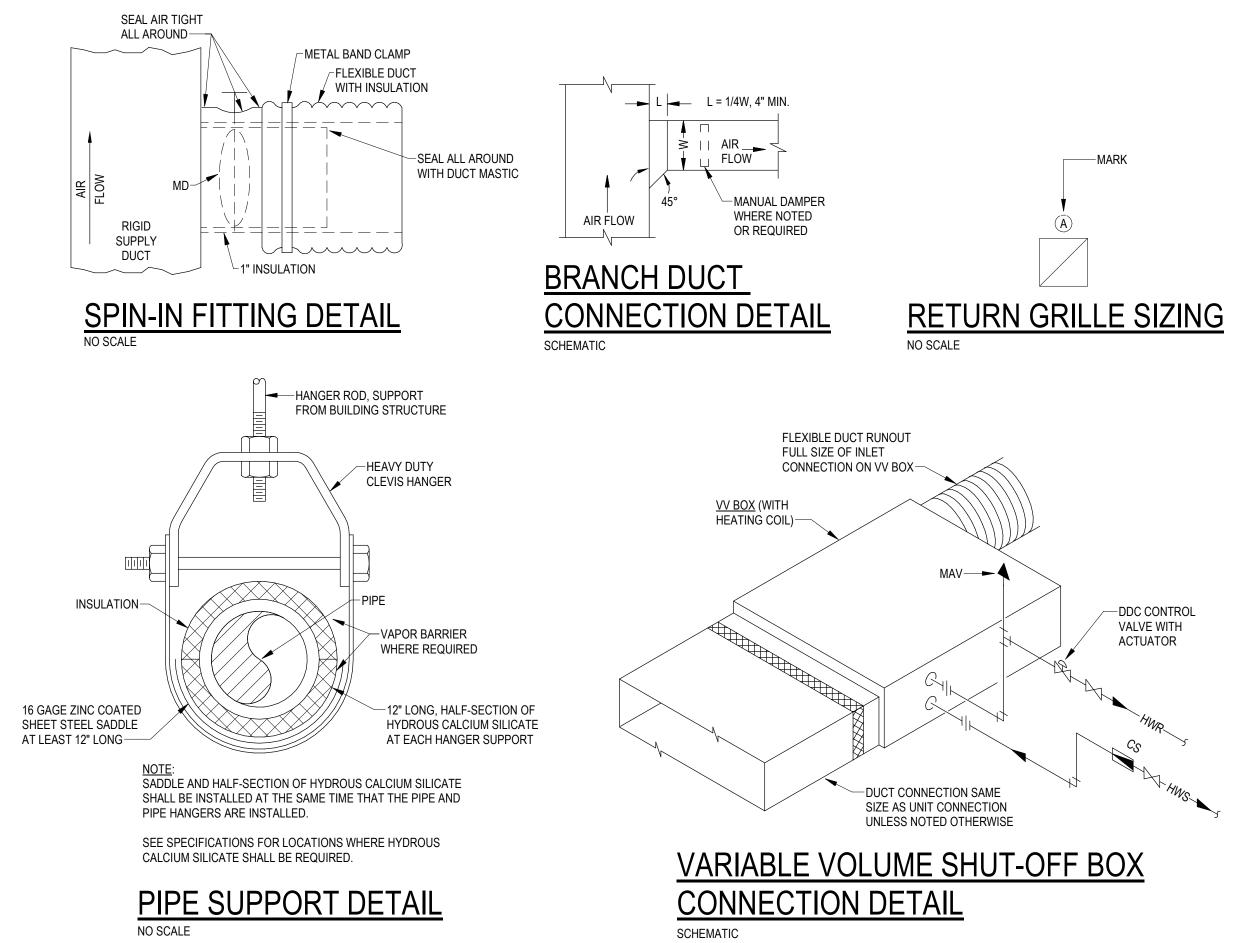
EQUIPMENT SCHEDULES:

VARIABLE AIR VOLUME HEATING BOXES: TRANE MODEL VCWF

			I	AIRFLOW, CFN	1				HEATING COIL			
MARK SIZ	SIZE	COOLING MAX	COOLING MIN - HIGH	COOLING MIN - LOW	HEATING MIN	HEATING MAX	Max ΔP, IN. H2O	MAX DISCHARGE N.C.	HEATING CAPACITY, MBH	FLOW RATE, GPM	MAX ΔP, FT. H2O	MAX NUMBER OF ROWS
VS-37	8	350		105	70	175	0.30	30	7.5	0.50	5.0	2
VS-39	8	350		105	70	175	0.30	30	7.5	0.50	5.0	2
VS-40	8	350		105	70	175	0.30	30	7.5	0.50	5.0	2
VS-41	8	320		100	65	160	0.30	30	7.5	0.50	5.0	2
VS-2134	8	350		105	70	175	0.30	30	7.5	0.50	5.0	2
VS-2135	8	310		95	65	155	0.30	30	7.5	0.50	5.0	2
VS-2136	8	350		105	70	175	0.30	30	7.5	0.50	5.0	2
VS-2137	8	350		105	70	175	0.30	30	7.5	0.50	5.0	2
VS-3065	10	965	605	290	195	605	0.30	30	25.5	1.70	5.0	2
VS-3061	12	1,025	645	310	205	645	0.30	30	27.0	1.80	5.0	2
VS-106	8	550		165	110	275	0.30	30	12.0	0.80	5.0	2
VS-109	6	200		60	40	100	0.30	30	7.5	0.50	5.0	2
VS-112	10	900		270	180	450	0.30	30	19.5	1.30	5.0	2
VS-4135	8	485		150	100	245	0.30	30	10.5	0.70	5.0	2
VS-4136	8	485		150	100	245	0.30	30	10.5	0.70	5.0	2
VS-4137	8	485		150	100	245	0.30	30	10.5	0.70	5.0	2
VS-4138	8	485		150	100	245	0.30	30	10.5	0.70	5.0	2
<u>NOTES:</u> . HEATING CA	APACITIES B	ASED ON 180 D	EG. F EWT, 52	DEG. F EAT.								
. PIPING RUN	OUT SIZES S	SHALL BE 3/4" U	JNLESS OTHER	WISE NOTED.								
. PROVIDE DI	SCONNECT	SWITCH AND 12	20V TO 24V TR	ANSFORMER.								

EXISTIN	g variab		VOLUME	RETURN &	EXHAUS	ST BOXES:	
	SIZE	DESIG	GN CFM	UNIT PD	LwNC @	MEASURED CFM	
MARK	SIZE	MAX	MIN	IN. H2O	2" H2O	MAX	
FLOOR 2	•						
VR-2	10	940	430	1.12	45	990	
VR-4	10	900	430	1.12	45	956	
VR-6	10	900	430	1.12	45	984	
VR-8	10	900	430	1.12	45	676	
FLOOR 3							
VE-3065	1615HLS	N/A	N/A	0.81	74	2,322	
FLOOR 4							
VE-67	1615HLS	2,300	1,100	0.81	74	1,645	
VE-68	1413HLS	1,600	1,100	0.65	73	1,344	
VE-69	1615HLS	2,300	1,100	0.81	74	1,983	

1. MEASURED CFM VALUES FROM TESCO PRE-TAB REPORT.



GRILLES, REGISTERS AND DIFFUSERS: PRICE

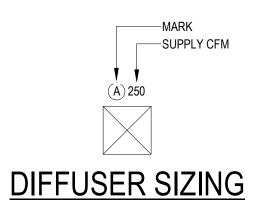
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MARK	SERVICE	TYPE	MATERIAL	FACE SIZE, IN. x IN.	NECK SIZE, IN. x IN.	Max Air P.D., In. H20	MAX N.C.	MODEL #	NOTES
А	SUPPLY	LAY-IN DIFFUSER	STEEL	24"x24"	8"Ø	0.1	25	SCD	1, 2
В	SUPPLY	LAY-IN DIFFUSER	STEEL	24"x24"	12"Ø	0.1	25	SCD	1, 2
С	SUPPLY	SURFACE MOUNTED REGISTER	STEEL	8"x8"	8"x8"	0.1	25	520D	3, 4, 5
R	RETURN	SURFACE MOUNTED GRILLE	STEEL	16"x8"	16"x8"	0.05	20	530	3
S	RETURN	SURFACE MOUNTED GRILLE	STEEL	24"x10"	24"x10"	0.05	20	530	3
U	RETURN	SURFACE MOUNTED GRILLE	STEEL	26"x10"	26"x10"	0.05	20	530	3
V	RETURN	SURFACE MOUNTED GRILLE	STEEL	6"x6"	6"x6"	0.05	20	530	3
W	RETURN	SURFACE MOUNTED GRILLE	STEEL	8"x8"	8"x8"	0.05	20	530	3
Х	RETURN	SURFACE MOUNTED GRILLE	STEEL	12"x12"	12"x12"	0.05	20	530	3
Y	RETURN	SURFACE MOUNTED GRILLE	STEEL	16"x16"	16"x16"	0.05	20	530	3
Z	RETURN	LAY-IN GRILLE	STEEL	22"x22"	22"x22"	0.05	20	530	

1. DIFFUSER SHALL BE 4-WAY UNLESS OTHERWISE NOTED.

FLEX DUCT CONNECTION SHALL EQUAL THE DIAMETER OF DIFFUSER CONNECTION UNLESS NOTED OTHERWISE.

3. PROVIDE SURFACE MOUNT FRAME AS REQUIRED FOR INSTALLATION IN HARD CEILING, WALL, OR DUCT, COORDINATE WITH REFLECTED CEILING PLAN. 4. PROVIDE INTEGRAL BALANCING DAMPER

5. DOUBLE DEFLECTION SUPPLY REGISTER.



NO SCALE

GENERAL NOTES:

- ALL DUCTWORK AND PIPES SHALL BE COORDINATED WITH OTHER DUCTS, PIPES, LIGHTS, STRUCTURAL SYSTEM, CEILING SUPPORTS AND FRAMING BEFORE INSTALLATION. MINOR DUCT AND PIPE OFFSETS AND MINOR DUCT TRANSITIONS SHALL BE PROVIDED AS REQUIRED. WHERE TRANSITIONS ARE REQUIRED, CROSS SECTIONAL AREA OF DUCT SHALL NOT BE REDUCED. MEASUREMENTS FOR VERTICAL CLEARANCES OF DUCTWORK SHALL BE TAKEN AT THE JOB SITE BEFORE FABRICATION OF ANY DUCTWORK.
- ALL EQUIPMENT SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S PUBLISHED INSTRUCTIONS.
- 3. MATERIALS AND INSTALLATION SHALL COMPLY WITH 2023 VIRGINIA TECH DESIGN AND CONSTRUCTION STANDARDS MANUAL, LOCAL CODES, APPLICABLE PROVISIONS OF LATEST EDITION OF NATIONAL FIRE PROTECTION ASSOCIATION, LOCAL UTILITY REGULATIONS AND GOVERNMENTAL DEPARTMENTS HAVING JURISDICTION.
- 4. CONTRACTOR SHALL SEAL AND FLASH ALL PENETRATIONS IN EXISTING WALLS.
- 5. VERIFY THE LOCATION OF ALL EXISTING TO REMAIN AND RELOCATED THERMOSTATS, TEMPERATURE SENSORS, PANELS AND CONTROL INSTRUMENTS PRIOR TO THE START OF NEW WORK. CONFIRM WITH THE ARCHITECT AND OWNER EXISTING AND RELOCATED THERMOSTAT LOCATIONS ARE ACCEPTABLE PRIOR TO ROUGH-IN.
- 6. VERIFY LOCATIONS OF EXISTING EQUIPMENT AND ROUTE OF NEW DUCTWORK AND PIPING WITH EXISTING CONDITIONS.
- 7. ALL CUTTING AND PATCHING FOR THE INSTALLATION OF NEW WORK IN EXISTING BUILDING SHALL BE DONE BY THE GENERAL CONTRACTOR.
- 8. REFER TO ARCHITECTURAL AND ELECTRICAL DRAWINGS TO COORDINATE THE EXACT LOCATIONS OF DIFFUSERS, REGISTERS, GRILLES, PIPING AND OTHER MECHANICAL EQUIPMENT WITH CEILING GRID, LIGHTS, AND OTHER BUILDING COMPONENTS.
- 9. CONTRACTOR SHALL PROVIDE ALL SUPPORTS REQUIRED TO MOUNT MECHANICAL EQUIPMENT, PIPING AND DUCTWORK.
- 10. WHERE PIPE AND DUCT CONNECTIONS ARE SHOWN CONNECTING TO EXISTING, CONTRACTOR SHALL DETERMINE EXACT LOCATIONS AND CONNECTION SIZES PRIOR TO INSTALLATION.
- 11. DUCTWORK SHALL BE ZINC-COATED SHEET STEEL OR ALUMINUM, CONSTRUCTED AND INSTALLED AS RECOMMENDED BY THE LATEST EDITION OF SMACNA "HVAC DUCT CONSTRUCTION STANDARDS".
- 12. ALL FLEXIBLE DUCTS CONNECTED TO SUPPLY DIFFUSERS SHALL BE SIZED TO EQUAL THE DIFFUSER NECK DIAMETER.
- 13. FLEXIBLE DUCTS SHALL BE FLEXIBLE METAL OR METAL AND NEOPRENE-COATED CANVAS HOSE INSULATED WITH 1" THICK FIBERGLASS WITH VINYL VAPOR BARRIER. ALL ROUND DUCT TAKE-OFFS SHALL BE MADE WITH SPIN-IN FITTINGS WITH 45 DEG. EXTRACTOR AND BALANCING DAMPER. THE DUCT DIAMETER SHALL MATCH THE AIR DIFFUSER SIZE UNLESS OTHERWISE INDICATED.
- 14. DUCT AND PIPE INSULATION SHALL MATCH EXISTING. INSULATION THAT IS DAMAGED OR REMOVED FOR NEW WORK SHALL BE REPLACED, REPAIRED AND SEALED AS REQUIRED.
- 15. EXPOSED PIPING RUNOUTS SHALL BE INSTALLED IN PRACTICAL ALIGNMENT WITH THE BUILDING AND SHALL BE ADEQUATELY SECURED TO THE BUILDING STRUCTURE.
- 16. ALL CEILING DIFFUSERS SHALL BE 4-WAY THROW TYPE UNLESS NOTED OTHERWISE.
- 17. HVAC CONTRACTOR SHALL ADJUST CFM FOR CEILING DEVICES AND AIR UNITS AS SHOWN ON THE FLOOR PLANS.
- 18. FOR EXACT LOCATIONS OF CEILING DEVICES, SEE REFLECTED CEILING PLAN.
- 19. PROVIDE ACCESS DOORS OF SUFFICIENT SIZE FOR ALL CONCEALED CONTROLS, DAMPERS OR ANY ITEMS REQUIRING ACCESS.
- 21. ALL REMOTE MOUNTED TEMPERATURE CONTROL DEVICES AND TEMPERATURE CONTROL WIRING SHALL BE FURNISHED AND INSTALLED BY THE MECHANICAL CONTRACTOR.
- 22. DUCTWORK AND PIPING SHALL NOT BE INSTALLED ABOVE ELECTRICAL PANELS. COORDINATE INSTALLATION OF DUCTWORK AND PIPING WITH ELECTRICAL PANELS WHEN SHOWN NEAR PANELS OR OVER ELECTRICAL ROOMS.
- 23. INSTRUCT THE OWNER IN THE PROPER OPERATION AND MAINTENANCE OF THE MECHANICAL SYSTEMS UNTIL THE OWNER IS FULLY PREPARED TO OPERATE AND MAINTAIN THE MECHANICAL SYSTEM. HOWEVER, LENGTH OF INSTRUCTION TIME SHALL BE LIMITED TO ONE-HALF DAY.
- 24. SYSTEMS SHALL OPERATE UNDER CONDITIONS OF LOAD WITHOUT UNUSUAL OR EXCESSIVE NOISE OR VIBRATION. UNUSUAL OR EXCESSIVE NOISE OR VIBRATION SHALL BE CORRECTED.
- 25. EQUIPMENT, MATERIALS AND LABOR REQUIRED BY THESE CONTRACT DRAWINGS SHALL BE GUARANTEED TO BE FREE FROM DEFECTIVE MATERIALS OR WORKMANSHIP FOR ONE YEAR AFTER FINAL ACCEPTANCE OF THE PROJECT UNLESS SPECIFIED OTHERWISE. DEFECTIVE MATERIALS OR WORKMANSHIP OCCURRING DURING THIS PERIOD SHALL BE CORRECTED AT NO ADDITIONAL COST
- 26. ANY AIR LEAKAGE IN THE EXISTING PRIMARY AIR DUCT SYSTEMS ADJACENT TO THE PROJECT AREA SHALL BE NOTED AND SEALED OR REPAIRED

20. AIR DEFLECTORS SHALL BE PROVIDED IN ALL SQUARE ELBOWS.

ABOVE ABV BELOW BEL BETWEEN BET CEILING CLG CEILING DIFFUSER CD CEILING GRILLE CG CUBIC FEET PER MINUTE CFM DIAMETER DIA DOWN DN DUCT-MOUNTED SUPPLY REGISTER DMSR DUCT SLOPE DOWN ____ DUCT SLOPE UP _ DUCTWORK (NEW) **RETURN & EXHAUST** SUPPLY _____ DUCTWORK (EXISTING TO REMAIN) DUCTWORK (EXISTING TO BE REMOVED) _ _ _ _ _ _ _ _ _ _ _ _ _ DUST COLLECTOR EACH EA EXISTING, REMOVE FROM THIS POINT FPM FEET PER MINUTE FLEXIBLE DUCT RUNOUT FLOOR FROM FRM HEATING WATER RETURN PIPE HWR ——— HWR—— HEATING WATER SUPPLY PIPE HWS ——— HWS——— MD MANUAL DAMPER _____ MPR ——— MPR ——— MEDIUM PRESSURE STEAM RETURN PIPE MPS MEDIUM PRESSURE STEAM SUPPLY PIPE ------ MPS ------MOTOR OPERATED DAMPER MOD NEW CONNECTED TO EXISTING PIPING INDICATION WITH RESPECT TO FLOW BOTTOM TAKEOFF SIDE CONNECTION TOP TAKEOFF TURN DOWN OR FROM BELOW TURN UP OR DOWN TURN UP OR FROM ABOVE _____O

HVAC LEGEND

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T'STAT

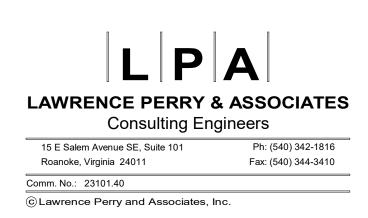
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GENERAL DEMOLITION NOTES:

THERMOSTAT OR TEMPERATURE SENSOR

- 1. THE CONTRACTOR SHALL REMOVE OR ALTER AS NECESSARY ALL EXISTING PIPING, EQUIPMENT, AND APPURTENANCES THAT ARE NOT REQUIRED FOR THE EXISTING SYSTEMS TO REMAIN. CONTRACTOR SHALL VISIT THE SITE TO REVIEW THE SCOPE OF THIS WORK AND VERIFY EXISTING CONDITIONS PRIOR TO PRICING.
- 2. EXISTING EQUIPMENT SHALL BE TURNED OVER TO THE OWNER, UNLESS DIRECTED OTHERWISE AND LOCATED ON SITE AS DIRECTED BY THE OWNER. ALL OTHER ITEMS TO BE REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND REMOVED FROM THE PREMISES.
- 3. INSULATION ON EXISTING PIPING OR DUCT THAT IS DAMAGED OR REMOVED DUE TO THE DEMOLITION WORK SHALL BE REPLACED AND SEALED AS REQUIRED.
- 4. THE CONTRACTOR SHALL PROTECT EXISTING SYSTEMS TO REMAIN. SYSTEMS THAT ARE DAMAGED OR INCORRECTLY REMOVED DUE TO THE DEMOLITION WORK SHALL BE REPAIRED OR REPLACED.
- 5. THE CONTRACTOR IS CAUTIONED THAT THE EXISTING HVAC SYSTEM LAYOUTS ARE INDICATED AS ONLY AN APPROXIMATION OF EXISTING CONDITIONS. NOT ALL EXISTING SYSTEMS ARE SHOWN AND SELECTIVE DEMOLITION IS REQUIRED. THE CONTRACTOR SHALL VERIFY ACTUAL SYSTEM CONFIGURATIONS IN THE FIELD AND SHALL COORDINATE ACCORDINGLY.

