


DIVISION 22, AND 23  
GENERAL PROVISIONS  
1.0 DESCRIPTION  
A. DIVISIONS 22, AND 23 SHALL BE GOVERNED BY ALL APPLICABLE PROVISIONS OF THE CONTRACT DOCUMENT.  
B. THE CONTRACTOR SHALL FURNISH, INSTALL AND CONNECT ALL MATERIALS, EQUIPMENT, APPARATUS, AND INCIDENTALS REQUIRED FOR A COMPLETE AND WORKING INSTALLATION. FOR ALL SYSTEMS SHOWN AND REQUIRED, THE CONTRACTOR SHALL SUPPLY ALL NECESSARY LABOR, EQUIPMENT, TOOLS, INSURANCE, AND TAX SERVICES, AND SHALL ASSUME FULL RESPONSIBILITY FOR ALL OBLIGATIONS ASSOCIATED WITH COMPLETION OF WORK AS PROVIDED BY THE CONTRACT DOCUMENTS.  
2.0 STANDARDS, REGULATIONS AND CODES  
A. WORK SHALL COMPLY WITH THE EDITION OF THE APPLICABLE STANDARDS, REGULATIONS AND CODES CURRENTLY IN FORCE OF ALL FEDERAL, STATE AND LOCAL AUTHORITIES HAVING JURISDICTION, WHERE QUANTITIES, SIZES, OR OTHER REQUIREMENTS INDICATED ON THE DRAWINGS OR HEREIN SPECIFIED ARE IN EXCESS OF THE STANDARD OR CODE REQUIREMENTS, THE SPECIFICATIONS AND/OR DRAWINGS SHALL GOVERN. IN THE ABSENCE OF OTHER APPLICABLE LOCAL CODES, ACCEPTABLE TO THE ARCHITECT/ENGINEER, THE NATIONAL SET OF CODES AND THE NATIONAL ELECTRICAL CODE SHALL APPLY TO THIS WORK.  
B. THE CONTRACTOR SHALL COMPLY WITH RULES AND REGULATIONS OF PUBLIC UTILITIES AND MUNICIPAL DEPARTMENTS AFFECTED BY CONNECTIONS OF SERVICES. THE CONTRACTOR SHALL PAY ALL FEES ASSOCIATED THERE WITH.  
C. THE CONTRACTOR SHALL BE LICENSED TO PERFORM ASSOCIATED WORK IN THE MUNICIPALITY IN WHICH THE PROJECT IS LOCATED.  
D. ALL PRODUCTS AND TYPES OF CONSTRUCTION SHALL MEET OR EXCEED THE LATEST EDITION OF APPLICABLE STANDARDS OF MANUFACTURER, TESTING, PERFORMANCE AND INSTALLATION.  
E. WHERE INDICATED OR REQUIRED, COMPLY WITH ALL PROVISIONS OF THE ADA AND/OR THE ABA ACCESSIBILITY GUIDELINES.  
F. WHERE INDICATED OR REQUIRED, COMPLY WITH ALL APPLICABLE PROVISIONS OF ENERGY AND VENTILATION CODES IN FORCE AT THE LOCAL JURISDICTION.  
3.0 GRAPHIC REPRESENTATION AND JOB CONDITIONS:  
A. THE CONTRACT DOCUMENTS SHALL SERVE AS WORKING DRAWINGS FOR THE GENERAL LAYOUT OF THE VARIOUS ITEMS OF EQUIPMENT, ARE DIAGRAMMATIC UNLESS SPECIFICALLY DIMENSIONED, AND DO NOT NECESSARILY INDICATE EVERY REQUIRED ITEM. THE CONTRACTOR SHALL INCLUDE ALL NECESSARY COMPONENTS AND ACCESSORIES AS REQUIRED FOR A COMPLETE WORKING SYSTEM WHETHER SO SPECIFICALLY INDICATED OR NOT.  
B. ARCHITECTURAL AND STRUCTURAL DRAWINGS TAKE PRECEDENCE OVER ALL OTHER DRAWINGS IN THE REPRESENTATION OF THE GENERAL CONSTRUCTION WORK; ANY CONFLICTS SHALL BE RESOLVED PRIOR TO COMMENCING WORK. FAILURE TO DO SO SHALL NOT BE CONSIDERED A BASIS FOR THE GRANTING OF ADDITIONAL COMPENSATION.  
C. ARRANGE WORK IN A NEAT, WELL ORGANIZED MANNER. COORDINATE WORK WITH OTHER TRADES INVOLVED, PRIOR TO COMMENCING WORK. SUBCONTRACTORS SHALL WORK TOGETHER TO RESOLVE ANY CONFLICTS OF SPACE OR ROUTING.  
4.0 GUARANTEES/WARRANTY:  
A. THE CONTRACTOR SHALL GUARANTEE/WARRANTY ALL WORK PERFORMED, INCLUDING LABOR, MATERIALS AND EQUIPMENT FURNISHED UNDER THIS CONTRACT, AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP FOR A MINIMUM PERIOD OF ONE YEAR FROM THE DATE OF THE OWNER'S REPRESENTATIVE FINAL ACCEPTANCE OF THE WORK. PROVIDE EXTENDED WARRANTIES AS NOTED IN EACH SECTION OR SPECIFIED FOR SPECIFIC PRODUCTS.  
5.0 WORKMANSHIP:  
A. ALL WORK PERFORMED UNDER THIS CONTRACT SHALL PROVIDE A NEAT AND 'WORKMANLIKE' APPEARANCE WHEN COMPLETED, TO THE SATISFACTION OF THE OWNER'S REPRESENTATIVE. THE COMPLETE INSTALLATION SHALL FUNCTION AS DESIGNED AND INTENDED WITH RESPECT TO EFFICIENCY, CAPACITY, AND NOISE LEVEL, ETC.  
6.0 LOCAL CONDITIONS:  
A. THE CONTRACTOR SHALL CAREFULLY EXAMINE AND BECOME THOROUGHLY FAMILIAR WITH LOCAL CONDITIONS, EXISTING INSTALLATIONS AND ALL OTHER CONDITIONS WHICH MAY AFFECT ASSOCIATED WORK. THE CONTRACTOR SHALL LOCATE ALL EXISTING UTILITIES AND PROTECT THEM DURING THE EXECUTION OF THE WORK.  
B. THE CONTRACTOR SHALL CAREFULLY EXAMINE ALL CONTRACT DOCUMENTS INCLUDING PROJECT DRAWINGS AND SPECIFICATIONS TO BECOME FAMILIAR WITH THE TYPE OF CONSTRUCTION, MATERIALS, AND EQUIPMENT TO BE USED FOR ALL WORK AND HOW IT WILL AFFECT THE INSTALLATION OF THIS CONTRACT.  
C. BY THE ACT OF SUBMITTING A BID, THE CONTRACTOR WILL BE DEEMED TO HAVE MADE SUCH EXAMINATION, TO HAVE ACCEPTED SUCH CONDITIONS, TO HAVE MADE ALL ALLOWANCE THEREFORE, AND INCLUDED ALL COSTS IN HIS PROPOSAL. FAILURE TO DETERMINE EXISTING CONDITIONS WILL NOT BE CONSIDERED A BASIS FOR THE GRANTING OF ADDITIONAL COMPENSATION.  
7.0 OPERATION DURING CONSTRUCTION:  
A. THE CONTRACTOR IS RESPONSIBLE FOR THE INSTALLATION AND OPERATION, SERVICE AND MAINTENANCE OF ALL NEW EQUIPMENT DURING CONSTRUCTION AND PRIOR TO ACCEPTANCE BY THE OWNER OF THE COMPLETED PROJECT. WARRANTY PERIODS SHALL NOT COMMENCE UNTIL FINAL ACCEPTANCE BY THE OWNER OR OWNER REPRESENTATIVE.  
B. THE CONTRACTOR SHALL PROVIDE, AT HIS OWN EXPENSE, ALL TEMPORARY UTILITIES REQUIRED TO PROVIDE FOR AND PROTECT THE WORK AND AS NECESSARY TO MAINTAIN AN ADEQUATE WORK FORCE.  
8.0 SAFETY REGULATIONS:  
A. ALL WORK SHALL BE PERFORMED IN COMPLIANCE WITH ALL APPLICABLE GOVERNING SAFETY REGULATIONS, INCLUDING OSHA REGULATIONS, PROVIDE SAFETY LIGHTS, GUARDS AND SIGNS REQUIRED.  
9.0 HOUSEKEEPING:  
A. THE CONTRACTOR SHALL BE RESPONSIBLE FOR KEEPING STOCKS OF MATERIAL AND EQUIPMENT STORED ON THE PREMISES IN A NEAT AND ORDERLY MANNER.  
B. THE CONTRACTOR SHALL CLEAN AND MAINTAIN THEIR SPECIFIC PORTIONS OF THE WORK ON A DAILY BASIS OR AS SPECIFIED IN THE GENERAL CONDITIONS.  
C. THE CONTRACTOR SHALL REMOVE FROM THE PREMISES ALL WASTE MATERIAL PRESENT AS A RESULT OF HIS WORK.  
10.0 CONNECTION AND ALTERATION TO EXISTING SYSTEMS:  
A. CONNECTION TO THE EXISTING BUILDING SYSTEMS MUST BE ACCOMPLISHED UNDER THIS CONTRACT. SYSTEM 'DOWNTIME' DUE TO CONNECTION SHALL BE UP TO AN ABSOLUTE MINIMUM. THE OWNER'S REPRESENTATIVE SHALL JUDGE IF AT WHAT TIME, AND FOR WHAT LENGTH OF TIME, A SHUT-DOWN CAN BE TOLERATED.  
B. PROVIDE ALL TEMPORARY PIPING AND WIRING SYSTEMS REQUIRED DURING CONSTRUCTION IN ORDER TO KEEP ALL EXISTING SYSTEMS FUNCTIONING.  
C. DEMOLITION, CUTTING AND PATCHING TO RESTORE SURFACES TO ORIGINAL CONDITION AS NECESSITATED FOR ACCESS TO WORK PERFORMED BY THE CONTRACTOR OR HIS SUBCONTRACTORS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.  
11.0 SUBSTITUTIONS:  
A. MATERIALS, PRODUCTS AND EQUIPMENT DESCRIBED IN THE BIDDING DOCUMENTS ESTABLISHED A STANDARD OF QUALITY TO BE MET BY ANY PROPOSED SUBSTITUTION.  
