

CENTRIFUGAL TYPE POWER WALL VENTILATORS (ALTERNATE #1)

1. FANS SHALL BE DIRECT DRIVEN CENTRIFUGAL TYPE WITH BACKWARD INCLINED, NON-OVERLOADING WHEEL. MOTOR HOUSING SHALL BE REMOVABLE AND WEATHERPROOF. UNIT HOUSING SHALL BE DESIGNED FOR SEALING TO BUILDING SURFACE AND FOR DISCHARGE AND CONDENSATE DRIPPAGE AWAY FROM BUILDING SURFACE. HOUSING SHALL BE CONSTRUCTED OF HEAVY GAUGE ALUMINUM. UNIT SHALL BE FITTED WITH BACKDRAFT DAMPER AN AIRTIGHT AND LIQUID-TIGHT METALLIC WALL SLEEVE. LUBRICATED BEARINGS SHALL BE PROVIDED.

REGISTERS & DIFFUSERS (SEE SCHEDULE ON PLANS)

1. SUPPLY DIFFUSERS: PRICE MODEL SPD, PLAQUE FACE HIGH CAPACITY, WHITE FINISH, MOUNTING FRAMES TO SUIT CONDITIONS.
2. RETURN REGISTERS: PRICE MODEL 535, LOUVERED FACE GRILL WITH 1/2" SPACING, STEEL CONSTRUCTION, WHITE FINISH. RETURN AND EXHAUST GRILLES AND REGISTERS SHALL BE LOCATED 12 INCHES ABOVE FINISHED FLOOR UNLESS OTHERWISE INDICATED ON THE DRAWINGS. FURNISH RETURN GRILLES WITH INTEGRAL OPPOSD BLADE DAMPERS FOR BALANCING.

LOUVERS

1. FURNISH AND INSTALL FIXED, DRAINABLE, WIND DRIVEN RAIN TYPE, 6" DEEP ALUMINUM LOUVERS OF THE SIZES AND CAPACITIES AS SHOWN ON THE CONTRACT DRAWINGS.
2. THE FIXED WALL LOUVERS SHALL HAVE HEADS, SILLS, JAMBS AND MULLIONS OF ONE (1) PIECE STRUCTURAL MEMBERS OF 6063-T5 ALLOY, 0.125 INCH (3.18 MM) THICK WITH INTEGRAL CAULKING SLOT AND RETAINING BEADS. MULLIONS SHALL BE SLIDING INTERLOCK TYPE WITH DOUBLE INTEGRAL INTERNAL DRAINS. DRAINABLE BLADE SHALL BE OF THE SAME MATERIAL AND SHALL BE MINIMUM 0.081 INCH (2.06 MM) THICK WITH FRONT LIP GUTTER AND RECESSED SECOND GUTTER DESIGNED TO CATCH AND DIRECT WATER TO JAMB AND MULLION DRAINS. CLOSED CELL PVC COMPRESSION GASKETS TO BE PROVIDED BETWEEN BOTTOM OF MULLION OR JAMB AND TOP OF SILL TO INSURE LEAK TIGHT CONNECTIONS. STRUCTURAL SUPPORTS SHALL BE DESIGNED TO CARRY A WIND LOAD OF NOT LESS THAN THIRTY (30) POUNDS PER SQUARE FOOT. ALL FASTENERS SHALL BE STAINLESS STEEL OR ALUMINUM. ALL LOUVERS SHALL BE FURNISHED WITH ALUMINUM MESH INSECT SCREEN.
3. MANUFACTURER TO SUBMIT AMCA500 TEST DATA ON A 4 FOOT X 4 FOOT UNIT SHOWING THAT THE LOUVER SHALL PASS 1010 FPM FREE AREA VELOCITY AT A PRESSURE DROP OF LESS THAN 0.01 OUNCES OF WATER PER SQUARE FOOT OF FREE AREA. AMCA DATA SHALL ALSO SHOW A 4 FOOT X 4 FOOT UNIT TO HAVE A MINIMUM OF 8.8 SQUARE FEET FREE AREA.
4. LOUVERS SHALL BE FINISHED WITH 2 COATS OF BAKED ACRYLIC ENAMEL PAINT, CONTAINING A MINIMUM OF 50% KYNAR. SUBMIT COLOR CHIPS TO ARCHITECT AND ENGINEER FOR APPROVAL.

