

CLEAN AND REBALANCE EXISTING DUCTWORK, DIFFUSERS, REGISTERS, AND GRILLES INTENDED FOR REUSE AS REQUIRED OR AS INDICATED ON DRAWINGS.

CLEAN AND REFINISH EXISTING HVAC EQUIPMENT INTENDED FOR REUSE AS REQUIRED FOR PROPER OPERATION INCLUDING REPLACEMENT OF FILTERS, BELTS, MOTORS, REMOTE CONTROLS, AND SAFETY INTERLOCKS.

**15A BUILDING OPERATION**

COMPLY WITH THE SCHEDULE OF OPERATIONS AS OUTLINED IN THE ARCHITECTURAL PORTIONS OF THIS SPECIFICATION. BUILDING SHALL BE IN CONTINUOUS OPERATION. ACCOMPLISH WORK REQUIRING INTERRUPTION OF BUILDING OPERATION AT A TIME WHEN THE BUILDING IS NOT IN OPERATION, AND ONLY WITH WRITTEN APPROVAL OF BUILDING OWNER AND/OR TENANT. COORDINATE INTERRUPTION OF BUILDING OPERATION WITH THE OWNER AND/OR TENANT A MINIMUM OF SEVEN DAYS IN ADVANCE OF WORK.

**15A MECHANICAL IDENTIFICATION**

PROVIDE MANUFACTURER'S STANDARD PRE-PRINTED, SEMI-RIGID SNAP-ON OR PERMANENT ADHESIVE, PRESSURE-SENSITIVE VINYL PIPE MARKERS. COLOR CODE PIPE MARKERS TO COMPLY WITH ANSI A13.1.

INSTALL PIPE MARKERS ON EACH HVAC PIPING SYSTEM AND INCLUDE ARROWS TO SHOW NORMAL DIRECTION OF FLOW.

LOCATE PIPE MARKERS AND COLOR BANDS WHEREVER PIPING IS EXPOSED TO VIEW IN OCCUPIED SPACES. MACHINE ROOMS, ACCESSIBLE MANTERACE SPACES (SHAFTS, TUNNELS, PLENUMS) AND EXTERIOR NON-CONCEALED LOCATIONS.

PROVIDE PLASTIC LAMINATE OR BRASS VALVE TAG ON EVERY VALVE. COCK AND CONTROL DEVICE IN EACH HVAC PIPING SYSTEM; EXCLUDE CHECK VALVES, VALVES WITHIN FACTORY-FABRICATED EQUIPMENT UNITS, AND SHUT-OFF VALVES AT HVAC TERMINAL DEVICES AND SIMILAR ROUGH-IN CONNECTIONS OF END-USE FIXTURES AND UNITS.

PROVIDE MANUFACTURER'S STANDARD LAMINATED PLASTIC, COLOR CODED EQUIPMENT MARKERS CONFORM TO THE SMACNA INTERIOR COLOR CODE: GREEN FOR COOLING; YELLOW FOR HEATING; YELLOW/GREEN FOR COMBINATION COOLING AND HEATING; BROWN FOR ENERGY RECLAMATION; BLUE FOR OTHER EQUIPMENT TYPES. CONFORM TO ANSI A13.1 FOR HAZARDOUS EQUIPMENT.

PROVIDE STENCILED SIGNS FOR EQUIPMENT IDENTIFICATION AT CONTRACTOR'S OPTION OR WHERE DISTANCE OF REQUIRED IDENTIFICATION REQUIRES LETTERING LARGER THAN 1 INCH HEIGHT. STENCIL PAINT SHALL BE EXTERIOR TYPE, OIL-BASED, ALKYD ENAMEL, MINIMUM 1-1/4 INCH HEIGHT OR GREATER AS REQUIRED FOR LONG DISTANCE IDENTIFICATION, WHITE OR BLACK COLOR FOR BEST CONTRAST.