VIRGINIA TECH UBO APPROVA



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09.19.2024

RODNEY D. FANNING No. 034568

PROJECT CODE: 23-607949

SPECIFICATIONS FOR HVAC WORK

- SCOPE OF THE WORK: WORK SHALL INCLUDE COMPLETE HVAC SYSTEMS. PROVIDE SUPERVISION, LABOR, MATERIAL, EQUIPMENT, MACHINERY, PLANT, AND ITEMS NECESSARY FOR COMPLETE SYSTEMS TESTED AND READY FOR OPERATION.
- REGULATIONS: MATERIALS AND INSTALLATION SHALL COMPLY WITH LOCAL CODES, APPLICABLE PROVISIONS OF LATEST EDITION OF NATIONAL FIRE PROTECTION ASSOCIATION, LOCAL UTILITY REGULATIONS AND GOVERNMENTAL DEPARTMENTS HAVING JURISDICTION.
- DRAWINGS: THESE DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF SYSTEMS AND WORK INCLUDED. WHERE VARIANCES OCCUR INCLUDE THE ITEMS OF BETTER QUALITY, GREATER QUANTITY OR HIGHER COST.
- COORDINATION OF WORK: THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COORDINATION AND PROPER RELATION OF HIS WORK TO THE BUILDING STRUCTURE AND TO THE WORK OF OTHER TRADES. CONTRACTOR SHALL PROVIDE DIMENSIONS AND LOCATIONS OF ALL OPENINGS. SHAFTS AND SIMILAR ITEMS TO THE PROPER TRADES AND SHALL INSTALL WORK AS REQUIRED SO AS NOT TO DELAY PROJECT PROGRESSION. THE CONTRACTOR IS RESPONSIBLE FOR DAMAGE CAUSED BY HIS WORK OR WORKMEN. REPAIRING OF DAMAGED WORK SHALL BE DONE BY THE CONTRACTOR AT NO ADDITIONAL COST.
- VISITING THE SITE: EACH CONTRACTOR SHALL BE RESPONSIBLE FOR VISITING THE SITE BEFORE PRICING THE JOB TO FAMILIARIZE HIMSELF WITH ALL EXISTING CONDITIONS TO BE MET IN THE EXECUTION OF THE WORK UNDER THIS CONTRACT. NO ADDITIONAL COMPENSATION WILL BE ALLOWED RELATING TO SITE CONDITIONS.
- INTERRUPTION OF SERVICES: INTERRUPTIONS OF SERVICE TO EXISTING SYSTEMS SHALL BE COORDINATED WITH THE OWNER AS TO TIME AND DURATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY INTERRUPTIONS TO SERVICE AND SHALL REPAIR ANY DAMAGES TO EXISTING SYSTEMS CAUSED BY HIS OPERATIONS.
- WORK IN OCCUPIED AREAS: WORK IN OCCUPIED AREAS SHALL BE COORDINATED WITH THE OCCUPANT AND OWNER AS TO TIME AND DURATION. THE CONTRACTOR SHALL PROTECT THE OCCUPIED AREA AND SHALL BE RESPONSIBLE FOR CLEANING AND REPAIRING ANY DAMAGES CAUSED BY HIS WORK. SAFETY OF BUILDING OCCUPANTS SHALL BE ASSURED AT ALL TIMES. TOOLS, MATERIAL, DIRT AND DEBRIS SHALL BE REMOVED FROM OCCUPIED AREAS WHENEVER WORK AREAS ARE LEFT UNATTENDED.
- ACCESSIBILITY: LOCATE EQUIPMENT WHICH MUST BE SERVICED OR MAINTAINED IN FULLY ACCESSIBLE POSITIONS WHERE POSSIBLE. OTHERWISE, FURNISH ACCESS PANELS OF SUFFICIENT SIZE AND LOCATED SO THAT THE CONCEALED EQUIPMENT CAN BE SERVICED.
- 9. THERMOSTAT ROUGH-IN: ROUGH-IN OPENINGS SHALL ALIGN VERTICALLY AND HORIZONTALLY WITH BUILDING STRUCTURE. WALL-MOUNTED THERMOSTATS SHALL BE MOUNTED 48" ABOVE FINISHED FLOOR TO THE TOP OF THE THERMOSTAT.
- 10. SLEEVES: LOCATE SLEEVES DURING NORMAL COURSE OF WORK. PROVIDE SLEEVES FOR PIPING PASSING THROUGH CONCRETE FLOOR SLABS AND CONCRETE, MASONRY, TILE AND GYPSUM WALL CONSTRUCTION. SLEEVES SHALL NOT BE REQUIRED FOR PIPING EMBEDDED IN CONCRETE OR SLAB ON GRADE, EXCEPT THAT COPPER PIPING SHALL REQUIRE SLEEVES THROUGH SLABS ON GRADE. WHERE SLEEVES ARE LOCATED THROUGH FIRE-RATED WALLS OR FLOORS, THE SLEEVE ASSEMBLIES SHALL MAINTAIN THE FIRE RATING OF THE WALL OR FLOOR. SLEEVES SHALL BE CONSTRUCTED OF 20 GAUGE GALVANIZED STEEL WITH LOCK SEAM JOINTS FOR ALL SLEEVES SET IN CONCRETE FLOOR SLABS. ALL OTHER SLEEVES SHALL BE CONSTRUCTED OF GALVANIZED STEEL PIPE.
- 11. <u>CUTTING AND PATCHING</u>: THE CONTRACTOR SHALL PROVIDE ALL CUTTING AND PATCHING NECESSARY TO INSTALL HIS WORK. PATCHING SHALL MATCH ADJACENT SURFACES. NO STRUCTURAL MEMBERS SHALL BE CUT WITHOUT THE APPROVAL OF THE ARCHITECT.
- 12. CLEANING: EQUIPMENT AND PIPING SHALL BE CLEANED TO REMOVE FOREIGN MATERIALS. PROVIDE TEMPORARY FILTERS FOR AIR UNITS THAT ARE OPERATED DURING CONSTRUCTION. PLUG OR CAP OPENINGS IN EQUIPMENT, DUCTWORK, PIPING AND MATERIALS UNTIL CONNECTION IS MADE TO THE SYSTEM. REMOVE FROM THE PREMISES ALL UNUSED MATERIAL AND DEBRIS RESULTING FROM THE PERFORMANCE OF HVAC WORK.
- 13. WIRING: TEMPERATURE CONTROL WIRING, EQUIPMENT CONTROL WIRING AND CONTROL INTERLOCK WIRING FOR MECHANICAL EQUIPMENT SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR. CONTROL WIRING SHALL NOT INCLUDE ANY WIRING WHICH CARRIES MOTOR CURRENT. ALL WIRING SHALL BE IN METAL CONDUIT AND SHALL COMPLY WITH THE ELECTRICAL SPECIFICATIONS
- 14. QUIET OPERATION: SYSTEMS SHALL OPERATE UNDER CONDITIONS OF LOAD WITHOUT UNUSUAL OR EXCESSIVE NOISE OR VIBRATION. UNUSUAL OR EXCESSIVE NOISE OR VIBRATION SHALL BE CORRECTED.
- 15. <u>TESTING AND BALANCING</u>: HVAC CONTRACTOR SHALL TEST ALL HVAC EQUIPMENT TO ASSURE THAT THE PROPER SEQUENCE OF CONTROL IS ESTABLISHED AND OPERATING IN A SAFE MANNER. THE AIR QUANTITIES FOR EQUIPMENT, DIFFUSERS AND REGISTERS SHALL BE BALANCED FOR THE CFM AS INDICATED ON THE DRAWING. ALL PERSONNEL INVOLVED IN THE EXECUTION OF THE WORK SHALL BE EXPERIENCED IN THE BALANCING OF MECHANICAL SYSTEMS, AND BE NEBB AND/OR AABC CERTIFIED.
- 16. INSTRUCTIONS TO OWNER: INSTRUCT THE OWNER IN THE PROPER OPERATION AND MAINTENANCE OF THE MECHANICAL SYSTEMS UNTIL THE OWNER IS FULLY PREPARED TO OPERATE AND MAINTAIN THE SYSTEMS. HOWEVER, LENGTH OF INSTRUCTION TIME SHALL BE LIMITED TO ONE-HALF DAY.
- 17. GUARANTEE: EQUIPMENT, MATERIALS AND LABOR REQUIRED BY THESE CONTRACT DRAWINGS SHALL BE GUARANTEED TO BE FREE FROM DEFECTIVE MATERIALS OR WORKMANSHIP FOR ONE (1) YEAR AFTER FINAL ACCEPTANCE OF THE PROJECT UNLESS SPECIFIED FOR A LONGER PERIOD IN OTHER PORTIONS OF THE SPECIFICATIONS. DEFECTIVE MATERIALS OR WORKMANSHIP OCCURRING DURING THIS PERIOD SHALL BE CORRECTED AT NO ADDITIONAL COST.
- 18. PAINTING: GENERAL PAINT MECHANICAL EQUIPMENT AND MATERIALS WHERE NOT CONCEALED. PAINTING IN CONCEALED SPACES SHALL BE LIMITED TO EQUIPMENT AND MATERIALS NOT OTHERWISE PROTECTED FROM RUSTING SUCH AS HANGERS AND SUPPORTS. PAINT SHALL BE PRODUCTS OF SHERWIN-WILLIAMS. PITTSBURGH, PRATT-LAMBERT OR EQUAL. SURFACE PREPARATION, PRIMING AND PAINT APPLICATION SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. GALVANIZED SURFACES SHALL BE PRETREATED WITH A PHOSPHORIC ACID CLEANING SOLUTION AND PRIMED. AFTER PREPARATION EACH ITEM SHALL BE PAINTED, EXCEPT COLOR OF PAINT FOR EQUIPMENT AND MATERIAL WHERE NOT CONCEALED SHALL BE AS SELECTED BY THE ARCHITECT. ITEMS NOT CONCEALED IN ROOMS SHALL BE PAINTED OF THE SAME COLOR TO MATCH ADJACENT WALLS OR CEILINGS. PAINTING IS NOT REQUIRED OF ITEMS WITH A FACTORY-FINISH COAT. PATCH PAINTING IS REQUIRED OF ANY DAMAGED AREAS TO MATCH FACTORY-FINISH COAT.
- 19. IDENTIFICATION OF PIPES AND EQUIPMENT: PIPING SHALL BE IDENTIFIED BY MARKING THAT WILL READ THE SAME AS THE IDENTIFICATION SHOWN ON THE DRAWINGS. STENCIL LETTERS SHALL BE 2 INCHES HIGH UPPER CASE PAINTED WITH BLACK ENAMEL ON PIPING AND CONDUIT. IDENTIFICATION SHALL BE PAINTED ON EACH PIPE OR CONDUIT WHERE EXPOSED OR ACCESSIBLE AND SHALL BE PLACED EVERY 15 FEET ALONG THE PIPE OR CONDUIT.
- 20. AIR DEVICES (SUBMITTAL REQUIRED):
 - A. DIFFUSERS, REGISTERS AND GRILLES SHALL BE PRICE OR EQUAL UNLESS NOTED OTHERWISE. CEILING DEVICE FINISH SHALL BE COORDINATED WITH ARCHITECT.
 - B. SUPPLY LAY-IN CEILING DIFFUSERS SHALL BE PRICE MODEL SCD OR EQUAL. DIFFUSER
 - SHALL BE 4-WAY UNLESS NOTED OTHERWISE. CONSTRUCTION SHALL BE STEEL.
 - C. SUPPLY SURFACE MOUNTED REGISTERS SHALL BE PRICE MODEL 520D OR EQUAL. GRILLES SHALL INCLUDE DEFLECTING VANES AND SHALL HAVE FREE AREA NOT LESS THAN 75%. REGISTER DAMPERS SHALL BE STEEL OPPOSED-BLADE FACE-OPERATED TYPE.
 - D. RETURN SURFACE MOUNTED GRILLES SHALL BE PRICE MODEL 530 OR EQUAL. GRILLES SHALL INCLUDE DEFLECTING VANES AND SHALL HAVE FREE AREA NOT LESS THAN 75%. CONSTRUCTION SHALL BE STEEL.
- 21. DUCTWORK (SUBMITTAL REQUIRED):
 - A. GENERAL: DUCTWORK SHALL BE ZINC-COATED SHEET STEEL OR ALUMINUM, CONSTRUCTED AND INSTALLED AS RECOMMENDED BY THE LATEST EDITION OF SMACNA.
 - B. DUCT CLEARANCE SHALL BE ESTABLISHED AT THE JOB SITE BEFORE ANY DUCTS ARE FABRICATED. THE CONTRACTOR WILL NOT BE ALLOWED ANY EXTRA COSTS FOR DUCTS FABRICATED AND THEN FOUND NOT TO FIT.