DUCTWORK

1. GALVANIZED STEEL DUCTS: ASTM A 653/A 653M GALVANIZED STEEL SHEET, FORMING STEEL (FS) DESIGNATION, WITH G90/Z275 ZINC COATING.
2. HANGER ROD: ASTM A 36/A 36M; STEEL; THREADED BOTH ENDS, THREADED ONE END, OR CONTINUOUSLY THREADED.
3. HANGER STRAPS: COMPLY WITH SMACNA "HVAC DUCT STANDARDS-METAL AND FLEXIBLE" FOR STEEL SHEET WIDTH AND THICKNESS.
4. SEALANT:
A. DUCTMATE PROSEAL OR APPROVED EQUAL.
B. NON-HARDENING, WATER RESISTANT, FIRE RESISTIVE, COMPATIBLE WITH MATING MATERIALS; LIQUID USED ALONE OR WITH TAPE, OR HEAVY MASTIC.
C. WATER BASED WITH A VERY MILD ODOR; UL 723 LISTED. FLAME SPREAD SHALL NOT EXCEED 25 AND SMOKE DEVELOPED RATING SHALL NOT EXCEED 50.
D. DRY TIME - TO TOUCH: 1 HOUR
E. DRY TIME - TO CURE: 24 TO 72 HOURS.
4. METAL DUCTWORK AND PLENUM FABRICATION
A. FABRICATE AND SUPPORT IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE, AND AS INDICATED. PROVIDE DUCT MATERIAL, GAGES, REINFORCING, AND SEALING FOR OPERATING PRESSURES INDICATED.
B. B. CONSTRUCT T'S, BENDS, AND ELBOWS WITH RADIUS OF NOT LESS THAN 1-1/2 TIMES WIDTH OF DUCT ON CENTERLINE. WHERE NOT POSSIBLE AND WHERE RECTANGULAR ELBOWS MUST BE USED, PROVIDE AIR FOIL TURNING VANES. SQUARE THROAT OR MITRED ELBOWS WITHOUT TURNING VANES ARE PROHIBITED.
C. RECTANGULAR BRANCH CONNECTIONS SHALL BE 45-DEGREE ENTRY TYPE.
D. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSTREAM OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSTREAM.
E. ROUND BRANCHES FROM RECTANGULAR MAIN SHALL BE EITHER CONICAL OR BELLMOUTH. SPIN-IN BRANCHES ALLOWED WHERE DUCT PRESSURE CLASS IS 1" OR LOWER.
F. PROVIDE STANDARD 45 DEGREE LATERAL WYE TAKEOFFS UNLESS OTHERWISE INDICATED WHERE 90 DEGREE CONICAL TEE CONNECTIONS MAY BE USED.
5. SEALING AND CONSTRUCTION SCHEDULES
A. SUPPLY AND MAKEUP AIR: GALVANIZED STEEL, 2" WG, SEAL CLASS A.
B. RETURN: GALVANIZED STEEL, 1" WG, SEAL CLASS C.
6. DUCTWORK INSTALLATION
A. INSTALL AND SEAL METAL AND FLEXIBLE DUCTS IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.
B. PROVIDE OPENINGS IN DUCTWORK WHERE REQUIRED TO ACCOMMODATE THERMOMETERS AND CONTROLLERS. PROVIDE PILOT TUBE OPENINGS WHERE REQUIRED FOR TESTING OF SYSTEMS, COMPLETE WITH METAL CAN WITH SPRING DEVICE OR SCREW TO ENSURE AGAINST AIR LEAKAGE. WHERE OPENINGS ARE PROVIDED IN INSULATED DUCTWORK, INSTALL INSULATION MATERIAL INSIDE A METAL RING.
C. LOCATE DUCTS WITH SUFFICIENT SPACE AROUND EQUIPMENT TO ALLOW NORMAL OPERATING AND MAINTENANCE ACTIVITIES.

INSULATION

1. THICKNESS AND MATERIAL SCHEDULE FOR DUCTWORK
A. SUPPLY: 1" FIBERGLASS DUCTWRAP WITH VAPOR BARRIER.
B. OUTSIDE AIR: 2" FIBERGLASS DUCTWRAP WITH VAPOR BARRIER.
C. RETURN: NONE REQUIRED.
2. DUCTWRAP
A. TYPE INSULATION: FLEXIBLE INORGANIC BLANKET OF GLASS FIBER WITH A FACTORY APPLIED VAPOR BARRIER FACING. CERTAINTED STANDARD DUCT WRAP WITH FOIL-SKRIM-KRAFT(FSK) FACING.
B. DENSITY: 1 POUND PER CUBIC FOOT.