PROVIDE DUCT MARKERS OR PROVIDE STENCILED SIGNS AND ARROWS INDICATING DUCTWORK SERVICE AND FLOW DIRECTION IN BLACK OR WHITE LETTERING FOR BEST CONTRAST WITH DUCT OR INSULATION COLOR. LOCATE MARKERS MAXIMUM 50 FEET ALONG EACH DUCT SIDE AND WITHIN 5 FEET OF ALL CONTROL AND BALANCING DAMPERS OR BRANCH DUCTS MORE THAN 25 FEET LENGTH AND WITHIN 5 FEET ON EACH SIDE OF WALL, FLOOR, AND CEILING PENETRATIONS. PROVIDE ADDITIONAL MARKERS IN CONGESTED AREAS OR AT MULTIPLE DUCT RUNS AS REQUIRED FOR CLARITY.

**15A DUCT INSULATION, DUCTWORK, ACCESSORIES, FLUES AND FANS**

**15A DUCT INSULATION**

COVER CONCEALED, RIGID DUCTWORK WITH 2" THICK, 3/4 POUND DENSITY, MINIMUM R-5.0 DUCT WRAP, CERTAINTED OR EQUIVALENT OWENS-CORNING OR KNAUF WITH HEAVY-DUTY FOL-SCRM-KRAFT FACING, AND WITH JOINTS TAPED WITH 3" WIDE FOIL TAPE AS FOLLOWS:

- A. ROUND AND RECTANGULAR SUPPLY AND RETURN AIR DUCTWORK.
- B. ROUND AND RECTANGULAR OUTSIDE AIR DUCTWORK.
- C. ROUND AND RECTANGULAR EXHAUST AND RELIEF AIR DUCTWORK WITHIN 5 FEET OF EXTERIOR DISCHARGE.

COVER OUTDOOR AIR, EXHAUST AIR AND RELIEF AIR PLENUMS CONNECTED TO EXTERIOR LOUVERS WITH 1-1/2" THICK, 1.5 POUND DENSITY, RIGID FIBERGLASS INSULATION CONFORMING TO ASTM C612, CLASS 1.

INSULATING MATERIALS, ADHESIVES, COATINGS, ETC., SHALL EXCEED FLAME SPREAD RATING OF 25 AND SMOKE DEVELOPED RATING OF 500 PER ASTM E 84. CONTAINERS FOR MASTICS AND TAPE SHALL HAVE U.L. LABELS.

**15A DUCTWORK**

PROVIDE GALVANIZED STEEL DUCTWORK AND HOUSINGS AS SHOWN ON DRAWINGS. CONSTRUCT DUCTWORK INCLUDING FITTINGS AND TRANSITIONS IN CONFORMANCE WITH CURRENT SMACNA STANDARDS RELATIVE TO GAUGE, BRACING, JOINTS, ETC. MINIMUM THICKNESS OF DUCT SHALL BE 26-GAUGE SHEET METAL. REINFORCE HOUSINGS AND DUCTWORK OVER 14" WITH 1-1/4" ANGLES NOT LESS THAN 5'-6" ON CENTERS, AND CLOSERS REQUIRED FOR SUFFICIENT RIGIDITY TO PREVENT VIBRATION. SUPPORT HORIZONTAL RUNS OF DUCT FROM STRAP IRON HANGERS ON CENTERS NOT TO EXCEED 8'-0". NOT SUPPORT CEILING GRID, CONDUITS, PIPES, EQUIPMENT, ETC. FROM DUCTWORK. COORDINATE ROUTING OF DUCTWORK WITH OTHER CONTRACTORS SUCH AS PIPING, ELECTRICAL CONDUIT, AND ASSOCIATED SUPPORTS ARE NOT ROUTED THROUGH THE DUCTWORK.

CONSTRUCT NON-VANED SUPPLY DUCTS TO MEET SMACNA POSITIVE PRESSURE OF 2" W.G. CONSTRUCT RETURN, EXHAUST AND EXHAUST DUCTWORK UPSTREAM OF FANS TO MEET SMACNA NEGATIVE PRESSURE OF 2" W.G. CONSTRUCT EXHAUST DUCTWORK DOWNSTREAM OF FANS TO MEET SMACNA POSITIVE PRESSURE OF [2" W.G.]

PROVIDE MILL PHOSPHATIZED OR GALVANEAL FINISH FOR EXPOSED DUCTWORK TO BE FIELD PAINTED. SHOP TREATED SHEET METAL SHALL HAVE GALVANIZED METAL PRIMER APPLIED IN THE SHOP AFTER FABRICATION AND PRIOR TO SHIPPING.