B. CONTRACTOR'S BIDS SHALL BE BASED ON THE MATERIAL IDENTIFIED OR SPECIFIED IN THE CONTRACT DOCUMENTS. ANY PROPOSALS FOR SUBSTITUTION SHALL BE MADE IN WRITING TO THE ARCHITECT/ENGINEER WITH ALL SUPPORTING DOCUMENTATION.  
C. ALLOWING ADEQUATE TIME FOR APPROPRIATE ACTION, THE PRODUCTS OF OTHER MANUFACTURERS MAY BE ACCEPTED, IF IN THE OPINION OF THE ARCHITECT/ENGINEER, THE SUBSTITUTE MATERIAL IS OF QUALITY AS GOOD OR BETTER THAN THE MATERIAL SPECIFIED, AND WILL SERVE WITH EQUAL EFFICIENCY AND DEPENDABILITY, THE PURPOSE FOR WHICH THE ITEMS SPECIFIED WERE INTENDED. THE BURDEN OF PROOF OF EQUALITY IS ENTIRELY UPON THE PROPOSER.  
C. REFER TO DIVISION 1 REQUIREMENTS FOR ADDITIONAL SUBSTITUTION PROCEDURES.  
D. WHEREVER SUBSTITUTIONS ALTER THE DESIGN OR SPACE REQUIREMENTS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR AND INCLUDE ALL ASSOCIATED COST ITEMS OF THE REVISED DESIGN AND OR CONSTRUCTION WORK REQUIRED BY HIS OR OTHER TRADES AFFECTED BY THE PROPOSED SUBSTITUTION.  
12.0 SHOP DRAWINGS AND PRODUCT DATA:  
A. THE CHECKING OF SHOP DRAWINGS IS A GRATUITOUS ASSISTANCE AND IN NO WAY RELIEVES THE CONTRACTOR OF RESPONSIBILITY FOR THE CONTENTS OF THE CONTRACT DOCUMENTS.  
B. SHOP DRAWINGS AND CATALOG DATA ON ALL MAJOR ITEMS OF EQUIPMENT AND APPARATUS, AND SUCH OTHER ILLUSTRATIVE MATERIALS AS MAY BE CONSIDERED NECESSARY BY THE OWNER'S REPRESENTATIVE SHALL BE SUBMITTED BY THE CONTRACTOR IN ADVANCE TO PREVENT DELAY AND CHANGES DURING CONSTRUCTION.  
C. REFER TO ARCHITECTURAL DOCUMENTS FOR ADDITIONAL SHOP DRAWING SUBMISSION PROCEDURES.  
13.0 FOUNDATIONS AND SUPPORTS:  
A. THE CONTRACTOR SHALL PROVIDE CONCRETE BASES, HANGERS AND FOUNDATIONS FOR ALL MACHINERY AND EQUIPMENT SPECIFIED OR SHOWN IN THIS CONTRACT, INCLUDING FANS, AIR CONDITIONING UNITS, WATER HEATERS, PUMPS, MOTORS, ELECTRICAL GEAR, ETC., UNLESS SPECIFICALLY NOTED OTHERWISE.  
B. ALL HANGERS, BRACKETS, CLAMPS, ETC., SHALL BE OF STANDARD WEIGHT STEEL, PERFORATED STRAP HANGERS SHALL NOT BE USED IN ANY WORK, WHEN TWO (2) OR MORE PIPES OR CONDUITS ARE RUN PARALLEL, OR WHERE DUCTS INTERFERE WITH THE PROPER LOCATION OF HANGERS, THEY MAY BE SUPPORTED ON TRAPEZE HANGERS. OTHER HANGERS SHALL BE HINGED RING MALLEABLE IRON, BY GRINNELL OR BY MASON OR APPROVED EQUAL WITH RINGS AND HANGER ADJUSTERS FOR ADEQUATE SIZE TO CARRY THE LOADS IMPOSED, ALL PIPING, DUCTWORK AND CONDUIT SYSTEMS SHALL EACH BE INDEPENDENTLY SUPPORTED FROM OTHER SYSTEMS AND FROM EQUIPMENT SO THAT NO WEIGHT IS BORNE BY EQUIPMENT.  
C. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONS AGAINST EXCESSIVE NOISE OR VIBRATION BY ISOLATING THE VARIOUS ITEMS OF EQUIPMENT FROM THE BUILDING STRUCTURE. PROVIDE FLEXIBLE CONNECTORS WHERE INDICATED AND AT ALL ROTATING EQUIPMENT AND FOR EQUIPMENT MOUNTED ON VIBRATION ISOLATORS.  
14.0 CUTTING AND PATCHING:  
A. ALL NECESSARY CUTTING, DRILLING AND PATCHING SHALL BE PROVIDED BY THIS CONTRACTOR. STRUCTURAL MEMBERS SHALL NOT BE DISTURBED WITHOUT PRIOR APPROVAL OF THE STRUCTURAL ENGINEER AND/OR THE OWNER'S REPRESENTATIVE. ALL AREAS AND SURFACES DISTURBED BY WORK PERFORMED UNDER THIS CONTRACT SHALL BE NEATLY REPAIRED AND REFINISHED TO THE CONDITION OF ADJOINING SURFACES IN A MANNER SUITABLE TO THE OWNER'S REPRESENTATIVE.  
15.0 SLEEVES AND ESCUTCHEONS:  
CONDITION OF ADJOINING SURFACES IN A MANNER SUITABLE TO THE OWNER'S REPRESENTATIVE.  
15.0 SLEEVES AND ESCUTCHEONS:  
A. PENETRATIONS THRU WALLS AND FLOORS SHALL BE AS DETAILED.  
B. WHERE NOT OTHERWISE SHOWN, PENETRATIONS SHALL CONFORM TO THE FOLLOWING:  
1. WHERE PIPES OR CONDUITS PASS THROUGH INTERIOR PARTITIONS, GALVANIZED STEEL PIPE SLEEVES OR GALVANIZED STEEL SHEET SLEEVES SHALL BE USED.  
2. WHERE PIPES OR CONDUITS PASS THRU CONCRETE FLOORS AND WALLS, WALLS BELOW GRADE OR EXTERIOR WALLS AND SLABS ON GRADE, CAST IRON OR STEEL PIPE SLEEVES SHALL BE USED.  
3. SLEEVES THROUGH INTERIOR NON-RATED WALLS, INCLUDING WALLS INDICATED AS SOUND PARTITIONS, SHALL BE PACKED WITH FIBERGLASS OR MINERAL WOOL AND CAULKED.  
D. SLEEVES BELOW GRADE, IN EXTERIOR WALLS OR THRU SLABS ON GRADE SHALL HAVE LEAD AND OKUM OR MECHANICAL LINK SEALS, THUNDER LINE OR ACCEPTABLE EQUIVALENT.  
E. PENETRATIONS OF FIRE RATED CONSTRUCTION SHALL BE MADE WITH A UL LISTED FIRE PENETRATION ASSEMBLY SUITABLE FOR THE RATING AT EACH LOCATION, WHERE REQUIRED. SLEEVES THROUGH FIRE RATED STRUCTURE SHALL BE FIRE BARRIER CAULKED WITH PUTTY STRIP OR SHEET BY 3M, HILTI OR ACCEPTABLE EQUAL.  
F. PROVIDE STEEL (DRY LOCATIONS) OR BRASS (DAMP LOCATIONS) ESCUTCHEONS TO COMPLETELY COVER PIPE PENETRATION HOLES IN FLOORS, WALLS, OR CEILINGS. PROVIDE PIPE ESCUTCHEONS WITH NICKEL OR CHROME FINISH FOR OCCUPIED AREAS, PRIME PAINT FINISH FOR UNOCCUPIED AREAS, BRASS FOR EXTERIOR.  
16.0 MOTORS, CONTROLS AND FIRE ALARM INTERFACE:  
A. ALL MOTORS FURNISHED UNDER THIS SPECIFICATION SHALL BE RECOGNIZED MANUFACTURER AND OF ADEQUATE CAPACITY FOR THE LOADS INVOLVED. ALL MOTORS SHALL CONFORM TO THE STANDARDS OF MANUFACTURER AND PERFORMANCE OF THE NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION AS SHOWN IN THEIR LATEST PUBLICATIONS.  
B. ALL MOTORS 3/4 HP AND ABOVE SHALL BE HIGH EFFICIENCY. PROVIDE ECM MOTORS WHERE INDICATED. ANY MOTOR INDICATED FOR USE WITH VARIABLE FREQUENCY DRIVES (VFD) SHALL BE SPECIFICALLY DESIGNED FOR COMPATIBILITY.  
C. DISCONNECTS AND MOTOR STARTERS FOR EQUIPMENT SHALL BE BY THE ELECTRICAL CONTRACTOR UNLESS FURNISHED INTEGRAL WITH THE EQUIPMENT OR AS OTHERWISE INDICATED. INSTALLATION SHALL BE BY THE ELECTRICAL CONTRACTOR EXCEPT FOR DEVICES FACTORY INSTALLED AND SHIPPED WITH EQUIPMENT. PROVIDE MANUAL OR MAGNETIC STARTERS WITH NECESSARY AUXILIARY CONTACTS TO ACCOMPLISH THE SPECIFIED OR REQUIRED SEQUENCE OF OPERATION.  
D. ALL TEMPERATURE CONTROLS UNLESS NOTED OTHERWISE SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR.  
E. IF NO SEQUENCE OF OPERATION IS INCLUDED, SUBMIT A PROPOSED SEQUENCE TO THE ENGINEER FOR APPROVAL.  
F. ALL FIRE ALARM DEVICES INCLUDING DUCT SMOKE DETECTOR AND SHUT DOWN/INTERLOCK WIRING SHALL BE THE RESPONSIBILITY OF THE ELECTRICAL OR FIRE ALARM CONTRACTOR OTHERWISE NOTED.  
17.0 PIPING IN ELECTRICAL ROOMS:  
A. NO PIPING EXCEPT SPECIFICALLY NOTED OTHERWISE WILL BE PERMITTED IN ELECTRICAL ROOMS OR DATA ROOMS INCLUDING SERVER ROOMS AND IT CLOSETS, IN ROOMS WHERE PIPING IS INDICATED OVER OR NEAR ELECTRICAL EQUIPMENT, A SUITABLE GALVANIZED SHEET METAL PAN OR GUTTER PIPED TO THE DRAINAGE SYSTEM SHALL BE PROVIDED.  
END OF SECTION  
230 100

