK SHALL BE CONSTRUCTED PER SMACNA "HVAC DUCT CONSTRUCTION STANDARDS" FOR 2 INCH STATIC PRESSURE, SEAL CLASS "B".

Q. HANGERS AND SUPPORTS

(1) PROVIDE GALVANIZED STEEL STRAPS, ALL-THREAD ROD AND HORIZONTAL ANGLE SUPPORTS SIZED PER SMACNA REQUIREMENTS.

(2) DUCT ATTACHMENTS SHALL BE MADE USING SHEET METAL SCREWS COMPATIBLE WITH DUCT MATERIALS.

(3) BUILDING ATTACHMENTS SHALL BE CONCRETE INSERTS OR STRUCTURAL STEEL FASTENERS APPROPRIATE FOR THE BUILDING MATERIALS. DO NOT USE POWER ACTIVATE CONCRETE FASTENERS. "C" TYPE MALLEABLE IRON BEAM CLAMPS ARE ACCEPTABLE ONLY IF USED WITH CARBON STEEL RETAINER STRAP.

16. NOT USED.

18. BALANCING DAMPERS

A. PROVIDE BALANCING DAMPERS FOR ALL AIR TERMINAL DEVICES (SUCH AS BUT NOT LIMITED TO, DIFFUSERS, REGISTERS, GRILLES, ETC.) AND BRANCH DUCTWORK REQUIRED FOR PROPER BALANCING OF SYSTEM.

B. ROUND DAMPERS SHALL BE SINGLE BLADE TYPE CONSTRUCTION, MINIMUM 18 GAUGE GALVANIZED STEEL. PIVOT ROD SHAFT SHALL BE CONTINUOUS.

C. RECTANGULAR DAMPERS SHALL BE SINGLE BLADE OR MULTIPLE (OPPOSED BLADE) TYPE CONSTRUCTION. MAXIMUM BLADE WIDTH IS 8 INCHES.

D. ALL BALANCING DAMPERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SMACNA "HVAC DUCT CONSTRUCTION STANDARDS"

E. FURNISH ALL BALANCING DAMPERS WITH YOUNG REGULATOR COMPANY VALCALOX REGULATORS WITH HANDLE PERMANENTLY ATTACHED. DAMPER HANDLE POSITION SHALL BE SECURELY LOCKED IN PLACE BY TIGHTENING OF A LOCK NUT. WHERE DUCTWORK IS EXTERNALLY INSULATED, REGULATOR BASE HEIGHT SHALL ACCOMMODATE INSULATION THICKNESS.

F. PROVIDE ALL MANUAL BALANCING DAMPERS WHERE INDICATED ON THE DRAWINGS AND WHERE NECESSARY TO PROPERLY DISTRIBUTE AND BALANCE THE AIR.

19. REGISTERS, GRILLES AND DIFFUSERS

A. PROVIDE REGISTERS, GRILLES AND DIFFUSERS WHERE SHOWN ON THE DRAWINGS, OF SIZE TYPE, AND MATERIAL AS INDICATED AND AS REQUIRED FOR A COMPLETE INSTALLATION.

B. BORDER TYPES SHALL BE COMPATIBLE WITH THE CEILINGS WHERE THE GRILLES AND DIFFUSERS ARE TO BE INSTALLED.

C. ALL GRILLES AND DIFFUSERS SHALL BE FINISHED WITH A FACTORY APPLIED OFF-WHITE FINISH UNLESS NOTED OTHERWISE.

D. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATION OF GRILLES AND DIFFUSERS.

20. VIBRATION ISOLATION

A. PROVIDE ADEQUATE VIBRATION ISOLATION FOR EACH PIECE OF EQUIPMENT.

B. PROVIDE FLEXIBLE CONNECTIONS WITH 1" SLACK BETWEEN DUCTS AND FANS AS MANUFACTURED BY DURO-DYNE, OR EQUIVALENT.

C. PROVIDE FLEXIBLE FITTING ON PIPING CONNECTIONS TO EQUIPMENT.

21. REFRIGERATION AND AIR CONDITIONING CONDENSATE PIPING SYSTEMS

A. USE TYPE DWV COPPER PIPING WITH BRAZED DRAINAGE FITTINGS FOR CONDENSATE PIPING.

B. USE TYPE ACR COPPER PIPING WITH BRAZED WROUGHT COPPER FITTINGS FOR ALL REFRIGERATION PIPING.

C. PITCH PUMPED AND GRAVITY CONDENSATE PIPING AT 1/8 INCH PER FOOT IN DIRECTION OF FLOW.

D. INSULATE ALL INTERIOR CONDENSATE PIPING AND REFRIGERATION SUCTION PIPING WITH 3/4 INCH ARMACELL CLOSED CELL SELF SEALING ARMAFLEX INSULATION.

22. NOT USED.

23. NOT USED.

24. NOT USED.

25. TEMPERATURE CONTROLS

A. ALL TEMPERATURE CONTROL COMPONENTS, WIRING AND CONDUIT SHALL BE THE RESPONSIBILITY OF THE HVAC CONTRACTOR.

B. WIRING AND CONDUIT

(1) ALL 24 VOLT WIRING SHALL BE INSTALLED IN CONDUIT, IN ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE.

(2) ALL OUTDOOR 24 VOLT WIRING SHALL BE INSTALLED IN CONDUIT, IN ACCORDANCE WITH THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE.

C. HVAC CONTRACTOR SHALL USE OWNER APPROVED TEMPERATURE CONTROL CONTRACTOR AND MANUFACTURER.

26. PROJECT COMPLETION:

A. UPON COMPLETION OF PROJECT THIS CONTRACTOR SHALL PROVIDE NEW FILTERS WITHIN ALL FAN POWERED EQUIPMENT.

B. ALL FAN POWERED EQUIPMENT SHALL HAVE THEIR EXTERIOR CLEANED WITH A MILD SOAP AND WATER SOLUTION AND THOROUGHLY DRIED.

C. PROVIDE 3 COPIES OF FINAL TEST AND BALANCE REPORT TO OWNER/ARCHITECT.

## FIRE PROTECTION SPRINKLER SYSTEM

### A. SCOPE

- Furnish all labor, materials and equipment as required to install a complete fire protection system for project.
- Sprinkler work for project essentially consists of the following:
  - Modify existing fire protection system to provide a system serving tenant space. Fire protection system shall be isolated by sprinkler control valve with flow and tamper switches connected to the fire alarm monitoring system. The balance of the building fire protection system shall remain active and with current monitoring in place.
  - Each flow switch shall be connected to an alarm bell outside the building as directed by Fire Marshal.
  - Prepare submittal drawings and hydraulic calculations in accordance with owner's insurance company, building department, and local fire authority's requirements and submit for approval.
  - Flush and conduct pressure test of completed system in accordance with NFPA and authorities having jurisdiction.
  - Other items indicated on drawings or required for complete installation.

### B. DESIGN BASIS

- Design basis for system shall be per all applicable NFPA standards, including but not limited to, Bulletins 13 and 30, Building Code, insurance underwriter, and fire marshal requirements. System shall be a hydraulically designed system.
- Sprinkler heads to be recessed head w/ cover plate per latest OSH design guidelines.

### C. DRAWINGS AND CALCULATIONS

- Contractor shall prepare submittal drawing and hydraulic calculations for space in accordance with owner's insurance company and building department requirements.
- Contractor shall obtain flow test data on city water main and submit data with calculations. Perform flow test if accurate recent data is not available.
- Contractor and designer shall be state certified.
- Contractor shall install all sprinkler piping as high as possible, tight to underside of structure, and through joists or trusses where possible with drains and offsets below beams. Sprinkler Contractor shall coordinate sprinkler system with ductwork and lights. All costs associated with raising sprinkler piping where the architectural design cannot be accomplished shall be the responsibility of the sprinkler contractor.

### D. PIPING

- All piping shall be installed in accordance with NFPA requirements and FM approved.
- Fire protection piping shall be as follows:
  - Inside Building - pipe and tubing shall be steel or copper in accordance with the latest accepted edition of NFPA-13.
  - Piping shall match existing building standards.
  - Contractor shall arrange for shutdown of existing system with landlord, owner and insurance underwriter.
  - Flush all piping upon completion of project and test per NFPA 13.
  - No wet sprinkler piping shall be installed at locations subject to freezing. Provide Glycol loop or dry system for areas subject to freezing.
  - Plastic piping is not approved.