SEAL DUCTWORK WITH HEAVY LIQUID SEALANT, HARDCAST IRONGRIP 601, DESIGN POLYMER DP 1010, UNITED MOLLIE DUCT SEALER OR APPROVED EQUAL, APPLIED ACCORDING TO SEALANT MANUFACTURER'S INSTRUCTIONS. FOR DUCTS WITH PRESSURE CLASSIFICATION OF 2" W.G. AND GREATER SEAL LONGITUDINAL AND TRANSVERSE DUCTWORK JOINTS AIRTIGHT TO MEET SMACNA CLASS B. FOR DUCTS WITH PRESSURE CLASSIFICATION LESS THAN 2" W.G. SEAL TRANSVERSE JOINTS AIRTIGHT TO MEET SMACNA CLASS C. TAPE AND MASTICS SHALL BE LISTED AND LABELED IN ACCORDANCE WITH UL 181A. FOR EXHAUST DUCTS OPERATING UNDER POSITIVE PRESSURE SEAL JOINTS AND PENETRATIONS TO MEET SMACNA CLASS A.

PROVIDE RADIUS ELBOWS, TURNS, AND OFFSETS WITH A MINIMUM CENTERLINE RADIUS OF 1-1/2 TIMES THE DUCT WIDTH, WHERE SPACE DOES NOT PERMIT FULL RADIUS ELBOWS, PROVIDE SHORT RADIUS ELBOWS WITH A MINIMUM OF TWO CONTINUOUS SPLITTER VANES. VANES SHALL BE THE ENTIRE LENGTH OF THE BEND. PROVIDE MITERED ELBOWS WHERE SPACE DOES NOT PERMIT RADIUS ELBOWS, WHERE SHOWN ON THE DRAWINGS, OR AT THE OPTION OF THE CONTRACTOR WITH THE ENGINEER'S APPROVAL. MITERED ELBOWS LESS THAN 45 DEGREES SHALL NOT REQUIRE TURNING VANES. MITERED ELBOWS 45-DEGREES AND GREATER SHALL HAVE SINGLE THICKNESS TURNING VANES OF SAME GAUGE AS DUCTWORK, RIGIDLY FASTENED WITH GUIDE STRIPS IN DUCTWORK. VANES FOR MITERED ELBOWS SHALL BE PROVIDED IN ALL SUPPLY AND EXHAUST DUCTWORK AND IN RETURN AND OUTSIDE AIR DUCTWORK THAT HAS AN AIR VELOCITY EXCEEDING 1000 FPM. DO NOT INSTALL VANES IN GREASE DUCTWORK.

DUCTS SHALL BE CONNECTED TO FANS, FAN CASINGS AND FAN PLENUMS BY MEANS OF FLEXIBLE CONNECTORS. FLEXIBLE CONNECTORS SHALL BE NEOPRENE COATED GLASS CLOTH CANVAS CONNECTIONS, DURO-DYNE, ELGEN, VENTFABRIC OR EQUAL. FLEXIBLE CONNECTORS SHALL HAVE A FLAME SPREAD OF 25 OR LESS AND SMOKE DEVELOPED RATING NOT HIGHER THAN 50. MAKE AIRTIGHT JOINTS AND INSTALL WITH MINIMUM 1-1/2" SLACK.

PROVIDE BALANCING DAMPERS, MANUFACTURED BY RUSKIN, GREENHECK, NALOR INDUSTRIES, CESCO, LOUVERS & DAMPERS, TAMCO, POTTOFF OR APPROVED EQUAL, WHERE SHOWN ON DRAWINGS AND WHERE NECESSARY FOR COMPLETE INTERLOCKING TYPE, ROUND VOLUME DAMPERS SHALL BE BUTTERFLY TYPE CONSISTING OF CIRCULAR BLADE MOUNTED TO A SHAFT. DAMPER LEAKAGE FOR OUTSIDE AIR DAMPERS SHALL NOT EXCEED 4.0 CFM/SQUARE FOOT IN FULL CLOSED POSITION AT 1" WG PRESSURE DIFFERENTIAL ACROSS DAMPER. REFERENCE MANUFACTURER AND MODEL NUMBER FOR OUTSIDE AIR DAMPERS IS RUSKIN MODEL CD-50. PROVIDE FLEXMASTER MODEL STO OR EQUAL 45 DEGREE RECTANGULAR/ROUND SIDE TAKEOFF FITTING WITH MODEL SLBO DOUBLE BEARING DAMPER WITH INSULATION BUILD OUT FOR ROUND DUCTWORK BRANCH TAKEOFFS TO INDIVIDUAL AIR DEVICES, OMIT DAMPER IF TAKEOFF FITTING WITHIN DAMPER IS LOCATED DOWNSTREAM OF TAKEOFF.

