

**SECTION 15A: HEATING, VENTILATING, AND AIR CONDITIONING:**

NOT ALL SECTIONS MAY BE USED.

**15A1 GENERAL INSTRUCTIONS.**

**15A 1-1 GENERAL REQUIREMENTS.**

REQUIREMENTS UNDER DIVISION ONE AND THE GENERAL AND SUPPLEMENTARY CONDITIONS OF THESE SPECIFICATIONS SHALL BE A PART OF THIS SECTION. EACH CONTRACTOR SHALL BECOME THOROUGHLY ACQUAINTED WITH ITS CONTENTS AS TO REQUIREMENTS WHICH AFFECT THIS DIVISION OR SECTION. THE WORK REQUIRED UNDER THIS SECTION INCLUDES MATERIAL, EQUIPMENT, APPLIANCES, TRANSPORTATION, SERVICES, AND LABOR REQUIRED TO COMPLETE THE ENTIRE SYSTEM AS REQUIRED BY THE DRAWINGS AND SPECIFICATIONS.

THE SPECIFICATIONS AND DRAWINGS FOR THIS PROJECT ARE COMPLEMENTARY, AND PORTIONS OF THE WORK DESCRIBED IN ONE, SHALL BE PROVIDED AS IF DESCRIBED IN BOTH. IN THE EVENT OF DISCREPANCIES ON THE DRAWINGS AND SPECIFICATIONS, THE CONTRACTOR SHALL ADVISE THE ENGINEER OF SAME PRIOR TO PROCEEDING WITH THE WORK INVOLVED, IN ORDER THAT CORRECT PROGRESS OF THE WORK MAY BE ENSURED.

**15A 1-2 INSPECTION OF SITE.**

THE CONTRACTOR SHALL PERSONALLY INSPECT THE SITE OF THE PROPOSED WORK AND BECOME FULLY INFORMED AS TO THE CONDITIONS UNDER WHICH THE WORK IS TO BE DONE. FAILURE TO DO SO WILL NOT BE CONSIDERED SUFFICIENT JUSTIFICATION TO REQUEST OR OBTAIN EXTRA COMPENSATION OVER AND ABOVE THE CONTRACT PRICE.

**15A 1-3 MATERIAL AND WORKMANSHIP.**

MATERIAL, EQUIPMENT, AND APPARATUS PROVIDED UNDER THIS CONTRACT SHALL BE NEW UNLESS OTHERWISE STATED HEREIN, OF BEST QUALITY NORMALLY USED FOR THE PURPOSE IN GOOD COMMERCIAL PRACTICE, AND FREE FROM DEFECTS. MATERIALS LISTED IN THE SPECIFICATIONS OR SHOWN ON THE DRAWINGS ARE NOT NECESSARILY INTENDED TO DESIGNATE THE REQUIRED TRIM, WRITTEN DESCRIPTIONS OF THE TRIM GOVERN MODEL NUMBERS.

WORK PERFORMED UNDER THIS CONTRACT SHALL PROVIDE A NEAT AND "WORKMANLIKE" APPEARANCE WHEN COMPLETED, TO THE SATISFACTION OF THE ENGINEER. WORKMANSHIP SHALL BE THE FINEST POSSIBLE BY APPLICABLE CODES AND LAWS. INSTALLATIONS SHALL COMPLY WITH APPLICABLE CODES AND LAWS.

THE COMPLETE INSTALLATION SHALL FUNCTION AS DESIGNED AND INTENDED WITH RELIENCY, CAPACITY, NOISE LEVEL, ETC. ABNORMAL NOISE CAUSED BY RATTLING EQUIPMENT, PIPING, DUCTS, AIR DEVICES, AND SOLEAKS IN ROTATING COMPONENTS WILL NOT BE ACCEPTABLE. IN GENERAL, MATERIALS AND EQUIPMENT SHALL BE OF COMMERCIAL SPECIFICATION GRADE IN QUALITY, LIGHT DUTY, AND RESIDENTIAL TYPE EQUIPMENT WILL NOT BE ACCEPTED.

THE CONTRACTOR SHALL REMOVE FROM THE PREMISES WASTE MATERIAL PRESENT AS A RESULT OF HIS WORK, INCLUDING CARTONS, GRATING, PAPER, STICKERS, AND/OR EXCAVATION MATERIAL NOT USED IN BACKFILLING, ETC. THE CONTRACTOR SHALL CLEAN EQUIPMENT INSTALLED UNDER THIS CONTRACT TO PRESENT A NEAT AND CLEAN INSTALLATION AT THE TERMINATION OF THE WORK.

PUBLIC AND PRIVATE PROPERTY DAMAGED AS A RESULT OF WORK PERFORMED UNDER THIS CONTRACT SHALL BE REPAIRED OR REPLACED BY THIS CONTRACTOR TO THE SATISFACTION OF AUTHORITIES AND REGULATIONS HAVING JURISDICTION.