### E. VALVES

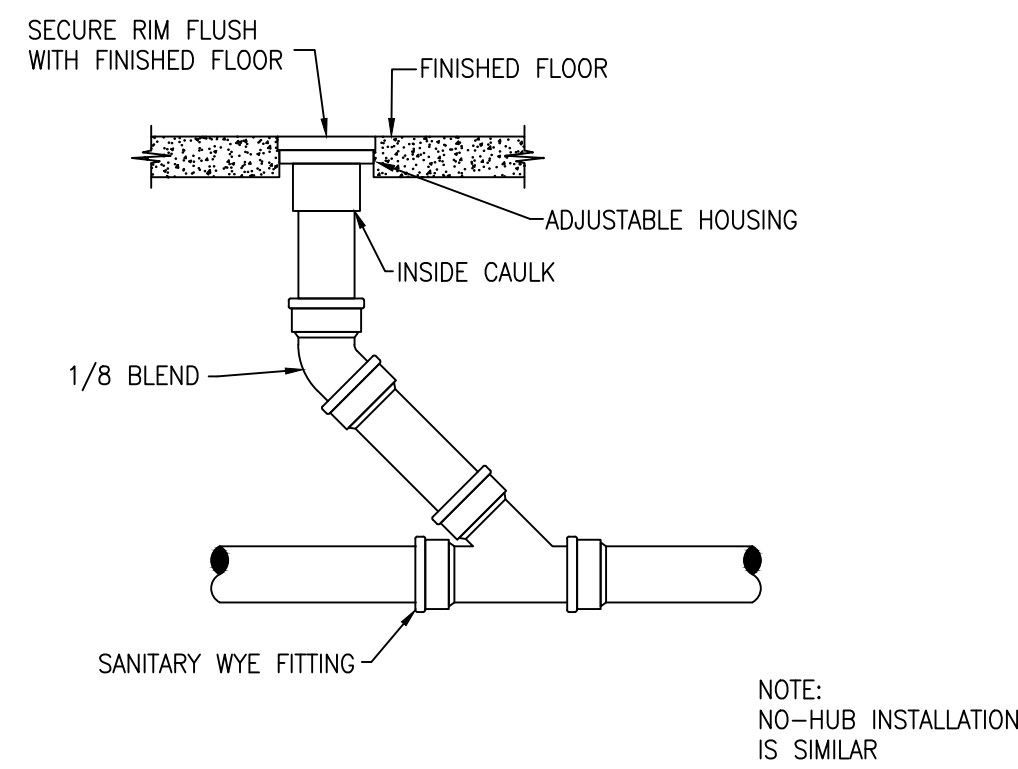
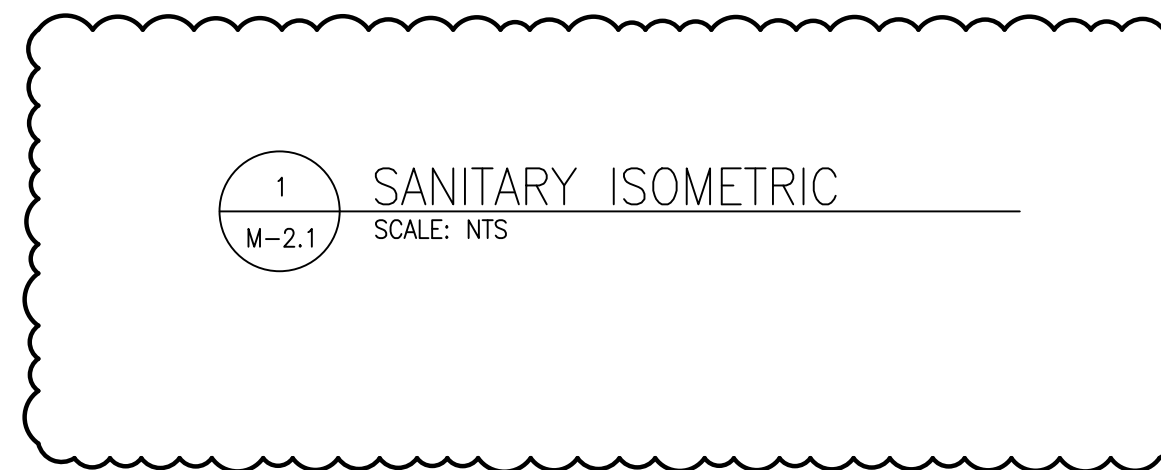
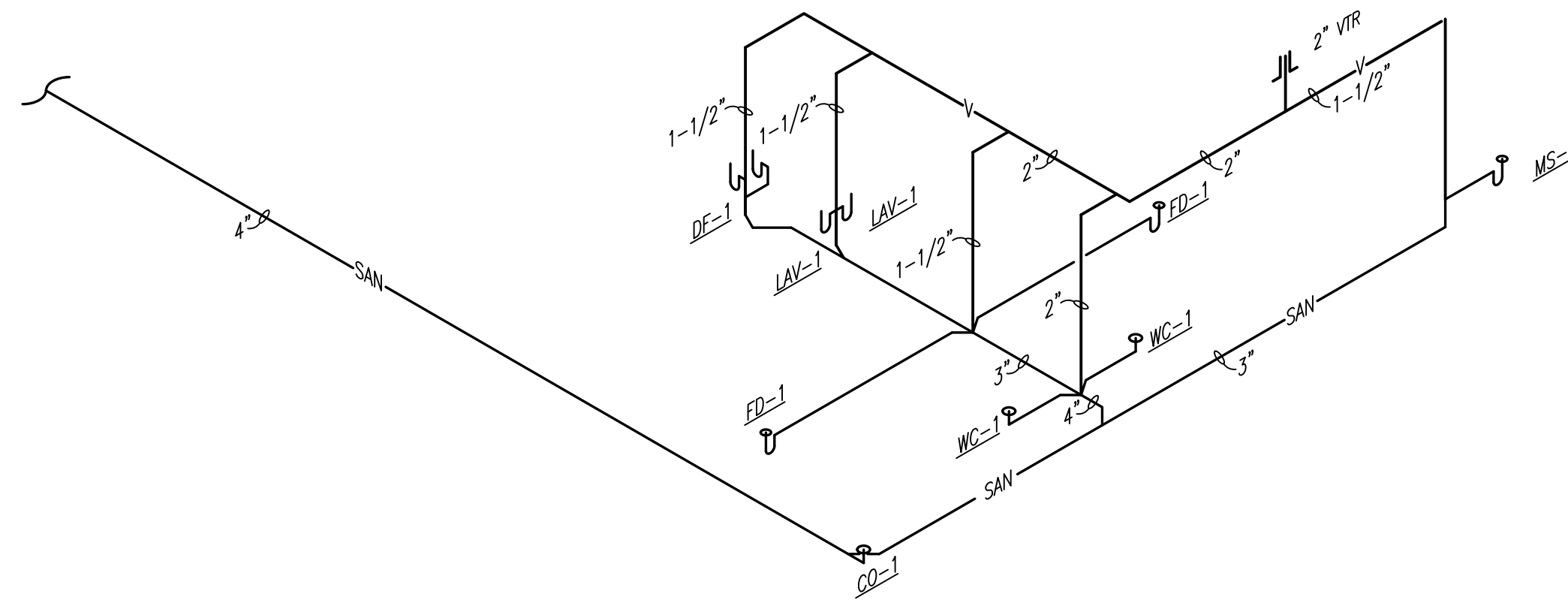
- Install all valves required by NFPA which are U.L. listed and FM approved.
- All shut-off valves shall be fitted with tamper switches by fire protection contractor and wired by electrical contractor.

### END OF SECTION

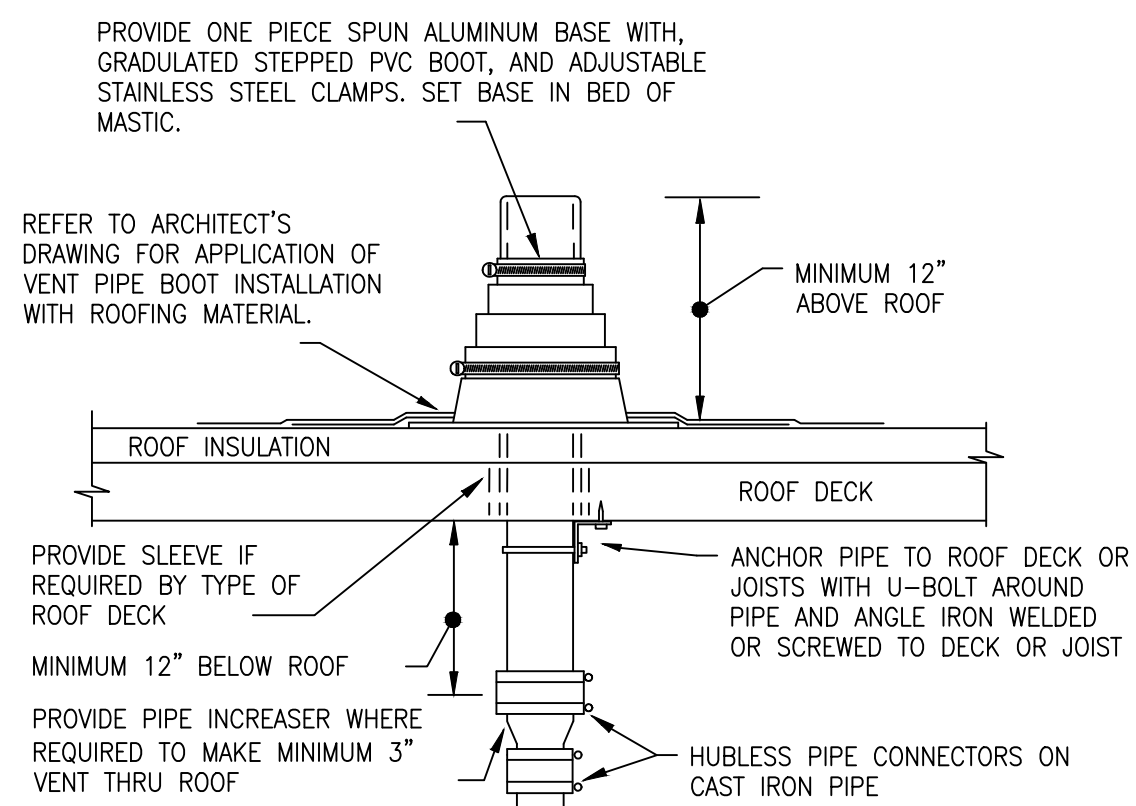
revisions:

**GENERAL PLUMBING NOTES**

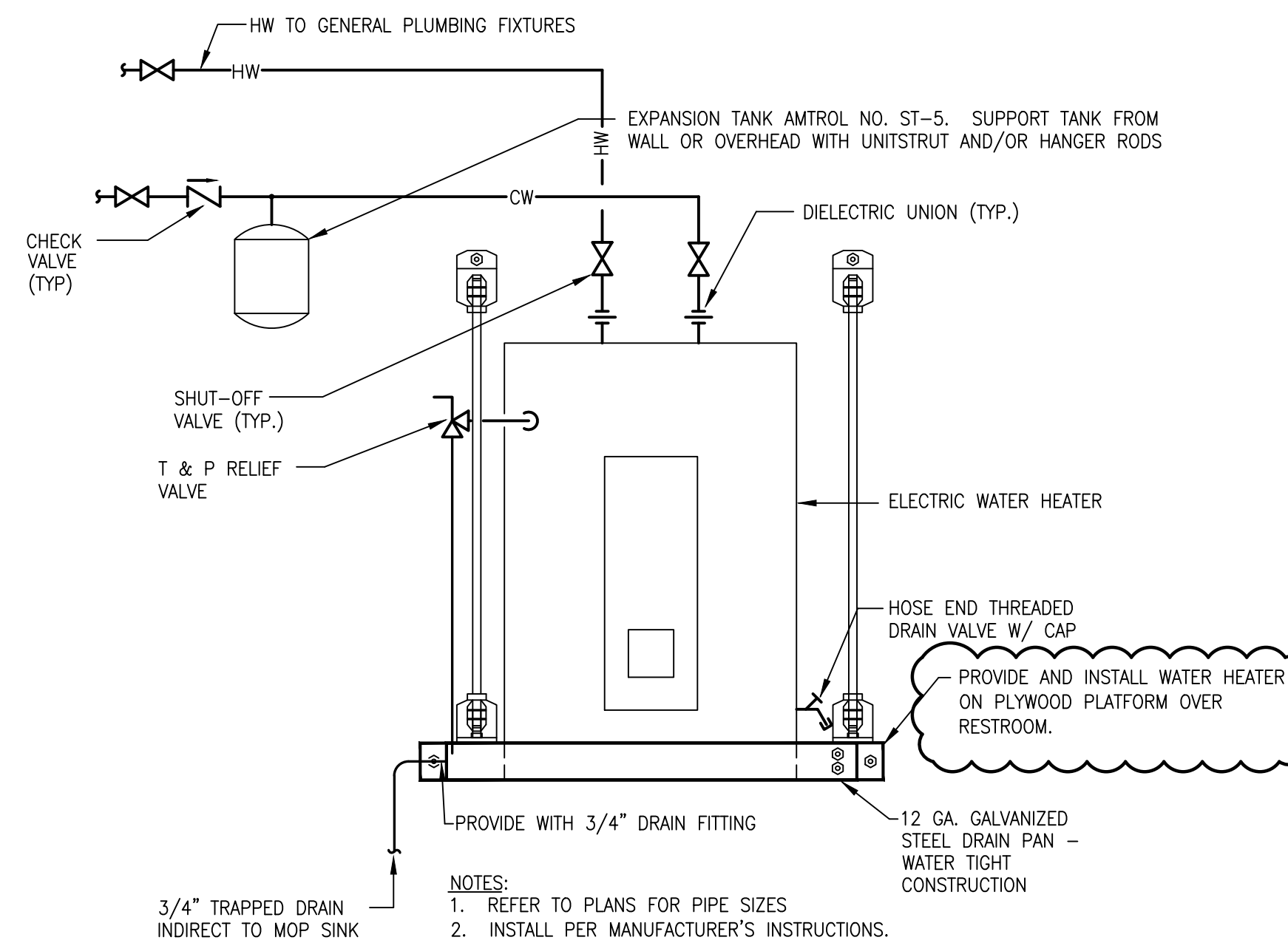
- CONTRACTOR SHALL VERIFY EXACT LOCATIONS OF ALL UTILITIES TO BE USED FOR POINTS OF CONNECTION PRIOR TO SUBMITTING BID AND START OF WORK, AND SHALL IMMEDIATELY NOTIFY THE ARCHITECT OF ANY DISCREPANCIES.
- FIXTURE: EXACT LOCATIONS, MOUNTING HEIGHTS AND COLORS OF PLUMBING FIXTURES SHALL BE OBTAINED FROM THE ARCHITECTURAL AND KITCHEN EQUIPMENT DRAWINGS.
- DISABLED ACCESS FIXTURES: SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS AND MOUNTING HEIGHTS, INSTALLATION SHALL COMPLY WITH A.D.A. REQUIREMENTS.
- INTERFERENCE: ALL PLUMBING WORK SHALL BE INSTALLED SO AS TO AVOID STRUCTURAL FRAMING, MECHANICAL AND ELECTRICAL EQUIPMENT.
- CLEANOUTS: ALL CLEANOUTS SHALL BE INSTALLED WHERE READILY ACCESSIBLE, WHERE INDICATED AND AS REQUIRED BY CODE. THE CONTRACTOR SHALL COORDINATE ALL CLEAN OUTS LOCATIONS WITH EQUIPMENT, CABINETS, ETC., AND THE ARCHITECT PRIOR TO ANY INSTALLATION.
- VENT TERMINATION: ALL PLUMBING FIXTURE VENTS TO TERMINATE A MIN. OF 12 INCHES FROM ANY VERTICAL SURFACE AND 10 FEET FROM OR TERMINATED 3'-0" ABOVE ANY OUTSIDE AIR INTAKES.
- FULL SIZE: ALL VALVES, UNIONS, ETC. TO BE SAME SIZE AS LINE SIZE UNLESS OTHERWISE INDICATED ON DRAWINGS.
- LATERAL SUPPORT: ALL EQUIPMENT SHALL BE LATERALLY SUPPORTED IN ALL DIRECTIONS TO RESIST A MIN. OF 50% OF THE EQUIPMENT'S OPERATING WEIGHT.
- CODE COMPLIANCE: ALL WORK AND MATERIAL SHALL BE PERFORMED AND INSTALLED IN COMPLIANCE WITH THE FOLLOWING CODES AS ADOPTED AND AMENDED BY THE INSPECTING AUTHORITY. NOTHING IN THESE DRAWINGS IS TO BE CONSTRUED TO PERMIT WORK NOT CONFORMING TO THESE CODES OR OTHERS APPLICABLE TO THIS PROJECT:
  - A. OHIO BUILDING CODE.
  - B. OHIO MECHANICAL CODE.
  - C. OHIO PLUMBING CODE.
  - D. OHIO ELECTRICAL CODE.
  - E. NFPA
  - F. SMACNA GUIDELINES
- FIELD VERIFICATION: BEFORE FABRICATION OR INSTALLATION. THIS CONTRACTOR SHALL VERIFY EXACT LOCATIONS OF ALL MECHANICAL EQUIPMENT AND EQUIPMENT PROVIDED UNDER ANOTHER SECTION OF SPECIFICATIONS. EXACT ROUGH-IN LOCATIONS AND REQUIREMENTS SHALL BE COORDINATED IN FIELD.
- ISOMETRICS: THE CONTRACTOR SHALL PROVIDE ALL RISER DIAGRAMS OR ISOMETRICS THAT MAYBE REQUIRED BY GOVERNING AUTHORITIES.
- COORDINATION: THE PLUMBING CONTRACTOR SHALL COORDINATE ALL REQUIREMENTS FOR ALL POINTS OF CONNECTION WITH THE GENERAL CONTRACTOR AND OTHER TRADES PRIOR TO BID.
- PIPE SLOPE: ALL WASTE AND VENT PIPING SHALL SLOPE AT 2% UNLESS OTHERWISE INDICATED.
- ACCESSIBILITY: ALL VALVES, OR OTHER EQUIPMENT SHOWN IN WALLS OR ABOVE NON-ACCESSIBLE CEILINGS SHALL BE INSTALLED WITHIN 24" OF, AND BEHIND, AN ACCESS PANEL.
- SPECIFICATION: THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH, AND BE CONSIDERED TO BE A PART OF THE SPECIFICATIONS.
- PATCHING: THE CONTRACTOR SHALL BE RESPONSIBLE FOR PATCHING AND REPAIRING ALL AREAS WHICH ARE EXCAVATED AND/OR DAMAGED BY HIS OPERATIONS.
- EXISTING PIPING DAMAGED: ALL EXISTING PIPING DAMAGED DURING EXCAVATION SHALL BE REPAIRED WITH MATERIALS TO MATCH EXISTING BY THE CONTRACTOR.
- SAW CUTTING/CORE DRILLING: ALL CUTTING OF EXISTING PAVING, WALKS AND/OR FLOORS SHALL BE BY MACHINE SAW CUTTING. HOLES FOR PIPING IN CONCRETE WALLS OR FLOORS SHALL BE DONE USING CORE DRILLING EQUIPMENT.
- INCOMPATIBLE MATERIAL CONNECTION: CONNECTION BETWEEN INCOMPATIBLE MATERIALS ABOVE GRADE AND INSIDE BUILDING SHALL BE MADE WITH 2 DIELECTRIC UNIONS SEPARATED BY A 12" SECTION OF RED BRASS PIPE.
- SUBMITTALS AND SHOP DRAWINGS: THE PLUMBING CONTRACTOR SHALL SUBMIT SHOP DRAWING ON ALL WORK AND SUBMITTALS ON ALL FIXTURES, EQUIPMENT AND ACCESSORIES FOR REVIEW PRIOR TO ORDERING, FABRICATION AND INSTALLATION.



