15A: Heating, Ventilating, and Air Conditioning:

15A 1 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. CONTRACTOR SHALL BECOME THOROUGHLY ACQUAINTED WITH ITS CONTENTS AS TO REQUIREMENTS THAT 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 THE PROJECT ARE COMPLEMENTARY, AND PORTIONS OF THE WORK DESCRIBED IN ONE, SHALL BE PROVIDED AS IF DESCRIBED IN BOTH. IN THE EVENT OF DISCREPANCIES, NOTIFY THE ENGINEER AND REQUEST CLARIFICATION PRIOR TO PROCEEDING WITH THE WORK INVOLVED.

15A 1-2 DEFINITIONS

FURNISH: THE TERM "FURNISH" IS USED TO MEAN "SUPPLY AND DELIVER TO THE PROJECT SITE, READY FOR UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION AND SIMILAR OPERATIONS."

INSTALL: THE TERM "INSTALL" IS USED TO DESCRIBE OPERATIONS AT THE PROJECT SITE INCLUDING THE ACTUAL "UNLOADING, UNPACKING, ASSEMBLY, ERECTION, PLACING, ANCHORING, APPLYING, WORKING TO DIMENSION, FINISHING, CURING, PROTECTING, CLEANING, AND SIMILAR OPERATIONS."

PROVIDE: THE TERM "PROVIDE" MEANS "TO FURNISH AND INSTALL, COMPLETE AND READY FOR THE INTENDED USE."

FURNISHED BY OWNER OR FURNISHED BY OTHERS: THE ITEM WILL BE FURNISHED BY THE OWNER OR OTHERS. IT IS TO BE INSTALLED AND CONNECTED UNDER THE REQUIREMENTS OF THIS DIVISION, COMPLETE AND READY FOR OPERATION, INCLUDING ITEMS INCIDENTAL TO THE WORK, INCLUDING SERVICES NECESSARY FOR PROPER INSTALLATION AND OPERATION. THE INSTALLATION SHALL BE INCLUDED UNDER THE GUARANTEE REQUIRED BY THIS DIVISION.

ENGINEER: WHERE REFERENCED IN THIS DIVISION, "ENGINEER" IS THE ENGINEER OF RECORD AND THE DESIGN PROFESSIONAL FOR THE WORK UNDER THIS DIVISION, AND IS A CONSULTANT TO, AND AN AUTHORIZED REPRESENTATIVE OF, THE ARCHITECT, AS DEFINED IN THE GENERAL AND/OR SUPPLEMENTARY CONDITIONS. WHEN USED IN THIS DIVISION, IT MEANS INCREASED INVOLVEMENT BY, AND OBLIGATIONS TO, THE ENGINEER, IN ADDITION TO INVOLVEMENT BY, AND OBLIGATIONS TO, THE "ARCHITECT".

AHJ: THE LOCAL CODE AND/OR INSPECTION AGENCY (AUTHORITY) HAVING JURISDICTION OVER THE WORK.

THE TERMS "APPROVED EQUAL", "EQUIVALENT", OR "EQUAL" ARE USED SYNONYMOUSLY AND SHALL MEAN "ACCEPTED BY OR ACCEPTABLE TO THE ENGINEER AS EQUIVALENT TO THE ITEM OR MANUFACTURER SPECIFIED". THE TERM "APPROVED" SHALL MEAN LABELED, LISTED, OR BOTH, BY A NATIONALLY RECOGNIZED TESTING LABORATORY (E.G. UL, ETL, CSA), AND ACCEPTABLE TO THE AHJ OVER THIS PROJECT.

15A 1-3 PREBID SITE VISIT

PRIOR TO SUBMITTING BID, VISIT 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 1-4 MATERIAL AND WORKMANSHIP

PROVIDE NEW MATERIAL, EQUIPMENT, AND APPARATUS UNDER THIS CONTRACT UNLESS OTHERWISE STATED HEREIN, OF BEST QUALITY NORMALLY USED FOR THE PURPOSE IN GOOD COMMERCIAL PRACTICE, AND FREE FROM DEFECTS. MODEL NUMBERS 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.

PIPE, PIPE FITTINGS, PIPE SPECIALTIES AND VALVES SHALL BE MANUFACTURED IN PLANTS LOCATED IN THE UNITED STATES.

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

THE COMPLETE INSTALLATION SHALL FUNCTION AS DESIGNED AND INTENDED WITH RESPECT TO EFFICIENCY, CAPACITY, NOISE LEVEL, ETC. ABNORMAL NOISE CAUSED BY RATTLING EQUIPMENT, PIPING, DUCTS, AIR DEVICES, AND SQUEAKS 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.

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

REPAIR OR REPLACE PUBLIC AND PRIVATE PROPERTY DAMAGED AS A RESULT OF WORK PERFORMED UNDER THIS CONTRACT TO THE SATISFACTION OF AUTHORITIES AND REGULATIONS HAVING JURISDICTION.