**15A 1-4 COORDINATION.**

COORDINATE WORK WITH THAT OF OTHER TRADES SO THAT THE VARIOUS COMPONENTS OF THE SYSTEMS WILL BE INSTALLED AT THE PROPER TIME, WILL FIT THE AVAILABLE SPACE, AND WILL ALLOW PROPER SERVICE ACCESS TO THOSE ITEMS REQUIRING MAINTENANCE. COMPONENTS WHICH ARE INSTALLED WITHOUT REGARD TO THE ABOVE SHALL BE RELOCATED AT NO ADDITIONAL COST TO THE OWNER.

UNLESS OTHERWISE INDICATED, THE GENERAL CONTRACTOR WILL PROVIDE CHASES AND OPENINGS IN BUILDING CONSTRUCTION REQUIRED FOR INSTALLATION OF THE SYSTEMS SPECIFIED HEREIN. THIS CONTRACTOR SHALL FURNISH THE GENERAL CONTRACTOR WITH INFORMATION WHERE CHASES AND OPENINGS ARE REQUIRED. THE CONTRACTOR SHALL KEEP INFORMED AS TO THE WORK OF OTHER TRADES ENGAGED IN THE CONSTRUCTION OF THE PROJECT, AND SHALL EXECUTE HIS WORK IN A MANNER AS TO NOT INTERFERE WITH OR DELAY THE WORK OF OTHER TRADES.

FIGURED DIMENSIONS SHALL BE TAKEN IN PREFERENCE TO SCALE DIMENSIONS. THE CONTRACTOR SHALL TAKE THEIR OWN MEASUREMENTS AT THE BUILDING, AS VARIATIONS MAY OCCUR. THE CONTRACTOR WILL BE HELD RESPONSIBLE FOR ERRORS THAT COULD HAVE BEEN AVOIDED BY PROPER CHECKING AND INSPECTION.

THE CONTRACTOR SHALL PROVIDE MATERIALS WITH TRIM THAT WILL FIT PROPERLY THE TYPES OF CEILING, WALL, OR FLOOR FINISHES ACTUALLY INSTALLED. MODEL NUMBERS LISTED IN THE SPECIFICATIONS OR SHOWN ON THE DRAWINGS ARE NOT INTENDED TO DESIGNATE THE REQUIRED TRIM.

**15A 1-5 ORDINANCES AND CODES.**

WORK PERFORMED UNDER THIS CONTRACT SHALL, AT A MINIMUM, BE IN CONFORMANCE WITH APPLICABLE NATIONAL, STATE AND LOCAL CODES HAVING JURISDICTION. EQUIPMENT FURNISHED AND ASSOCIATED INSTALLATION WORK PERFORMED UNDER THIS CONTRACT SHALL BE IN STRICT COMPLIANCE WITH CURRENT APPLICABLE STANDARDS AS SET FORTH BY THE LOCALLY ENFORCED CODES, NATIONAL FIRE PROTECTION ASSOCIATION (NFPA), UNDERWRITERS LABORATORIES (UL), OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME), AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR CONDITIONING ENGINEERS (ASHRAE), AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI), AMERICAN SOCIETY OF TESTING MATERIALS (ASTM) AND OTHER NATIONAL STANDARDS AND CODES WHERE APPLICABLE. WHERE THE CONTRACT DOCUMENTS EXCEED THE REQUIREMENTS OF THE REFERENCED CODES, STANDARDS, ETC., THE CONTRACT DOCUMENTS SHALL TAKE PRECEDENCE.

THE CONTRACTOR SHALL PROCURE AND PAY FOR PERMITS AND LICENSES REQUIRED FOR THE ACCOMPLISHMENT OF THE WORK HEREIN DESCRIBED. CERTIFICATES OF INSPECTION, WHERE REQUIRED, SHALL BE OBTAINED AND PAID FOR BY THE CONTRACTOR AND FURNISHED TO THE OWNER. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR VIOLATIONS OF THE LAW. THE CONTRACTOR SHALL MAINTAIN NECESSARY SIGNAL LIGHTS AND GUARDS FOR THE SAFETY OF THE PUBLIC.

**15A 1-6 PROTECTION OF EQUIPMENT AND MATERIALS.**

CONTRACTOR SHALL STORE AND PROTECT FROM DAMAGE EQUIPMENT AND MATERIALS AFTER DELIVERY TO JOB SITE. COVER WITH WATERPROOF, TEAR-RESISTANT, HEAVY TARP OR POLYETHYLENE PLASTIC AS REQUIRED TO PROTECT FROM PLASTER, DIRT, PAINT, WATER, OR PHYSICAL DAMAGE. EQUIPMENT AND MATERIAL THAT HAS BEEN DAMAGED BY CONSTRUCTION ACTIVITIES WILL BE REJECTED, AND CONTRACTOR IS OBLIGATED TO FURNISH NEW EQUIPMENT AND MATERIAL OF A LIKE KIND.