3. THERMAL CONDUCTIVITY AT 75°F: 0.29 BTU-INCH/HR/SQ. FT./F. (ASTM C518-70)
A. INSULATION EXTERIOR FACING: FSK VAPOR BARRIER WITH ONE 2" FLANGE.
B. INSULATION EXTERIOR FACING PERMEABILITY: 0.02 PERM (ASTM E96-66, PROCEDURE A).
C. EXTERIOR FACING: PROVIDE MINIMUM 28 GA. ALUMINUM JACKET SECURELY BONDED.
D. MAXIMUM AIR TEMPERATURE: 250 DEGREES F.
E. INSULATION ATTACHMENT ADHESIVE: FOSTER STIC-SAFE ADHESIVE 85-15.
F. FASTENERS: WELD PINS OR NYLON TUFF-WELD STICK CLIP UNITS, BY GOODLOE E. MOORE, OR AN APPROVED EQUAL.
G. FASTENER ATTACHMENT ADHESIVE: TUFF-BOND QUICK-SET ADHESIVE, BY GOODLOE E. MOORE, OR AN APPROVED EQUAL.
H. TAPE: REINFORCED FOIL/SCRIM/KRAFT TO MATCH THE FACING, 3" WIDE WITH PRESSURE SENSITIVE ADHESIVE, BY FASSON OR AN APPROVED EQUAL.
1. ADHESION (PSTC-1): 80 OZ/INCH OF WIDTH.
2. SHEAR (PSTC-7): 3000 MINUTES.
3. TENSILE: 25 LBS./INCH OF WIDTH.
4. PRESSURE SENSITIVE TAPE COUNCIL.
4. REFRIGERANT PIPING: INSULATE ALL LIQUID, SUCTION AND DISCHARGE LINES WITH 3/4" THICK CLOSED CELL INSULATION.

SUPPLEMENTARY STEEL CHANNELS AND SUPPORTS

1. PROVIDE ALL SUPPLEMENTARY STEEL, FACTORY FABRICATED CHANNELS AND SUPPORTS REQUIRED FOR PROPER INSTALLATION, MOUNTING AND SUPPORT OF ALL EQUIPMENT AND SYSTEMS PROVIDED UNDER THIS SECTION OF THE SPECIFICATION.
2. SUPPLEMENTARY STEEL AND FACTORY FABRICATED CHANNELS SHALL BE FIRMLY CONNECTED TO BUILDING CONSTRUCTION.
3. THE TYPE AND SIZE OF THE SUPPORTING CHANNELS AND SUPPLEMENTARY STEEL PROVIDED UNDER THIS SECTION OF THE SPECIFICATIONS SHALL BE DETERMINED BY THE SUBCONTRACTOR AND SHALL BE OF SUFFICIENT STRENGTH AND SIZE TO ALLOW ONLY A MINIMUM DEFLECTION IN CONFORMANCE WITH THE MANUFACTURER'S REQUIREMENTS FOR LOADING.
4. ALL SUPPLEMENTARY STEEL AND FACTORY FABRICATED CHANNELS SHALL BE INSTALLED IN A NEAT AND WORKMANLIKE MANNER PARALLEL TO THE WALLS, FLOORS AND CEILING CONSTRUCTION. ALL TURNS SHALL BE MADE WITH 90 DEGREE AND 45 DEGREE FITTINGS, AS REQUIRED TO SUIT THE CONSTRUCTION AND INSTALLATION CONDITIONS.
5. ALL SUPPLEMENTARY STEEL INCLUDING FACTORY FABRICATED CHANNELS, SUPPORTS AND FITTINGS SHALL BE GALVANIZED STEEL, ALUMINUM, OR STAINLESS STEEL WHERE EXPOSED OR SUBJECT TO RUST PRODUCING ATMOSPHERE AND SHALL BE MANUFACTURED BY UNISTRUT, H-STRUT, POWERSTRUT, ERICO OR APPROVED EQUAL.