- C. MANUAL VOLUME CONTROL DAMPERS SHALL HAVE ACCESSIBLE OPERATING MECHANISM. BLADE HEIGHT SHALL NOT EXCEED 8 INCHES.
- D. MOTORIZED DAMPERS SHALL BE OPPOSED BLADE CONSTRUCTION FOR MODULATING SERVICE AND PARALLEL BLADE CONSTRUCTION FOR TWO-POSITION SERVICE. MOTORIZED DAMPERS SHALL BE CONSTRUCTED WITH BRASS BEARINGS, CHANNEL IRON FRAME AND INTERLOCKING BLADES WITH AIR-TIGHT FELT SEALS. MOTOR OPERATOR FOR DAMPERS ARE SPECIFIED IN PARAGRAPH 24 -TEMPERATURE CONTROL SYSTEM.
- E. AIR DEFLECTORS SHALL BE PROVIDED IN ALL SQUARE ELBOWS AND DUCT-MOUNTED SUPPLY OUTLETS.
- F. DUCT SUPPORTS SHALL CONSIST OF NOT LESS THAN 1" X 16-GAUGE GALVANIZED STRAP IRON HANGERS SPACED NOT OVER 4'-0" ON CENTER.
- G. FLEXIBLE DUCTS SHALL BE FLEXIBLE METAL OR METAL AND NEOPRENE-COATED CANVAS HOSE INSULATED WITH 1" THICK FIBERGLASS WITH VINYL VAPOR BARRIER. ALL ROUND DUCT TAKE-OFFS SHALL BE MADE WITH SPIN-IN FITTINGS WITH BALANCING DAMPER. THE DUCT DIAMETER SHALL MATCH THE AIR DIFFUSER SIZE UNLESS OTHERWISE INDICATED.
- 22. <u>PIPING (SUBMITTAL REQUIRED):</u>
 - A. STEAM LINES SHALL BE ASTM A53 GRADE B ERW OR SEAMLESS SCHEDULE 40 STANDARD WEIGHT BLACK STEEL. CONDENSATE LINES SHALL BE ASTM A53 GRADE B ERW OR SEAMLESS SCHEDULE 80 EXTRA HEAVY BLACK STEEL. FABRICATION SHALL BE THREADED OR WELDED, SUITABLE FOR 125 PSI STEAM SERVICE.
 - B. HEATED OR CHILLED WATER LINES: PIPE 2 1/2 " AND SMALLER SHALL BE ALL TYPE 'L' HARD DRAWN COPPER TUBING OR ALL ASTM A53 SCHEDULE 40 STANDARD WEIGHT BLACK STEEL. PIPE OVER 2 1/2" SHALL BE ASTM A53 SCHEDULE 40 STANDARD WEIGHT BLACK STEEL. ALL FITTINGS SHALL BE SUITABLE FOR 125 PSI WATER SERVICE.
 - C. SERVICE VALVES: UP TO AND INCLUDING 2" SHALL BE ALL BRASS, RISING STEM, SOLID WEDGE DISC GATE VALVES, VALVES OVER 2" FOR WATER SERVICE SHALL BE IRON BODY BUTTERFLY DISC TYPE WITH EPT NORDEL SEATS. VALVES OVER 2" FOR STEAM SERVICE SHALL BE BUTTERFLY TYPE WITH CARBON STEEL BODY AND DISC AND TEFLON SEAL RING.
 - D. GLOBE VALVES SHALL BE ALL BRASS WITH BRASS DISC, EXCEPT GLOBE VALVES OVER 2" SIZE MAY BE BUTTERFLY TYPE.
 - E. CHECK VALVES SHALL BE BRASS OR IRON BODY, SWING TYPE, REGRINDING SEAT.
 - F. BALANCING COCKS SHALL BE ALL BRASS, SQUARE HEAD OR SCREWDRIVER HEAD WITH CHECK. BALANCING COCKS OVER 2" SIZE MAY BE IRON BODY.
 - G. STRAINERS FOR HEATING WATER SHALL BE Y TYPE WITH BRONZE BASKET SUITABLE FOR 125 PSI SERVICE. STRAINERS FOR STEAM SHALL BE Y TYPE SUITABLE FOR 150 PSI SATURATED STEAM AT 450 DEG. F. STEAM STRAINERS UP TO 2" SHALL BE BRONZE. STEAM STRAINERS 2 1/2" AND OVER SHALL BE FALNGED, IRON BODY. SCREENS FOR STEAM STRAINERS SHALL BE BRONZE, MONEL METAL OR 18-8 STAINLESS STEEL WITH FREE AREA NOT LESS THAN 25 TIMES PIPE AREA WITH 0.045-INCH DIAMETER PERFORATIONS.
 - H. MANUAL AIR VENTS SHALL BE CHROMIUM-PLATED BRASS 1/8" NPT COIN-OPERATED TYPF.
 - I. SAFETY RELIEF VALVES FOR WATER HEATING SYSTEMS SHALL BE WATTS ASME, SERIES 740. VALVES FOR HEATING SYSTEMS SHALL BE SIZED TO RELIEVE THE FULL HEATING CAPACITY OF THE SYSTEM. PIPE DISCHARGE PORTS FULL SIZE TO FLOOR DRAIN
 - J. PRESSURE GAUGES SHALL BE 4" DIAL ASHCROFT BOURDON TUBE TYPE SUITABLE FOR 125 PSI SERVICE.
 - K. FLEXIBLE PIPE JOINTS SHALL BE PIPE LINE SIZE, FLANGED, MINIMUM 125 PSI WORKING PRESSURE AT 250 DEG. F, FLEXONICS MODEL PCS.
 - L. THERMOMETERS SHALL BE WEISS 9" VARI-ANGLE MERCURY TYPE WITH SEPARATE SOCKET.
 - M. STEAM TRAPS SHALL BE SARCO, WEBSTER, HOFFMAN OR TRANE THERMOSTATIC, INVERTED BUCKET OR FLOAT AND THERMOSTAT TYPE AS INDICATED. TRAPS SHALL BE SIZED BY THE TRAP MANUFACTURER TO PASS CONDENSATE AT 2-1/2 TIMES THE CONDENSATION RATE OF THE CONNECTED HEATING APPLIANCE AT 5 PSI DROP ON MEDIUM PRESSURE SYSTEMS. STEAM MAIN DRIP TRAPS SHALL BE 3/4" BUCKET TRAPS, OR YARWAY SERIES 130 IMPULSE TRAP MAY BE USED IN LIEU OF STRAINER AND BUCKET TRAP. TRAPS SHALL BE RATED FOR 60 PSI SERVICE ON MEDIUM PRESSURE SYSTEMS.
 - N. REDUCING VALVES FOR STEAM SERVICE SHALL BE LESLIE, SPENCE, OR AERCO SELF-CONTAINED, EXTERNAL PILOT, PISTON. VALVES SHALL BE ADJUSTABLE OVER A 2 TO 35 PSI RANGE AND SHALL PROVIDE NOT LESS THAN 75% ACCURACY OF REGULATION AT 10% OF THE RATED CAPACITY.
 - O. STEAM PRESSURE RELIEF VALVES FOR REDUCING STATIONS SHALL BE CONSOLIDATED, BRONZE OR CAST IRON BODY, MANUAL TEST LEVER, AND SUITABLE FOR STEAM SERVICE OF SUFFICIENT CAPACITY TO RELIEVE THE FULL DISCHARGE CAPACITY OF THE CONNECTED REDUCING VALVE. DISCHARGE PORT OF RELIEF VALVES SHALL BE PIPED FULL SIZE TO 6" ABOVE FLOOR DRAIN OR FLOOR AND SHALL BE SUPPORTED SO THAT NO STRAIN IS ON THE VALVE.
 - P. PIPE SUPPORTS: SUSPENDED HORIZONTAL PIPING SHALL BE SUPPORTED BY ADJUSTABLE WROUGHT STEEL CLEVIS HANGERS. ALL SUPPORTS SHALL BE ATTACHED TO THE BUILDING STRUCTURE SPACED 10'-0" ON CENTER. HANGER RODS SHALL BE 3/8" DIAMETER SIZE FOR PIPES UP THROUGH 2", 1/2" DIAMETER SIZE FOR 2-1/2" THROUGH 3", 5/8" DIAMETER FOR PIPES 4" THROUGH 5" AND 7/8" DIAMETER SIZE FOR 6" THROUGH 12". PIPE HANGER RODS SHALL BE ATTACHED TO THE TOP CHORD ONLY ON STEEL JOISTS AND BEAMS WITH CLAMPS. PIPING SHALL BE INSTALLED IN PRACTICAL ALIGNMENT WITH THE BUILDING.
 - Q. INSTALLATION: ALL PIPING SHALL BE INSTALLED WITH SUFFICIENT PITCH TO INSURE ADEQUATE DRAINAGE AND VENTING. ALL HIGH POINTS IN WATER LINES SHALL BE PROVIDED WITH AUTO-AIR VENTS, ALL LOW POINTS WITH DRAINS. STEAM AND CONDENSATE LINES SHALL SLOPE A MINIMUM OF 1" IN 40' IN DIRECTION OF FLOW UNLESS INDICATED OTHERWISE. LOW POINTS IN STEAM LINES SHALL BE PROVIDED WITH DRIP STATION. PIPE SIZE CHANGES IN STEAM LINES SHALL BE MADE WITH ECCENTRIC REDUCERS WITH OUTLET ON BOTTOM. CONDENSATE DRAIN LINES SHALL SLOPE 1/8" PER FOOT IN DIRECTION OF FLOW.
 - R. DIELECTRIC FITTINGS SUCH AS COUPLINGS, UNIONS OR FLANGES SHALL BE INSTALLED TO ISOLATE PIPES OF NON-FERROUS METAL WHERE CONNECTION IS MADE TO FERROUS METAL.
- 23. THERMAL COVERING (SUBMITTAL REQUIRED):
 - A. INSULATION SHALL BE JOHNS MANVILLE, OWENS CORNING, ARMSTRONG OR EQUAL. INSULATION SHALL NOT BE APPLIED UNTIL AFTER THE EQUIPMENT. PIPES OR DUCTS TO BE INSULATED HAVE PROVEN SATISFACTORY UNDER TESTS. ALL MATERIALS USED SHALL HAVE COMPOSITE FLAME-SPREAD RATING NOT EXCEEDING 25 AND A SMOKE-DEVELOPED RATING NOT EXCEEDING 50.
 - B. PIPING: INSULATION SHALL BE INSTALLED IN CONFORMANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
 - C. FIBERGLASS PIPE INSULATION SHALL HAVE A WHITE KRAFT BONDED TO ALUMINUM FOIL, REINFORCED WITH FIBERGLASS YARN JACKET. ELASTOMERIC INSULATION SHALL BE CONSTRUCTED OF A CLOSED CELL STRUCTURE TO EFFECTIVELY RETARD THE FLOW OF MOISTURE VAPOR AND SERVE AS A VAPOR BARRIER. INSULATION THICKNESS AND TYPE FOR VARIOUS PIPING SYSTEMS SHALL BE AS INDICATED IN THE FOLLOWING TABLE (PIPE SIZE/INSULATION THICKNESS).