**FLOOR CLEANOUT DETAIL**  
NO SCALE



**VENT THRU ROOF DETAIL**  
NO SCALE



**ELECTRIC WATER HEATER DETAIL**  
SHELF MOUNTED  
NO SCALE

FIXTURE CONNECTION SCHEDULE					
MARK	FIXTURE	HW	CW	SAN	VENT
WC-1	ADA WATER CLOSET	--	1/2	4	2
LAV-1	ADA LAVATORY	1/2	1/2	1-1/2	1-1/2
MS-1	MOP SINK	1/2	1/2	3	1-1/2
DF-1	DRINKING FOUNTAIN	--	1/2	1-1/2	1-1/2
WH-1	WATER HEATER	3/4	3/4	--	--
FD-1	FLOOR DRAIN	--	--	--	--
CO-1	FLOOR CLEANOUT	--	--	--	--

**PLUMBING FIXTURES:**

**WC-1 (ADA WATER CLOSET):** AMERICAN STANDARD "CADET RIGHT HEIGHT" MODEL #2467.016, PRESSURE-ASSISTED TOILET, ELONGATED FRONT, VITREOUS CHINA, TWO PIECE TOILET, LOW CONSUMPTION 1.6 GPF, ADA.  
**SEAT:** AMERICAN STANDARD MODEL #5901.100.020 HEAVY-DUTY COMMERCIAL, ELONGATED CHAMPION SLOW, OPEN-FRONT PLASTIC SEAT.

**LAV-1 (ADA LAVATORY):** AMERICAN STANDARD "LUCERNE" MODEL #0355.012, WALL HUNG LAVATORY WITH FAUCET LEDGE, VITREOUS CHINA, FAUCET HOLES ON 4" CENTERS, OVERFLOW & WALL HANGER.  
**FAUCET:** MOEN "M-BITION" MODEL #8430, CHROME, 4" CENTERSET, 1/2" CONNECTIONS AND LEVER HANDLE.  
**MIXING VALVE:** ZURN "AQUA-GUARD" MODEL #ZW3870XLT.

**FURNISH CHROME STOPS, SUPPLIES AND 1-1/4" WHEELCHAIR LAVATORY DRAIN WITH STAINLESS STEEL GRID AND P-TRAP. PROTECT 17 GAUGE CHROME TRAP AND SUPPLIES WITH A TRAP WRAP KIT SOOR AS MANUFACTURED BY BROCAR PRODUCTS INC. LAVATORY MOUNTING HEIGHT SHALL BE AS REQUIRED BY THE A.D.A.**

**MS-1 (MOP SINK):** E.L. MUSTEE "DURASTONE" MODEL #63M, 24" X 24" X 10" HIGH FLOOR MOUNTED, MOLDED STONE SERVICE BASIN WITH CHROME PLATED STRAINER, INTEGRAL MOLDED DRAIN WITH SEAL AND BUMPER GUARDS.

**FAUCET:** MOEN COMMERCIAL MODEL #8124 CHROME PLATED, CAST BRASS, WALL MOUNTED, TWO HANDLE SERVICE SINK FAUCET WITH INTEGRAL VACUUM BREAKER, INTEGRAL STOPS, PAIL HOOK, WALL BRACE AND THREADED HOSE END SPOUT.

**DF-1 (DRINKING FOUNTAIN):** ELKAY EZ(ST)L9; BARRIER FREE BI-LEVEL DRINKING FOUNTAIN. PROVIDE CANE GUARD.

**WH-1 (ELECTRIC WATER HEATER):** A.O. SMITH MODEL #DEL-6S-2, 6 GALLON ELECTRIC WATER HEATER. PROVIDE WITH FACTORY INSTALLED HEAT TRAPS. NON-SIMULTANEOUS OPERATION - 2.0 KW, 208V-1Ø. REFER TO ELECTRICAL DRAWINGS FOR MORE INFORMATION. PROVIDE COMPLETE WITH T&P RELIEF VALVE, VACUUM RELIEF VALVE, DRAIN VALVE, SAFETY DRAIN PAN, SCREW-IN TYPE ELEMENTS.

**FD-1 (FLOOR DRAIN):** SIOUX CHIEF MODEL #863-44SNR MEDIUM DUTY, NICKEL-BRONZE, HELI-PROOF NICKEL RING AND STRAINER. PVC HOUSING AND FLASHING. INSTALL WITH RECTORSEAL "SURESEAL" TRAP SEALER.

**CO-1 (FLOOR CLEANOUT):** ZURN MODEL #002450 GENERAL PURPOSE CLEANOUT.



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**fabo architecture**

**RAINBOW-SURREY SQUARE UNIT B6**

4458 MONTGOMERY ROAD  
 NORWOOD, OHIO 45212

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revisions:

issue date: 01-03-2023

**M-2.1**

sheet No.  
 job No. FA22055

ROOFTOP UNIT SCHEDULE											BELT				
TAG	TONNAGE	CFM	MIN OUTSIDE AIR	ESP	SUPPLY FAN B.H.P.	VOLTAGE	MCA/MOCP	COOLING CAPACITY		HEATING CAPACITY		MANUFACTURER & MODEL NO.	SEER/EER/IEER	WEIGHT	REMARKS
								TOTAL	SENSIBLE	MBH INPUT	MBH OUTPUT				
EX.RTU-2	15	--	--	1.0	5.0	480V/3φ	49.3/50	180	--	400	--	YORK ZJ190N3Z0418B1B	12.2	3209	1-9
EX.RTU-4	12.5	--	--	1.0	5.0	480V/3φ	45.5/50	150	--	240	--	YORK ZJ150NZ0Q4TAASA	12.2	1675	1-9

- REMARKS:
1. REPLACE OUTSIDE AIR FILTERS
  2. VERTICAL SUPPLY & RETURN DUCTS
  3. ALL T-STAYS PROVIDED WITH LOCKING COVERS
  4. 7 DAY PROGRAMMABLE THERMOSTAT
  5. PROVIDE SMOKE DETECTOR W/TEST SWITCH (AUDIO/VISUAL) - RETURN AIR - FIELD INSTALLED

Ventilation Calculation For EX.RTU-2												
Space Name	Designation	Floor Area (A)	Zone Population (P)	Area Outdoor Air Rate (R <sub>a</sub> )	People Outdoor Air Rate (R <sub>p</sub> )	Area Exhaust Air Rate (R <sub>e</sub> )	Breathing Zone Outdoor Airflow (V <sub>bz</sub> )	Zone Outdoor Airflow (V <sub>zo</sub> )	Minimum Exhaust (R <sub>m</sub> )	Zone Primary Airflow (V <sub>zp</sub> )	Primary Outdoor Air Fraction (Z <sub>po</sub> )	
Sales Area	Sales	3203	48	0.12	7.5	-	744	930	0	4500	-	
		Total:						744	930	0	4500	

Ventilation Calculation For RTU-2												
Space Name	Designation	Floor Area (A)	Zone Population (P)	Area Outdoor Air Rate (R <sub>a</sub> )	People Outdoor Air Rate (R <sub>p</sub> )	Area Exhaust Air Rate (R <sub>e</sub> )	Breathing Zone Outdoor Airflow (V <sub>bz</sub> )	Zone Outdoor Airflow (V <sub>zo</sub> )	Minimum Exhaust (R <sub>m</sub> )	Zone Primary Airflow (V <sub>zp</sub> )	Primary Outdoor Air Fraction (Z <sub>po</sub> )	
BOH Storage	Storage Rooms	440	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	275	#NAME?	
Sales Area	Sales	2188	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	2500	#NAME?	
Rest Room	Toilet Rooms - Public	54	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	75	#NAME?	
Rest Room	Toilet Rooms - Public	54	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	75	#NAME?	
Fitting Rooms	Sales	62	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	#NAME?	75	#NAME?	
		Total:						#NAME?	#NAME?	#NAME?	3000	