REFRIGERANT PIPING

1. DIMENSIONS AND MATERIAL REQUIREMENTS FOR REFRIGERANT (AND OTHER FLUIDS/GASSES THAT CAN BE BELOW 35 DEGREES F) PIPE, PIPE FITTINGS AND COMPONENTS SHALL CONFORM TO ASHRAE 15 AND ASME/ANSI B31.5 AND SHALL BE COMPATIBLE WITH FLUIDS USED AND CAPABLE OF WITHSTANDING THE PRESSURES AND TEMPERATURES OF THE SERVICE. PIPE, TUBING, AND COMPONENTS USED FOR REFRIGERANT SERVICE SHALL BE CLEANED, SEALED, CAPPED, OR PLUGGED PRIOR TO SHIPMENT FROM THE MANUFACTURER'S PLANT.
2. COPPER PIPE AND FITTINGS SHALL BE SEAMLESS COPPER TUBING, SOFT DRAWN, TYPE ACR FOR ALL OTHER USES (UNLESS OTHERWISE NOTED), ASTM B 88M (ASTM B 88). FITTINGS FOR COPPER TUBING SHALL BE WROUGHT COPPER, BRAZED JOINT TYPE (TYPE C1), ASME/ANSI B16.22. BRAZING ALLOYS SHALL BE B-AG ALLOY (OR EQUIVALENT STRENGTH ALLOY) HAVING A MELTING POINT ABOVE 1000 DEGREES F.
3. SOLDERED AND BRAZED PIPE AND TUBING: PIPE AND TUBING SHALL BE CUT SQUARE AND BURRS SHALL BE REMOVED. BOTH INSIDE OF FITTINGS AND OUTSIDE OF TUBING SHALL BE CLEANED WITH AN ABRASIVE BEFORE SWEATING. CARE SHALL BE TAKEN TO PREVENT ANNEALING OF FITTINGS AND HARD DRAWN TUBING WHEN MAKING CONNECTION. INSTALLATION SHALL BE MADE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. CHANGES IN DIRECTION OF PIPING SHALL BE MADE WITH FLARED, SOLDERED, OR BRAZED FITTINGS ONLY. SOLDER AND FLUX SHALL BE LEAD FREE. JOINTS FOR SOLDERED FITTINGS SHALL BE MADE WITH SILVER SOLDER OR 95:5 TIN-ANTIMONY SOLDER. CORED SOLDER SHALL NOT BE USED. JOINTS FOR BRAZED FITTINGS SHALL USE BRAZING ALLOYS WITH STRENGTH EQUAL TO B-AG ALLOY AND HAVE A MELTING POINT ABOVE 1000 DEGREES F.
4. PIPE SIZING ON DRAWINGS IS APPROXIMATE, CONFIRM AND PROVIDE ALL PIPE SIZES AS RECOMMENDED BY UNIT MANUFACTURER BASED ON ACTUAL FIELD ROUTING. PROVIDE BYPASS CIRCUITS, CONTROL EQUIPMENT, ANY RECOMMENDED DOUBLE SUCTION RISERS, TRAPS, APPURTENANCES, AND ANY HOT GAS BYPASS AND REHEAT PIPING AS RECOMMENDED SIZED AND DIAGRAMMED BY THE UNIT MANUFACTURER. INSTALL REFRIGERANT PIPING PER MANUFACTURER'S BEST RECOMMENDED PRACTICE AND LAYOUT AND TEST PIPE FOR LEAKAGE. SUBMIT PIPING DIAGRAM (WITH ALL RECOMMENDED COMPONENTS) ALONG WITH CALCULATIONS AND SIZING CHARTS FOR ENGINEER'S REVIEW.