KEEP PREMISES BROOM CLEAN FROM FOREIGN MATERIAL CREATED DURING WORK PERFORMED UNDER THIS CONTRACT. PIPING, EQUIPMENT, ETC. SHALL HAVE A NEAT AND CLEAN APPEARANCE AT THE TERMINATION OF THE WORK.

**15A 1-7 SUBSTITUTIONS.**

THE SPECIFICATION PROVIDES THAT THE BASE BID OF CONTRACTORS SHALL INCLUDE ONLY THE PRODUCTS FROM MANUFACTURERS SPECIFICALLY NAMED. THE CONTRACTOR SHALL, IF HE DESIRES TO SUBSTITUTE OTHER THAN SPECIFIED MATERIAL, SUBMIT IN ALTERNATE PROPOSAL FORM, WITH HIS BID, A LIST OF SUCH ITEMS INDICATING ITEM, MANUFACTURER, MODEL NUMBER, AND THAT AMOUNT TO BE ADDED OR DEDUCTED FROM THE BASE BID UNDER THIS ELECTS TO ALLOW SUBSTITUTION. EACH SUCH MATERIAL SUBSTITUTION ITEM SHALL BE SEPARATELY LISTED IN ORDER THAT PROPER CONSIDERATION MAY BE GIVEN. ONLY THE SPECIFIED MATERIAL SHALL BE PROPOSED UNDER THE BASE BID.

THE TERMS "APPROVED", "APPROVED EQUAL", OR "EQUAL" SHALL MEAN APPROVED BY THE ENGINEER AS AN ACCEPTABLE ALTERNATE BID. NO SUBSTITUTIONS WILL BE CONSIDERED THAT ARE NOT BID AS AN ALTERNATE. NO MATERIAL SUBSTITUTIONS SHALL BE CONSIDERED FOR APPROVAL PRIOR TO AWARD OF CONTRACT.

IT IS THE CONTRACTORS RESPONSIBILITY TO COORDINATE AND VERIFY WITH OTHER TRADES THAT THE SUBSTITUTED EQUIPMENT CAN BE INSTALLED AS SHOWN ON THE CONSTRUCTION DRAWINGS WITHOUT MODIFICATION TO ASSOCIATED SYSTEMS OR ARCHITECTURAL OR ENGINEERING DESIGN. THE CONTRACTOR SHALL INCLUDE ADDITIONAL COSTS FOR ARCHITECTURAL AND ENGINEERING DESIGN FEES IN HIS BID IF DRAWING MODIFICATIONS ARE REQUIRED BECAUSE OF SUBSTITUTED EQUIPMENT.

**15A 1-8 SHOP DRAWINGS.**

THE CONTRACTOR SHALL, UPON BEING AWARDED A CONTRACT, SUBMIT FOR APPROVAL SIX (6) COPIES OF MANUFACTURER'S SHOP DRAWINGS FOR EQUIPMENT TO BE FURNISHED UNDER THIS CONTRACT. ITEMS REQUIRING COORDINATION BETWEEN CONTRACTORS AND SHEET METAL DUCTWORK FABRICATION DRAWINGS. BEFORE SUBMITTING SHOP DRAWINGS AND MATERIAL LISTS, THE CONTRACTOR SHALL VERIFY THAT EQUIPMENT SUBMITTED IS MUTUALLY COMPATIBLE AND SUITABLE FOR THE INTENDED USE, AND SHALL FIT THE AVAILABLE SPACE AND ALLOW AMPLE ROOM FOR MAINTENANCE.

THE ENGINEER'S CHECKING AND SUBSEQUENT APPROVAL OF SUCH SHOP DRAWINGS SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ERRORS IN DIMENSIONS, DETAILS, SIZE OF MEMBERS, QUANTITIES, OMISSIONS OF COMPONENTS OR FITTINGS; OR FOR COORDINATING ITEMS WITH ACTUAL BUILDING CONDITIONS. THE CONTRACTOR SHALL PROCEED WITH THE PROCUREMENT AND INSTALLATION OF EQUIPMENT ONLY AFTER RECEIVING APPROVED SHOP DRAWINGS RELATIVE TO EACH ITEM.

CATALOG DATA SHALL BE PROPERLY BOUND, IDENTIFIED, INDEXED AND TABBED IN A 3-RING BINDER. EACH ITEM OR MODEL NUMBER SHALL BE CLEARLY MARKED AND ACCESSORIES INDICATED. CATALOG DATA SHALL HAVE THE EQUIPMENT IDENTIFICATION ACRONYM OR NUMBER AS USED ON DRAWINGS CLEARLY LABELED AND INCLUDE PERFORMANCE CURVES, CAPACITIES, SIZES, MATERIALS, FINISHES, WIRING DIAGRAMS AND DEVIATIONS FROM SPECIFIED EQUIPMENT OR MATERIALS CLEARLY LABELED. MARK OUT INAPPLICABLE ITEMS.