GRILLE & DIFFUSER SCHEDULE								
TAG	MANUFACTURER & MODEL NO.	DAMPER NUMBER	FRAME/BORDER	CFM	MODULE SIZE	PATTERN	FINISH	REMARKS
A	TITUS TMS	OBD	LAY-IN	AS NOTED	24"x24"	4-WAY	WHITE	SUPPLY
B	TITUS 50F	--	LAY-IN	AS NOTED	AS NOTED	EGGCRATE	WHITE	RETURN
C	TITUS TMS	OBD	SURFACE	AS NOTED	12"x12"	4-WAY	WHITE	SUPPLY

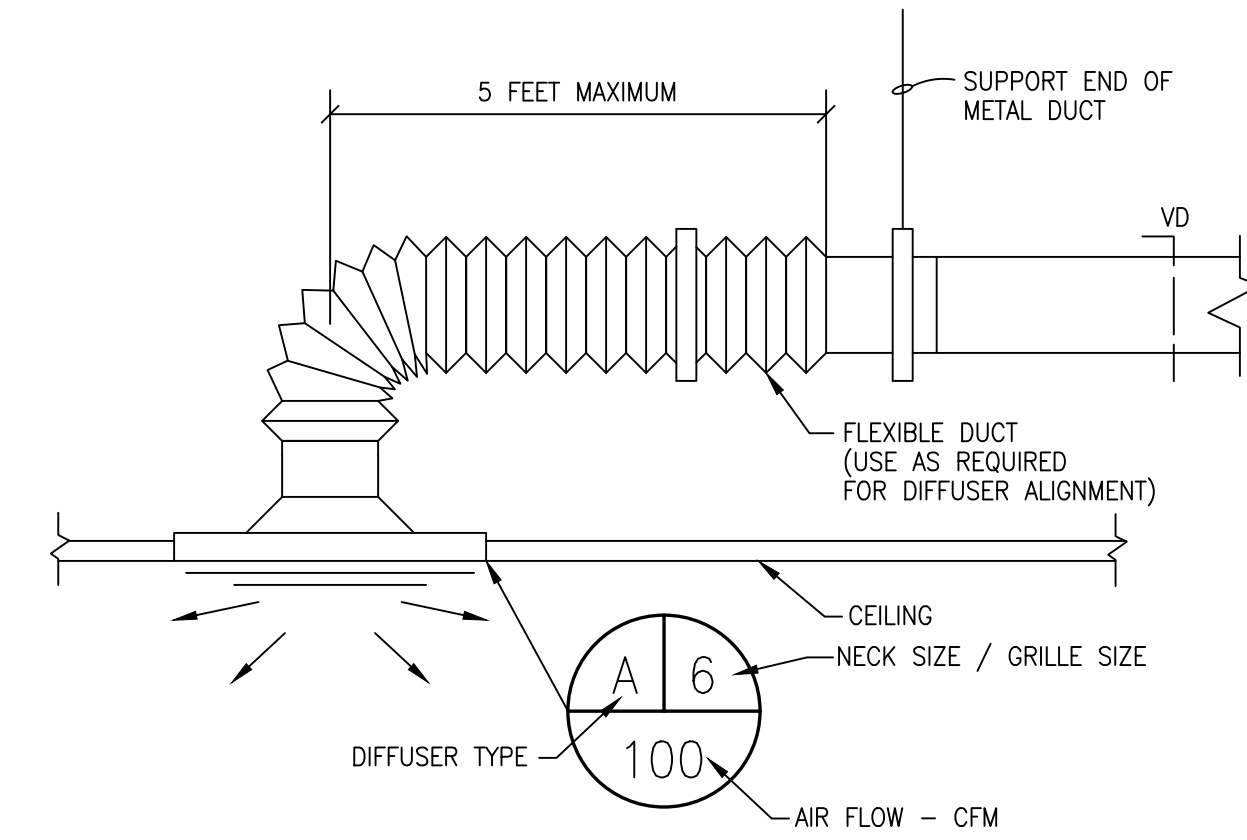
- REMARKS:
1. NEW AIR DISTRIBUTION DEVICES TO MATCH EXISTING RETAIL SPACE.

EXHAUST FAN SCHEDULE										
MARK	SERVICE	CFM	S.P. (WG)	RPM	HP (WATTS)	SONES	VOLTAGE	MANUFACTURER & MODEL NO.	WEIGHT (LBS)	REMARKS
EF-1	RESTROOM	80	0.1	856	8.5	0.4	120V-1φ	PANASONIC FV-0810VSS1	8.6	1-2
EF-2	RESTROOM	80	0.1	856	8.5	0.4	120V-1φ	PANASONIC FV-0810VSS1	8.6	1-2

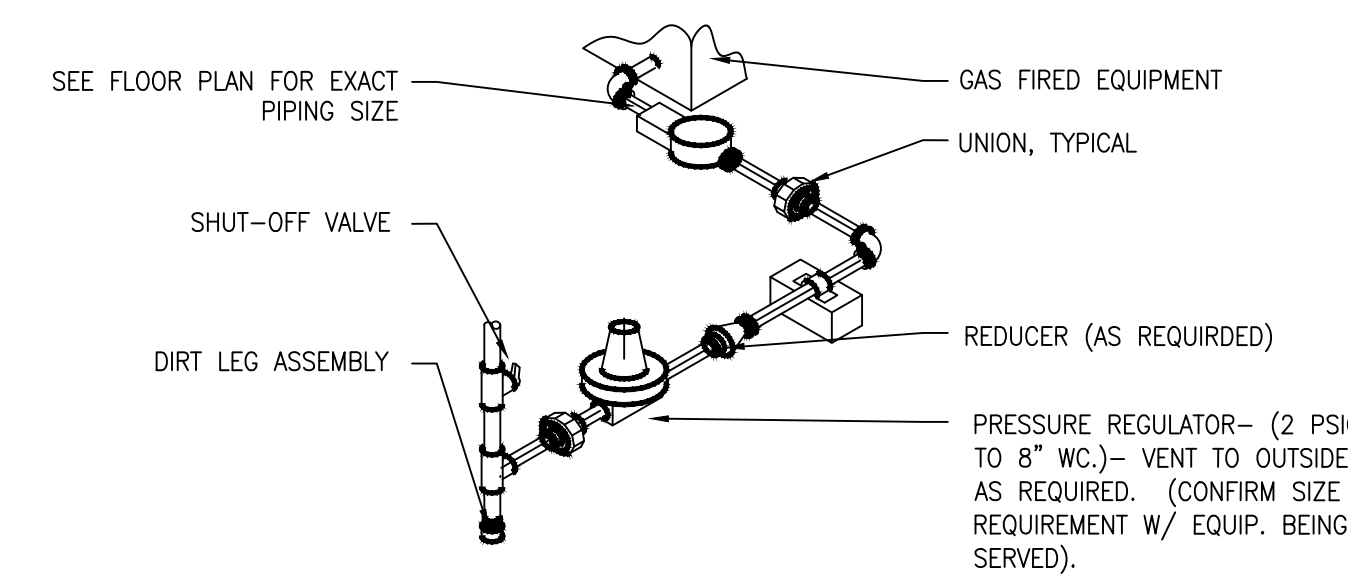
- REMARKS:
1. PROVIDE WITH GRILLE, VIBRATION ISOLATION KIT, BACKDRAFT DAMPER, & DISCONNECT
  2. INTERLOCK WITH LIGHTING SWITCH

**FIELD VERIFY ALL CONDITIONS**

- DESIGN DRAWINGS ARE SCHEMATIC. THIS CONTRACTOR SHALL VISIT THE SITE PRIOR TO BIDDING OR AWARD OF CONTRACT TO INSPECT EXISTING FIELD CONDITIONS. THIS CONTRACT SHALL INCLUDE ALL LABOR AND MATERIALS NECESSARY FOR FIELD MODIFICATIONS DUE TO EXISTING CONDITIONS.
- THE CONTRACTOR SHALL CONTACT THE ARCHITECT, ENGINEER OR OWNER PRIOR TO BIDDING FOR INTERPRETATIONS AND CLARIFICATIONS OF THE DESIGN AND INCLUDE IN HIS BID ALL COSTS TO MEET THE DESIGN INTENT. CLARIFICATIONS MADE BY THE ARCHITECT, ENGINEER OR OWNER AFTER BIDDING WILL BE FINAL AND SHALL BE IMPLEMENTED AT CONTRACTORS COST.
- BIDDING CONTRACTORS SHALL HAVE A WORKING KNOWLEDGE OF LOCAL CODES AND ORDINANCES AND SHALL INCLUDE IN THEIR BIDS THE COSTS FOR ALL WORK INSTALLED IN STRICT ACCORDANCE WITH GOVERNING CODES, THE PLANS AND SPECIFICATIONS NOT WITHSTANDING. THE CONTRACTOR SHALL ALERT ARCHITECT, ENGINEER OR OWNER OF ANY APPARENT DISCREPANCIES BETWEEN GOVERNING CODES AND DESIGN INTENT.