5. INITIAL CHARGE: UPON COMPLETION OF ALL THE REFRIGERANT PIPE TESTS, ADD THE REQUIRED CHARGE OF REFRIGERANT AND OIL FOR WHICH THE SYSTEM IS DESIGNED, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR SHALL PROVIDE THE COMPLETE CHARGE OF REFRIGERANT IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. UPON SATISFACTORY COMPLETION OF THE SYSTEM PERFORMANCE TESTS, ANY REFRIGERANT THAT HAS BEEN LOST FROM THE SYSTEM SHALL BE REPLACED. AFTER THE SYSTEM IS FULLY OPERATIONAL, ANY SERVICE VALVE SEAL CAPS AND BLANKS OVER GAUGE POINTS SHALL BE INSTALLED AND TIGHTENED.
6. REFRIGERANT LEAKAGE: IF A REFRIGERANT LEAK IS DISCOVERED AFTER THE SYSTEM HAS BEEN CHARGED, THE LEAKING PORTION OF THE SYSTEM SHALL IMMEDIATELY BE ISOLATED FROM THE REMAINDER OF THE SYSTEM AND THE REFRIGERANT SHALL BE PUMPED INTO THE SYSTEM RECEIVER OR OTHER SUITABLE CONTAINER. THE REFRIGERANT SHALL NOT BE DISCHARGED INTO THE ATMOSPHERE.
7. OIL CHARGING: EXCEPT FOR FACTORY SEALED UNITS, TWO COMPLETE CHARGES OF LUBRICATING OIL FOR EACH COMPRESSOR CRANKCASE SHALL BE FURNISHED. ONE CHARGE SHALL BE USED DURING THE PERFORMANCE TESTING PERIOD, AND UPON THE SATISFACTORY COMPLETION OF THE TESTS, THE OIL SHALL BE DRAINED AND REPLACED WITH THE SECOND CHARGE.
8. AFTER ALL COMPONENTS OF THE REFRIGERANT SYSTEMS HAVE BEEN INSTALLED AND THE PIPING CONNECTED, EACH SYSTEM SHALL BE SUBJECTED TO REFRIGERANT LEAKAGE TESTS. THE REFRIGERANT LEAKAGE TESTS SHALL BE DONE BEFORE ANY REFRIGERANT PIPE IS INSULATED OR COVERED. THE FIRST TEST SHALL BE DONE AFTER CHARGING THE SYSTEM TO HALF NORMAL OPERATING PRESSURE. ALL PIPING SHALL THEN BE TEST FOR LEAKAGE USING ELECTRONIC LEAK DETECTORS. FIX ANY LEAKS FOUND AND RETEST UNTIL THERE ARE NO MORE LEAKS.
9. LEAKS, DAMAGE, AND DEFECTS DISCOVERED OR RESULTING FROM TESTING SHALL BE REPAIRED OR REPLACED TO LIKE-NEW CONDITION WITH ACCEPTABLE MATERIALS. TESTS SHALL BE CONTINUED UNTIL SYSTEMS OPERATE WITHOUT LEAKS OR REPAIRS. WHEN THE FINAL TEST IS SUCCESSFUL, THE REFRIGERANT LEVELS SHALL BE SET AT MANUFACTURER'S RECOMMENDED PRESSURES.