**15A 1-9 GUARANTEE.**

GUARANTEE AGAINST DEFECTIVE WORKMANSHIP AND MATERIAL FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL PAYMENT. GUARANTEE SHALL INCLUDE MATERIAL TO BE REPLACED AND REQUIRED LABOR.

**15A 1-10 CUTTING AND PATCHING.**

THE CONTRACTOR SHALL DO CUTTING OF WALLS, FLOORS, CEILINGS, ETC. AS REQUIRED TO INSTALL WORK UNDER THIS SECTION, AND SHALL OBTAIN PERMISSION FROM THE ARCHITECT BEFORE DOING CUTTING. STRUCTURAL MEMBERS SHALL NOT BE DISTURBED WITHOUT PRIOR APPROVAL FROM THE ARCHITECT. HOLES SHALL BE CUT AS SMALL AS POSSIBLE. GENERAL CONTRACTOR SHALL PATCH WALLS, FLOORS, ETC. AS REQUIRED BY WORK UNDER THIS SECTION. PATCHING SHALL MATCH THE ORIGINAL MATERIAL AND CONSTRUCTION, AND AREAS DISTURBED BY WORK PERFORMED UNDER THIS CONTRACT SHALL BE NEATLY REPAIRED AND REFINISHED TO THE CONDITION OF ADJOINING SURFACES IN A MANNER SATISFACTORY TO THE ARCHITECT.

**15A 1-11 ROUGH-IN.**

COORDINATE WITHOUT DELAY ROUGHING-IN WITH GENERAL CONSTRUCTION. PIPING AND CONDUIT ROUGH-IN SHALL BE CONCEALED EXCEPT IN UNFINISHED AREAS AND WHERE OTHERWISE SHOWN.

**15A 1-12 ACCESS DOORS.**

PROVIDE ACCESS DOORS IN CEILINGS, WALLS, ETC. WHERE INDICATED OR REQUIRED FOR ACCESS OR MAINTENANCE TO CONCEALED VALVES AND EQUIPMENT INSTALLED UNDER THIS SECTION. DOORS SHALL HAVE CONCEALED HINGES, SCREWDRIVER-TYPE LOCK, ANCHOR STRAPS; MANUFACTURED BY MILCOR, ZURN, TITUS, OR EQUAL. OBTAIN ARCHITECT'S APPROVAL OF TYPE AND LOCATIONS BEFORE ORDERING.

**15A 1-13 PENETRATIONS.**

SEAL MECHANICAL FLOOR, WALL AND ROOF PENETRATIONS WATERTIGHT AND WEATHERTIGHT. CAULK AROUND MECHANICAL PENETRATIONS WITH 3M CP-25 FIRE BARRIER CAULK (THICKNESS AS REQUIRED AND RECOMMENDED BY MANUFACTURER) TO MAINTAIN FIRE RESISTANCE RATING OF FIRE-RATED ASSEMBLIES.

PIPING PENETRATIONS THROUGH ROOFS SHALL BE PROVIDED WITH PREFABRICATED ROOF CURBS MANUFACTURED BY CUSTOM CURB, INC., PATE COMPANY, THYCURB OR APPROVED EQUAL. ROOF CURB SHALL BE PROVIDED WITH FACTORY INSTALLED WOOD NAILER, WELDED, 18 GAUGE GALVANIZED STEEL SHELL, BASE PLATE AND FLASHING; 1-1/2" THICK, 3 POUND RIGID INSULATION; FULLY MITERED 3-INCH RAISED GANT; COVER OF WEATHER-RESISTANT, WEATHER-PROOF MATERIAL AND PIPE COLLAR OF WEATHER-RESISTANT MATERIAL WITH STAINLESS STEEL PIPE CLAMPS.

**15A 1-14 AIR FILTERS.**

FILTERS SHALL BE FARR 30/30 THROWAWAY TYPE, OR AS OTHERWISE INDICATED. AIR UNITS SHALL HAVE FILTERS INSTALLED WHEN THEY ARE OPERATED BEFORE FINAL ACCEPTANCE. PROVIDE EXTRA SET OF FILTERS AND INSTALL IN UNITS JUST BEFORE TURNING OVER BUILDING TO OWNER. FILTERS SHALL BE MANUFACTURED BY DUSTSTOP, FARR, CAMBRIDGE, OR APPROVED EQUAL.