PIPE SIZE/INSULATION THICKNESS(1) SYSTEM TEMP. LESS THAN 1" TO 1-1/2" 4" TO 8" & INS. RANGE 1-1/4" TO 3" 6" UP TYPE 1" MEDIUM PRESSURE 251-350 3.0 4.0 4.5 4.5 4.5 A STEAM HEATING WATER 140-200 1.5 1.5 2.0 2.0 2.0 A STFAM CONDENSATE ANY 1.5 1.5 2.0 2.0 A

(1) MINIMUM THICKNESS FOR INSULATION LISTED IN PRECEDING TABLE IS BASED ON THERMAL CONDUCTIVITY, 'K' NOT EXCEEDING 0.27 BTU PER INCH/HR. X SQ. FT. X DEG. F. BASED ON MEAN TEMPERATURE OF 75 DEG. F. INSULATION WITH GREATER THERMAL CONDUCTIVITY SHALL HAVE INCREASED THICKNESS TO PROVIDE SAME PERFORMANCE CHARACTERISTICS AS SPECIFIED.

(2) A - FIBERGLASS TYPE INSULATION; B - ELASTOMERIC TYPE INSULATION.

- D. FIBERGLASS PIPE INSULATION FITTINGS SHALL BE COVERED WITH PREMOLDED PVC FITTING COVERS. JACKETS ON FIBERGLASS PIPE INSULATION BELOW 80 DEG. F. SHALL BE VAPOR SEALED USING SELF-SEALING LAP, LAP SEAL GUN OR ADHESIVE. ALL INSULATION JOINTS, LAPS, VOIDS, PUNCTURES AND END TAPERS SHALL BE SEALED WITH 1/32" THICKNESS OF VAPOR ADHESIVE. A 12" LONG, 1/2 SECTION OF HYDROUS CALCIUM SILICATE OR FOAMGLAS INSULATION SHALL BE USED BETWEEN HANGERS AND PIPING. ON PIPE, SIZES 1-1/2" AND BELOW, HYDROUS CALCIUM SILICATE OR FOAMGLAS WILL NOT BE REQUIRED. ALL PIPING SHALL HAVE LOAD-DISTRIBUTING GALVANIZED 16 GAUGE METAL SHIELDS INSTALLED AROUND THE LOWER HALF OF THE INSULATION.
- E. DUCTWORK: ALL SUPPLY DUCTS SHALL BE INSULATED. INSULATION WHERE DUCTS ARE NOT CONCEALED SHALL BE RIGID DUCT INSULATION MEETING ASTM C 612. ALL OTHER INSULATION SHALL BE FLEXIBLE DUCT INSULATION MEETING ASTM C 533. INSULATION SHALL HAVE A FACTORY-APPLIED FACING OF FOIL-SCRIM-KRAFT PAPER JACKET REINFORCED WITH FIBERGLASS YARN MESH. INSULATION SHALL BE SECURED TO RECTANGULAR DUCTS BY IMPALING OVER METAL STICK CLIPS SPACED 12" CENTER EACH WAY. ROUND DUCT INSULATION SHALL BE SECURED WITH NO. 18 GAUGE COPPERWELD WIRE SPACED NOT OVER 18" ON CENTER. WHERE INSULATION JOINTS OCCUR, FACING TABS SHALL BE LAPPED NOT LESS THAN 2"; ALL JOINTS, VOIDS AND PUNCTURES IN FACING SHALL BE EFFECTIVELY VAPOR SEALED WITH FOSTER VAPOR-SAFE OR VAPOR-FAS ADHESIVE. INSULATION FOR ALL SUPPLY DUCTWORK SHALL BE 1-1/2" THICK AND SHALL HAVE A MINIMUM TOTAL THERMAL RESISTANCE (R) OF 5.6 AT A MEAN TEMPERATURE OF 75 DEG. F.

24. VARIABLE AIR VOLUME TERMINAL: A. NEW SHUT OFF VARIABLE TERMINAL BOX SHALL BE TRANE, PRICE, OR TITUS.

- B. CASING SHALL BE 22-GAUGE GALVANIZED STEEL WITH DOUBLE-WALL INSULATION. INTERIOR SURFACE OF UNIT SHALL BE ACOUSTICALLY AND THERMALLY LINED WITH 1", 1.0 LB./CU. FT. DENSITY GLASS FIBER WITH HIGH DENSITY FACING, U.L. LISTED AND MEETING NFPA-90A, UL 181. INSULATION R VALUE SHALL BE R-3.85 AND SHALL BE COVERED BY INTERIOR LINING MADE OF 26-GAUGE GALVANIZED STEEL.
- C. PRIMARY AIR VALVE SHALL BE A HEAVY GAUGE GALVANIZED STEEL CYLINDER SIZED TO FIT STANDARD ROUND DUCT WITH INTEGRAL ELECTRIC ACTUATOR. MAXIMUM LEAK RATE 1 PERCENT AT 4 INCHES WG. INLET STATIC PRESSURE, INTEGRAL MULTIPLE POINT. AVERAGING FLOW SENSING RING TO PROVIDE PRIMARY AIR FLOW MEASUREMENT WITHIN +/- 5 PERCENT OF UNIT RATED AIRFLOW WITH 1-1/2 DIAMETERS OF STRAIGHT DUCT UPSTREAM OF UNIT. INTEGRAL FLOW TAPS AND CALIBRATION CHART PROVIDED ON EACH UNIT. DAMPER BLADE SHALL BE CONSTRUCTED OF A CLOSED CELL FOAM SEAL THAT IS MECHANICALLY LOCKED BETWEEN BETWEEN TWO 22 GAUGE, GALVANIZED STEEL DISKS WITH PERMANENT DAMPER POSITION INDICATOR ON THE SHAFT AND MECHANICAL STOP TO PREVENT OVER-STROKING.
- D. HEATING WATER COIL SHALL BE FACTORY MOUNTED ON DISCHARGE OUTLET AND CONSTRUCTED OF SEAMLESS COPPER TUBES MECHANICALLY EXPANDED INTO THE FIN COLLARS. COILS SHALL BE LEAK TESTED AT 450 PSIG AIR PRESSURE UNDER WATER.
- E. OUTLET CONNECTION SHALL BE INTEGRAL OUTLET SHEET METAL CONNECTION AT UNIT DISCHARGE TO FACILIATTE DUCTWORK INSTALLATION. ALL UNITS SHALL BE U.L. LISTED AND CSA APPROVED.
- F. TERMINAL BOX SHALL BE PROVIDED WITH DDC CONTROLLER FURNISHED BY SIEMENS AND WIRED BY TERMINAL UNIT MANUFACTURER.

25. TEMPERATURE CONTROL SYSTEM (EXISTING SIEMENS BAS):

A. GENERAL – THE SYSTEM SHALL BE A COMPLETE SYSTEM OF AUTOMATIC TEMPERATURE REGULATION OF THE ELECTRIC/ ELECTRONIC TYPE. COMPONENT PARTS OF THE SYSTEM SHALL BE MANUFACTURED BY ONE CONTROL MANUFACTURER AND/OR BY THE PARTICULAR HVAC EQUIPMENT MANUFACTURER. IN EITHER CASE, THE TEMPERATURE CONTROL CONTRACTOR SHALL BE RESPONSIBLE FOR ACHIEVING THE "SEQUENCE OF CONTROL". THE SYSTEM SHALL BE INSTALLED BY COMPETENT, TRAINED MECHANICS. ROOM THERMOSTAT LOCATIONS SHALL BE COORDINATED TO ALIGN VERTICALLY OR HORIZONTALLY WITH ADJACENT LIGHT SWITCHES OR CONTROL INSTRUMENTS. PROVIDE ALL EQUIPMENT AND MATERIALS AS REQUIRED TO ACCOMPLISH THE SEQUENCE OF CONTROL.

B. MATERIALS

- 1. THERMOSTATS (AC): HEATING-COOLING SIEMENS THERMOSTATS SHALL BE AS REQUIRED FOR THE SEQUENCE OF CONTROL. THESE UNIT THERMOSTATS SHALL BE EQUIPPED WITH ADJUSTMENTS FOR HEATING AND COOLING.
- 2. DAMPER ACTUATORS SHALL BE PROVIDED FOR ALL AUTOMATIC DAMPERS AND SHALL BE OF SUFFICIENT CAPACITY TO OPERATE THE CONNECTED DAMPER.
- 3. CONTROL VALVES 2" AND SMALLER SHALL BE BRONZE, SCREWED TYPE AND SHALL BE RATED AT 250 PSIG. VALVE BODIES 2-1/2" AND LARGER SHALL BE IRON, FLANGED AND RATED AT 125 PSIG. VALVES SHALL BE SIZED BY THE CONTROLS MANUFACTURER AND THE MAXIMUM ALLOWABLE PRESSURE DROP SHALL BE 5 FEET WATER COLUMN. VALVE ACTUATORS SHALL BE ELECTRONIC SPRING RETURN, LOW VOLTAGE, AND PROPERLY SELECTED FOR VALVE BODY AND SERVICE.
- C. COORDINATION OF WORK: ALL WIRING IN CONNECTION WITH THE TEMPERATURE CONTROL SYSTEM SHALL BE FURNISHED AND INSTALLED BY THE CONTROLS SYSTEM CONTRACTOR. WIRING SHALL BE INSTALLED IN ACCORDANCE WITH THE ELECTRICAL SPECIFICATION. WIRING WITHOUT CONDUIT ABOVE CEILINGS SHALL BE PROPERLY SUPPORTED WITHOUT SAGS. LOOSE WIRES LAYING ON CEILINGS, LIGHTS, OR PIPES WILL NOT BE ACCEPTABLE AT ANY LOCATION.
- D. SERVICE AND GUARANTEE THE ENTIRE CONTROL SYSTEM SHALL BE SERVICED AND MAINTAINED IN FIRST-CLASS CONDITION BY THE CONTROL MANUFACTURER FOR A PERIOD OF ONE YEAR AFTER ACCEPTANCE AT NO EXTRA COST TO THE OWNER.

E. SEQUENCE OF CONTROL:

- 1. VARIABLE AIR VOLUME TERMINAL WITH REHEAT:
- a. OCCUPIED MODE:
- A. WHEN THE ZONE TEMPERATURE IS GREATER THAN ITS COOLING SETPOINT, THE ZONE DAMPER SHALL MODULATE BETWEEN THE MINIMUM AND MAXIMUM AIRFLOW UNTIL THE ZONE IS SATISFIED.
- B. WHEN THE ZONE TEMPERATURE IS BETWEEN THE COOLING AND HEATING SETPOINTS, THE ZONE DAMPER SHALL MAINTAIN THE MINIMUM BOX AIRFLOW.