WHERE ACCESS TO DAMPERS THROUGH A HARD CEILING IS REQUIRED, PROVIDE A METROPOLITAN AIR TECHNOLOGY MODEL RT-250 OR EQUAL BY YOUNG'S REGULATOR CONCEALED, CABLE OPERATED VOLUME DAMPER WITH REMOTE OPERATOR. DAMPER SHALL BE ADJUSTABLE THROUGH THE DIFFUSER FACE OR FRAME WITH STANDARD 1/4" NUTDRIVER OR FLAT SCREWDRIVER. CABLE ASSEMBLY SHALL ATTACH TO DAMPER AS ONE PIECE WITH NO LINKAGE ADJUSTMENT. POSITIVE, DIRECT, TWO-WAY DAMPER CONTROL SHALL BE PROVIDED WITH NO SLEEVES, SPRINGS OR SCREW ADJUSTMENTS TO COME LOOSE AFTER INSTALLATION. SUPPORT CABLE ASSEMBLY TO AVOID BENDS AND KINKS IN CABLE. WHERE APPROVED BY ARCHITECT, A CEILING CUP WITH COVER PLATE CAN BE USED FOR ACCESS TO CABLE OPERATOR.

ROUND OR OVAL DUCTWORK SHALL BE SEMCO, UNITED, WESCO OR EQUAL, SHEETMETAL WITH SMOOTH INTERIOR SURFACE, WITH LOW PRESSURE (DUCT PRESSURE CLASS UP TO AND INCLUDING 2" W.G.) ROUND DUCTWORK GAUGES PER THE FOLLOWING TABLE (REFERENCE SMACNA HVAC DUCT CONSTRUCTION STANDARDS FOR GAUGES WHEN PRESSURES EXCEED 2" W.G.):

SIZE	DUCT GAUGE	FITTING GAUGE
14" & UNDER	26	26
16" THRU 20"	24	24
22" THRU 36"	22	20

LINK INDUSTRIES SPROSARE, LEWIS & LAMBERT OR APPROVED EQUAL FACTORY-MANUFACTURED ROUND DUCTWORK AND FITTINGS MAY BE SUBSTITUTED FOR SPECIFIED ROUND BRANCH DUCTWORK, AT CONTRACTOR'S OPTION. HEAVY LIQUID JOINT SEALANT MAY BE OMITTED ON FACTORY-MANUFACTURED ROUND DUCTWORK.

LOW PRESSURE (DUCT PRESSURE CLASS UP TO AND INCLUDING 2" W.G.) FITTINGS 24" IN DIAMETER AND LESS SHALL BE PREFABRICATED, SPOTWEALED AND INTERNALLY SEALED. CONTINUOUS WELD THICKNESS SHALL BE 24" IN DIAMETER. FITTING GAUGE SHALL BE 24" GAUGE FOR 24" FITTINGS AND UNDER. GAUGE FOR LARGER SIZES, 90 DEGREE ELBOWS SHALL BE 26" GAUGE. SEAL LONGITUDINAL AND TRANSVERSE DUCTWORK JOINTS AIRTIGHT TO MEET SMACNA CLASS B. HEAVY LIQUID SEALANT APPLIED ACCORDING TO MANUFACTURER'S INSTRUCTIONS. PROVIDE GAUGE THICKNESS IN MEDIUM PRESSURE (DUCT PRESSURE CLASS UP TO AND INCLUDING 6" W.G.) DUCTWORK AS RECOMMENDED BY SMACNA.