**15A 1-15 ELECTRICAL WIRING.**

LINE VOLTAGE WIRING SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR. LINE VOLTAGE CONTROL AND INTERLOCK WIRING FOR MECHANICAL SYSTEMS SHALL ALSO BE FURNISHED BY THE ELECTRICAL CONTRACTOR. LOW VOLTAGE CONTROL WIRING SHALL BE BY THE MECHANICAL CONTRACTOR. CONDUIT FOR THE LOW VOLTAGE CONTROL WIRING SHALL BE BY THE ELECTRICAL CONTRACTOR. THE MECHANICAL CONTRACTOR SHALL PROVIDE WIRING DIAGRAMS TO THE ELECTRICAL CONTRACTOR AS REQUIRED FOR PROPER EQUIPMENT HOOKUP. THIS CONTRACTOR SHALL COORDINATE WITH THE ELECTRICAL CONTRACTOR THE ACTUAL WIRE SIZING AMPS FOR MECHANICAL EQUIPMENT (FROM THE EQUIPMENT NAMEPLATE) TO ENSURE PROPER INSTALLATION.

**15A 1-16 REFRIGERANT AND OIL.**

FURNISH AND INSTALL FULL REFRIGERANT AND OIL CHARGE IN NEW AIR CONDITIONING REFRIGERATION SYSTEMS, AND MAINTAIN IT FOR FULL TERM OF THE GUARANTEE.

**15A 1-17 FINAL TESTING AND ADJUSTMENTS.**

CONTRACTOR SHALL PERFORM TEST READINGS ON FANS, UNITS, COILS, ETC. AND ADJUST EQUIPMENT TO DELIVER SPECIFIED AMOUNTS OF AIR. AIR SHALL BE BALANCED TO WITHIN PLUS/MINUS 10% OF DESIGN REQUIREMENTS. EQUIPMENT SHALL BE ADJUSTED TO OPERATE AS INTENDED BY THE SPECIFICATION. BEARINGS SHALL BE ALIGNED. BEARINGS THAT HAVE DIRT OR FOREIGN MATERIAL IN THEM SHALL BE REPLACED WITH NEW BEARINGS WITHOUT ADDITIONAL COST TO THE OWNER.

THERMOSTATS AND CONTROL DEVICES SHALL BE ADJUSTED TO OPERATE AS INTENDED. ADJUST BURNERS, FANS, ETC. FOR PROPER AND EFFICIENT OPERATION. ADJUST AIR DEVICES TO SUPPLY THE AMOUNT OF AIR SHOWN ON THE DRAWINGS. FURTHER ADJUSTMENTS SHALL BE MADE TO OBTAIN UNIFORM TEMPERATURE IN SPACES. CALIBRATE, SET, AND ADJUST AUTOMATIC TEMPERATURE CONTROLS. CHECK PROPER SEQUENCING OF INTERLOCK SYSTEMS, AND OPERATION OF SAFETY CONTROLS.

**15A2 INSULATION AND SHEET METAL WORK.**

**15A 2-1 DUCT INSULATION, DUCT WRAP.**

CONCEALED RIGID SUPPLY, RETURN, AND OUTSIDE AIR DUCTWORK SHALL BE COVERED WITH 2" THICK DUCT WRAP, CERTAINTED OR EQUAL OWENS-CORNING, 3/4 POUND DENSITY, WITH HEAVY-DUTY FOIL-SCRM-KRAFT FACING, AND WITH JOINTS TAPED WITH 3" WIDE FOIL TAPE.

INSULATING MATERIALS, ADHESIVES, COATINGS, ETC., SHALL HAVE A FLAME SPREAD OF 25 OR LESS AND SMOKE DEVELOPED RATING NOT HIGHER THAN 50. CONTAINERS FOR MASTICS AND ADHESIVES SHALL HAVE U.L. LABEL.

**15A 2-2 DUCTWORK.**

FURNISH AND INSTALL GALVANIZED STEEL DUCTWORK AND HOUSINGS AS SHOWN ON DRAWINGS. DUCTWORK SHALL BE 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 30" WITH 1-1/4" ANGLES NOT LESS THAN 5"-6" ON CENTERS, AND CLOSER IF REQUIRED FOR SUFFICIENT RIGIDITY TO PREVENT VIBRATION. SUPPORT HORIZONTAL RUNS OF DUCT FROM STRAP IRON HANGERS ON CENTERS NOT TO EXCEED 8'-0". DO NOT SUPPORT CEILING GRID, CONDUITS, PIPES, EQUIPMENT, ETC. FROM DUCTWORK.

ALL OFFSETS IN DUCTWORK OF 45 DEGREES OR MORE SHALL HAVE AIRFOIL TYPE TURNING VANES OF SAME GAUGE AS DUCTWORK AND SHALL BE RIGIDLY FASTENED WITH GUIDE STRIPS. VANES IN DUCTWORK OVER 30" DEEP SHALL BE INSTALLED IN MULTIPLE SECTIONS WITH VANES NOT OVER 30" LONG AND SHALL BE RIGIDLY FASTENED.

ALL FANS, BLOWERS, UNITS, ETC. SHALL BE CONNECTED TO DUCTWORK WITH NEOPRENE COATED GLASS CLOTH CANVAS CONNECTIONS, DURO-DYNE ELGON, VENTAFIBRIC OR EQUAL CANVAS CONNECTIONS SHALL HAVE A FLAME SPREAD OF 25 OR LESS AND SMOKE DEVELOPED RATING NOT HIGHER THAN 50.