MECHANICAL IDENTIFICATION

1. PROVIDE EQUIPMENT IDENTIFICATION TAGS ON ALL NEW MECHANICAL EQUIPMENT. COORDINATE EQUIPMENT IDENTIFICATION NAMES W/ OWNER'S NAMING STANDARDS.

2. LABELING SHALL APPEAR AT INTERVALS OF NOT MORE THAN 20 FEET AND AT LEAST ONCE IN EACH ROOM AND EACH STORY TRAVERSED BY THE PIPING SYSTEM. ALL PIPING SHALL BE CLEARLY IDENTIFIED SPECIFICALLY FOR TYPE OF SERVICE WITH COILED PLASTIC PIPE MARKERS AND FLOW DIRECTION ARROWS.
3. PROVIDE DUCT LABELS ON ALL SUPPLY AND RETURN DUCTWORK.

AIR SYSTEMS BALANCING

1. THE CONTRACTOR SHALL SELECT AABC MN-1, NEBB-01, SMACNA-07 OR ASHRAE 111 AS THE STANDARD FOR PROVIDING TESTING, ADJUSTING AND BALANCING (TAB) OF AIR AND HYDRONIC SYSTEMS. THE SELECTED STANDARD SHALL BE USED THROUGHOUT THE PROJECT. TESTING, ADJUSTING, AND BALANCING SHALL BE ACCOMPLISHED BY A FIRM CERTIFIED FOR TESTING AND BALANCING BY ASSOCIATED AIR BALANCE COUNCIL (AABC) OR NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB), OR NATIONAL BALANCING INSTITUTE (NBI).
2. PRIOR TO TESTING, ADJUSTING, AND BALANCING, THE CONTRACTOR SHALL VERIFY THAT THE SYSTEMS HAVE BEEN INSTALLED AND ARE OPERATING AS SPECIFIED. APPROVED DETAIL DRAWINGS AND ALL OTHER DATA REQUIRED FOR EACH SYSTEM AND/OR COMPONENT TO BE TESTED SHALL BE ATTACHED TO SYSTEM FLOW DIAGRAM DOCUMENTATION.
3. THE CONTRACTOR SHALL VERIFY THAT ALL BALANCING DEVICES REQUIRED DURING THE FIELD COORDINATION PHASE AND CONFIRM DURING THE CONSTRUCTION PHASE THAT THEY ARE PROPERLY INSTALLED TO PERMIT TESTING, ADJUSTING AND BALANCING AND THAT ALL DUCT LEAKAGE TESTS HAVE BEEN COMPLETED PRIOR TO TESTING, ADJUSTING AND BALANCING. THE DESIGN BUILD CONTRACTOR'S REPRESENTATIVE SHALL BE NOTIFIED IN WRITING OF ALL EQUIPMENT, COMPONENTS, OR BALANCING DEVICES, THAT ARE DAMAGED, INCORRECTLY INSTALLED, OR MISSING, AS WELL AS ANY DESIGN DEFICIENCIES THAT WILL PREVENT PROPER TESTING, ADJUSTING, AND BALANCING. TESTING, ADJUSTING, AND BALANCING SHALL NOT COMMENCE UNTIL APPROVED BY THE OWNER'S REPRESENTATIVE. INSTRUMENTATION ACCURACY SHALL BE IN ACCORDANCE WITH THE STANDARD SELECTED IN THIS PARAGRAPH.
4. PROVIDE ADDITIONAL SHEAVES AND BELTS REQUIRED TO REACH DESIGN CFM LEVELS AT NO ADDITIONAL COST.
5. IN ADDITION TO THE PROCEDURES OUTLINED IN THIS SPECIFICATION SECTION, THE PROCEDURES USED FOR AIR AND TEMPERATURE BALANCING SHALL ALSO BE IN CONFORMANCE WITH THE "PROCEDURAL STANDARDS FOR TESTING, ADJUSTING, BALANCING OF ENVIRONMENTAL SYSTEM", SEVENTH (2005) EDITION PUBLISHED BY THE NATIONAL ENVIRONMENTAL BALANCING BUREAU, THE "NATIONAL STANDARDS FOR TESTING AND BALANCING HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS", FIFTH EDITION PUBLISHED BY THE ASSOCIATED AIR BALANCE COUNCIL OR THE PRACTICAL STANDARDS AND PROCEDURES PUBLISHED BY THE NATIONAL BALANCING INSTITUTE.
6. ALL INSTRUMENTATION SHALL BE CHECKED FOR ACCURACY BEFORE BEGINNING TESTING, ADJUSTING AND BALANCING PROCEDURES. INSTRUMENT ACCURACY SHALL BE IN ACCORDANCE WITH THE STANDARD SELECTED IN PARAGRAPH A. GENERAL REQUIREMENTS, IMMEDIATELY ABOVE. CHECKS MAY BE CARRIED OUT AGAINST SIMILAR EQUIPMENT MAINTAINED SPECIFICALLY FOR CHECKING PURPOSES OR BY THE MANUFACTURER OR A RECOGNIZED TESTING FACILITY. ALL INSTRUMENTATION USED FOR TESTING SHALL BE CALIBRATED WITHIN 6 MONTHS OF USE. PITOT TUBES AND U-TUBE MANOMETERS DO NOT REQUIRE CHECKING. IN NO CASE SHALL THE INSTRUMENTATION ACCURACY BE LESS THAN SPECIFIED BY THE INSTRUMENT MANUFACTURER.