**15A FLEXIBLE DUCT**

MEDIUM PRESSURE (DUCT PRESSURE CLASS UP TO AND INCLUDING 2" W.G.) AND MEDIUM DENSITY (DUCT PRESSURE CLASS 2-1" TO 6" W.G.) FLEXIBLE DUCT SHALL BE EXTERIOR TYPE BB, THERMAFLEX TYPE G-KM, M-KE, JPL TYPE SILVER JACKET, OR EQUAL (NON-FLAMMABLE TARDANT POLYETHYLENE) PROTECTIVE VAPOR BARRIER, UL181 CLASS 1 RIGID INSULATED DUCT, R-6.0 FIBERGLASS INSULATION. PROVIDE ONE LINER WITH STEEL WIRE HELIX MECHANICALLY LOCKED OR PERMANENTLY WELDED TO THE LINER.

FLEXIBLE DUCT RUNS SHALL NOT EXCEED 5 FEET IN LENGTH, AND SHALL BE INSTALLED FULLY EXTENDED AND STRAIGHT AS POSSIBLE AVOIDING TIGHT TURNS. INSTALL FLEXIBLE DUCT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. SUPPORT FLEXIBLE DUCT AT MAXIMUM 5 FEET ON CENTER AND WITHIN 6 INCHES OF BENDS. BENDS SHALL NOT EXCEED A CENTERLINE RADIUS OF ONE DUCT DIAMETER. DUCT SAG SHALL NOT EXCEED 1/2 INCH, SUPPORTING MATERIAL IN DIRECT CONTACT WITH THE DUCT SHALL NOT BE LESS THAN 1-1/2 INCHES IN WIDTH.

CONNECT FLEXIBLE DUCT TO RIGID METAL DUCT OR AIR DEVICES AS RECOMMENDED BY THE MANUFACTURER. AT A MINIMUM, INSTALL TWO WRAPS OF DUCT TAPE OVER THE INNER CORE CONNECTION AND A METALLIC OR NON-METALLIC CLAMP OVER THE TAPE AND TWO WRAPS OF DUCT TAPE OR A CLAMP OVER THE OUTER JACKET. DUCT CLAMPS SHALL BE LABELED IN ACCORDANCE WITH UL-181B AND MARKED 181B-C. DUCT TAPE SHALL BE LABELED IN ACCORDANCE WITH UL 181B AND MARKED 181B-FX.

**15A AIR DEVICES**

PROVIDE AIR DEVICES AS SCHEDULED ON DRAWINGS, MANUFACTURED BY CARNES, PRICE, KRUEGER, NALOR INDUSTRIES, TITUS, OR TUTTLE & BAILEY. SELECT AIR DEVICES TO LIMIT ROOM NOISE LEVEL TO NO HIGHER THAN NC-30 UNLESS OTHERWISE SHOWN. PROVIDE DEVICES WITH A SOFT PLASTIC GASKET TO MAKE AN AIRTIGHT SEAL AGAINST THE MOUNTING SURFACE. COORDINATE FINAL LOCATION, FRAME, AND MOUNTING TYPE OF AIR DEVICES WITH ARCHITECTURAL REFLECTED CEILING PLANS.

SUBMIT COMPLETE SHOP DRAWINGS INCLUDING INFORMATION ON NOISE LEVEL, PRESSURE DROP, THROW, CFM FOR EACH AIR DEVICE, STYLES, BORDERS, ETC. CLEARLY MARKED WITH SPECIFIED EQUIPMENT NUMBER. SUBMIT SAMPLES OF EACH AIR DEVICE AS REQUESTED BY THE ENGINEER.

PROVIDE CEILING MOUNTED AIR DEVICES OF LAY-IN OR SURFACE MOUNTED TYPE AS REQUIRED TO BE COMPATIBLE WITH CEILING CONSTRUCTION. PROVIDE CEILING DIFFUSERS AND GRILLES WITH WHITE ENAMEL FINISH UNLESS NOTED OTHERWISE.

**15A EXHAUST AIR SYSTEMS**

PROVIDE ROOF MOUNTED EXHAUST FANS AS SCHEDULED ON THE DRAWINGS, OR EQUAL COOK, GREENHECK, CARNES, TWIN CITY FANS, ACME OR PENNBARRY COMPLETE WITH ALUMINUM HOUSING, ALUMINUM CENTRIFUGAL WHEEL, MOTOR WITH INTEGRAL THERMAL OVERLOAD PROTECTION, DISCONNECT SWITCH MOUNTED INSIDE THE HOUSING, BIRDSCREEN, BACKDRAFT DAMPER, AND PATE PREFABRICATED ROOF CURB. THREE PHASE FANS SHALL BE FURNISHED WITH MAGNETIC STARTERS WITH PUSH BUTTON STATION.