PROVIDE BALANCING DAMPERS WHERE SHOWN ON DRAWINGS AND WHERE NECESSARY FOR COMPLETE CONTROL OF AIR FLOW. WHERE ACCESS TO DAMPERS THROUGH A HARD CEILING IS REQUIRED, COORDINATE ACCESS DOOR LOCATION WITH ARCHITECT, OR AT CONTRACTOR'S OPTION, A YOUNG'S REGULATOR CONCEALED VOLUME DAMPER WITH EXTENSION ROD AND CEILING OPERATOR MAY BE USED. COORDINATE CEILING OPERATOR LOCATION WITH ARCHITECT. SPLITTER DAMPERS SHALL BE CONTROLLED BY LOCKING QUADRANTS; PROVIDE YOUNG REGULATOR OR VENTLOK END BEARINGS FOR THE DAMPER ROD. VOLUME DAMPERS SHALL BE OPPOSED BLADE INTERLOCKING TYPE. FACTORY MADE BY RUSKIN, APC, AIR BALANCE, OR APPROVED EQUAL.

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	GAUGE
14" & UNDER	26
15" THRU 26"	24

SPIROSAFE PREMANUFACTURED DUCTWORK AND FITTINGS MAY BE SUBSTITUTED FOR SPECIFIED ROUND BRANCH DUCTWORK, AT CONTRACTORS OPTION. HEAVY LIQUID JUNT SEALANT MAY BE OMITTED ON SPIROSAFE DUCTWORK.

LOW PRESSURE (DUCT PRESSURE CLASS UP TO AND INCLUDING 2" W.G.) FITTINGS 24" IN DIAMETER AND LESS SHALL BE PREFABRICATED. SPOTWELDED AND INTERNALLY SEALED. FITTINGS LARGER THAN 24" IN DIAMETER SHALL BE CONTINUOUSLY WELDED. FITTING GAUGE SHALL BE 22 GAUGE FOR 30" FITTINGS AND UNDER, 20 GAUGE FOR LARGER SIZES. 90 DEGREE TEE'S SHALL BE CONICAL TYPE. SEAL LONGITUDINAL AND TRANSVERSE DUCTWORK JOINTS AIRTIGHT WITH HEAVY LIQUID SEALANT APPLIED ACCORDING TO MANUFACTURER'S INSTRUCTIONS. PROVIDE GAUGE THICKNESS IN MEDIUM PRESSURE (DUCT PRESSURE CLASS 2.1" TO 6" W.G.) DUCTWORK AS RECOMMENDED BY SMACNA.

**15A 2-3 FLEXIBLE DUCT.**

LOW PRESSURE (DUCT PRESSURE CLASS UP TO AND INCLUDING 2" W.G.) AND MEDIUM PRESSURE (DUCT PRESSURE CLASS 2.1" TO 6" W.G.) FLEXIBLE DUCT SHALL BE FLEXMASTER TYPE 8, THERMAFLEX TYPE G-KM, OR EQUAL (FIRE RETARDANT POLYETHYLENE) PROTECTIVE VAPOR BARRIER, U.L.181 CLASS 1, ACOUSTICAL INSULATED DUCT, 2" (R-6.7) FIBERGLASS INSULATION. FLEXIBLE DUCTWORK SHALL HAVE CP LNER WITH STEEL WIRE HELIX MECHANICALLY LOCKED OR PERMANENTLY BONDED TO THE LINER. FLEXIBLE DUCT RUNS SHALL NOT EXCEED 5 FEET IN LENGTH, AND SHALL BE INSTALLED STRAIGHT AS POSSIBLE AVOIDING TIGHT TURNS. CONNECT EACH END WITH STAINLESS STEEL SCREW OPERATED METAL DRAWBANDS.

**15A 2-4 AIR DEVICES.**

PROVIDE AIR DEVICES AS SCHEDULED ON DRAWINGS, MANUFACTURED BY CARNES, METAL-AIRE, KRUEGER, NALOR INDUSTRIES, TITUS, TEMPMASTER, OR E.H. PRICE. AIR DEVICES SHALL BE SELECTED 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. CONTRACTOR SHALL COORDINATE FINAL LOCATION, FRAME, AND MOUNTING TYPE OF AIR DEVICES WITH ARCHITECTURAL REFLECTED CEILING PLANS.

**15A 2-5 LOUVERS, PLENUMS, SCREENS.**

PROVIDE BIRDSCREENS AND/OR INSECT SCREENS ON LOUVERS, DUCTS, HOODS, FANS, AND OPENINGS TO THE OUTDOORS AS SCHEDULED AND/OR NOTED ON THE DRAWINGS. BIRDSCREENS SHALL BE NO. 19 GAGE GALVANIZED STEEL. INSECT SCREENS SHALL BE ALUMINUM MESH.