15A 1-5 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. CONTRACTOR SHALL FURNISH THE GENERAL CONTRACTOR WITH INFORMATION WHERE CHASES AND OPENINGS ARE REQUIRED. KEEP INFORMED AS TO THE WORK OF OTHER TRADES ENGAGED IN THE CONSTRUCTION OF THE PROJECT, AND EXECUTE 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. CONTRACTOR SHALL TAKE HIS OWN MEASUREMENTS AT THE BUILDING, AS VARIATIONS MAY OCCUR. CONTRACTOR WILL BE HELD RESPONSIBLE FOR ERRORS THAT COULD HAVE BEEN AVOIDED BY PROPER CHECKING AND INSPECTION.

PROVIDE MATERIALS WITH TRIM THAT WILL PROPERLY FIT 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 1-6 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 CODES ADOPTED BY THE LOCAL AHJ INCLUDING ANY AMENDMENTS AND STANDARDS AS SET FORTH BY THE 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.

PROCURE AND PAY FOR PERMITS AND LICENSES REQUIRED FOR THE ACCOMPLISHMENT OF THE WORK HEREIN DESCRIBED. WHERE REQUIRED, OBTAIN, PAY FOR AND FURNISH CERTIFICATES OF INSPECTION TO OWNER. CONTRACTOR WILL BE HELD RESPONSIBLE FOR VIOLATIONS OF THE LAW.

15A 1-7 PROTECTION OF EQUIPMENT AND MATERIALS

STORE AND PROTECT FROM DAMAGE EQUIPMENT AND MATERIALS DELIVERED 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.

PLUG OR CAP OPEN ENDS OF DUCTWORK AND PIPING SYSTEMS WHILE STORED AND INSTALLED DURING CONSTRUCTION WHEN NOT IN USE TO PREVENT THE ENTRANCE OF DEBRIS INTO THE SYSTEMS.

15A 1-8 SUBSTITUTIONS

THE BASE BID SHALL INCLUDE ONLY THE PRODUCTS FROM MANUFACTURERS SPECIFICALLY NAMED IN THE DRAWINGS AND SPECIFICATIONS. NO SUBSTITUTION WILL BE CONSIDERED PRIOR TO RECEIPT OF BIDS UNLESS WRITTEN REQUEST FOR APPROVAL TO BID HAS BEEN RECEIVED BY THE ENGINEER AT LEAST TEN CALENDAR DAYS PRIOR TO THE DATE FOR RECEIPT OF BIDS. EACH SUCH REQUEST SHALL INCLUDE THE NAME OF THE MATERIAL OR EQUIPMENT FOR WHICH IT IS TO BE SUBSTITUTED AND A COMPLETE DESCRIPTION OF THE PROPOSED SUBSTITUTE INCLUDING DRAWINGS, CUTS, PERFORMANCE AND TEST DATA AND OTHER INFORMATION NECESSARY FOR AN EVALUATION. A STATEMENT SETTING FORTH CHANGES IN OTHER MATERIALS, EQUIPMENT OR OTHER WORK THAT INCORPORATION OF THE SUBSTITUTE WOULD REQUIRE SHALL BE INCLUDED. THE BURDEN OF PROOF OF THE MERIT OF THE PROPOSED SUBSTITUTE IS UPON THE PROPOSER. THE ENGINEER'S DECISION OF APPROVAL OR DISAPPROVAL TO BID OF A PROPOSED SUBSTITUTION SHALL BE FINAL.

THE TERMS "APPROVED", "APPROVED EQUAL", AND "EQUAL" REFER TO APPROVAL 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.

COORDINATE AND VERIFY WITH OTHER TRADES WHETHER OR NOT THE SUBSTITUTED EQUIPMENT CAN BE INSTALLED AS SHOWN ON THE CONSTRUCTION DRAWINGS WITHOUT MODIFICATION TO ASSOCIATED SYSTEMS OR ARCHITECTURAL OR ENGINEERING DESIGN. INCLUDE ADDITIONAL COSTS FOR ARCHITECTURAL AND ENGINEERING DESIGN FEES IN BID IF DRAWING MODIFICATIONS ARE REQUIRED BECAUSE OF SUBSTITUTED EQUIPMENT.

15A 1-9 SHOP DRAWINGS

UPON BEING AWARDED A CONTRACT, SUBMIT TO THE ARCHITECT 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, VERIFY THAT EQUIPMENT SUBMITTED IS MUTUALLY COMPATIBLE AND SUITABLE FOR THE INTENDED USE, AND WILL FIT THE AVAILABLE SPACE AND ALLOW AMPLE ROOM FOR MAINTENANCE.

THE ENGINEER'S CHECKING AND SUBSEQUENT APPROVAL OF SUCH SHOP DRAWINGS WILL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ERRORS IN DIMENSIONS, DETAILS, SIZE OF MEMBERS, QUANTITIES, OMISSIONS OF COMPONENTS OR FITTINGS; COORDINATION OF ELECTRICAL REQUIREMENTS; OR FOR COORDINATING ITEMS WITH ACTUAL BUILDING CONDITIONS. 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. LABEL THE CATALOG DATA WITH THE EQUIPMENT IDENTIFICATION ACRONYM OR NUMBER AS USED ON THE DRAWINGS AND INCLUDE PERFORMANCE CURVES, CAPACITIES, SIZES, MATERIALS, FINISHES, WIRING DIAGRAMS AND DEVIATIONS FROM SPECIFIED EQUIPMENT OR MATERIALS. MARK OUT INAPPLICABLE ITEMS. SHOP DRAWINGS WILL BE RETURNED WITHOUT REVIEW IF THE ABOVE MENTIONED REQUIREMENTS ARE NOT MET.