C. WHEN THE ZONE TEMPERATURE IS LESS THAN THE HEATING THE CONTROLLER SHALL MODULATE THE 2-WAY HEATING WAT SERVING THE BOX TO MAINTAIN THE ZONE TEMPERATURE AT SETPOINT. UPON A FURTHER CALL FOR HEATING, THE BOX AIR BE INCREASED FROM ITS MINIMUM CFM TO MAINTAIN THE ZONE TEMPERATURE AT ITS HEATING SETPOINT.

b. UNOCCUPIED MODE:

- A. WHEN THE ZONE IS UNOCCUPIED THE ZONE DAMPER SHALL CO ITS MINIMUM AIRFLOW. B. WHEN THE ZONE TEMPERATURE IS GREATER THAN ITS UNOCC
- COOLING SETPOINT, THE ZONE DAMPER SHALL MODULATE BE MINIMUM AND MAXIMUM AIRFLOW UNIT THE ZONE IS SATISFIED WHEN THE ZONE TEMPERATURE IS LESS THAN ITS UNOCCUPI SETPOINT, THE CONTROLLER SHALL MODULATE THE 2-WAY HE WATER VALVE SERVING THE BOX TO MAINTAIN THE ZONE TEM AT ITS HEATING SETPOINT. UPON A FURTHER CALL FOR HEATING AIRFLOW SHALL BE INCREASED FROM ITS MINIMUM CFM TO MA ZONE TEMPERATURE AT ITS HEATING SETPOINT.

2. FUME HOOD CONTROL – AIRFLOW CONTROL VALVES:

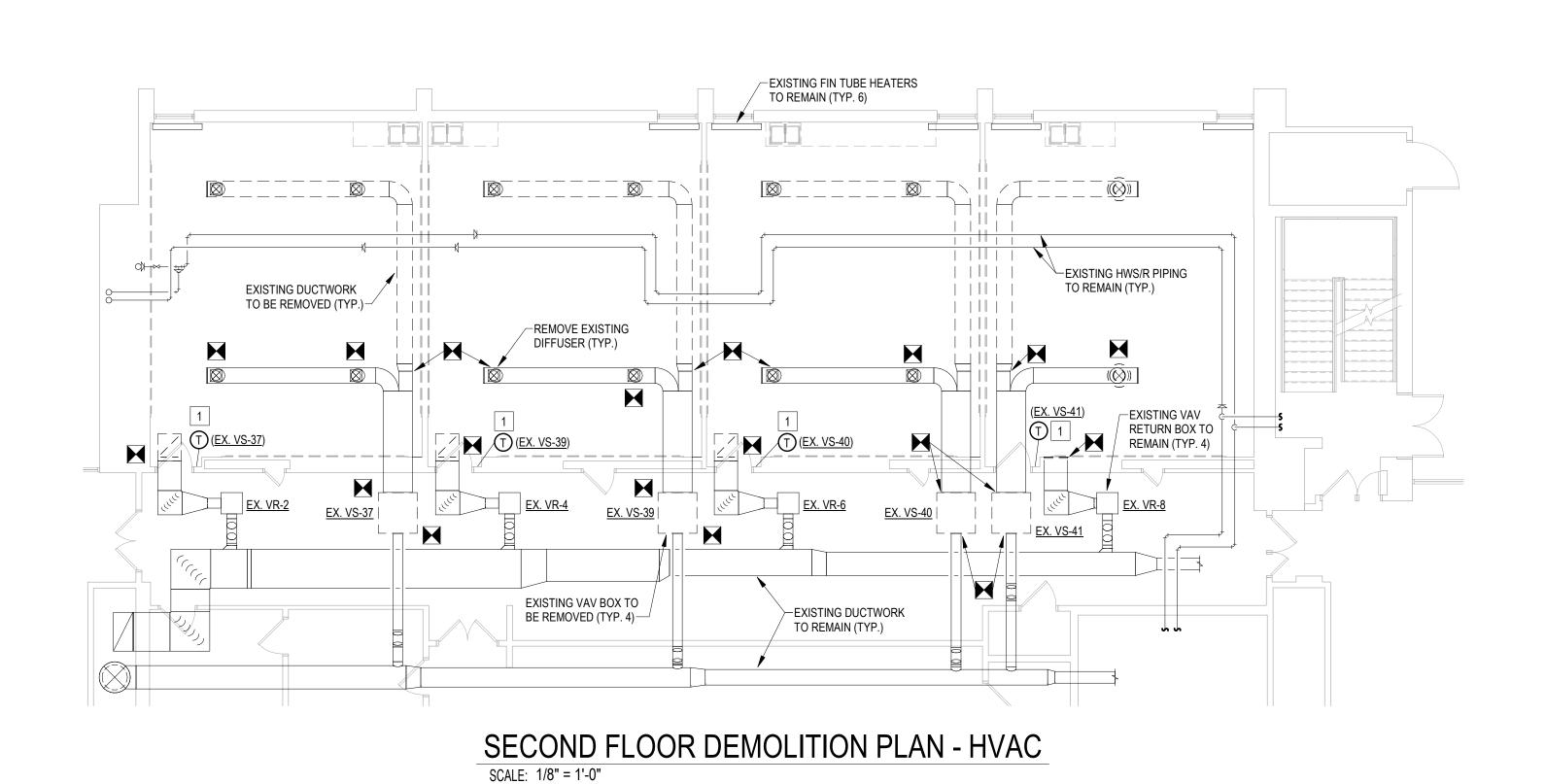
- a. OCCUPIED MODE:
- A. THE BAS SHALL MONITOR VAV UNIT SUPPLY AIRFLOWS (VS-30) VS-3061) TO CONTROL SUPPLY AIR AND GENERAL EXHAUST AIR VALVES (VE-3065) IN RESPONSE TO THE FUME HOOD AIRFLOW BETWEEN SUPPLY AND EXHAUST (AS MEASURED BY A STAINLE PROBE IN THE FUME HOOD EXHAUST DUCT). MEASUREMENT SUMMATION OF THE FUME HOOD SUPPLY AND EXHAUST AIRFL ALLOW FOR TRACKING OF THE TOTAL EXHAUST.
- B. THE FUME HOOD IN LAB 3065A IS CONTROLLED BY AN INDIVIDU SWITCH. IF THE HOOD IS OFF, THERE IS NO AIRFLOW THROUG HOOD.
- C. IF THE HOOD IS OFF, THE GENERAL EXHAUST WILL OPERATE UNLESS ADDITIONAL FLOW IS NEEDED FOR SPACE COOLING C AIR CHANGE REQUIREMENTS.
- D. FUME HOOD OPERATION: THE FUME HOOD IS CONSTANT VOLU SHALL HAVE THE PROPER AIR VELOCITIES AT OPERATING HEIC
- E. UPON ACTIVATION OF THE LABORATORY EXHAUST HOOD, THE MODULATE THE SUPPLY AIRFLOWS FOR VS-3065 AND VS-3061 COOLING MODE, THE ZONE DAMPERS FOR THESE UNITS SHALL BETWEEN THE MIN-HIGH AND MAXIMUM SETPOINTS TO SATISF WHILE THE FUME HOOD IS ACTIVATED. DURING HEATING MODE SUPPLY AIRFLOWS FOR VS-3065 AND VS-3061 SHALL MODULAT MAXIMUM SETPOINT. SPACE GENERAL EXHAUST VAV UNIT (VE OPERATE AT MINIMUM UNLESS ADDITIONAL FLOW IS NEEDED DEACTIVATION OF THE LABORATORY EXHAUST HOOD, VS-3065 VS-3061 SHALL BE ABLE TO MODULATE BETWEEN THE MIN-LOW MAXIMUM SETPOINT FOR COOLING AND THE MINIMUM AND MAX SETPOINT FOR HEATING.
- HEATING AND COOLING: IF THE SUPPLY AIRFLOW CONTROL V (VS-3065 AND VS-3061) DAMPER OPERATES AT MAXIMUM AIRFL UNABLE TO MAINTAIN HEATING OR COOLING SETPOINT, THE BA RESET THE ASSOCIATED ROOFTOP UNIT SUPPLY AIR TEMPERA THE SUPPLY AIRFLOW CONTROL VALVE (VS-3065 & VS-3061) IS S UNABLE TO MAINTAIN SPACE HEATING SETPOINT, THEN THE AS VAV UNIT REHEAT COIL CONTROL VALVE SHALL MODULATE OP
- G. THE BAS SHALL PROVIDE THE FOLLOWING CONTROL / ALARM F a. DIGITAL STATUS OF FUME HOOD POWER SWITCH. b. DIGITAL STATUS OF ROOF EXHAUST FAN MOTOR. c. DIGITAL PROOF OF AIRFLOW FOR FUME HOOD, WITH AIRF
- MEASUREMENT d. ROOMS SHALL BE CONTROLLED TO AN AIRFLOW OFFSET THAN A PRESSURE SETPOINT). TYPICALLY, 400-500 CFM M
- EXHAUST THAN SUPPLY. e. ALARM IN CASE OF LOW AIRFLOW (FUME HOOD EXHAUST EXHAUST FAN.

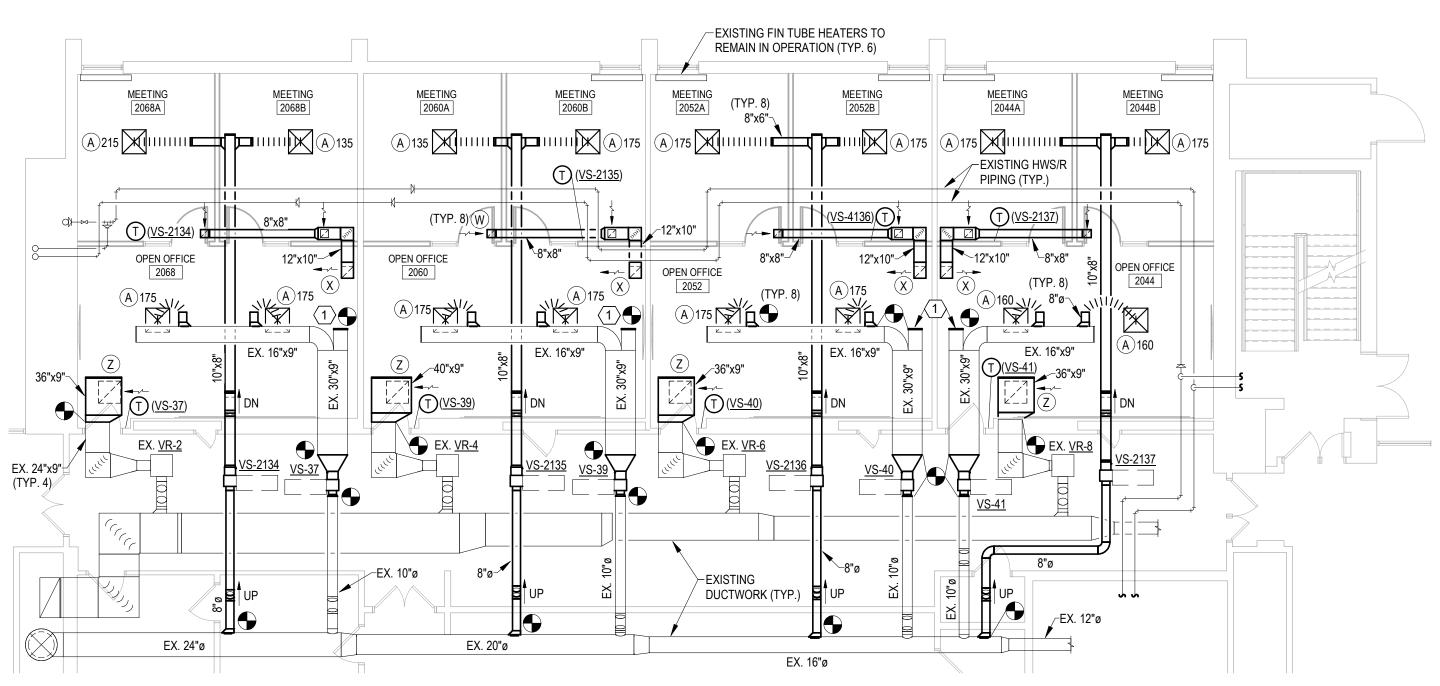
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ATURE. IF STILL SSUCIATED PEN. FUNCTIONS: -LOW (RATHER MORE - DUCT) OR		Designed FLM / BCR
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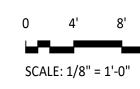
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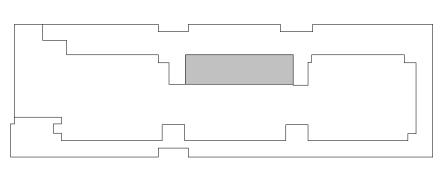
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DEMOLITION NOTES:

1. EXISTING VAV TERMINAL BOX THERMOSTAT TO BE REMOVED.

GENERAL NOTES:

- 1. NEW CONNECTIONS TO EXISTING DUCTWORK SHALL BE FIELD VERIFIED.
- 2. PIPING RUN-OUTS TO NEW VAV BOXES SHALL BE CONNECTED TO EXISTING HWS/R PIPING LOCATED IN CORRIDOR. INSTALL PIPING RUN-OUTS TO EQUIPMENT IN STRICT ACCORDANCE TO MANUFACTURER'S INSTRUCTIONS.