HEATING, VENTILATION AND AIR CONDITIONING  
1.0 SCOPE:  
A. THE WORK INCLUDED UNDER THIS CONTRACT CONSISTS OF PROVIDING ALL LABOR, MATERIALS, TOOLS, TRANSPORTATION, SERVICES, ETC., NECESSARY TO COMPLETE THE INSTALLATION OF THE HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS AND OTHER ITEMS HEREIN LISTED AND AS DESCRIBED IN THESE SPECIFICATIONS, AS ILLUSTRATED IN THE ACCOMPANYING DRAWINGS OR AS DIRECTED BY THE ARCHITECT/ENGINEER.  
2.0 SHEET METAL:  
A. DUCTWORK SHALL BE NEW PRIME GRADE GALVANIZED STEEL SHEETS CONSTRUCTED PER ASHRAE AND SMACNA STANDARDS. DUCT SYSTEMS INSTALLATION SHALL BE IN ACCORDANCE WITH SMACNA DUCT CONSTRUCTION STANDARDS MANUAL AND INDUSTRY STANDARDS. PROVIDE ROUND OR RECTANGULAR DUCT AS INDICATED.  
1. PROVIDE DUCT SYSTEM(S), INCLUDING ALL NECESSARY COMPONENTS SUCH AS DAMPERS, TURNING VANES, OFFSETS AND TAKEOFFS, ETC. REQUIRED BY THE PROJECT (WHETHER SHOWN OR NOT), WHICH SHALL BE FABRICATED AND INSTALLED FOR MAXIMUM EFFICIENCY AND TO MINIMIZE PRESSURE DROPS AND OBJECTIBLE SOUND AND TO PROVIDE FOR COMPLETE SYSTEM BALANCING.  
2. ALL DUCT SIZES SHOWN ARE FREE AREA SIZE AND DO NOT INCLUDE LINER.  
B. FABRICATE FOR THE PRESSURE AND SMACNA SEAL CLASS REQUIRED BY THE APPLICATION.  
LEAKAGE CLASS MINIMUM REQUIREMENTS ARE:  
1. UP THRU 2" WG PRESSURE - CLASS 24 - ROUND - CLASS 12.  
2. GREATER THAN 2", LESS THAN 4" WG PRESSURE - CLASS 12 - RECTANGULAR, CLASS 6 - ROUND.  
SEAL CLASS MINIMUM REQUIREMENTS ARE:  
1. UP THRU 2" WG PRESSURE - CLASS A FOR ALL DUCT JOINTS.  
2. GREATER THAN 2", LESS THAN 4" WG PRESSURE - CLASS A FOR ALL DUCT JOINTS.  
C. DUCT SEALANTS  
1. DUCT SEALANT SHALL HAVE 25/50 FLAME AND SMOKE RATING WITH A STATIC PRESSURE CLASS OF 10" WG, MOLD AND MILDEW RESISTANT. SEALANT SHALL BE INSTALLED PER MANUFACTURER INSTRUCTIONS.  
2. SEALANT FOR CONCEALED DUCTWORK SHALL BE AN EXTERNALLY APPLIED SOLVENT OR WATER BASED JOINT AND SEAM SEALANT WITH OR WITHOUT TAPE.  
3. SPIRAL LOCK SEAMS AND GASKETED DUCT JOINTS ARE EXEMPTED FROM OTHER SEALANT REQUIREMENTS.  
D. DUCT FINISHES  
1. CONCEALED DUCTWORK SHALL BE MANUFACTURER'S STANDARD MILL FINISHED.  
2. DUCTWORK THAT WILL REMAIN EXPOSED TO VIEW SHALL BE FURNISHED WITHOUT MARKS, MARKERS, SHIPPING, IDENTIFICATION OR OTHER TAGS LOCATED ON EXTERIOR DUCT SURFACES, NO EXCEPTIONS. ANY DUCTWORK SO INSTALLED SHALL BE REMOVED AT CONTRACTOR EXPENSE. PROTECT EXPOSED DUCTWORK FROM DENTS, SCRATCHES OR OTHER DAMAGE DURING CONSTRUCTION, WIPE DOWN AND THOROUGHLY CLEAN ALL EXPOSED DUCT, FITTINGS AND ACCESSORIES.  
E. ROUND OR OVAL DUCT SHALL BE FACTORY BUILT OF GALVANIZED STEEL, SUITABLE FOR PRESSURE CLASS REQUIRED OR INDICATED. SNAP LOCK DUCT AND FITTINGS SHALL BE USED FOR LOW PRESSURE/VELOCITY APPLICATIONS ONLY. FITTINGS SHALL HAVE 1.5 TIMES DIAMETER CENTERLINE RADIUS. SPIRAL DUCT MAY BE USED FOR ANY PRESSURE/VELOCITY CLASS. SPIRAL DUCT SHALL BE SEMICO OR ACCEPTABLE EQUAL BY MCGILL AIRFLOW OR LINDAB.  
1. SINGLE WALL, 20" WG MINIMUM.  
2. SINGLE WALL, 40" WG MINIMUM.  
3. ROUND OR OVAL DUCT SYSTEMS SHALL BE DUCTMATE QUICK SLEEVE, SLIP JOINT, WELDED OR FLANGED.  
F. FLEXIBLE AIR DUCT AND ACCESSORIES SHALL BE UL-181 CLASS 1 COMPLIANT, 25/50 SMOKE AND FLAME PLENUM RATED, MAXIMUM LENGTH SHALL BE 5'-0". FLEXIBLE DUCT SHALL HAVE ENDS BANDED AND INSULATION ENDS SEALED. ATTACH WITH NYLON DUCT ZIP TIE PROVIDE THERMAFLEX OR EQUIVALENT FLEX TIE SUPPORTS. SUPPLY AIR AND RETURN AIR FLEXIBLE DUCTS AND BOOTS SHALL BE INSULATED. EXHAUST FLEXIBLE DUCT SHALL NOT BE INSULATED.  
G. INSULATED - THERMAFLEX CORE OR HELIX WIRE WITH R4.2 INSULATION AND POLYETHYLENE VAPOR BARRIER JACKET, WITH MAXIMUM VELOCITY OF 5,000 FPM, PRESSURE OF 6" WG POSITIVE AND 1" NEGATIVE.  
H. UNINSULATED - THERMAFLEX WIG FOIL LAMINATE AND HELIX WIRE, WITH MAXIMUM VELOCITY OF 5,000 FPM, PRESSURE OF 12" WG POSITIVE AND 1" NEGATIVE.  
3. FLEXIBLE DUCTS SHALL BE THERMAFLEX OR ACCEPTABLE EQUAL BY ATCO OR FLEXMASTER.  
PIPE ROUTING AND DROP LOCATIONS WITH NECESSARY PIPE OFFSETS TO ACCOMMODATE BEAMS AND OTHER OBSTRUCTIONS.  
12.0 INSULATION:  
B. DUCTWORK  
1. INTERIOR DUCT WRAP  
A. CONCEALED LOW VELOCITY ROUND RUN-OUT DUCT - WRAP ALL SPIRAL OR SNAP-LOCK LOW PRESSURE DUCT RUN-OUTS TO SUPPLY GRILLES, REGISTERS, AND DIFFUSERS WITH 1-1/2" THICK, 0.75 LB. DENSITY FIBERGLASS WRAP WITH VAPOR BARRIER.  
B. CONCEALED LOW VELOCITY ROUND AIR CONDITIONING SUPPLY, WITH 1-1/2" THICK, 0.75 LB. DENSITY FLEXIBLE FIBERGLASS DUCTWORK INSULATION WITH LAMINATED JACKET OF BONDED ALUMINUM FOIL AND KRAFT PAPER WITH A GLASS FIBER REINFORCING FSK).  
C. CONCEALED AND EXPOSED MEDIUM/HIGH VELOCITY ROUND AND RECTANGULAR DUCT - WRAP WITH 1-1/2" THICK 0.75 LB. DENSITY FLEXIBLE DUCTWORK INSULATION WITH LAMINATED JACKET OF BONDED ALUMINUM FOIL AND KRAFT PAPER WITH A GLASS FIBER REINFORCING FSK).  
D. DUCTWORK INDICATED TO BE INSULATED THAT IS LOCATED IN UNCONDITIONED SPACES SUCH AS ATTICS AND OTHER SIMILAR AREAS SHALL BE BOTH LINED AND WRAPPED.  
C. PIPING  
1. PIPE INSULATION SHALL RUN CONTINUOUSLY THRU HANGERS AND SUPPORTS WITH ALL JOINTS SEALED AND VAPOR BARRIERS PRESERVED.  
2. CHILLED WATER PIPING (UP TO 55F): INSULATE WITH FIBERGLASS WITH ALL SERVICE PAPER JACKET WITH REINFORCED SCUM (BSJ). INSTALL PVC FITTING COVERS ON ALL FITTINGS.  
A. INTERIOR - 1-1/2" FOR ALL PIPE SIZES.  
13.0 VIBRATION ISOLATION:  
A. PROVIDE FLEXIBLE CONNECTIONS AT ALL MOTOR DRIVEN EQUIPMENT, WHERE SHOWN AND WHERE REQUIRED TO HOLD TRANSMITTED NOISE AND VIBRATION TO AN ACCEPTABLE MINIMUM AT PIPING AND DUCT CONNECTIONS.  
B. DUCT FLEXIBLE CONNECTION SHALL BE DURODYNE NON-COMBUSTIBLE 22 OUNCE (MINIMUM) POLYMER COATED HOVEN FABRIC OR ACCEPTABLE EQUAL. PROVIDE HYPALON UV RESISTANT COATING WHERE EXPOSED TO WEATHER.  
C. EQUIPMENT VIBRATION ISOLATION: ALL MOTOR DRIVEN EQUIPMENT SHALL BE FURNISHED WITH ISOLATING MOUNTINGS. MOTORS SHALL BE MOUNTED ON RESILIENT BASES, SPRING OR RUBBER SUPPORTS AS RECOMMENDED BY THE MANUFACTURER. ISOLATORS SHALL BE AMBER BOOTH OR ACCEPTABLE EQUAL BY KINETICS, MASON INDUSTRIES, VIBRATION ELIMINATOR CO.  
14.0 EQUIPMENT AND PIPE LABELS:  
A. EQUIPMENT LABELS SHALL BE PROVIDED FOR ALL MECHANICAL EQUIPMENT AND SHALL BE SELF ADHESIVE ENGRAVED PLASTIC.  
B. LABELS WITH WHITE LETTERING, SIZED, MINIMUM 1-1/2" HIGH, AND LOCATED FOR VIEWING FROM GROUND OR FLOOR LEVEL.  
C. LABEL SHALL INDICATE DRAWING DESIGNATION OR UNIQUE EQUIPMENT NUMBER.  
D. PIPE LABELS FOR CHILLED, HEATING HOT WATER, REFRIGERANT, CONDENSER AND CONDENSATE PIPING SHALL BE PREPRINTED, COLOR-CODED, WITH 1-1/2" LETTERING INDICATING SERVICE, AND SHOWING FLOW DIRECTION. LOCATE PIPE LABELS WHERE PIPING IS EXPOSED OR ABOVE ACCESSIBLE CEILINGS IN FINISHED SPACES, MACHINE ROOMS; ACCESSIBLE MAINTENANCE SPACES SUCH AS SHAFTS, TUNNELS, AND PLENUMS; AND LOCATIONS AS FOLLOWS:  
1. NEAR EACH WALL AND END OF EACH RUN.  
2. NEAR EACH BRANCH CONNECTION, EXCLUDING SHORT TAKEOFFS FOR FIXTURES AND TERMINAL UNITS, WHERE FLOW PATTERN IS NOT OBVIOUS, MARK EACH PIPE AT BRANCH.  
3. NEAR PENETRATIONS THROUGH WALLS, FLOORS, CEILINGS, AND INACCESSIBLE ENCLOSURES.  
4. AT ACCESS DOORS, AND SIMILAR ACCESS POINTS THAT PERMIT VIEW OF CONCEALED PIPING.  
5. NEAR MAJOR EQUIPMENT TERMINALS AND TERMINAL UNITS.  
6. SPACED AT MAXIMUM INTERVALS OF 50 FEET ALONG EACH RUN, REDUCED INTERVALS TO 25 FEET IN AREAS OF CONGESTED PIPING AND EQUIPMENT.  
15.0 MISCELLANEOUS  
A. PROVIDE ESCUTCHEONS AT ALL PIPING PENETRATIONS OF FINISHED WALL, FLOOR OR CEILING CONSTRUCTION. ESCUTCHEONS SHALL BE CHROME PLATED BRASS IN OCCUPIED AREAS, PRIME PAINT FINISH FOR UNOCCUPIED AREAS UNLESS OTHERWISE NOTED. ESCUTCHEONS FOR EXTERIOR OR MOIST AREAS SHALL BE BRASS.  
B. ALL CABLE TIES FOR CONTROLS AND OTHER CABLE SYSTEMS LOCATED IN PLENUMS UTILIZED FOR AIR MOVEMENT THAT ARE NOT INSTALLED IN CONDUIT SHALL BE 25/50 FLAME AND SMOKE RATED, HELLEFARMYNT TSNR2C2JUL OR EQUAL.  
16.0 CLEANING:  
A. NEW WORK  
1. CLEAN AIR SYSTEM BY OPERATING AT LEAST THREE HOURS PRIOR TO FINAL ACCEPTANCE WITH TEMPORARY FILTERS. REMOVE ALL FILTERS AND REPLACE WITH CLEAN.  
2. CLEAN WATER PIPING SYSTEMS BY FLUSHING WITH WATER UNTIL CLEAR. PROVIDE CHEMICAL TREATMENT AS REQUIRED FOR APPLICATION.  
17.0 TESTING AND ADJUSTING:  
A. CONTRACTOR SHALL OBTAIN THE SERVICES OF AN INDEPENDENT TEST AND BALANCE AGENCY AND SHALL OPERATE AND TEST THE AIR CONDITIONING AND VENTILATION SYSTEMS AND INSTRUCT THE OWNER IN ITS OPERATION. PERFORM A SERIES OF GENERAL CAPACITY AND OPERATING TESTS. THE TESTS SHALL DEMONSTRATE THE SPECIFIED CAPACITIES OF VARIOUS PIECES OF EQUIPMENT.  
B. THE ENTIRE TEMPERATURE CONTROLS SYSTEMS SHALL BE ADJUSTED AND BALANCED AND PUT IN OPERATING CONDITION TO CAUSE THE EQUIPMENT TO MAINTAIN THE TEMPERATURES IN ACCORDANCE WITH THE INTENT OF THESE SPECIFICATIONS. OPERATE AND TEST EQUIPMENT DURING SUMMER AND WINTER SEASONAL STARTUP UNDER THIS CONTRACT.  
C. TEST PRESSURE PIPING SYSTEM TO 1-1/2 TIMES THE OPERATING PRESSURE BUT NOT LESS THAN 50 PSIG FOR A PERIOD OF 2 HOURS WITH NO OBSERVABLE PRESSURE DROP.  
D. TEST CONDENSATE DRAIN PIPING BY FILLING WITH WATER TO THE DRAIN PAN CONNECTION(S) FOR A PERIOD OF 2 HOURS WITH NO OBSERVABLE LEAKS.  
E. SUBMIT THE COMPLETE TEST AND BALANCE REPORT FOR REVIEW TO THE ARCHITECT/ENGINEER IN TRIPPLICATE. TEST PROCEDURE AND REPORT SHALL CONFORM TO NEBB STANDARDS. THE REPORT SHALL BE SIGNED BY THE RESPONSIBLE INDIVIDUAL.  
F. PROVIDE TEST AND BALANCE SERVICE BY ONE OF THE FOLLOWING APPROVED TEST AND BALANCE AGENCIES:  
1. ACUTEC SERVICES, INC. CHAD FL YNN 816 215 3567  
2. DOYLE FIELD SERVICE INC. 913 677 3374  
3. NATIONAL TAB. DAN HERTENSTEIN 816.221.8575  
4. PRO BALANCE. DUKE YOCUM 816.228.7800  
5. SYS-TEK. DAN KREBS 816.229.3009.  
END OF SECTION  
4.0 GRILLES, REGISTERS, INLETS AND OUTLETS:  
A. ALL SUPPLY, RETURN AND EXHAUST GRILLES, REGISTERS AND DIFFUSERS SHALL BE AS SCHEDULED ON THE DRAWINGS. COMMERCIAL QUALITY - E.H. PRICE OR ACCEPTABLE EQUAL BY TITUS, CARNES, KRUEGER OR NALOR.  
1. ALL AIR DISTRIBUTION DEVICES SHALL BE SELECTED FOR THROW AND LOW NOISE (25 NC OR LESS) PERFORMANCE CHARACTERISTICS UNLESS OTHERWISE INDICATED.  
2. UNLESS OTHERWISE INDICATED, LOUVERED SUPPLY GRILLES SHALL BE DOUBLE DEFLECTION DEVICES WITH FRONT BLADES PARALLEL TO THE LONG DIMENSION.  
3. A BALANCING DAMPER SHALL BE PROVIDED FOR EACH AND EVERY DIFFUSER, REGISTER AND GRILLE WHERE AIRFLOW CONTROL IS REQUIRED UNLESS OTHERWISE INDICATED, PROVIDE INTEGRAL VOLUME DAMPER WHERE A DUCT MOUNTED DAMPER WOULD NOT BE ACCESSIBLE.  
4. CEILING SUPPLY DIFFUSER CONNECTION SHALL BE MADE WITH HARD ELBOW OR FLEX DUCT WITH THERMAFLEX FLEX FLOW ELBOW SUPPORT.  
5.0 HEATING AND AIR CONDITIONING UNITS:  
A. ALL SUPPLY, RETURN AND EXHAUST GRILLES, REGISTERS AND DIFFUSERS SHALL BE AS SCHEDULED OR BY ACCEPTABLE EQUAL. UNITS SHALL BE STANDARD CATALOGUE PRODUCTS WITH THE APPROPRIATE APPROVAL OR CERTIFICATION BY AGA, ARI AND UL. EFFICIENCIES SHALL CONFORM TO ASHRAE 90 STANDARDS.  
C. ROOF MOUNTED AIR HANDLING UNITS:  
1. AIR HANDLING UNITS SHALL BE ROOF MOUNTED, VERTICAL DISCHARGE, WITH COOLING AND/OR HEATING COMPONENTS OF CHARACTERISTICS AND CAPACITIES SCHEDULED. UNIT SHALL HAVE DIRECT DRIVE ECM AIRFLOW SUPPLY FANS, COOLING COIL WITH COPPER TUBES AND ALUMINUM FINNS, INSULATED STAINLESS STEEL COIL DRAIN PAN, CABINET SHALL BE DOUBLE WALL INSULATED, PROVIDE WITH FILTERS, HINGED ACCESS DOORS, MOUNTING CURB AND DUCT FLEX CONNECTORS AND OTHER ACCESSORIES AS INDICATED OR REQUIRED.  
2. PACKAGED UNITS SHALL BE DAKIN OR ACCEPTABLE EQUAL BY CARRIER, YORK, OR TRANE.  
PIPE ROUTING AND DROP LOCATIONS WITH NECESSARY PIPE OFFSETS TO ACCOMMODATE BEAMS AND OTHER OBSTRUCTIONS.