**15A 2-6 EXHAUST AIR SYSTEMS.**

CEILING MOUNTED EXHAUST FANS SHALL BE AS SCHEDULED ON THE DRAWINGS, OR EQUAL COOK, CARNES, OR JENN-AIR, COMPLETE WITH ISOLATED BLOWER UNIT AND CEILING GRILLE. PROVIDE DISCONNECT SWITCH, BACKDRAFT DAMPER, DISCHARGE DUCT, ROOF JACK, AND NEOPRENE VIBRATION ISOLATORS WITH ALL-THREAD HANGING RODS.

**15A3 HVAC EQUIPMENT.**

**15A 3-1 ROOFTOP UNITS (GAS FIRED HEAT).**

TRANE "PRECEDENT" MODEL YSC ELECTRIC COOLING, GAS HEATING ROOFTOP UNITS AS SCHEDULED ON THE DRAWINGS, OR EQUAL CARRIER OR LENOX, 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 COOLING AND CONDENSING CAPACITY EQUAL TO OR GREATER THAN OR EQUAL TO SEER (5 TONS) OR EER (GREATER THAN 5 TONS) RATING OF 10.0 (COOLING); CENTRIFUGAL EVAPORATOR BLOWER; AIR FILTER RACK WITH 2" THROWAWY FILTERS; PROPELLER TYPE CONDENSER FAN; ALUMINIZED STEEL HEAT EXCHANGER; 8 1/2" MINIMUM AFUE RATING (HEATING); FORCED COMBUSTION AIR BLOWER; COMPLETE FACTORY INSTALLED MICRO-PROCESSOR CONTROLS INCLUDING ANTI-SHORT CYCLE TIMERS, TIME DELAY RELAYS AND MINIMUM "ON" TIME CONTROLS, 100% SAFETY GAS SHUTOFF, DIRECT SPARK IGNITION SYSTEM; BUILT-IN THERMAL OVERLOAD PROTECTION ON MOTORS AND COMPRESSORS; MANUAL OUTDOOR AIR DAMPER (25 PERCENT MAX) OR 100% OUTDOOR AIR DRY-BULB OR ENTHALPY ECONOMIZER WITH BAROMETRIC RELIEF DAMPER AS SCHEDULED ON DRAWINGS; WEATHERTIGHT HOUSING CONSTRUCTED OF ZINC COATED, HEAVY GAUGE, GALVANIZED STEEL WITH WEATHER-RESISTANT BAKED ENAMEL FINISH; MINIMUM INSULATED DOWNFLOW ROOF CURB WITH MINIMUM HEIGHT OF 14 INCHES; SINGLE POINT ELECTRICAL POWER CONNECTION. PROVIDE PAINTED, GALVANIZED STEEL WIRE CONDENSER COIL GUARD. UNIT SHALL BE FACTORY SHIPPED WITH INTERNAL UNPOWERED 120 VOLT GFCI CONVENIENCE OUTLET. DIVISION 16 SHALL PROVIDE FUSED DISCONNECT. PROVIDE HONEYWELL OR EQUAL ELECTRONIC PROGRAMMABLE TYPE THERMOSTAT, SEVEN-DAY MODEL, MANUAL CHANGEOVER, SWITCHING SUBBASE, MULTI-STAGE AS REQUIRED TO MATCH UNIT COOLING/HEATING STAGING. PROVIDE AND INSTALL A UL LISTED DUCT TYPE SMOKE DETECTOR IN RETURN AND/OR SUPPLY DUCTWORK AS SPECIFIED ON DRAWINGS TO SHUT DOWN ROOFTOP UNIT UPON DETECTION OF SMOKE. UNIT SHALL BE COMPLETE WITH MAIN YEAR GUARANTEE ON THE COMPRESSORS AND HEAT EXCHANGERS.

**15A4 TEMPERATURE CONTROLS.**

**15A 4-1 TEMPERATURE CONTROLS.**

THE HVAC EQUIPMENT SUPPLIER SHALL INCLUDE WITH HIS EQUIPMENT PACKAGE A SYSTEM OF CONTROLS INCLUDING THERMOSTATS, AND RELAYS REQUIRED TO PROVIDE THE DESIRED SEQUENCE OF OPERATION. THE SUPPLIER SHALL ALSO PROVIDE INTEGRATED WIRING DIAGRAMS SHOWING INTERCONNECTIONS BETWEEN FIELD INSTALLED EQUIPMENT AND PACKAGE WIRING FURNISHED WITH THE HVAC EQUIPMENT. SMOKE DETECTORS WITH UL LISTING (OR HEAT DETECTORS, IF PERMITTED BY CODE) SHALL BE PROVIDED BY THE MECHANICAL CONTRACTOR FOR EACH UNIT TO SHUT DOWN SUPPLY FAN UPON ACTIVATION.