**15A HVAC EQUIPMENT**

FOR NATIONAL ACCOUNTS PRICING AND ORDERING INFORMATION CONTACT ALAN HASEMEYER AT TRANE, PHONE #865-386-3777 OR ATHASEMETER@TRANE.COM.

**15A ROOFTOP UNITS (HEAT PUMP) 3-20 TONS**

PROVIDE PACKAGE ROOFTOP HEAT PUMP UNITS AS SCHEDULED ON THE DRAWINGS, MANUFACTURED BY TRANE, CARRIER, AODN, JOHNSON CONTROLS, DAKIN, LENNOX OR YORK, COMPLETE WITH FACTORY INSTALLED DIRECT-DRIVE HERMETIC COMPRESSORS WITH INTERNAL SPRING VIBRATION ISOLATION, BUILT-IN MOTOR THERMAL OVERLOAD PROTECTION, CRANKCASE HEATER, AND LOW PRESSURE SWITCHES; DIRECT EXPANSION EVAPORATING AND CONDENSING COILS, MINIMUM SEER OR EER RATING (COOLING) AND MINIMUM HSPF OR COP RATING (HEATING) AS REQUIRED BY THE APPLICABLE ENERGY CODE OR GREATER IF SCHEDULED ON THE DRAWINGS; CENTRIFUGAL EVAPORATOR BLOWER; AIR FILTER RACK WITH 2" THICK THROWAWAY FILTERS; PROPELLER TYPE CONDENSER FAN; COMPLETE FACTORY INSTALLED MICRO-PROCESSOR CONTROLS INCLUDING ANTI-SHORT CYCLE TIMERS, TIME DELAY RELAYS AND MINIMUM "ON" TIME CONTROLS; BUILT-IN THERMAL OVERLOAD PROTECTION ON MOTORS AND COMPRESSORS; CONDENSING VALVE, SUCTION LINE ACCUMULATOR, FLOW CONTROL, CHECK VALVE, AND SOLID STATE DEFROST CONTROL UTILIZING THERMISTORS; OUTDOOR AIR DAMPER; POWER RELIEF

FAN; WEATHERTIGHT HOUSING CONSTRUCTED OF ZINC COATED, HEAVY GAUGE, GALVANIZED STEEL WITH WEATHER-RESISTANT BAKED ENAMEL FINISH; MINIMUM INSULATED DOWNFLOW VIBRATION ISOLATION ROOF CURB WITH MINIMUM HEIGHT OF 12 INCHES FOR ROOFS WITH NO INSULATION, 14" FOR ROOFS WITH INSULATION OR AS SCHEDULED ON THE DRAWINGS; SINGLE POINT ELECTRICAL POWER CONNECTION. PROVIDE SLOPED ROOF CURB AS REQUIRED TO MATCH SLOPE OF ROOF STRUCTURE SO THAT UNIT IS INSTALLED LEVEL. PROVIDE GUARDS OR LOUVERED PANELS TO PROTECT THE CONDENSER COIL FROM HAIL OR OTHER DAMAGE. PROVIDE A 125 VAC, 20 AMP DUPLEX CONVENIENCE RECEPTACLE MOUNTED TO UNIT READY FOR FIELD WIRING WITH A COVER UL LISTED FOR WET AND DAMP LOCATIONS WHEN IN USE. PROVIDE UNIT COMPLETE WITH MANUFACTURER'S ONE YEAR GUARANTEE ON COMPONENTS PLUS AN ADDITIONAL FOUR YEAR GUARANTEE ON THE COMPRESSORS.