7. THREE COPIES OF THE FINAL TAB REPORT ON FORMS SHOWN IN AABC MN-1, SMACNA-07, OR EQUIVALENT FORMS FROM NEBB, WITHIN 2 WEEKS AFTER COMPLETION OF THE TEST AND BALANCE OPERATION. DATA SHALL BE IN A HARD BOUND COVER IDENTIFYING THE PROJECT NAME, LOCATION, DATE OF SUBMITTAL, NAME OF CONTRACTOR, AND A GENERAL TITLE INDICATING THE SPECIFIC AREA AND TYPE OF WORK, AND SHALL BE SIGNED BY A REGISTERED PROFESSIONAL ENGINEER, EMPLOYED BY THE TEST AND BALANCE FIRM, WHO HAS A MINIMUM OF 2 YEARS EXPERIENCE IN TESTING, ADJUSTING AND BALANCING WORK. THE FINAL REPORT SHALL INCLUDE A SUMMARY OF THE PRELIMINARY REPORT DESCRIBING TEST METHODS, TEST RESULTS, AND MAJOR CORRECTIVE ACTIONS TAKEN. THE REPORT SHALL INCLUDE AS-TESTED FLOOR PLANS SHOWING ALL MEASUREMENT LOCATIONS AND TYPES OF MEASUREMENTS MADE. THE AIR HANDLING UNIT DATA SHALL INCLUDE A STATIC PRESSURE PROFILE DIAGRAM, AND PITOT TUBE TRAVERSES WHERE POSSIBLE.
8. AIR SYSTEMS: EACH SYSTEM SHALL BE ADJUSTED UNTIL ALL FLOW QUANTITIES (SUPPLY, RETURN, EXHAUST/RELIEF, AND OUTDOOR AIR) ARE WITHIN PLUS 10% AND MINUS 5%. DAMPERS SHALL BE CHECKED FOR TIGHT SHUTOFF. AIR LEAKAGE AROUND DAMPERS SHALL BE VERIFIED. FANS SHALL BE CHECKED FOR CORRECT DIRECTION OF ROTATION AND PROPER SPEED SHALL BE VERIFIED.
9. GENERAL BALANCING METHODS: IN ADDITION TO THE REQUIREMENTS FOR SPECIFIC SYSTEMS, FLOWS IN SUPPLY, EXHAUST AND RETURN AIR SYSTEMS SHALL BE BALANCED USING THE METHODS IN STANDARD SELECTED IN PARAGRAPH GENERAL REQUIREMENTS. THROTTLING LOSSES SHALL BE LIMITED. AIR FLOW ADJUSTMENTS SHALL BE MADE BY FIRST ADJUSTING THE FAN SPEED TO MEET THE DESIGN FLOW CONDITIONS. FAN SPEED ADJUSTMENT MAY NOT BE REQUIRED FOR FAN MOTORS WHICH ARE LESS THAN 746 W, (ONE HORSEPOWER,) OR IF THROTTLING RESULTS IN NO GREATER THAN AN ADDITIONAL 5% OF THE KW DRAW ABOVE THAT REQUIRED IF THE FAN SPEED WERE ADJUSTED. IF THE EXCESSIVE DRAW CAUSES THE MOTOR TO ENTER ITS SERVICE FACTOR, FAN SPEED SHALL BE REDUCED ACCORDINGLY. FLOWS AND PRESSURES SHALL BE CHECKED IN ALL MAIN RISERS AND SUPPLY DUCTS AT ALL SUPPLY, EXHAUST AND RETURN FAN DISCHARGES. ALL FLOWS SHALL BE RECORDED BEFORE AND AFTER EACH ADJUSTMENT.
10. BALANCING OF DIFFERENTIAL AIRFLOW: FOR AREAS SUCH AS CLEANROOMS, IN ADDITION TO BALANCING THE INDIVIDUAL SUPPLY, RETURN AND EXHAUST AIRFLOWS, THE PRESSURIZING AIR (POSITIVE OR NEGATIVE) SHALL ALSO BE MAINTAINED AS SHOWN ON DRAWINGS (AIR IN LESS AIR OUT) FOR EACH ROOM.
11. CONTROL SYSTEMS: TESTING, ADJUSTING, AND BALANCING OF THE SYSTEMS SHALL BE COORDINATED WITH THE CONTROL SYSTEM INSTALLATION. WORK WITH THE BAS CONTRACTOR FOR ALL BALANCING ITEMS SHOWN ON THE CONTROL SEQUENCES SUCH AS AIRFLOW AT AIR MONITORING STATIONS, OUTDOOR AIRFLOW, AND OPTIMIZED SETPOINTS FOR REMOTE DIFFERENTIAL PRESSURE SENSORS/TRANSMITTERS (DPT) USED FOR CONTROL OF VFD'S ALL CONTROL COMPONENTS SHALL BE VERIFIED TO BE PROPERLY INSTALLED AND OPERATING AS SPECIFIED BEFORE PROCEEDING WITH TESTING, ADJUSTING, AND BALANCING. VERIFICATION SHALL BE IN ACCORDANCE WITH AABC MN-1.
12. ADJUSTMENT OF THE TEMPERATURE CONTROLS SHALL BE COORDINATED BY THE PERSON IN CHARGE OF THE BALANCING AND ADJUSTING AND SHALL BE PERFORMED COINCIDENTAL THEREWITH. IN CONJUNCTION WITH THE CONTROLS CONTRACTOR SIMULATE A COMPLETE CYCLE OF OPERATION FOR EACH SYSTEM.