**15A5 SEQUENCE OF OPERATION.**

**15A 5-1 ROOFTOP UNIT CONTROL (NO ECONOMIZER 5-TON AND LESS):**

SET ROOFTOP UNIT SUPPLY FAN TO RUN CONTINUOUS DURING OCCUPIED HOURS TO MAINTAIN MINIMUM VENTILATION. DURING OCCUPIED HOURS, CYCLE STAGE(S) OF COOLING AND HEATING TO MAINTAIN ROOM THERMOSTAT SETPOINT (75 DEGREES FAHRENHEIT ADJUSTABLE). DURING UNOCCUPIED HOURS, PROGRAM THERMOSTAT CONTROL TO CYCLE UNIT TO MAINTAIN THE AREA AT A SETBACK TEMPERATURE AS DETERMINED BY OWNER. PROVIDE A 7-DAY TIMESWITCH TO SWITCH EACH SYSTEM BETWEEN OCCUPIED AND UNOCCUPIED OPERATION. PROVIDE OVERRIDE TIMER SWITCH TO OVERRIDE THE MAIN TIMESWITCH AND BRING THE SPACE TO OCCUPIED OPERATION FOR THE AMOUNT OF TIME INDEXED BY THE SWITCH. DUCT MOUNTED SMOKE DETECTOR SHALL SHUTDOWN UNIT UPON ALARM.

**15A 5-2 ROOFTOP UNIT CONTROL (ENTHALPY ECONOMIZER 6-TON AND GREATER-HUMID REGIONS)**

SET ROOFTOP UNIT SUPPLY FAN TO RUN CONTINUOUS DURING OCCUPIED HOURS TO MAINTAIN MINIMUM VENTILATION. DURING OCCUPIED HOURS, CYCLE STAGE(S) OF COOLING AND HEATING TO MAINTAIN ROOM THERMOSTAT SETPOINT (75 DEGREES FAHRENHEIT ADJUSTABLE). DURING UNOCCUPIED HOURS, PROGRAM THERMOSTAT CONTROL TO CYCLE UNIT TO MAINTAIN THE AREA AT A SETBACK TEMPERATURE AS DETERMINED BY OWNER. PROVIDE FACTORY INSTALLED ECONOMIZER ACCESSORY WITH ENTHALPY SENSOR AND SOLID STATE CONTROLLER. ECONOMIZER DAMPERS SHALL MODULATE TO MAINTAIN 55 DEGREES FAHRENHEIT SUPPLY AIR TEMPERATURE WHEN AMBIENT TEMPERATURE REACHES 60 DEGREES FAHRENHEIT (ADJUSTABLE) OR WHEN AN ENTHALPY LEVEL OF 18 BTU/LB OF DRY AIR (ADJUSTABLE) IS REACHED. RETURN ECONOMIZER TO MINIMUM POSITION WHEN AMBIENT TEMPERATURE IS ABOVE 60 DEGREES FAHRENHEIT OR WHEN ENTHALPY LEVEL EXCEEDS 22 BTU/LB. DUCT MOUNTED SMOKE DETECTORS SHALL SHUTDOWN UNIT UPON ALARM.

**15A 5-3 ROOFTOP UNIT CONTROL (DRY-BULB ECONOMIZER 6-TON AND GREATER-DRY REGIONS)**


SET ROOFTOP UNIT SUPPLY FAN TO RUN CONTINUOUS DURING OCCUPIED HOURS TO MAINTAIN MINIMUM VENTILATION. DURING OCCUPIED HOURS, CYCLE STAGE(S) OF COOLING AND HEATING TO MAINTAIN ROOM THERMOSTAT SETPOINT (75 DEGREES FAHRENHEIT ADJUSTABLE). DURING UNOCCUPIED HOURS, PROGRAM THERMOSTAT CONTROL TO MAINTAIN THE AREA AT A SETBACK TEMPERATURE AS DETERMINED BY OWNER. MODULATE OUTDOOR AIR DRY-BULB ECONOMIZER TO MAINTAIN 55 DEGREES FAHRENHEIT SUPPLY AIR TEMPERATURE WHEN AMBIENT TEMPERATURE REACHES 60 DEGREES FAHRENHEIT (ADJUSTABLE) OR BELOW. RETURN ECONOMIZER TO MINIMUM POSITION WHEN AMBIENT TEMPERATURE IS ABOVE 60 DEGREES FAHRENHEIT. DUCT MOUNTED SMOKE DETECTORS SHALL SHUTDOWN UNIT UPON ALARM.

**15A 5-4 TENANT RESTROOM EXHAUST FAN CONTROL:**

SET TENANT RESTROOM EXHAUST FAN(S) TO ENERGIZE WITH ROOM LIGHT SWITCH DURING OCCUPIED AND UNOCCUPIED HOURS.

NO.	DATE	DESCRIPTION	BY

**DDG DUPLANTIS DESIGN GROUP, PC**  
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