$\underline{\mathsf{PLAN NOTES:}} \bigcirc$

1. CAP EXISTING 14"x9" SUPPLY DUCT.

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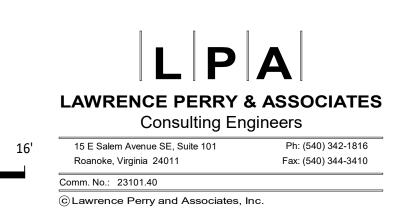
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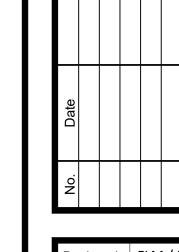
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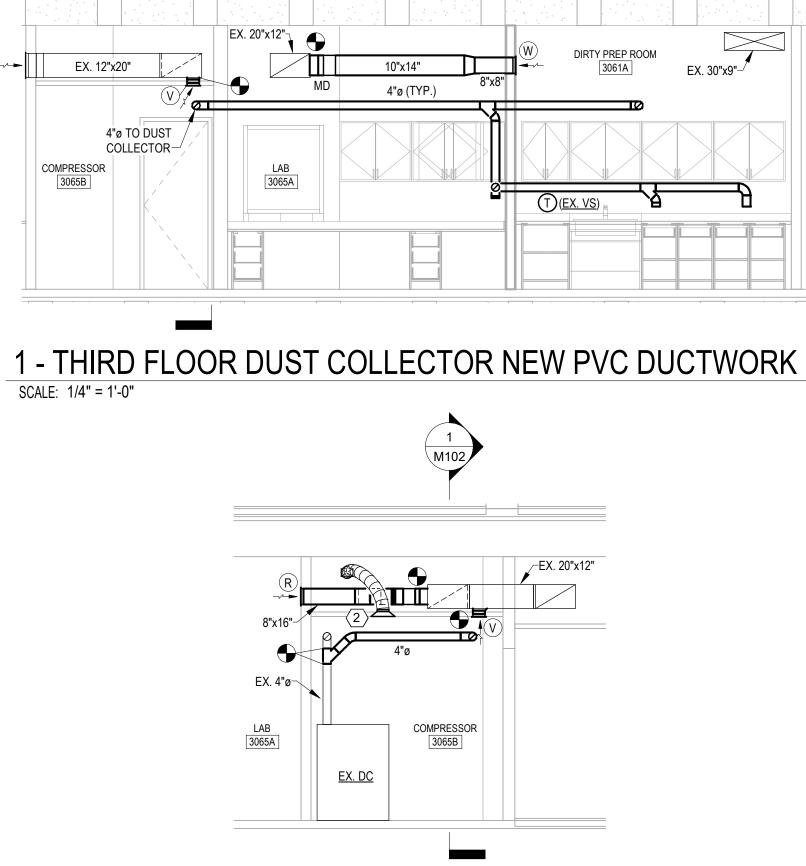
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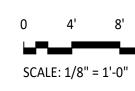
VIRGINIA TECH UBO APPROVAL

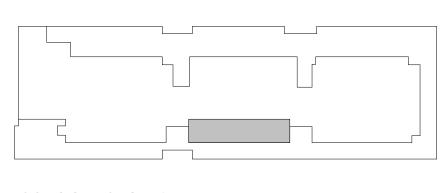


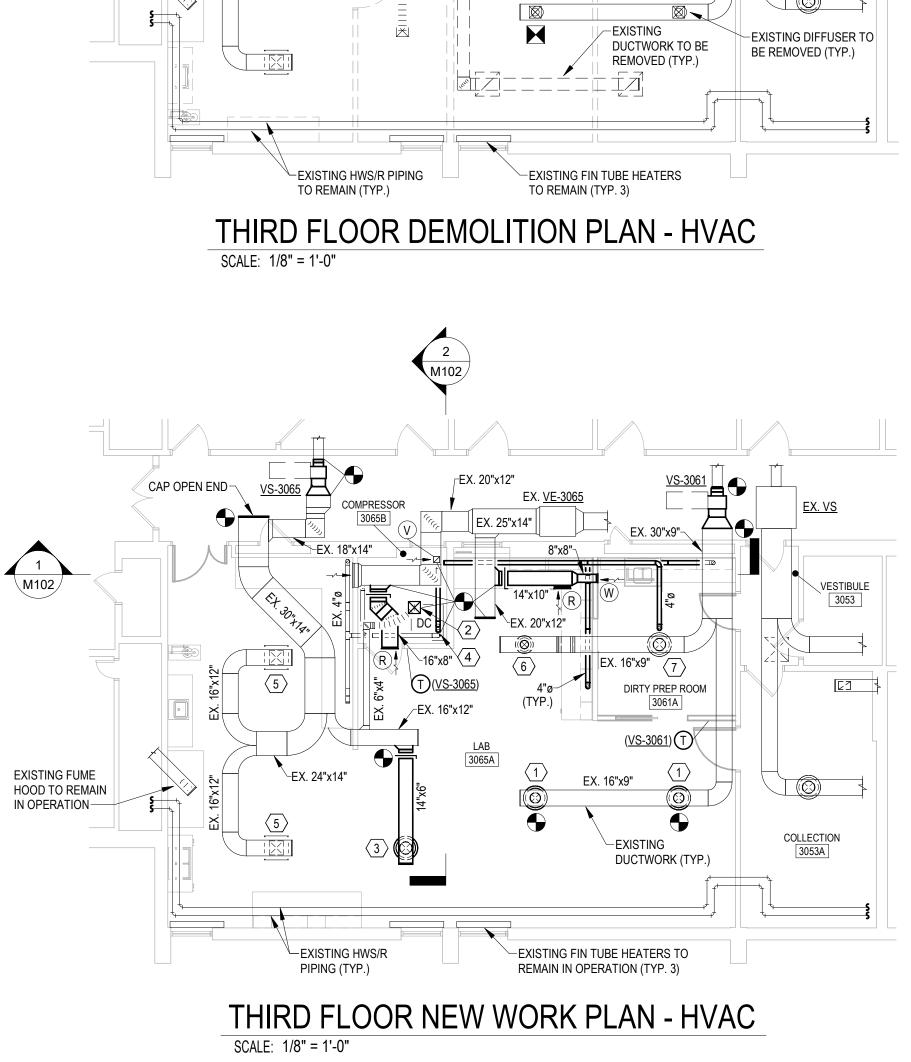


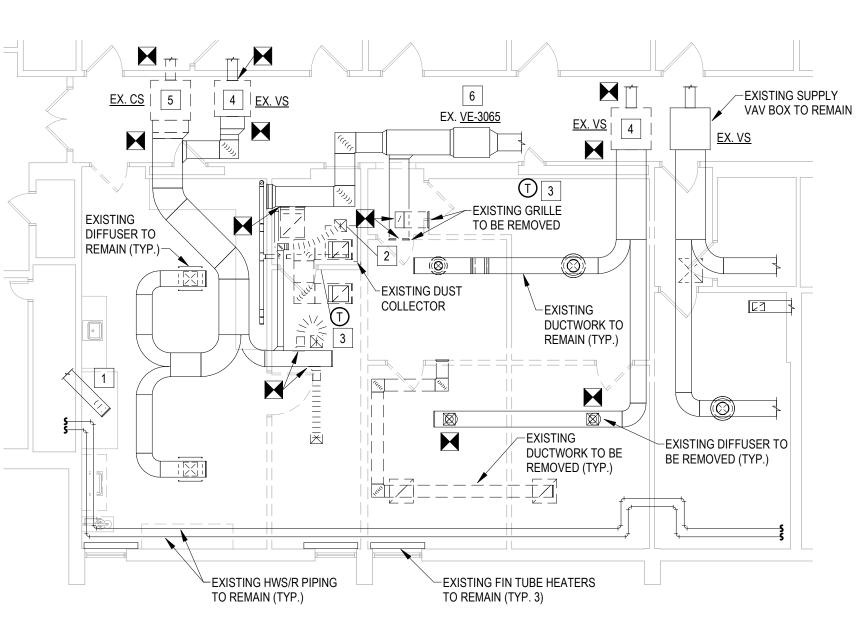
2 - EXISTING DUST COLLECTOR PVC DUCT CONNECTIONS SCALE: 1/4" = 1'-0"











DEMOLITION NOTES:

- 1. EXISTING 12"ø FUME HOOD DUCT TO REMAIN.
- 2. EXISTING 12"x12" CEILING DIFFUSER TO BE REINSTALLED IN NEW CEILING. SEE THIRD FLOOR NEW WORK PLAN FOR UPDATED LOCATION.
- 3. EXISTING VAV TERMINAL BOX THERMOSTAT TO BE REMOVED.
- 4. EXISTING VAV SUPPLY BOX TO BE REMOVED.
- 5. EXISITNG CONSTANT SUPPLY BOX TO BE REMOVED.
- 6. EXISTING VARIABLE EXHAUST BOX TO REMAIN.

GENERAL PLAN NOTES:

- 1. ALL EXISTING GRILLES AND DIFFUSERS TO REMAIN SHALL BE CLEANED AND PAINTED TO MATCH ADJACENT SURFACE. IF CONDITION OF EXISTING GRILLE OR DIFFUSER IS DEEMED POOR THEN PROVIDE DIRECT REPLACEMENT AFTER VERIFYING SIZE.
- 2. NEW CONNECTIONS TO EXISTING DUCTWORK SHALL BE FIELD VERIFIED.
- PIPING RUN-OUTS TO NEW VAV BOXES SHALL BE CONNECTED TO EXISTING HWS/R PIPING LOCATED IN CORRIDOR. INSTALL PIPING RUN-OUTS TO EQUIPMENT IN STRICT ACCORDANCE TO MANUFACTURER'S INSTRUCTIONS.