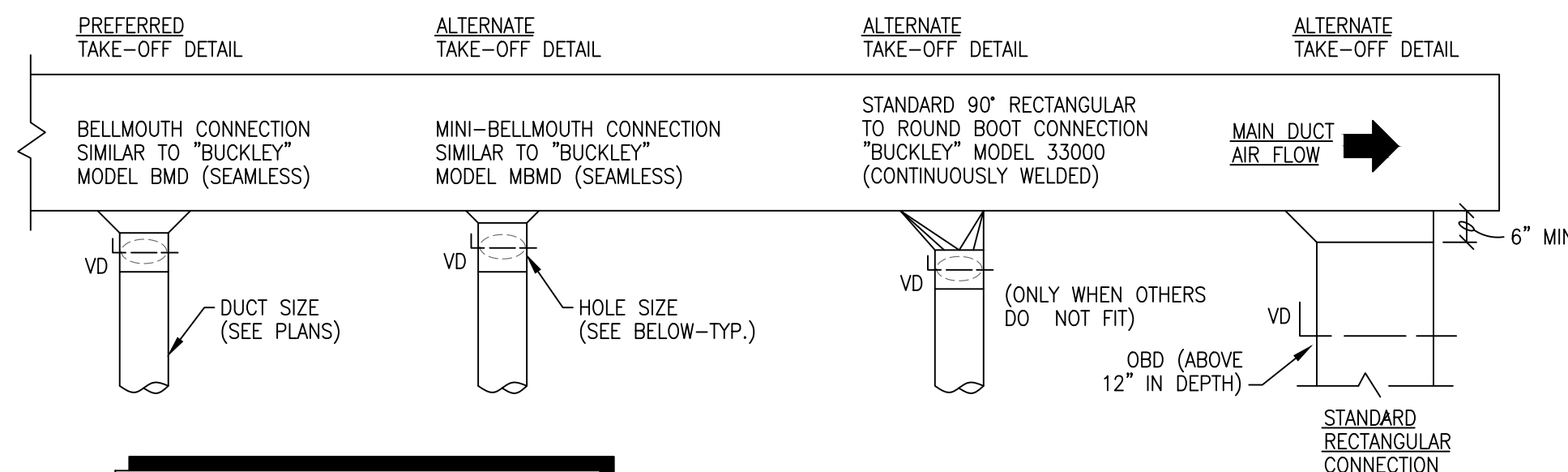


**CEILING DIFFUSER BRANCH DUCTS W/ FLEX CONNECTION**  
NO SCALE



NOTE: PROVIDE COMPLETE ASSEMBLY AS REQUIRED. REGULATORS NOT REQUIRED AT ALL LOCATIONS, VERIFY PRIOR TO ROUGH-IN.

**GAS FIRED EQUIPMENT CONNECTION DETAIL**  
N.T.S.

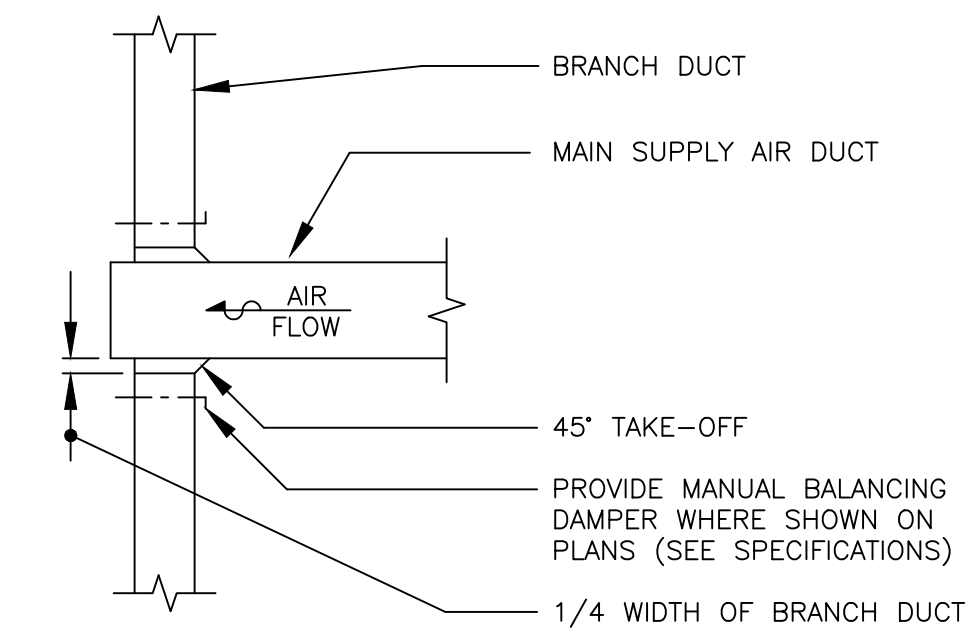


THIS DETAIL APPLIES TO SINGLE TAKEOFFS TO DIFFUSER AS WELL AS BRANCH TAKEOFFS. IT ALSO APPLIES TO TAKEOFFS IN THE HORIZONTAL AS WELL AS VERTICAL DIRECTION.

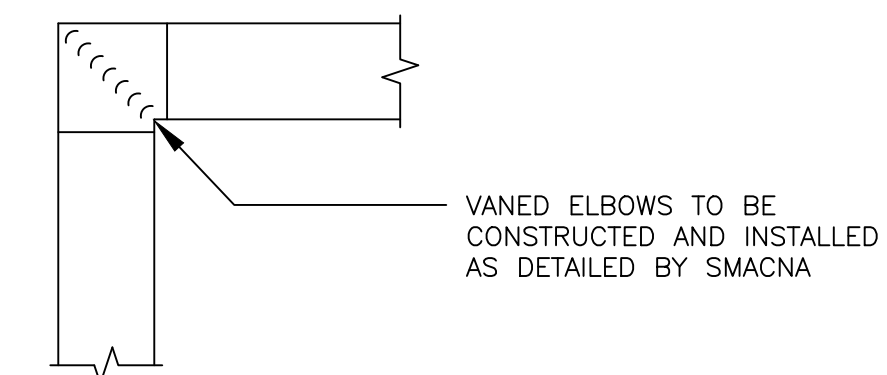
NOTE: ALTERNATE FITTINGS SHALL BE USED WHEN DUCT HEIGHTS DOES NOT PERMIT THE USE OF THE PREFERRED FULL SIZE BELLMOUTH. SUBMIT FITTINGS FOR REVIEW BY ENGINEER PRIOR TO INSTALLATION.

**DUCT TAKEOFFS**  
NO SCALE

- GENERAL MECHANICAL NOTES**
1. PROVIDE ALL LOW PRESSURE DUCTWORK SIZED EQUAL TO OR LESS THAN 0.1" W.G./100" (TYP.) UNLESS SCHEDULED OTHERWISE. INDICATE ALL DUCT SIZES ON SHOP DRAWINGS.
  2. PROVIDE MINIMUM DUCT RADIUS ON ELBOWS AT 1-1/2 TIMES DUCT SIZE.
  3. PROVIDE 5'-0" MAX. FLEX DUCT CONNECTION TO DIFFUSERS, TYPICAL.
  4. ALL CONCEALED SUPPLY DUCTWORK NOT LOCATED IN RETURN AIR PLENUM SHALL BE INSULATED.
  5. ALL DUCTS SHALL BE FREE FROM CONTACT WITH ALL: PIPING, WALLS, ELECTRICAL CONDUITS, CEILING SUSPENSION SYSTEMS, ETC.
  6. PROVIDE THROAT WITH PROPORTIONAL SPLIT AND TURNING VANES ON TEE TRANSITIONS. (BULLHEAD TEE'S WILL NOT BE PERMITTED.)
  7. CEILING DIFFUSER CORES AND BACK-PANS SHALL HAVE A FLAT BLACK ENAMEL FINISH. FACE TO BE OFF-WHITE BAKED ENAMEL ON PERFORATED PLATE AND MARGIN UNLESS SPECIFIED OTHERWISE BY ARCHITECT AND APPROVED BY MECHANICAL ENGINEER. NECK VELOCITIES NOT TO EXCEED 500 FPM MAXIMUM.
  8. PROVIDE GALVANIZED SHEET METAL DUCTWORK. ALUMINUM OR ALUMINUM FLEX IS NOT PERMITTED.
  9. ALL PIPING AND DUCTWORK SHALL FREELY PASS THROUGH ALL WALLS AND FLOORS WITHOUT RIGID CONNECTIONS. PENETRATION POINTS SHALL BE SLEEVED TO ALLOW PASSAGE OF PIPING OR DUCTWORK AND MAINTAIN 3/4" TO 1-1/4" CLEARANCE AROUND THE OUTSIDE SURFACES. THIS CLEARANCE SHALL BE TIGHTLY PACKED WITH ONE POUND DENSITY GLASS FIBER, AND CAULKED AIR TIGHT WITH NON-HARDENING SEALANT AFTER INSTALLATION OF PIPING OR DUCTWORK.
  10. PROVIDE FIRE DAMPERS WITH ACCESS IN ALL RATED WALLS IN ACCORDANCE WITH LOCAL CODES.
  11. FABRICATE, INSTALL, SEAL, AND INSULATE ALL DUCTWORK IN STRICT CONFORMANCE WITH THE REQUIREMENTS OF THE INTERNATIONAL MECHANICAL CODE AND THE STATE HAVING JURISDICTION BUILDING CODE.
  12. ALL EQUIPMENT, MATERIALS AND WORK SHALL CONFORM TO THE APPLICABLE CODES OF THE INTERNATIONAL BUILDING, FIRE, MECHANICAL, AND ELECTRICAL CODES AS ADOPTED BY THE CITY HAVING JURISDICTION AND ALL OTHER CODES. SAFETY ORDERS AND REGULATIONS AS ENFORCED BY THE THE STATE AND CITY FIRE MARSHALL'S PERTAINING TO THIS PROJECT.
  13. PROTECTIVE BARRIERS SHALL BE INSTALLED IN FRONT OF EQUIPMENT WHERE EQUIPMENT IS SUBJECT TO MECHANICAL DAMAGE.
  14. SUITABLE OPENINGS WITH TIGHTLY FITTED COVERS SHALL BE PROVIDED TO MAKE FIRE DAMPERS ACCESSIBLE FOR INSPECTION.
  15. CONDENSATE DRAIN LINES SHALL BE PROVIDED FOR ALL MECHANICAL EQUIPMENT WHICH PRODUCES CONDENSATE.