**15A TEMPERATURE CONTROLS**

**15A GENERAL REQUIREMENTS**

PROVIDE A SYSTEM OF TEMPERATURE CONTROLS INCLUDING THERMOSTATS, CONTROL PANELS, TIME SWITCHES, OVERRIDE TIMERS, DAMPER CONTROLS, RELAYS REQUIRED TO PROVIDE THE DESIRED SEQUENCE OF OPERATION. PROVIDE INTEGRATED WIRING DIAGRAMS SHOWING SUPERCONDUCTIVE SWITCHING FIELD INSTALLED EQUIPMENT AND PACKAGE WIRING FURNISHED WITH THE HVAC EQUIPMENT. CONTROL WIRING SHALL BE SIZED TO ACCOMMODATE THE VOLTAGE DROP ASSOCIATED WITH THE DISTANCE BETWEEN THE CONTROL DEVICES AND THE CONTROLLER.

DRY-BULB AND WET-BULB TEMPERATURE SENSORS SHALL BE ACCURATE TO +/- 2 DEGREES FAHRENHEIT OVER THE RANGE OF 40 TO 90 DEGREES FAHRENHEIT. ENTHALPY SENSOR SHALL BE ACCURATE TO +/- 0.1 BTU/LB OVER THE RANGE OF 30 TO 36 BTU/LB.

PROVIDE MAINTENANCE AND PRE-JOB CHECKUP SERVICE AS REQUIRED TO ENSURE THAT INSTALLATION MEETS REQUIREMENTS OF THE SPECIFICATION. THE SYSTEM SHALL BE GUARANTEED FOR ONE YEAR OR ONE YEAR FOLLOWING THE ACCEPTANCE OF THE SYSTEM BY THE ARCHITECT/ENGINEER. CORRECT DEFECTS OCCURRING WITHIN THIS PERIOD AT NO ADDITIONAL COST TO THE OWNER.

**15A EQUIPMENT**

MANUFACTURERS AND MODEL NUMBERS ARE LISTED FOR REFERENCE AS TO QUALITY AND FEATURES REQUIRED FOR THE CONTROL DEVICES. CONTROL DEVICES SHALL BE FURNISHED BY PROLIFHX WITH QUALITY AND FEATURES AS INDICATED.

SEVEN-DAY PROGRAMMABLE, OCCUPIED/UNOCCUPIED CONTROL OF MECHANICAL SYSTEMS SHALL BE ACCOMPLISHED THROUGH PROLIFHX ENERGY MANAGEMENT SYSTEM (EMS). CONTROL DEVICES SHALL BE BY PROLIFHX PURCHASED BY OWNER AND INSTALLED BY MECHANICAL CONTRACTOR. CONTROL SYSTEM ARCHITECTURE SHALL BE DESIGNED BY PROLIFHX TO COMPLY WITH THE SEQUENCE OF OPERATION MOUNT ALL THERMOSTATS AT 48" AFF AND ALL OTHER WALL MOUNTED SENSORS AT 54" AFF. PROVIDE THERMOSTATS WITH FULL KEYPAD LOCKOUT CAPABILITY TO PREVENT TAMPERING WITH THE THERMOSTAT SETTINGS.

COORDINATE WITH PROLIFHX TO PROVIDE DAMPER OPERATOR FOR EACH AUTOMATIC DAMPER WITH SUFFICIENT CAPACITY TO OPERATE THE DAMPER UNDER ALL CONDITIONS AND TO GUARANTEE TIGHT CLOSE-OFF DAMPERS UNDER SYSTEM PRESSURE ENCOUNTERED. EACH OPERATOR SHALL BE PROVIDED WITH SPRING-RETURN FOR NORMALLY CLOSED OR NORMALLY OPEN POSITION FOR FAIL SAFE OPERATION TO ACCOUNT FOR FIRE, LOW TEMPERATURES, OR POWER INTERRUPTION AS REQUIRED BY THE SEQUENCE OF OPERATION.

SMOKE DETECTORS FURNISHED AND INSTALLED AS INDICATED IN SECTION 15A PART 3 OR AS SCHEDULED ON THE PLANS (OR HEAT DETECTORS IF PERMITTED BY CODE) SHALL SHUT DOWN EACH ASSOCIATED UNIT SUPPLY FAN UPON ACTIVATION WHERE REQUIRED BY CODE. PROVIDE REMOTE VISUAL AND AUDIBLE ALARM DEVICE IN AN APPROVED LOCATION IF SMOKE DETECTORS ARE NOT CONNECTED TO A FIRE ALARM PANEL AND LABEL DEVICE AS "AIR DUCT DETECTOR TROUBLE".