PLAN NOTES:

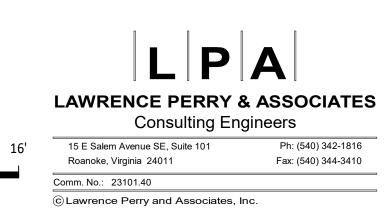
- 1. RELOCATED EXISTING 10"ø DIFFUSER. REBALANCE DIFFUSER TO 350 CFM.
- 2. RELOCATED EXISTING 12"x12" DIFFUSER. REBALANCE DIFFUSER TO 65 CFM.
- 3. RELOCATED EXISTING 12"ø DIFFUSER. REBALANCE DIFFUSER TO 300 CFM.
- 4. EXISTING DUST COLLECTOR TO REMAIN IN OPERATION. ROUTE NEW 4"ø SCHEDULE 40 PVC PIPING WITH 4"ø BLAST GATE TO EACH WORK STATION AS SHOWN. COORDINATE EXACT ROUTING AND ARRANGEMENT WITH END USER.
- 5. EXISTING DIFFUSER TO BE REBALANCED TO 300 CFM.
- 6. EXISTING DIFFUSER TO BE REBALANCED TO 200 CFM.
- 7. EXISTING DIFFUSER TO BE REBALANCED TO 125 CFM.

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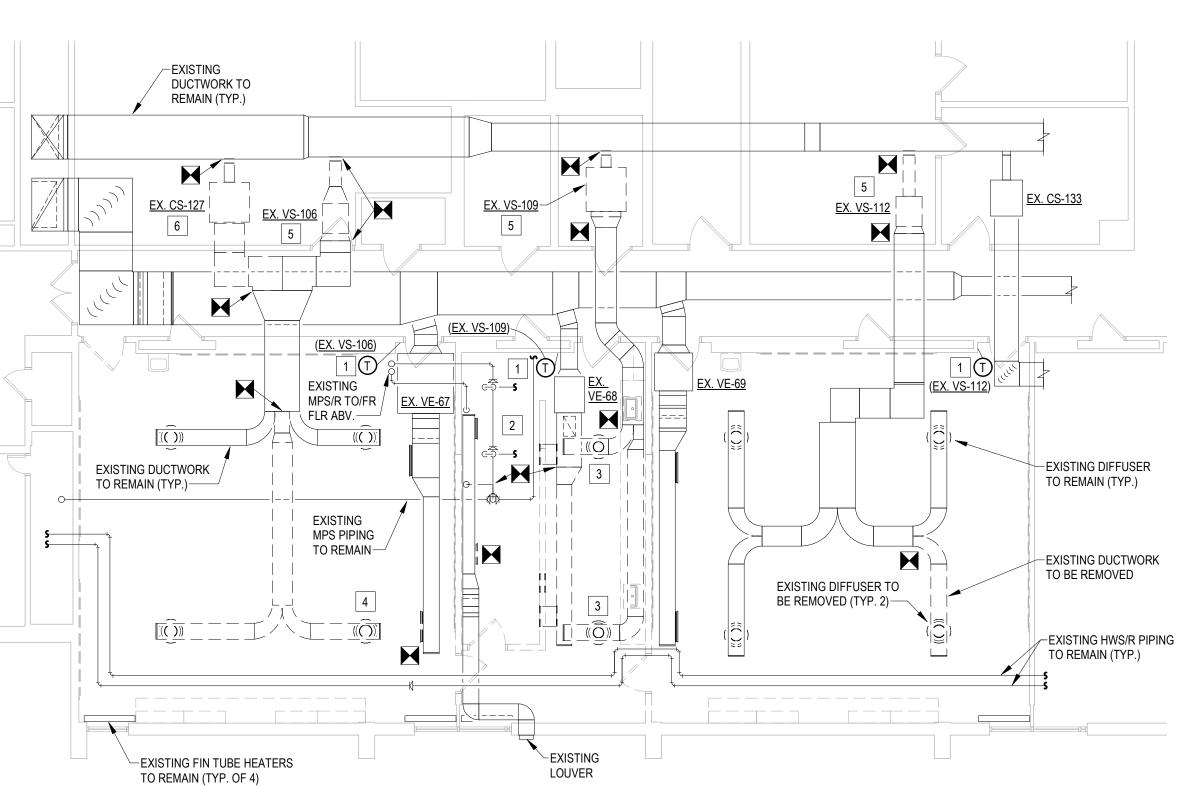
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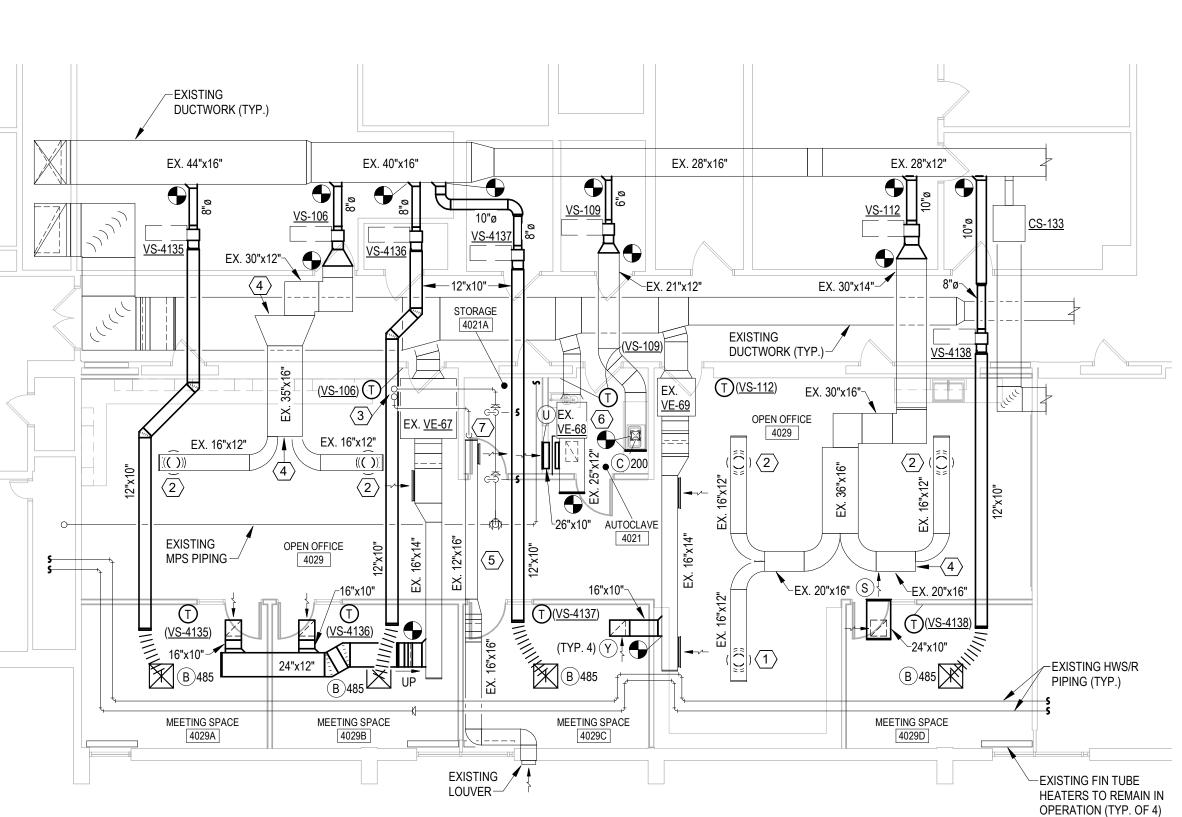




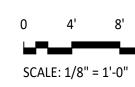
VIRGINIA TECH UBO APPROVAL

M102













DEMOLITION NOTES:

- 1. EXISTING VAV TERMINAL BOX THERMOSTAT TO BE REMOVED
- FIELD VERIFY EXISTING STEAM/CONDENSATE PIPING BEFORE MODIFYING OR REMOVING ANY EXISTING PIPING REQUIRED TO ACCOMODATE NEW LOCATION OF EXISTING AUTOCLAVE. ENSURE ALL ACTIVE EXISTING PIPING REMAINS IN PLACE OR IS RELOCATED TO CONTINUE SERVICE.
- 3. EXISTING 10"ø DIFFUSER TO BE RELOCATED. SEE SHEET M102 FOR NEW LOCATION.
- 4. EXISTING 12"ø DIFFUSER TO BE RELOCATED. SEE SHEET M102 FOR NEW LOCATION. 5. EXISTING VAV SUPPLY BOX TO BE REMOVED.
- 6. EXISITNG CONSTANT SUPPLY BOX TO BE REMOVED.

GENERAL PLAN NOTES:

- 1. ALL EXISTING GRILLES AND DIFFUSERS TO REMAIN SHALL BE CLEANED AND PAINTED TO MATCH ADJACENT SURFACE. IF CONDITION OF EXISTING GRILLE OR DIFFUSER IS DEEMED POOR THEN PROVIDE DIRECT REPLACEMENT AFTER VERIFYING SIZE.
- 2. NEW CONNECTIONS TO EXISTING DUCTWORK SHALL BE FIELD VERIFIED.
- 3. PIPING RUN-OUTS TO NEW VAV BOXES SHALL BE CONNECTED TO EXISTING HWS/R PIPING LOCATED IN CORRIDOR. INSTALL PIPING RUN-OUTS TO EQUIPMENT IN STRICT ACCORDANCE TO MANUFACTURER'S INSTRUCTIONS.

<u>Plan Notes:</u> ()

- 1. REBALANCE EXISTING 12" DIFFUSER TO 350 CFM.
- 2. REBALANCE EXISTING 12" DIFFUSER TO 275 CFM.
- 3. EXISTING MPS/R TO/FROM FLOOR ABOVE.
- 4. CAP OPEN PORTION OF EXISTING DUCTWORK.
- 5. PAINT DUCTWORK TO MATCH EXISTING EXPOSED DUCTWORK.
- 6. ADJUST RETURN AIRFLOW FOR EX. VE-68 TO BE 825 CFM. ADJUST MANUAL DAMPER IN NEW 26"x10" DUCTWORK TO 625 CFM.
- 7. CONNECT/MODIFY EXISTING STEAM/CONDENSATE PIPING IN 4021A STORAGE TO ACCOMODATE RELOCATED AUTOCLAVE IN ADJACENT ROOM 4021. CAP/REMOVE ANY EXISTING PIPING NOT REQUIRED TO REMAIN FOR RELOCATED AUTOCLAVE. FIELD VERIFY EXISTING STEAM/CONDENSATE PIPING BEFORE MODIFYING OR REMOVING ANY EXISTING PIPING TO ENSURE ALL ACTIVE PIPING REMAINS IN PLACE OR IS RELOCATED TO CONTINUE SERVICE.

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Designed FLM / BCR

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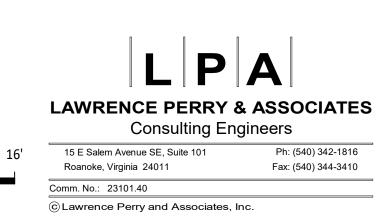
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