**LOW PRESSURE END OF SUPPLY AIR DUCT DETAIL**  
N.T.S.



(1-1/2 WIDTH RADIUS-TYPE ELBOWS ARE OPTIONAL; SEE MECHANICAL SPECIFICATIONS)

**LOW PRESSURE DUCT ELBOW DETAIL**  
N.T.S.



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**fabo architecture**

**RAINBOW-SURREY SQUARE UNIT B6**

4458 MONTGOMERY ROAD  
NORWOOD, OHIO 45212

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**M-2**

sheet No.  
job No. FA22055

### MECHANICAL LEGEND

SYMBOL	DESCRIPTION
	TURNING VANE
	AIR EXTRACTOR
	OPPOSED BLADE VOLUME DAMPER
	SUPPLY DUCT
	RETURN DUCT
	EXHAUST DUCT
	FLEXIBLE DUCT CONNECTION
	LINED DUCTWORK
	THERMOSTAT
	SMOKE DETECTOR TEST STATION
	DUCT SMOKE DETECTOR TO SHUT DOWN UNIT UNDER ALARM
	UNDERCUT DOOR (BY G.C.)
	CONNECT TO EXISTING

### ABBREVIATIONS

SR SUPPLY REGISTER	G.C. GENERAL CONTRACTOR
RG RETURN GRILLE	M.C. MECHANICAL CONTRACTOR
SA SUPPLY AIR	P.C. PLUMBING CONTRACTOR
RA RETURN AIR	E.C. ELECTRICAL CONTRACTOR
VD VOLUME DAMPER	CLG.CEIL. CEILING
FD FIRE DAMPER	A.F.F. ABOVE FINISHED FLOOR
UCD UNDERCUT DOOR	ETR EXISTING TO REMAIN

### PLUMBING LEGEND

SYMBOL	DESCRIPTION
	EXISTING PIPING
	SANITARY SEWER (UNDERFLOOR)
	VENT PIPING
	COLD WATER
	HOT WATER
	GAS
	SHUT-OFF VALVE
	FLOOR DRAIN
	PIPE UP OR DOWN
	PIPE UP
	CLEANOUT

### ABBREVIATIONS

AD AREA DRAIN	HB HOSE BIBB
AFB ABOVE FINISHED FLOOR	INL INLET
BT BATHTUB	INV INVERT
CB CATCH BASIN	LAV LAVATORY
CLG CEILING	LT LAUNDRY TRAY
CI CAST IRON	MC MECHANICAL CONTRACTOR
DF DRINKING FOUNTAIN	MH MANHOLE
DV DRAIN VALVE	P-1 FIXTURE DESIGNATION
EC ELECTRICAL CONTRACTOR	PC PLUMBING CONTRACTOR
EL ELEVATION	PIV POST INDICATOR VALVE
ETR EXISTING TO REMAIN	RD ROOF DRAIN
EWC ELECTRIC WATER COOLER	SD SHOWER DRAIN
FD FLOOR DRAIN	SS SERVICE SINK
FEC FIRE EXTINGUISHER CABINET	UR URINAL
FHC FIRE HOSE CABINET	VT VITREOUS TILE
FPHB FROSTPROOF HOSE BIBB	VTR VENT THRU ROOF
GC GENERAL CONTRACTOR	WC WATER CLOSET

### GAS SIZING CALCULATION

GAS PIPING SIZES BASED ON 7" W.C. INCOMING PRESSURE AND 0.05 PSI PRESSURE DROP

DEVELOPED LENGTH	
VERTICAL	20
HORIZONTAL	143
FITTINGS (25%)	57
TOTAL:	220

PROPOSED GAS LOAD				
EQUIPMENT TAG	DESCRIPTION	QTY.	INDIVIDUAL GAS LOAD (CFH)	GAS LOAD (CFH)
EX.RTU	EXISTING PACKAGED RTU	1	350	350
EX.RTU	EXISTING PACKAGED RTU	1	115	115
RTU-1	NEW PACKAGED RTU	1	200	200
RTU-2	NEW PACKAGED RTU	1	150	150
TOTAL(CFM):			815	

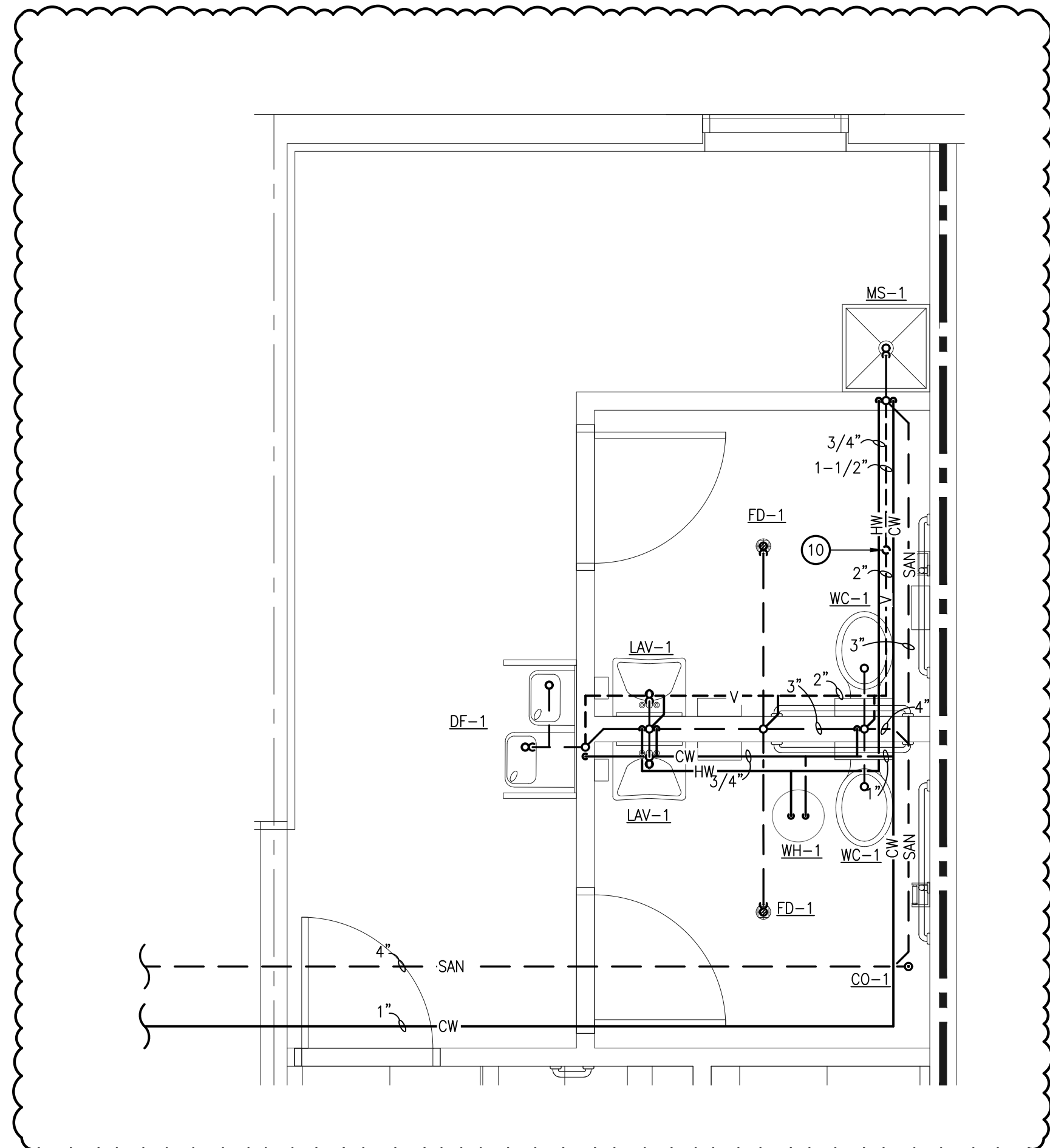
GAS MAIN SIZE SHALL BE 2-1/2" PER SECTION 402 OF THE IFGC. FIELD VERIFY EXACT DEVELOPED LENGTH IN FIELD.