6.0 FANS:  
A. FANS SHALL BE AS SCHEDULED WITH ALL REQUIRED ACCESSORIES INCLUDING VIBRATION ISOLATORS, ETC.  
1.0 QUALITY:  
FANS SHALL BE AMCA RATED BY GREENHECK OR ACCEPTABLE EQUAL BY COOK, PENN BARRY.  
7.0 MISCELLANEOUS MECHANICAL EQUIPMENT:  
A. LAB CONTROL VALVES SHALL BE AS SCHEDULED.  
1. E.H. PRICE OR ANTEC.  
8.0 FILTERS:  
A. PROVIDE FILTERS IN AIR INTAKE TO EACH UNITS A/C SYSTEM WITH SIZE AND NUMBER OF FILTERS STANDARD WITH AIR UNIT MANUFACTURER. PROVIDE 1" AND/OR 2" THICK TO SUIT EQUIPMENT REQUIREMENTS, H.V.VELOCITY, THROW-WAY MERV 8 FILTERS, FARR 3030 OR ACCEPTABLE EQUAL BY AMERICAN AIR FILTER, AIRGUARD, AIR FILTERS, INC, PURALATOR, FILTERS SHALL BE NEW AND CLEAN AT TIME OF OWNER'S ACCEPTANCE. SUPPLY EXTRA SET OF FILTERS FOR EACH UNIT.  
9.0 CONTROLS AND LOW VOLTAGE SYSTEMS:  
A. CONTRACT CONTROL SERVICES COMPANY AS REQUIRED TO INSTALL THE CONTROL COMPONENTS INCLUDING THERMOSTATS/SENSORS, CONTROLLERS, ACTUATORS, WIRING, CHILLED WATER CONTROL VALVES, WIRING, SOFTWARE, GRAPHICS AND OTHER COMPONENTS AS REQUIRED FOR A COMPLETE OPERATING SYSTEM. WHERE NO SEQUENCE IS INDICATED, CONTRACTOR SHALL SUBMIT A PROPOSED SEQUENCE FOR APPROVAL.  
B. DEVICES EXPOSED TO VIEW AND MOUNTED IN FINISHED SPACES SHALL BE WHITE IN COLOR UNLESS OTHERWISE NOTED OR DIRECTED.  
C. ALL OCCUPANT ADJUSTABLE DEVICES SHALL BE MOUNTED IN ACCORDANCE WITH ADA AND ADAAG REQUIREMENTS.  
D. INTEGRATE NEW DIGITAL DEVICES INCLUDING TEMPERATURE SENSORS, HUMIDISTATS AND OTHER SENSORS AND CONTROLLERS INTO THE EXISTING ENERGY MANAGEMENT SYSTEM.  
10.0 PIPE, FITTINGS AND VALVES:  
A. PROVIDE SERVICE VALVES FOR EACH ITEM OF EQUIPMENT, AT BRANCH PIPING AND ELSEWHERE AS INDICATED OR REQUIRED.  
B. PROVIDE CONTROL VALVES, BALANCE VALVES, STRAINERS, CHECK VALVES AND OTHER VALVES AS INDICATED OR REQUIRED BY THE APPLICATION.  
C. PROVIDE A UNION OR FLANGED CONNECTION BETWEEN EACH ITEM OF EQUIPMENT AND ITS SERVICE VALVE.  
D. COPPER TO FERROUS PIPE CONNECTIONS SHALL HAVE ISOLATION COUPLING, FLANGE OR UNION.  
E. ROUND OR OVAL DUCT SHALL BE FACTORY BUILT OF GALVANIZED STEEL, SUITABLE FOR PRESSURE CLASS REQUIRED OR INDICATED. SNAP LOCK DUCT AND FITTINGS SHALL BE USED FOR LOW PRESSURE/VELOCITY APPLICATIONS ONLY. FITTINGS SHALL HAVE 1.5 TIMES DIAMETER CENTERLINE RADIUS. SPIRAL DUCT MAY BE USED FOR ANY PRESSURE/VELOCITY CLASS. SPIRAL DUCT SHALL BE SEMICO OR ACCEPTABLE EQUAL BY MCGILL AIRFLOW OR LINDAB.  
1. SINGLE WALL, 20" WG MINIMUM.  
2. SINGLE WALL, 40" WG MINIMUM.  
3. ROUND OR OVAL DUCT SYSTEMS SHALL BE DUCTMATE QUICK SLEEVE, SLIP JOINT, WELDED OR FLANGED.  
F. FLEXIBLE AIR DUCT AND ACCESSORIES SHALL BE UL-181 CLASS 1 COMPLIANT, 25/50 SMOKE AND FLAME PLENUM RATED, MAXIMUM LENGTH SHALL BE 5'-0". FLEXIBLE DUCT SHALL HAVE ENDS BANDED AND INSULATION ENDS SEALED. ATTACH WITH NYLON DUCT ZIP TIE PROVIDE THERMAFLEX OR EQUIVALENT FLEX TIE SUPPORTS. SUPPLY AIR AND RETURN AIR FLEXIBLE DUCTS AND BOOTS SHALL BE INSULATED. EXHAUST FLEXIBLE DUCT SHALL NOT BE INSULATED.  
G. INSULATED - THERMAFLEX CORE OR HELIX WIRE WITH R4.2 INSULATION AND POLYETHYLENE VAPOR BARRIER JACKET, WITH MAXIMUM VELOCITY OF 5,000 FPM, PRESSURE OF 6" WG POSITIVE AND 1" NEGATIVE.  
H. UNINSULATED - THERMAFLEX WIG FOIL LAMINATE AND HELIX WIRE, WITH MAXIMUM VELOCITY OF 5,000 FPM, PRESSURE OF 12" WG POSITIVE AND 1" NEGATIVE.  
3. FLEXIBLE DUCTS SHALL BE THERMAFLEX OR ACCEPTABLE EQUAL BY ATCO OR FLEXMASTER.  
PIPE ROUTING AND DROP LOCATIONS WITH NECESSARY PIPE OFFSETS TO ACCOMMODATE BEAMS AND OTHER OBSTRUCTIONS.  
12.0 INSULATION:  
B. DUCTWORK  
1. INTERIOR DUCT WRAP  
A. CONCEALED LOW VELOCITY ROUND RUN-OUT DUCT - WRAP ALL SPIRAL OR SNAP-LOCK LOW PRESSURE DUCT RUN-OUTS TO SUPPLY GRILLES, REGISTERS, AND DIFFUSERS WITH 1-1/2" THICK, 0.75 LB. DENSITY FIBERGLASS WRAP WITH VAPOR BARRIER.  
B. CONCEALED LOW VELOCITY ROUND AIR CONDITIONING SUPPLY, WITH 1-1/2" THICK, 0.75 LB. DENSITY FLEXIBLE FIBERGLASS DUCTWORK INSULATION WITH LAMINATED JACKET OF BONDED ALUMINUM FOIL AND KRAFT PAPER WITH A GLASS FIBER REINFORCING FSK).  
C. CONCEALED AND EXPOSED MEDIUM/HIGH VELOCITY ROUND AND RECTANGULAR DUCT - WRAP WITH 1-1/2" THICK 0.75 LB. DENSITY FLEXIBLE DUCTWORK INSULATION WITH LAMINATED JACKET OF BONDED ALUMINUM FOIL AND KRAFT PAPER WITH A GLASS FIBER REINFORCING FSK).  
D. DUCTWORK INDICATED TO BE INSULATED THAT IS LOCATED IN UNCONDITIONED SPACES SUCH AS ATTICS AND OTHER SIMILAR AREAS SHALL BE BOTH LINED AND WRAPPED.  
C. PIPING  
1. PIPE INSULATION SHALL RUN CONTINUOUSLY THRU HANGERS AND SUPPORTS WITH ALL JOINTS SEALED AND VAPOR BARRIERS PRESERVED.  
2. CHILLED WATER PIPING (UP TO 55F): INSULATE WITH FIBERGLASS WITH ALL SERVICE PAPER JACKET WITH REINFORCED SCUM (BSJ). INSTALL PVC FITTING COVERS ON ALL FITTINGS.  
A. INTERIOR - 1-1/2" FOR ALL PIPE SIZES.  
13.0 VIBRATION ISOLATION:  
A. PROVIDE FLEXIBLE CONNECTIONS AT ALL MOTOR DRIVEN EQUIPMENT, WHERE SHOWN AND WHERE REQUIRED TO HOLD TRANSMITTED NOISE AND VIBRATION TO AN ACCEPTABLE MINIMUM AT PIPING AND DUCT CONNECTIONS.  
B. DUCT FLEXIBLE CONNECTION SHALL BE DURODYNE NON-COMBUSTIBLE 22 OUNCE (MINIMUM) POLYMER COATED HOVEN FABRIC OR ACCEPTABLE EQUAL. PROVIDE HYPALON UV RESISTANT COATING WHERE EXPOSED TO WEATHER.  
C. EQUIPMENT VIBRATION ISOLATION: ALL MOTOR DRIVEN EQUIPMENT SHALL BE FURNISHED WITH ISOLATING MOUNTINGS. MOTORS SHALL BE MOUNTED ON RESILIENT BASES, SPRING OR RUBBER SUPPORTS AS RECOMMENDED BY THE MANUFACTURER. ISOLATORS SHALL BE AMBER BOOTH OR ACCEPTABLE EQUAL BY KINETICS, MASON INDUSTRIES, VIBRATION ELIMINATOR CO.  
14.0 EQUIPMENT AND PIPE LABELS:  
A. EQUIPMENT LABELS SHALL BE PROVIDED FOR ALL MECHANICAL EQUIPMENT AND SHALL BE SELF ADHESIVE ENGRAVED PLASTIC.  
B. LABELS WITH WHITE LETTERING, SIZED, MINIMUM 1-1/2" HIGH, AND LOCATED FOR VIEWING FROM GROUND OR FLOOR LEVEL.  
C. LABEL SHALL INDICATE DRAWING DESIGNATION OR UNIQUE EQUIPMENT NUMBER.  
D. PIPE LABELS FOR CHILLED, HEATING HOT WATER, REFRIGERANT, CONDENSER AND CONDENSATE PIPING SHALL BE PREPRINTED, COLOR-CODED, WITH 1-1/2" LETTERING INDICATING SERVICE, AND SHOWING FLOW DIRECTION. LOCATE PIPE LABELS WHERE PIPING IS EXPOSED OR ABOVE ACCESSIBLE CEILINGS IN FINISHED SPACES, MACHINE ROOMS; ACCESSIBLE MAINTENANCE SPACES SUCH AS SHAFTS, TUNNELS, AND PLENUMS; AND LOCATIONS AS FOLLOWS:  
1. NEAR EACH WALL AND END OF EACH RUN.  
2. NEAR EACH BRANCH CONNECTION, EXCLUDING SHORT TAKEOFFS FOR FIXTURES AND TERMINAL UNITS, WHERE FLOW PATTERN IS NOT OBVIOUS, MARK EACH PIPE AT BRANCH.  
3. NEAR PENETRATIONS THROUGH WALLS, FLOORS, CEILINGS, AND INACCESSIBLE ENCLOSURES.  
4. AT ACCESS DOORS, AND SIMILAR ACCESS POINTS THAT PERMIT VIEW OF CONCEALED PIPING.  
5. NEAR MAJOR EQUIPMENT TERMINALS AND TERMINAL UNITS.  
6. SPACED AT MAXIMUM INTERVALS OF 50 FEET ALONG EACH RUN, REDUCED INTERVALS TO 25 FEET IN AREAS OF CONGESTED PIPING AND EQUIPMENT.  
15.0 MISCELLANEOUS  
A. PROVIDE ESCUTCHEONS AT ALL PIPING PENETRATIONS OF FINISHED WALL, FLOOR OR CEILING CONSTRUCTION. ESCUTCHEONS SHALL BE CHROME PLATED BRASS IN OCCUPIED AREAS, PRIME PAINT FINISH FOR UNOCCUPIED AREAS UNLESS OTHERWISE NOTED. ESCUTCHEONS FOR EXTERIOR OR MOIST AREAS SHALL BE BRASS.  
B. ALL CABLE TIES FOR CONTROLS AND OTHER CABLE SYSTEMS LOCATED IN PLENUMS UTILIZED FOR AIR MOVEMENT THAT ARE NOT INSTALLED IN CONDUIT SHALL BE 25/50 FLAME AND SMOKE RATED, HELLEFARMYNT TSNR2C2JUL OR EQUAL.  
16.0 CLEANING:  
A. NEW WORK  
1. CLEAN AIR SYSTEM BY OPERATING AT LEAST THREE HOURS PRIOR TO FINAL ACCEPTANCE WITH TEMPORARY FILTERS. REMOVE ALL FILTERS AND REPLACE WITH CLEAN.  
2. CLEAN WATER PIPING SYSTEMS BY FLUSHING WITH WATER UNTIL CLEAR. PROVIDE CHEMICAL TREATMENT AS REQUIRED FOR APPLICATION.  
17.0 TESTING AND ADJUSTING:  
A. CONTRACTOR SHALL OBTAIN THE SERVICES OF AN INDEPENDENT TEST AND BALANCE AGENCY AND SHALL OPERATE AND TEST THE AIR CONDITIONING AND VENTILATION SYSTEMS AND INSTRUCT THE OWNER IN ITS OPERATION. PERFORM A SERIES OF GENERAL CAPACITY AND OPERATING TESTS. THE TESTS SHALL DEMONSTRATE THE SPECIFIED CAPACITIES OF VARIOUS PIECES OF EQUIPMENT.  
B. THE ENTIRE TEMPERATURE CONTROLS SYSTEMS SHALL BE ADJUSTED AND BALANCED AND PUT IN OPERATING CONDITION TO CAUSE THE EQUIPMENT TO MAINTAIN THE TEMPERATURES IN ACCORDANCE WITH THE INTENT OF THESE SPECIFICATIONS. OPERATE AND TEST EQUIPMENT DURING SUMMER AND WINTER SEASONAL STARTUP UNDER THIS CONTRACT.  
C. TEST PRESSURE PIPING SYSTEM TO 1-1/2 TIMES THE OPERATING PRESSURE BUT NOT LESS THAN 50 PSIG FOR A PERIOD OF 2 HOURS WITH NO OBSERVABLE PRESSURE DROP.  
D. TEST CONDENSATE DRAIN PIPING BY FILLING WITH WATER TO THE DRAIN PAN CONNECTION(S) FOR A PERIOD OF 2 HOURS WITH NO OBSERVABLE LEAKS.  
E. SUBMIT THE COMPLETE TEST AND BALANCE REPORT FOR REVIEW TO THE ARCHITECT/ENGINEER IN TRIPPLICATE. TEST PROCEDURE AND REPORT SHALL CONFORM TO NEBB STANDARDS. THE REPORT SHALL BE SIGNED BY THE RESPONSIBLE INDIVIDUAL.  
F. PROVIDE TEST AND BALANCE SERVICE BY ONE OF THE FOLLOWING APPROVED TEST AND BALANCE AGENCIES:  
1. ACUTEC SERVICES, INC. CHAD FL YNN 816 215 3567  
2. DOYLE FIELD SERVICE INC. 913 677 3374  
3. NATIONAL TAB. DAN HERTENSTEIN 816.221.8575  
4. PRO BALANCE. DUKE YOCUM 816.228.7800  
5. SYS-TEK. DAN KREBS 816.229.3009.  
END OF SECTION  
4.0 GRILLES, REGISTERS, INLETS AND OUTLETS:  
A. ALL SUPPLY, RETURN AND EXHAUST GRILLES, REGISTERS AND DIFFUSERS SHALL BE AS SCHEDULED ON THE DRAWINGS. COMMERCIAL QUALITY - E.H. PRICE OR ACCEPTABLE EQUAL BY TITUS, CARNES, KRUEGER OR NALOR.  
1. ALL AIR DISTRIBUTION DEVICES SHALL BE SELECTED FOR THROW AND LOW NOISE (25 NC OR LESS) PERFORMANCE CHARACTERISTICS UNLESS OTHERWISE INDICATED.  
2. UNLESS OTHERWISE INDICATED, LOUVERED SUPPLY GRILLES SHALL BE DOUBLE DEFLECTION DEVICES WITH FRONT BLADES PARALLEL TO THE LONG DIMENSION.  
3. A BALANCING DAMPER SHALL BE PROVIDED FOR EACH AND EVERY DIFFUSER, REGISTER AND GRILLE WHERE AIRFLOW CONTROL IS REQUIRED UNLESS OTHERWISE INDICATED, PROVIDE INTEGRAL VOLUME DAMPER WHERE A DUCT MOUNTED DAMPER WOULD NOT BE ACCESSIBLE.  
4. CEILING SUPPLY DIFFUSER CONNECTION SHALL BE MADE WITH HARD ELBOW OR FLEX DUCT WITH THERMAFLEX FLEX FLOW ELBOW SUPPORT.  
5.0 HEATING AND AIR CONDITIONING UNITS:  
A. ALL SUPPLY, RETURN AND EXHAUST GRILLES, REGISTERS AND DIFFUSERS SHALL BE AS SCHEDULED OR BY ACCEPTABLE EQUAL. UNITS SHALL BE STANDARD CATALOGUE PRODUCTS WITH THE APPROPRIATE APPROVAL OR CERTIFICATION BY AGA, ARI AND UL. EFFICIENCIES SHALL CONFORM TO ASHRAE 90 STANDARDS.  
C. ROOF MOUNTED AIR HANDLING UNITS:  
1. AIR HANDLING UNITS SHALL BE ROOF MOUNTED, VERTICAL DISCHARGE, WITH COOLING AND/OR HEATING COMPONENTS OF CHARACTERISTICS AND CAPACITIES SCHEDULED. UNIT SHALL HAVE DIRECT DRIVE ECM AIRFLOW SUPPLY FANS, COOLING COIL WITH COPPER TUBES AND ALUMINUM FINNS, INSULATED STAINLESS STEEL COIL DRAIN PAN, CABINET SHALL BE DOUBLE WALL INSULATED, PROVIDE WITH FILTERS, HINGED ACCESS DOORS, MOUNTING CURB AND DUCT FLEX CONNECTORS AND OTHER ACCESSORIES AS INDICATED OR REQUIRED.  
2. PACKAGED UNITS SHALL BE DAKIN OR ACCEPTABLE EQUAL BY CARRIER, YORK, OR TRANE.  
PIPE ROUTING AND DROP LOCATIONS WITH NECESSARY PIPE OFFSETS TO ACCOMMODATE BEAMS AND OTHER OBSTRUCTIONS.