AUTOMATIC TEMPERATURE CONTROLS

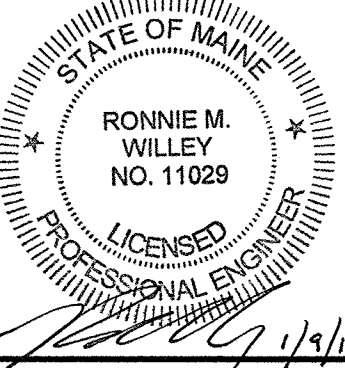
1. CONTROLS SHALL BE STAND ALONE TRANE TRACKER, OR APPROVED EQUAL. ALL CONTROLS SHALL BE DDC. PROVIDE ALL COMPONENTS NECESSARY TO PROVIDE A COMPLETE NETWORK OF COMMUNICATION BETWEEN HVAC EQUIPMENT AND INPUT/OUTPUT MODULES TO CONTROL A FULL ARRAY OF ANCILLARY DEVICES AND SENSORS.
2. CONTROL SYSTEM SHALL OPERATE AS A CONSTANT VOLUME SYSTEM WITH ECONOMIZER CONTROL.
3. PROVIDE INPUT/OUTPUT MODULE FOR COMMUNICATION WITH ROOF MOUNTED EXHAUST FAN AND MINI-SPLIT AIR CONDITIONING UNIT.
4. START AND COMMISSION SYSTEMS. PROVIDE ALL REQUIRED SOFTWARE MODIFICATIONS AND DE-BUGGING. ALLOW SUFFICIENT TIME FOR START-UP AND COMMISSIONING PRIOR TO PLACING CONTROL SYSTEMS IN PERMANENT OPERATION. ALLOW FOR COORDINATION WITH THE TESTING, ADJUSTING, AND BALANCING CONTRACTOR. ASSISTANCE SHALL BE PROVIDED AS REQUIRED FOR REPROGRAMMING, COORDINATION, AND PROBLEM RESOLUTION.
5. THERMOSTAT: ZONE THERMOSTAT SHALL BE A SENSOR WITH THUMBWHEEL SETPOINT ADJUSTMENT, NIGHT SETBACK OVERRIDE AND CANCEL BUTTONS, AND A COMMUNICATIONS JACK.

6. CONTROLS TESTING SHALL BE ACCOMPLISHED ON EACH CONTROL DEVICE. ACTUATORS SHOULD BE CHECKED AND ADJUSTED FOR START AND EXTENT OF TRAVEL. ALL RELAYS AND ADAPTERS SHOULD BE CHECKED SHOULD FOR PROPER OPERATION. CONTROLLERS SHOULD BE CHECKED FOR PROPER ACTION. ALL SYSTEM INTERLOCKS, INTERCONNECTIONS, AND SAFETY DEVICES SHOULD BE CHECKED FOR PROPER FUNCTION.
7. ALL CONTROL DEVICES SHALL BE ADJUSTED AND CALIBRATED. ALL CONTROL SETTINGS SHOULD BE VERIFIED BY COMPARING ACTUAL INPUT AND OUTPUT VALUES TO CALIBRATED VALUES.
8. FURNISH ALL COMPONENTS AS REQUIRED FOR COMPLETE AND FUNCTIONING SYSTEM. PROVIDE DDC CONTROL WITH FULLY MODULATING ACTUATORS.
9. COORDINATE SENSOR LOCATIONS.
10. ALL POINTS SHALL BE INTERFACED AND CONNECTED TO THE HOST WORKSTATION.
11. CONTROLS SHALL PROVIDE TRENDR LOGGING AND STORAGE FOR TEMPERATURE AND HUMIDITY. DATA POINTS SHALL BE COLLECTED EVERY 15 MINUTES (ADJ.). STORAGE SHALL BE OF ENOUGH CAPACITY FOR SEVEN DAYS OF COLLECTED DATA.
12. ALL CONTROL COMPONENTS SHALL HAVE CALIBRATION CERTIFICATES TO MEET FDA STANDARDS FOR DATA COLLECTION.

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1-9-14

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CLEANROOM RENOVATION
PORTLAND, ME
CURRENT ISSUE STATUS:

REV	DESCRIPTION	DATE
0	ISSUED FOR PERMIT	1-9-14

GRAPHIC SCALE:
0" 1"

SCALE: NONE
PROJECT MANAGER: RAB
JC/DRAWN BY: BAL
A/E OF RECORD: RMW
CAD FILE: 13157-M-003
PROJECT NO: 13157
DATE: 1-9-14
SHEET TITLE:

HVAC
SPECIFICATIONS

SHEET No.
M-003
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