### CODED NOTES

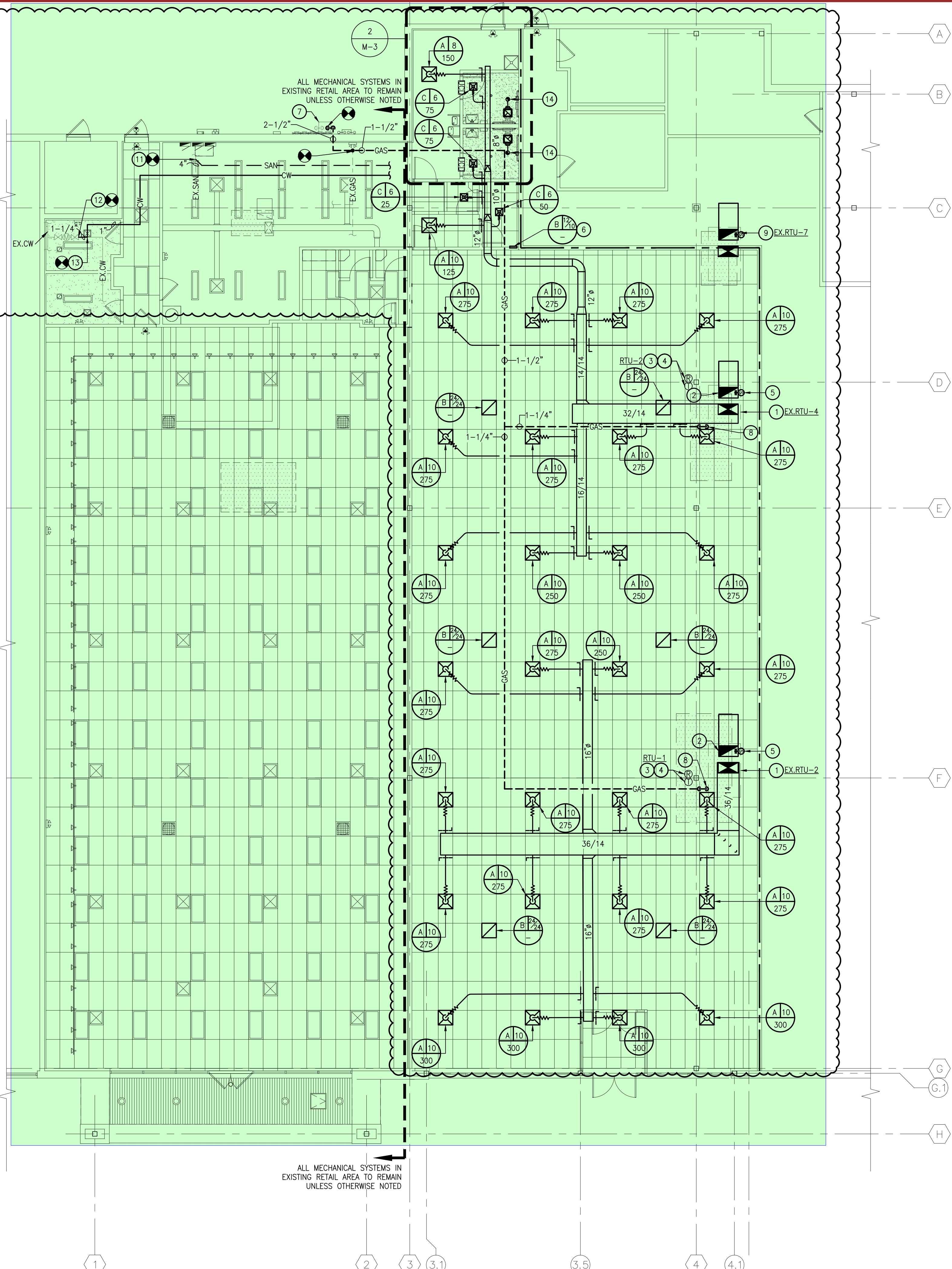
- EXISTING PACKAGED HVAC ROOFTOP UNIT NEAR THIS LOCATION TO REMAIN. EXTEND VERIFY EXISTENCE OF FULL SIZE SUPPLY & RETURN DUCTWORK FROM EXISTING ROOFTOP UNIT TO SPACE, IF NOT PRESENT, PROVIDE & EXTEND AS SHOWN. ACOUSTICALLY LINE THE FIRST 10'-0" OF BOTH SUPPLY AND RETURN MAIN DUCTS. SET UNIT OUTSIDE AIR QUANTITY AS LISTED ON ROOFTOP UNIT SCHEDULE. FANS TO RUN CONTINUOUS DURING OCCUPIED HOURS.
- PROVIDE INSULATED ELBOW CONNECTED TO ROOFTOP UNIT DUCT DROP W/ SCREEN OVER END.
- INSTALL AND WIRE NEW 7-DAY PROGRAMMABLE THERMOSTAT. COORDINATE EXACT LOCATION WITH ARCHITECT AND OWNER PRIOR TO ROUGH-IN.
- MECHANICAL CONTRACTOR TO MOUNT SMOKE DETECTOR REMOTE KEY STATUS AND TEST STATIONS (WITH AUDIO AND VISUAL ALARM) NEXT TO UNIT THERMOSTAT. M.C. TO INDICATE DETECTOR SERVING AIR CONDITIONING UNIT. COORDINATE EXACT LOCATION WITH FIRE MARSHAL PRIOR TO ROUGH-IN. ALL WIRING SHALL BE BY ELECTRICAL CONTRACTOR IN CONDUIT PER N.E.C. REMOTE STATION SHALL BE A SYSTEM SENSOR MODEL RTS151KEY OR EQUAL.
- SMOKE DETECTOR SHALL BE FURNISHED/INSTALLED BY MECHANICAL CONTRACTOR AND WIRED BY ELECTRICAL CONTRACTOR TO SHUT DOWN CORRESPONDING AIR CONDITIONING UNIT UNDER ALARM CONDITIONS. ALL WIRING SHALL BE IN CONDUIT PER N.E.C. SMOKE DETECTOR SHALL BE SYSTEM SENSOR MODEL DH100ACDCLP OR EQUAL.
- INSTALL TRANSFER GRILLE HIGH ON WALL IN BOH STORAGE AREA TO ALLOW RETURN AIR BETWEEN BOH STORAGE AND SALES AREA RETURN AIR PLENUM ABOVE CEILING GRID.
- NOT USED.
- NOT USED.
- EXISTING PACKAGED HVAC ROOFTOP UNIT NEAR THIS LOCATION TO BE REMOVED AND ROOF TO BE CAPPED AND PATCHED AS REQUIRED TO MATCH EXISTING. COORDINATE WITH GC.
- 2" VENT THRU ROOF
- CONNECT NEW 4" SANITARY LINE IN EXISTING 4" LINE. VERIFY EXACT SIZE, LOCATION, AND INVERT IN FIELD PRIOR TO BID.
- CONNECT NEW 1-1/4" CW LINE INTO EXISTING 1" METER. VERIFY EXACT SIZE AND LOCATION IN FIELD PRIOR TO BID.
- CONNECT EXISTING 1" CW LINE SERVING EXISTING RESTROOMS INTO NEW 1-1/4" CW LINE.
- 6"Ø EXHAUST UP TO SPUN ALUMINUM ROOF CAP. MAINTAIN 10- FEET FROM MECHANICAL FRESH AIR INTAKES. VERIFY CONDITIONS IN FIELD PRIOR TO STARTING WORK. COORDINATE ALL ROOF PENETRATIONS WITH LANDLORD APPROVED CONTRACTOR.

### BRANCH DUCTWORK

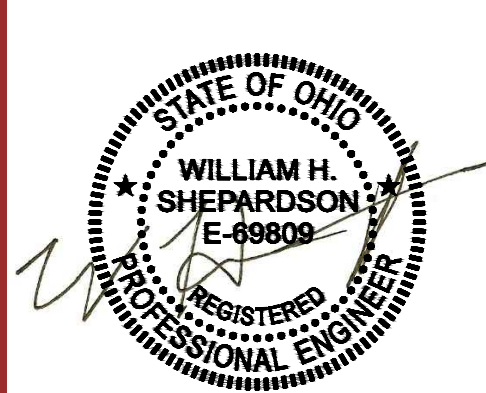
CFM	DUCT SIZE
0-100	6"Ø
101-250	8"Ø
251-400	10"Ø
401-650	12"Ø



2 ENLARGED PLUMBING PLAN  
SCALE: 3/8" = 1'-0"



1 MECHANICAL PLANS  
SCALE: 1/8" = 1'-0"



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