**PROJECT TEAM**

**ARCHITECTURAL**  
Welfer Architects, Inc.  
802 Broadway, 4th Floor  
Kansas City, MO 64105  
816.221.0017

**STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING, FIRE ALARM, AUDIO/VISUAL**  
Olson Associates  
1301 Building Center  
North Kansas City, MO 64116  
816.361.1177

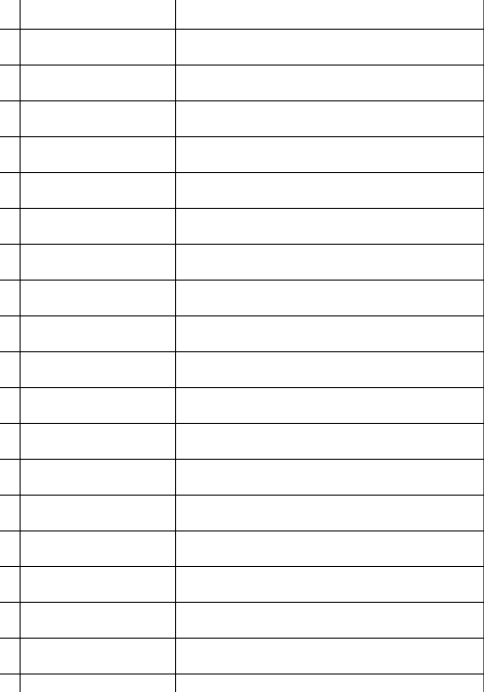
**CIVIL & AVIATION PLANNING**  
Crowford, Murphy & Tilly, Inc.  
1627 Main St, Suite 600  
Kansas City, MO 64108  
816.800.9447



**UNIVERSITY OF CENTRAL MISSOURI**  
**SKYHAVEN AVIATION CENTER**  
NW 251 Road, Warrensburg, MO 64093

| No. | Date                | Description                    |
|-----|---------------------|--------------------------------|
|     |                     | Issue: <b>FOR CONSTRUCTION</b> |
|     |                     | Date: <b>AUGUST, 2022</b>      |
|     | Drawn By: <b>EH</b> | Checked By: <b>JG</b>          |

KEY PLAN



**AREA OF WORK**

SHEET NAME

**MECHANICAL SPECIFICATIONS**

SHEET NUMBER

**M-000**

WAI Project Num: **2013**



**PROJECT TEAM**

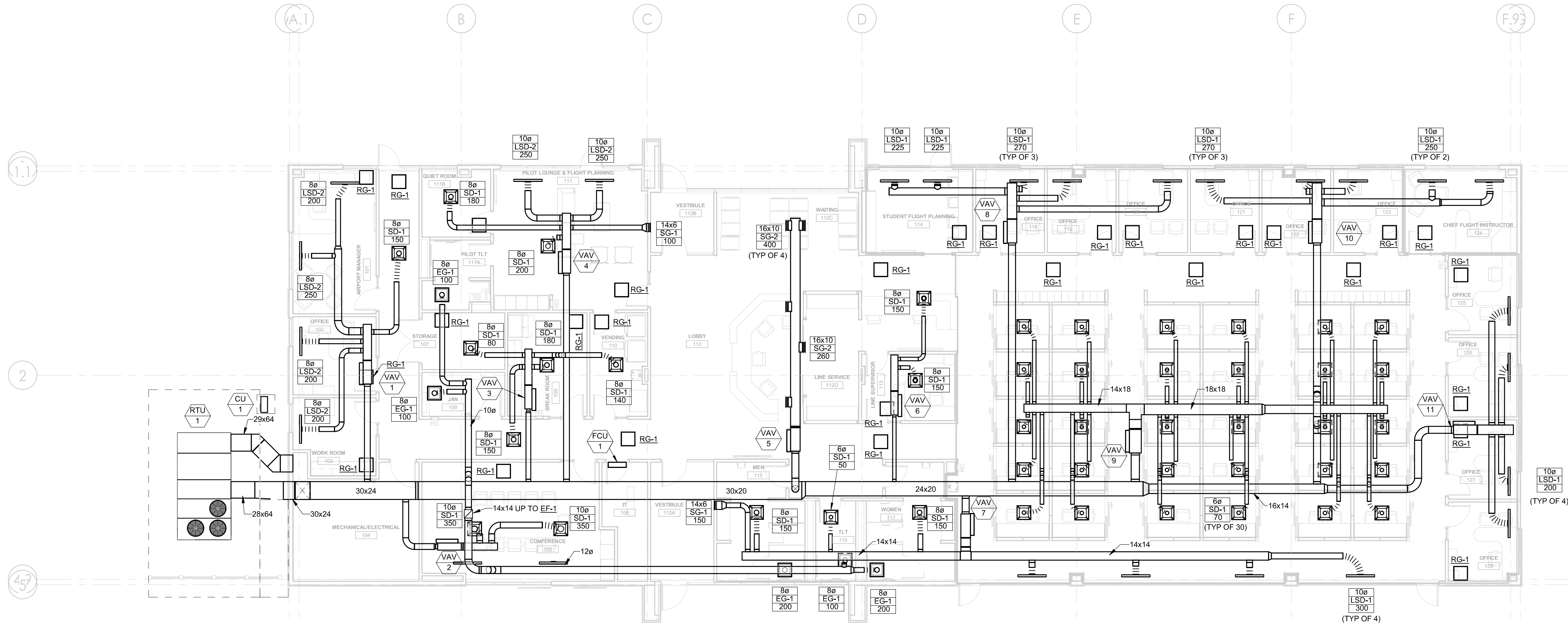
**ARCHITECTURAL**  
Wellner Architects, Inc.  
802 Broadway, 4th Floor  
Kansas City, MO 64105  
816.221.0017

**STRUCTURAL, MECHANICAL, ELECTRICAL,  
PLUMBING, FIRE ALARM, AUDIO/VISUAL**  
Olsson Associates  
1301 Burlington St  
North Kansas City, MO 64116  
816.361.1177

**CIVIL & AVIATION PLANNING**  
Crawford, Murphy, & Tilly, Inc.  
1627 Main St, Suite 400  
Kansas City, MO 64108  
816.800.9447

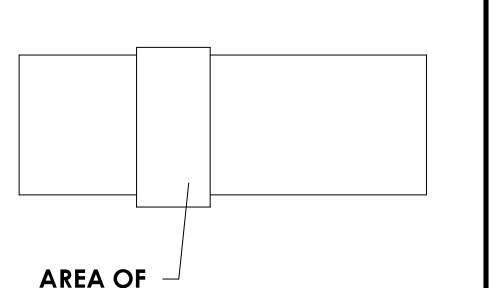


UNIVERSITY OF CENTRAL  
MISSOURI  
**SKYHAVEN AVIATION CENTER**  
NW 251 Road, Warrensburg, MO 64093



| No. | Date         | Description      |
|-----|--------------|------------------|
| 1   | AUGUST, 2022 | FOR CONSTRUCTION |
| 2   | AUGUST, 2022 |                  |
| 3   |              |                  |
| 4   |              |                  |
| 5   |              |                  |
| 6   |              |                  |
| 7   |              |                  |
| 8   |              |                  |
| 9   |              |                  |
| 10  |              |                  |
| 11  |              |                  |
| 12  |              |                  |
| 13  |              |                  |
| 14  |              |                  |
| 15  |              |                  |
| 16  |              |                  |
| 17  |              |                  |
| 18  |              |                  |
| 19  |              |                  |
| 20  |              |                  |
| 21  |              |                  |
| 22  |              |                  |
| 23  |              |                  |
| 24  |              |                  |
| 25  |              |                  |
| 26  |              |                  |
| 27  |              |                  |
| 28  |              |                  |
| 29  |              |                  |
| 30  |              |                  |
| 31  |              |                  |
| 32  |              |                  |
| 33  |              |                  |
| 34  |              |                  |
| 35  |              |                  |
| 36  |              |                  |
| 37  |              |                  |
| 38  |              |                  |
| 39  |              |                  |
| 40  |              |                  |
| 41  |              |                  |
| 42  |              |                  |
| 43  |              |                  |
| 44  |              |                  |
| 45  |              |                  |
| 46  |              |                  |
| 47  |              |                  |
| 48  |              |                  |
| 49  |              |                  |
| 50  |              |                  |