**15A SEQUENCE OF OPERATION**

**15A ROOFTOP UNIT CONTROL (COMPARATIVE ENTHALPY ECONOMIZER)**

DURING OCCUPIED HOURS, OPERATE ROOFTOP UNIT SUPPLY FAN CONTINUOUSLY AND OPEN OUTDOOR AIR DAMPER TO MINIMUM POSITION TO MAINTAIN MINIMUM VENTILATION INDICATED IN THE SCHEDULE. CYCLE STAGE(S) OF COOLING AND HEATING TO MAINTAIN ROOM THERMOSTAT SET POINT (76 DEGREES FAHRENHEIT COOLING, 69 DEGREES FAHRENHEIT HEATING). WHEN OUTDOOR AIR ENTHALPY IS LESS THAN THE RETURN AIR ENTHALPY, ENABLE COMPARATIVE ENTHALPY TYPE OUTDOOR AIR ECONOMIZER FOR FIRST STAGE COOLING TO MAINTAIN DISCHARGE AIR TEMPERATURE SET POINT (55 DEGREES F, ADJUSTABLE) AND CYCLE SECOND STAGE MECHANICAL COOLING SYSTEM, IF NEEDED, TO MAINTAIN SPACE TEMPERATURE. RTU-1 ONLY: START POWER RELIEF FAN WHEN OUTDOOR AIR DAMPER IS GREATER THAN 50% OPEN. RETURN THE OUTDOOR AIR DAMPER TO MINIMUM POSITION WHEN OUTDOOR AIR ENTHALPY EXCEEDS RETURN AIR ENTHALPY OR WHEN DISCHARGE AIR TEMPERATURE DROPS BELOW 50 DEGREES FAHRENHEIT. IF FREEZE STAT SENSES TEMPERATURE BELOW 40 DEGREES FAHRENHEIT, CLOSE OUTDOOR AIR DAMPER AND STOP SUPPLY FAN. SMOKE DETECTORS SHALL SHUTDOWN UNIT UPON ALARM; HVAC UNITS SHALL RESTART AUTOMATICALLY UPON RESET OF SMOKE DETECTORS.

CO2 CONTROL (RTU-1 ONLY) DURING OCCUPIED HOURS SPACE MOUNTED CARBON DIOXIDE SENSOR SHALL CONTINUOUSLY MONITOR SPACE CARBON DIOXIDE (CO2) LEVELS. UPON CO2 LEVELS RISING ABOVE 400PPM MODULATE THE OUTSIDE AIR DAMPER FROM ITS MINIMUM POSITION MORE OPEN UNTIL IT ACHIEVES ITS MAXIMUM OPEN SET POINT POSITION AT 1000PPM CO2. ALARM SHALL NOTIFY IF CO2 CONTINUES TO RISE ABOVE 1000 PPM WITH OUTSIDE AIR DAMPER AT MAXIMUM POSITION. MAXIMUM AND MINIMUM SETPOINTS SHALL BE DEFINED BY THE POSITION NECESSARY TO PROVIDE SCHEDULED OUTDOOR AIR VALUES.

DURING UNOCCUPIED HOURS, CYCLE THE ROOFTOP UNIT SUPPLY FAN AND COOLING OR HEATING SYSTEM TO MAINTAIN UNOCCUPIED SETBACK TEMPERATURE SET POINTS. OUTDOOR AIR DAMPER SHALL BE CLOSED DURING UNOCCUPIED HOURS.

**15A TENANT RESTROOM EXHAUST FAN CONTROL**

EXHAUST FAN SHALL BE INTERLOCKED WITH RESPECTIVE RESTROOM LIGHT SWITCH AND BE ENERGIZED WHEN LIGHT SWITCH IS 'ON' AND DE-ENERGIZED WHEN LIGHT SWITCH IS 'OFF'.



700 W. Pete Rose Way, Suite 400 Cincinnati, OH 45203 Telephone: (513) 421-1100  
Timothy L. Habering, PE

**Sprint**  
#1408 DURHAM  
2707 GUESS RD, SUITE 110  
DURHAM, NC 27705

MECHANICAL SPECIFICATIONS  
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Order Plans