Drawn By: **EH** Checked By: **JG**



SHEET NAME  
**LEVEL 1 - HVAC PLAN**

SHEET NUMBER  
**M-101**

WAI Project Num: 2013





**PROJECT TEAM**

**ARCHITECTURAL**  
Wellner Architects, Inc.  
802 Broadway, 4th Floor  
Kansas City, MO 64105  
816.221.0017

**STRUCTURAL, MECHANICAL, ELECTRICAL,  
PLUMBING, FIRE ALARM, AUDIO/VISUAL**  
Olsson Associates  
1301 Burlington St  
North Kansas City, MO 64116  
816.361.1177

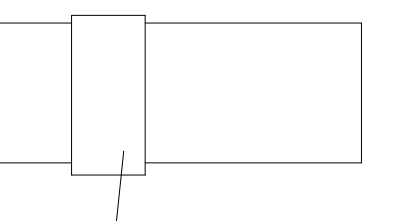
**CIVIL & AVIATION PLANNING**  
Crawford, Murphy, & Tilly, Inc.  
1627 Main St, Suite 600  
Kansas City, MO 64108  
816.800.9447



UNIVERSITY OF CENTRAL  
MISSOURI  
**SKYHAVEN AVIATION CENTER**  
NW 251 Road, Warrensburg, MO 64093

| No. | Date | Description             |
|-----|------|-------------------------|
|     |      | Issue: FOR CONSTRUCTION |
|     |      | Date: AUGUST, 2022      |
|     |      | Drawn By: EH            |
|     |      | Checked By: JG          |

KEY PLAN



AREA OF WORK

SHEET NAME

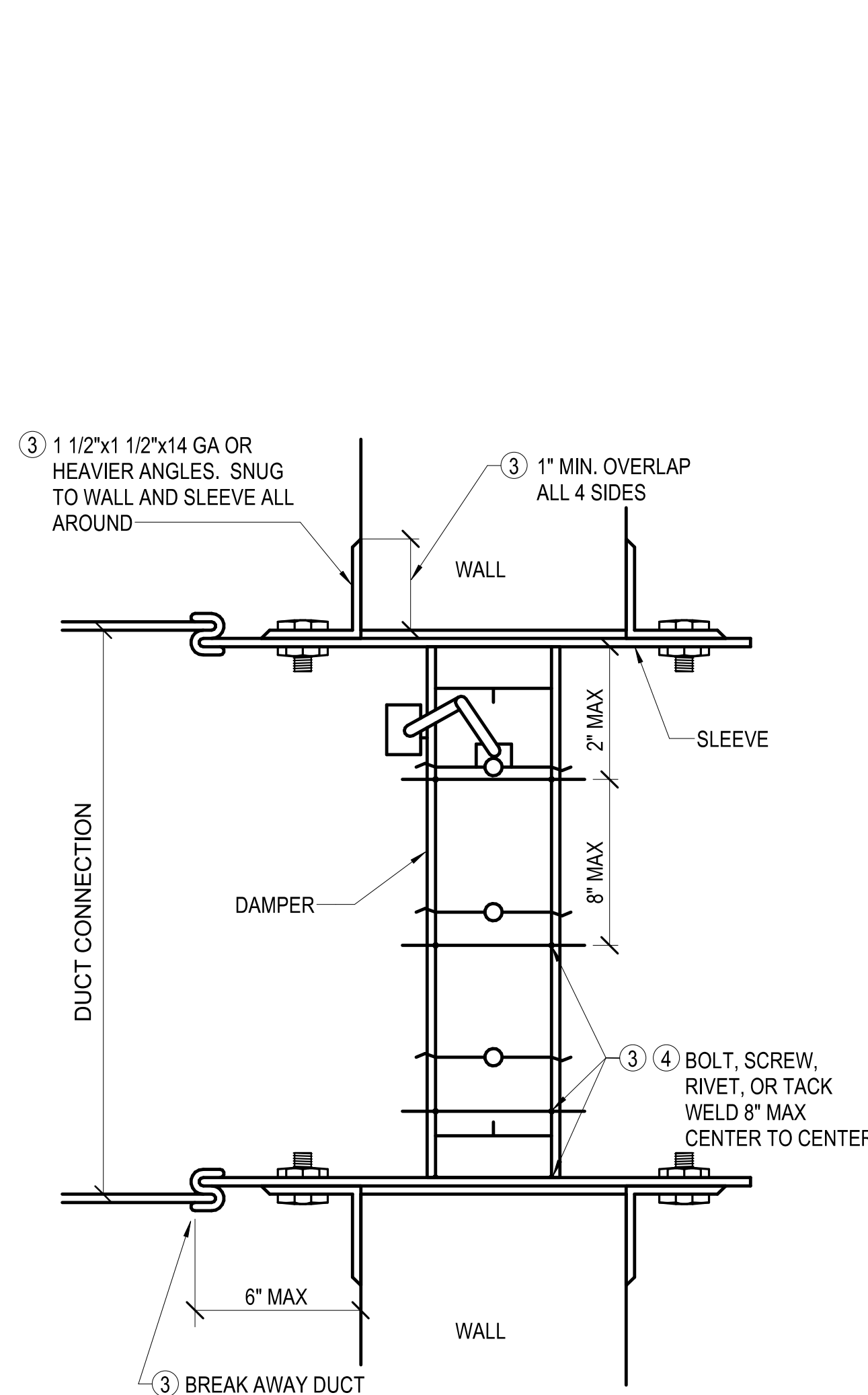
MECHANICAL  
DETAILS

SHEET NUMBER

M-500

WAI Project Num: 2013

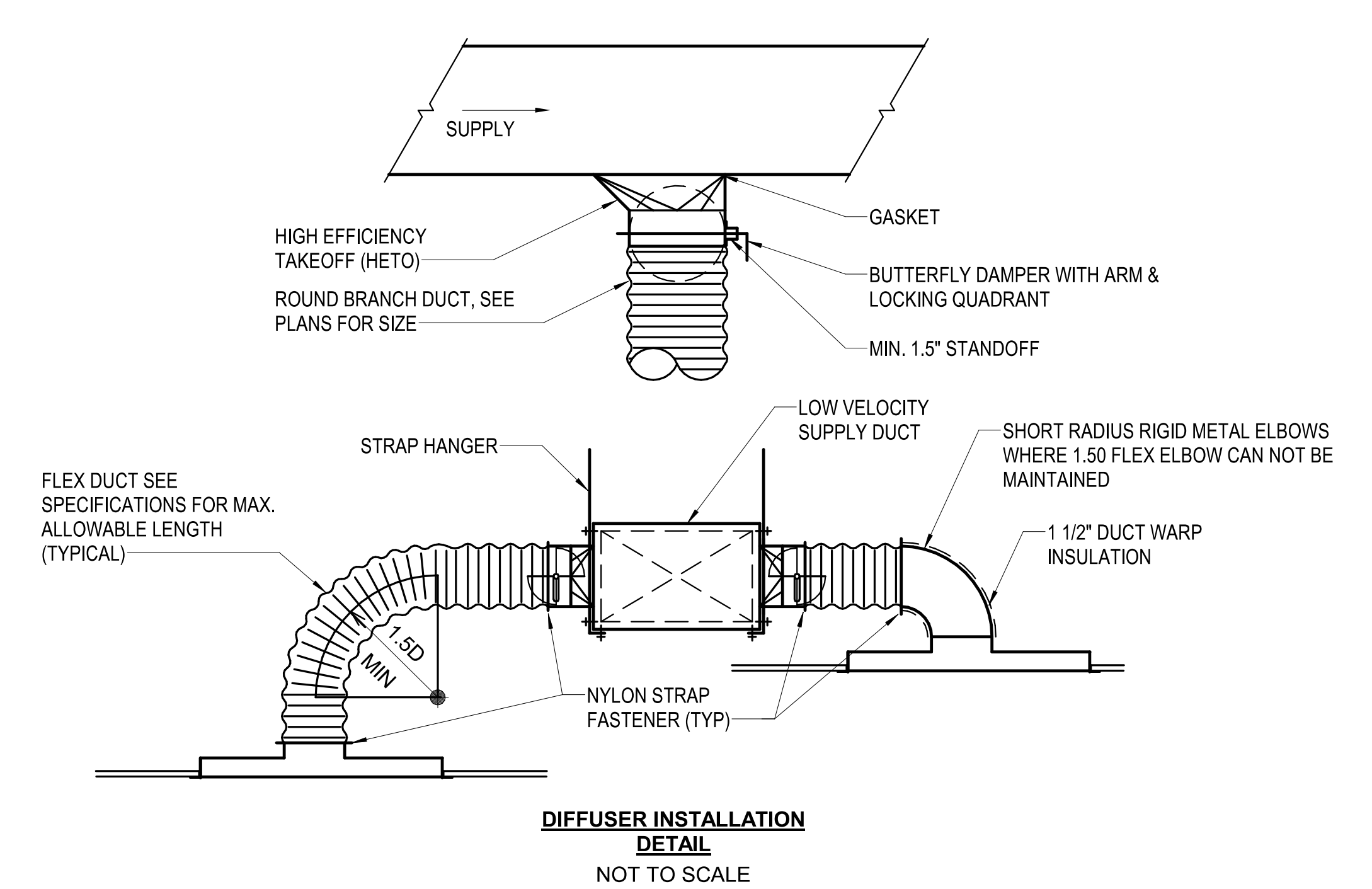
THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS ON THIS PAGE ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE. ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL REMAINS TO BE LEGISLATION OR PART OF THE PROJECT TO WHICH THESE PAGES REFER.



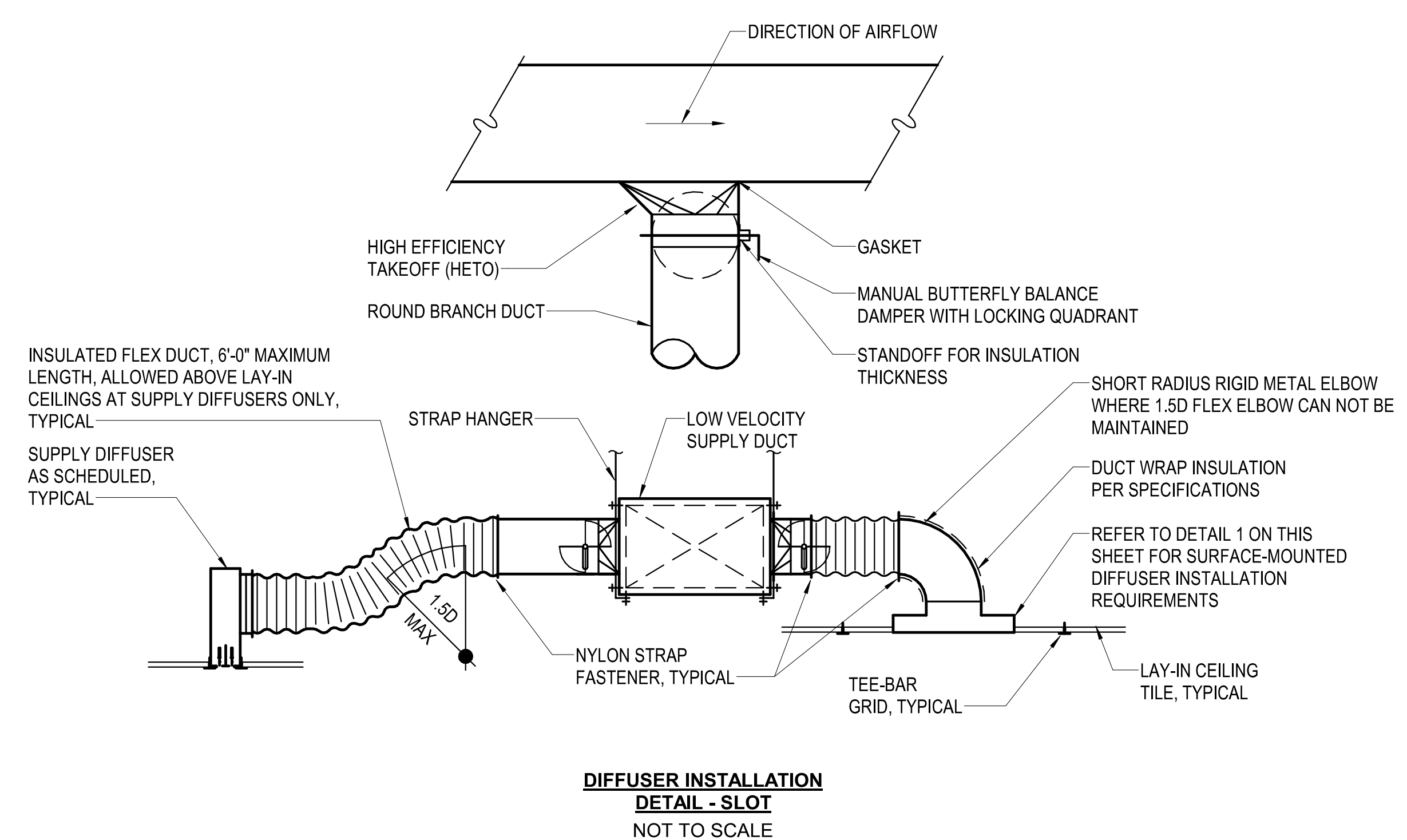
**VERTICAL INSTALLATION**

- NOTES:**
1. OPENINGS IN FLOOR OR WALL SHALL BE 1/4" TO 1/2" LARGER THAN OVERALL SIZE OF FIRE DAMPER AND SLEEVE ASSEMBLY.
  2. ALL CONNECTIONS TO DUCTS SHALL CONFORM TO U.L. 555 AND NFPA 90-A.
  3. MOUNTING ANGLES SHALL BE MIN. OF 1 1/2" X 1 1/2" X 14 GA. AND BOLTED, TACK WELDED, RIVETED, OR SCREWED TO SLEEVE AT MAX. SPACING OF 12" AND MIN. OF 2 CONNECTIONS PER SIDE, TOP, AND BOTTOM. MOUNTING ANGLES SHALL OVERLAP WALL AND FLOOR OPENING MIN. OF 1" ON ALL SIDES.
  4. DAMPER SHALL BE ATTACHED TO SLEEVE IN SAME MANNER AND SPACING AS MOUNTING ANGLES.
  5. THE LENGTH OF THE SLEEVE EXTENDING BEYOND THE WALL OR FLOOR OPENING SHALL NOT EXCEED 6" ON EACH SIDE.
  6. DAMPER INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND SHALL CONFORM TO NFPA 90-A AND UL 555.
  7. HARDCAST ALL FRAMES PRIOR TO INSTALLATION.

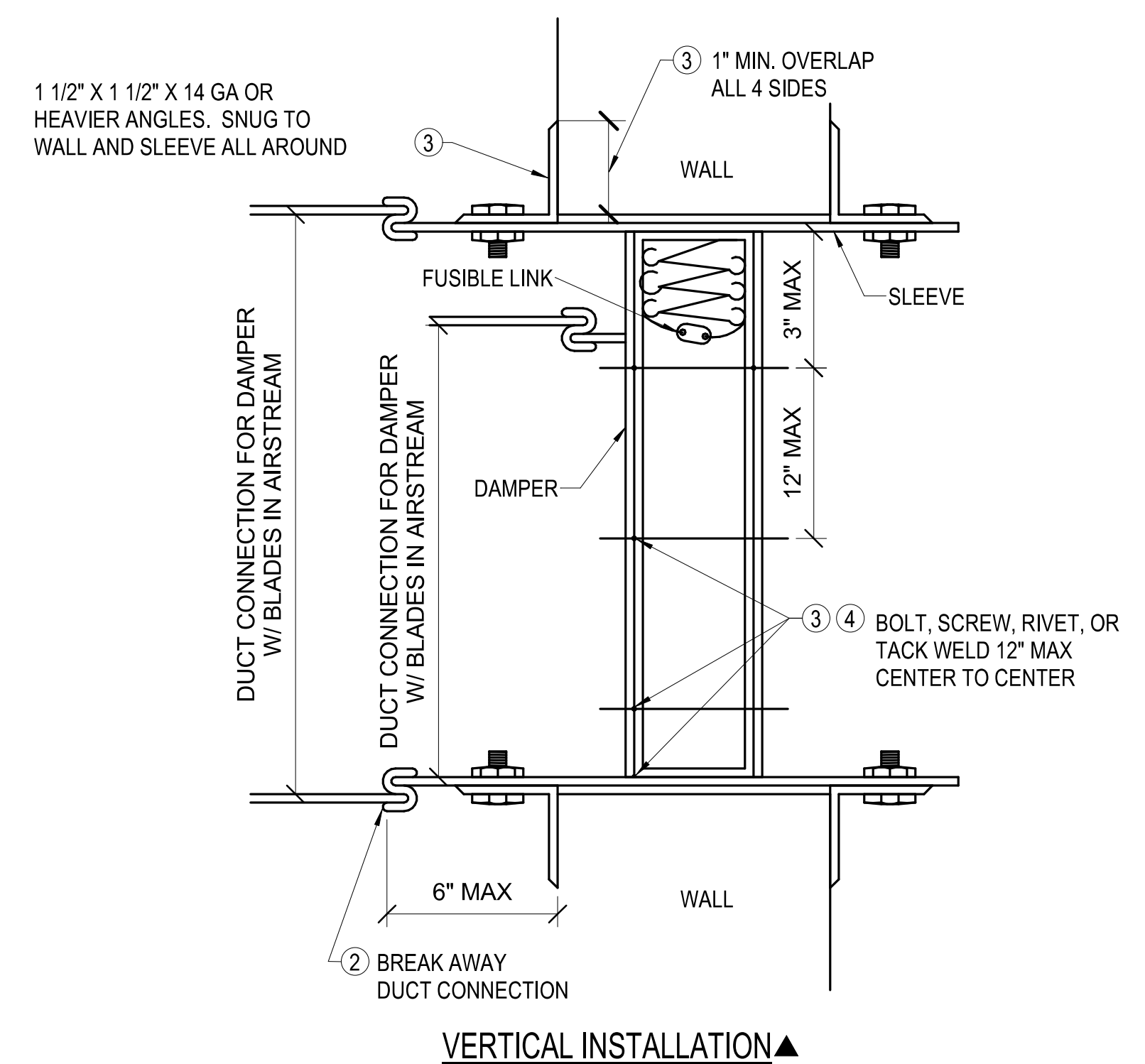
**FIRE/SMOKE DAMPER  
INSTALLATION DET.**  
NOT TO SCALE



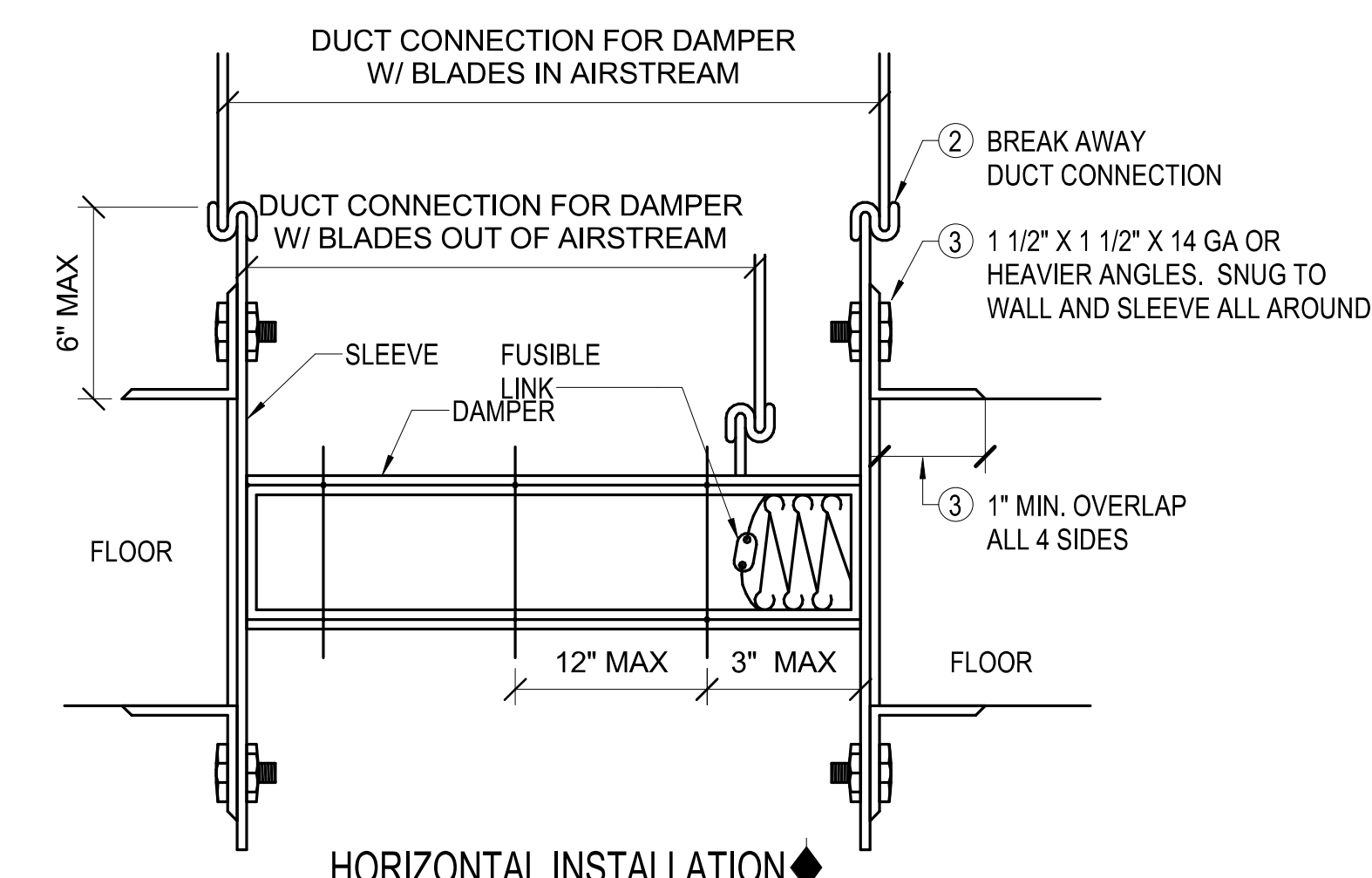
**DIFFUSER INSTALLATION  
DETAIL**  
NOT TO SCALE



**DIFFUSER INSTALLATION  
DETAIL - SLOT**  
NOT TO SCALE



**VERTICAL INSTALLATION**



**HORIZONTAL INSTALLATION**

- NOTES:**
1. OPENINGS IN FLOOR OR WALL SHALL BE 1/4" TO 1/2" LARGER THAN OVERALL SIZE OF FIRE DAMPER AND SLEEVE ASSEMBLY.
  2. ALL CONNECTIONS TO DUCTS SHALL CONFORM TO U.L. 555 AND NFPA 90-A.
  3. MOUNTING ANGLES SHALL BE MIN. OF 1 1/2" X 1 1/2" X 14 GA. AND BOLTED, TACK WELDED, RIVETED, OR SCREWED TO SLEEVE AT MAX. SPACING OF 12" AND MIN. OF 2 CONNECTIONS PER SIDE, TOP, AND BOTTOM. MOUNTING ANGLES SHALL OVERLAP WALL AND FLOOR OPENING MIN. OF 1" ON ALL SIDES.
  4. DAMPER SHALL BE ATTACHED TO SLEEVE IN SAME MANNER AND SPACING AS MOUNTING ANGLES.
  5. THE LENGTH OF THE SLEEVE EXTENDING BEYOND THE WALL OR FLOOR OPENING SHALL NOT EXCEED 6" ON EACH SIDE.
  6. FIRE DAMPER INSTALLATION SHALL BE IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND SHALL CONFORM TO NFPA 90-A AND UL 555.
  7. HARDCAST ALL FRAMES PRIOR TO INSTALLATION.

**FIRE DAMPER INSTALLATION  
DETAIL**  
NOT TO SCALE



8151 MCCOY • SHAWNEE, KANSAS 66227  
PHONE (913)888-3991 • FAX (913)599-3808

| PACKAGED ROOFTOP UNIT (DX COOLING/GAS HEAT) |              |        |                 |          |           |            |          |          |              |      |      |      |               |              |                           |                              |            |       |       |              |     |       |            |       |      |       |
|---|--------------|--------|-----------------|----------|-----------|------------|----------|----------|--------------|------|------|------|---------------|--------------|---------------------------|------------------------------|------------|-------|-------|--------------|-----|-------|------------|-------|------|-------|
| MARK  | MANUFACTURER | MODEL  | NOMINAL TONNAGE | SERVICE  | UNIT TYPE | SUPPLY FAN |          |          | COOLING COIL |      |      |      | ELECTRIC HEAT |              | MINIMUM VENTILATION (CFM) | DESIGN/MAX VENTILATION (CFM) | ELECTRICAL |       |       | WEIGHT (LBS) | ARI | NOTES |            |       |      |       |
|   |              |        |                 |          |           | CFM        | ESP (IN) | HP (Y/N) | VFD          | EAT  | LAT  | TH   | SH            | INPUT STAGES |                           |                              | MCA        | MOC   | VIPH  |              |     |       | DISC. TYPE | EER   |      |       |
| RTU-1                                       | TRANE        | TEH330 | 27.5            | BUILDING | VAV       | 10,000     | 1.50     | 10.0     | Y            | 80.0 | 67.0 | 57.5 | 56.6          | 325          | 246                       | 30kW                         | STAGED     | 1,000 | 1,000 | 158          | 200 | 208/3 | NF         | 4,194 | 10.3 | A - F |

NOTES:

A. EQUIPMENT SIZED FOR 100 DEGREE F AMBIENT TEMPERATURE.

B. PROVIDE WITH 4" MERV 14 PLEATED THROWAWAY AIR FILTERS.

C. PROVIDE WITH FACTORY MOUNTED NON-FUSED DISCONNECT SWITCH, PLEATED FILTERS AND HAIL GUARDS.

D. PROVIDE WITH BACNET CARD FOR DDC CONTROLS.

E. RETURN AIR SMOKE DETECTOR FURNISHED AND INSTALLED BY OTHERS.

F. PROVIDE WITH MANUFACTURERS STANDARD 14" INSULATED ROOF CURB.

| VARIABLE AIR VOLUME BOX SCHEDULE |              |       |          |                 |             |                            |                            |                       |               |      |               |      |        |       |       |
|----------------------------------|--------------|-------|----------|-----------------|-------------|----------------------------|----------------------------|-----------------------|---------------|------|---------------|------|--------|-------|-------|
| MARK                             | MANUFACTURER | MODEL | EXPOSURE | INLET SIZE (IN) | DUCT OUTLET | MAX. COOLING AIRFLOW (CFM) | MIN. COOLING AIRFLOW (CFM) | HEATING AIRFLOW (CFM) | CONTROLS/HEAT |      | ELECTRIC HEAT |      |        | NOTES |       |
|                                  |              |       |          |                 |             |                            |                            |                       | ACCESS        | EAT  | LAT           | Kw   | STAGES |       | VIPH  |
| VAV-1                            | PRICE        | SDV   | EXT      | 10              | 14x12.5     | 1000                       | 200                        | 500                   | SEE DRAWINGS  | 65.0 | 100           | 6.0  | 2      | 480/3 | A - E |
| VAV-2                            | PRICE        | SDV   | EXT      | 8               | 12x10       | 700                        | 140                        | 350                   | SEE DRAWINGS  | 65.0 | 100           | 4.0  | 2      | 480/3 | A - E |
| VAV-3                            | PRICE        | SDV   | INT      | 6               | 12x8        | 370                        | 80                         | 190                   | SEE DRAWINGS  | 65.0 | 85            | 2.0  | 2      | 480/3 | A - E |
| VAV-4                            | PRICE        | SDV   | EXT      | 10              | 14x12.5     | 1030                       | 210                        | 520                   | SEE DRAWINGS  | 65.0 | 100           | 6.0  | 2      | 480/3 | A - E |
| VAV-5                            | PRICE        | SDV   | EXT      | 14              | 20x17.5     | 1860                       | 380                        | 930                   | SEE DRAWINGS  | 65.0 | 100           | 11.0 | 2      | 480/3 | A - E |
| VAV-6                            | PRICE        | SDV   | INT      | 6               | 12x8        | 300                        | 60                         | 150                   | SEE DRAWINGS  | 65.0 | 85            | 1.0  | 2      | 480/3 | A - E |
| VAV-7                            | PRICE        | SDV   | EXT      | 12              | 16x15       | 1650                       | 330                        | 830                   | SEE DRAWINGS  | 65.0 | 100           | 10.0 | 2      | 480/3 | A - E |
| VAV-8                            | PRICE        | SDV   | EXT      | 12              | 16x15       | 1260                       | 260                        | 630                   | SEE DRAWINGS  | 65.0 | 100           | 8.0  | 2      | 480/3 | A - E |
| VAV-9                            | PRICE        | SDV   | INT      | 14              | 20x17.5     | 2100                       | 420                        | 1050                  | SEE DRAWINGS  | 65.0 | 85            | 7.0  | 2      | 480/3 | A - E |
| VAV-10                           | PRICE        | SDV   | EXT      | 12              | 16x15       | 1310                       | 270                        | 660                   | SEE DRAWINGS  | 65.0 | 100           | 8.0  | 2      | 480/3 | A - E |
| VAV-11                           | PRICE        | SDV   | EXT      | 8               | 12x10       | 680                        | 140                        | 340                   | SEE DRAWINGS  | 65.0 | 100           | 4.0  | 2      | 480/3 | A - E |

NOTES:

A. INSTALL FLEXIBLE DUCT CONNECTOR AT INLET CONNECTION.

B. PROVIDE INTEGRAL DISCONNECT SWITCH AND FACTORY MOUNTED CONTROL POWER TRANSFORMER AND CONTROLS ENCLOSURE.

C. PROVIDE WITH MANUFACTURER'S STANDARD INTERNAL LINER INSULATION.

D. PROVIDE FACTORY-INSTALLED, PRESSURE INDEPENDENT, DDC CONTROL PACKAGE FURNISHED BY OTHERS.

E. VERIFY HANDING/CONTROLS LOCATION WITH DETAIL PLANS.

F. INCLUDED IN SHELL PACKAGE AND SHOWN FOR CLARITY IN TL. PROVIDE BREAK-OUT PRICING FOR SHELL EQUIPMENT

| GRILLE, REGISTER & DIFFUSER SCHEDULE |              |          |                 |                |        |          |       |
|--------------------------------------|--------------|----------|-----------------|----------------|--------|----------|-------|
| MARK                                 | MANUFACTURER | MODEL    | TYPE            | SIZE           | FINISH | MATERIAL | NOTES |
| SD-1                                 | TITUS        | OMNI     | SQUARE PLAQUE   | 24" x 24"      | WHITE  | STEEL    | A-C   |
| SD-2                                 | TITUS        | SPECTRUM | SQUARE PANEL    | 24" x 24"      | WHITE  | STEEL    | A-C   |
| SG-1                                 | TITUS        | 300FS    | DUAL DEFLECTION | AS NOTED       | WHITE  | STEEL    | A-C   |
| LSD-1                                | TITUS        | TBD4     | LINEAR SLOT     | 4" LONG 2-SLOT | WHITE  | STEEL    | A-C   |
| RG-1                                 | TITUS        | 45F      | PERFORATED      | 12" x 24"      | WHITE  | STEEL    | A-C   |
| RG-2                                 | TITUS        | 45F      | PERFORATED      | 24" x 24"      | WHITE  | STEEL    | A-C   |
| RG-3                                 | TITUS        | 33RL     | WALL MOUNT      | AS NOTED       | WHITE  | STEEL    | A-C   |
| EG-1                                 | TITUS        | PAR      | PERFORATED      | 12"x12"        | WHITE  | ALUMINUM | A-C   |
| EG-2                                 | TITUS        | PAR      | PERFORATED      | 24" x 24"      | WHITE  | ALUMINUM | A-C   |
| EG-3                                 | TITUS        | 33RL     | 38 DEGREE BLADE | AS NOTED       | WHITE  | ALUMINUM | A-C   |

A. PROVIDE WITH DAMPER OPERABLE FROM FACE OF DEVICE IF IN GYP CEILING OR WALL.

B. PROVIDE WITH SURFACE MOUNT FRAME KIT IF NECESSARY.

C. PROVIDE TRANSITION TO ROUND CONNECTION WHERE SHOWN.

| DUCTWORK SCHEDULE                               |                   |                 |             |                         |                              |                            |                              |                                |                      |
|---|-------------------|-----------------|-------------|-------------------------|------------------------------|----------------------------|------------------------------|--------------------------------|----------------------|
| DESCRIPTION                                     | DUCT CONSTRUCTION | INSULATION TYPE | UNINSULATED | 24" 1/2" INTERNAL LINER | FIBERGLASS BLANKET (Min R-6) | FIBERGLASS BOARD (Min R-9) | 2" ELANET, 2 HOUR FIRE RATED | 2" FIBERGLASS W/ VAPOR BARRIER | 3/8" ALUMINUM JACKET |
|   |                   |                 |             |                         |                              |                            |                              |                                |                      |
| SUPPLY AIR                                      |                   |                 |             |                         |                              |                            |                              |                                |                      |
| INTERIOR (ROUND)- CONCEALED                     | X                 |                 |             |                         |                              | X                          |                              |                                |                      |
| INTERIOR MED. PRESSURE (RECTANGULAR)- CONCEALED | X                 |                 |             |                         |                              | X                          |                              |                                |                      |
| INTERIOR LOW PRESSURE (RECTANGULAR)- CONCEALED  | X                 |                 |             | X                       |                              |                            |                              |                                |                      |
| INTERIOR (ROUND)- EXPOSED                       | X                 | X               |             |                         |                              |                            |                              |                                |                      |
| INTERIOR (RECTANGULAR)- EXPOSED                 | X                 |                 |             | X                       |                              |                            |                              |                                |                      |
| RETURN AIR                                      |                   |                 |             |                         |                              |                            |                              |                                |                      |
| INTERIOR (RECTANGULAR)- CONCEALED               | X                 | X               |             |                         |                              |                            |                              |                                |                      |
| EXHAUST AIR                                     |                   |                 |             |                         |                              |                            |                              |                                |                      |
| INTERIOR (ROUND)- CONCEALED                     | X                 | X               |             |                         |                              |                            |                              |                                |                      |
| INTERIOR (RECTANGULAR)- CONCEALED               | X                 | X               |             |                         |                              |                            |                              |                                |                      |
| INTERIOR (RECTANGULAR)- EXPOSED                 | X                 | X               |             |                         |                              |                            |                              |                                |                      |

GENERAL NOTES:

1. "INTERIOR" REFERS TO PARTS OF SYSTEM IN CONDITIONED SPACES WITHIN BUILDING ENVELOPE.

2. "EXTERIOR" REFERS TO PARTS OF SYSTEM OUTSIDE THE BUILDING ENVELOPE.

3. PROVIDE STICK PINS ON INTERIOR LINER OR FIBERGLASS BLANKET PER SMACNA STANDARDS.

4. "MEDIUM PRESSURE" REFERS TO DUCTWORK BETWEEN AIR HANDLING UNIT AND TERMINAL UNITS.

5. "LOW PRESSURE" REFERS TO DUCTWORK DOWNSTREAM OF TERMINAL UNIT.

| FAN SCHEDULE |              |          |                    |                  |     |          |      |     |                   |              |         |
|--------------|--------------|----------|--------------------|------------------|-----|----------|------|-----|-------------------|--------------|---------|
| MARK         | MANUFACTURER | MODEL    | LOCATION/ MOUNTING | SERVICE          | FAN |          |      |     | ELECTRICAL (VIPH) | WEIGHT (LBS) | NOTES   |
|              |              |          |                    |                  | CFM | ESP (IN) | RPM  | HP  |                   |              |         |
| EF-1         | GREENHECK    | G-100 VG | ROOF               | RESTROOM EXHAUST | 800 | 0.5      | 1321 | 1/4 | 120/1             | 40           | A, B, C |

NOTES:

A. PROVIDE FACTORY MOUNTED DISCONNECT SWITCH.

B. PROVIDE WITH 14" INSULATED ROOF CURB, BACKDRAFT DAMPER AND INSECT SCREEN.

C. FAN TO BE CONTROLLED BY BUILDING MANAGEMENT SYSTEM.

| DUCTLESS SPLIT SYSTEM EQUIPMENT SCHEDULE |              |              |                     |            |          |     |              |          |            |            |     |       |              |       |
|--|--------------|--------------|---------------------|------------|----------|-----|--------------|----------|------------|------------|-----|-------|--------------|-------|
| MARK                                     | MANUFACTURER | MODEL        | TYPE                | SUPPLY FAN |          |     | COOLING COIL |          |            | ELECTRICAL |     |       | WEIGHT (LBS) | NOTES |
|  |              |              |                     | CFM        | ESP (IN) | RPM | TH (MBH)     | SH (MBH) | HEAT (MBH) | MCA        | MOC | VIPH  |              |       |
| FCU-1                                    | LENNOX       | MLA024S4S-1P | WALL MOUNT FAN-COIL | 750        | --       | --  | 24           | 17       | 24         | 1          | --  | --    | 35           | E     |
| CU-1                                     | LENNOX       | MWMA024S4-2P | CONDENSING UNIT     | --         | --       | --  | --           | --       | --         | 20         | 30  | 208/1 | 115          | A - D |

NOTES:

A. PROVIDE WITH WIRELESS TEMPERATURE CONTROLLER AND LOW-AMBIENT WIND BAFFLE KIT.

B. FAN-COIL TO BE POWERED FROM CONDENSING UNIT POWER CIRCUIT. REFER TO INSTALLATION INSTRUCTIONS.

C. INSTALL CONDENSING UNIT ON TREATED 4X4 WOOD BLOCKING.

D. PROVIDE WITH 50'-0" PRE-INSULATED LINESET AS REQUIRED.

E. PROVIDE WITH CONDENSATE PUMP AND DISCHARGE TO FLOOR DRAIN/ROOF AS REQUIRED.



**PROJECT TEAM**

**ARCHITECTURAL**  
Wellner Architects, Inc.  
802 Broadway, 4th Floor  
Kansas City, MO 64105  
816.221.0017

**STRUCTURAL, MECHANICAL, ELECTRICAL, PLUMBING, FIRE ALARM, AUDIO/VISUAL**  
Olsson Associates  
1301 Burlington St  
North Kansas City, MO 64116  
816.361.1177

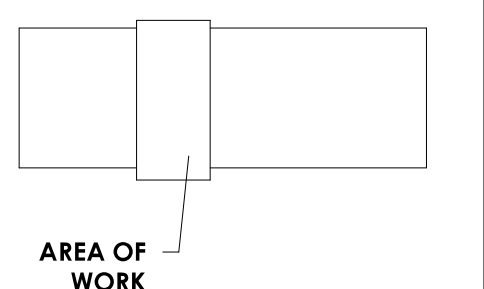
**CIVIL & AVIATION PLANNING**  
Crawford, Murphy, & Tilly, Inc.  
1627 Main St, Suite 600  
Kansas City, MO 64108  
816.800.9447



UNIVERSITY OF CENTRAL MISSOURI  
**SKYHAVEN AVIATION CENTER**  
NW 251 Road, Warrensburg, MO 64093

No. / Date / Description  
Issue: **FOR CONSTRUCTION**  
Date: **AUGUST, 2022**  
Drawn By: **EH** / Checked By: **JG**

KEY PLAN



SHEET NAME  
**MECHANICAL SCHEDULES**

SHEET NUMBER  
**M-600**

WAI Project Num: 2013



THE PROFESSIONAL, WIDESPREAD SIGNATURE AND PERSONAL SEAL APPEARS ON THIS PAGE ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE. ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL, REMAINS TO OR INTENDED TO BE LEGISLATED BY THE STATE OF MISSOURI. ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE UNDERSIGNED PROFESSIONAL, REMAINS TO OR INTENDED TO BE LEGISLATED BY THE STATE OF MISSOURI.