15A 1-10 ELECTRONIC DRAWING FILES

IN PREPARATION OF SHOP DRAWINGS, CONTRACTOR MAY, AT HIS OPTION, OBTAIN ELECTRONIC DRAWING FILES IN AUTOCAD OR DXF FORMAT ON 3.5 INCH FLOPPY DISK, 100 MB ZIP DISK OR CD-ROM DISK, AS DESIRED, FROM THE ENGINEER FOR A SHIPPING AND HANDLING FEE OF $200 FOR A DRAWING SET UP TO 12 SHEETS AND $15 PER SHEET FOR EACH ADDITIONAL SHEET. CONTRACTOR SHALL CONTACT THE ARCHITECT FOR WRITTEN AUTHORIZATION AND ENGINEER FOR THE NECESSARY RELEASE AGREEMENT FORM AND TO SPECIFY SHIPPING METHOD AND DRAWING FORMAT. IN ADDITION TO PAYMENT, ARCHITECT'S WRITTEN AUTHORIZATION AND ENGINEER'S RELEASE AGREEMENT FORM MUST BE RECEIVED BEFORE ELECTRONIC DRAWING FILES WILL BE SENT.

15A 1-11 OPERATION AND MAINTENANCE INSTRUCTIONS

DURING THE COURSE OF CONSTRUCTION, COLLECT AND COMPILE A COMPLETE BROCHURE OF EQUIPMENT FURNISHED AND INSTALLED ON THIS PROJECT. INCLUDE OPERATIONAL AND MAINTENANCE INSTRUCTIONS, MANUFACTURER'S CATALOG SHEETS, WIRING DIAGRAMS, PARTS LISTS, APPROVED SHOP DRAWINGS, AND DESCRIPTIVE LITERATURE AS FURNISHED BY THE EQUIPMENT MANUFACTURER. INCLUDE AN INSIDE COVER SHEET THAT LISTS THE PROJECT NAME, DATE, OWNER, ARCHITECT, CONSULTING ENGINEER, GENERAL CONTRACTOR, SUB-CONTRACTOR, AND AN INDEX OF CONTENTS.

SUBMIT THREE COPIES OF LITERATURE BOUND IN APPROVED BINDERS WITH INDEX AND TABS SEPARATING EQUIPMENT TYPES TO THE ARCHITECT AT THE TERMINATION OF THE WORK. PAPER CLIPS, STAPLES, RUBBER BANDS, AND MAILING ENVELOPES ARE NOT CONSIDERED APPROVED BINDERS. FINAL APPROVAL OF MECHANICAL SYSTEMS INSTALLED UNDER THIS CONTRACT WILL BE WITHHELD UNTIL THIS EQUIPMENT BROCHURE IS RECEIVED AND DEEMED COMPLETE BY THE ARCHITECT AND ENGINEER. INSTRUCT WORKMEN TO SAVE REQUIRED LITERATURE SHIPPED WITH THE EQUIPMENT ITSELF, FOR INCLUSION IN THIS BROCHURE.

PROVIDE "AS-BUILT" DRAWINGS (SEE DIVISION 1 AND GENERAL CONDITIONS).

15A 1-12 TRAINING

AT A TIME MUTUALLY AGREED UPON BETWEEN THE OWNER AND CONTRACTOR, PROVIDE THE SERVICES OF A FACTORY TRAINED AND AUTHORIZED REPRESENTATIVE TO TRAIN OWNER'S DESIGNATED PERSONNEL ON THE OPERATION AND MAINTENANCE OF THE EQUIPMENT PROVIDED FOR THIS PROJECT.

PROVIDE TRAINING TO INCLUDE BUT NOT BE LIMITED TO AN OVERVIEW OF THE SYSTEM AND/OR EQUIPMENT AS IT RELATES TO THE FACILITY AS A WHOLE; OPERATION AND MAINTENANCE PROCEDURES AND SCHEDULES RELATED TO STARTUP AND SHUTDOWN, TROUBLESHOOTING, SERVICING, PREVENTIVE MAINTENANCE AND APPROPRIATE OPERATOR INTERVENTION; AND REVIEW OF DATA INCLUDED IN THE OPERATION AND MAINTENANCE MANUALS.

SUBMIT A CERTIFICATION LETTER TO THE ARCHITECT STATING THAT THE OWNER'S DESIGNATED REPRESENTATIVE HAS BEEN TRAINED AS SPECIFIED HEREIN. LETTER SHALL INCLUDE DATE, TIME, ATTENDEES AND SUBJECT OF TRAINING. THE CONTRACTOR AND THE OWNER'S REPRESENTATIVE SHALL SIGN THE CERTIFICATION LETTER INDICATING AGREEMENT THAT THE TRAINING HAS BEEN PROVIDED.

SCHEDULE OWNER TRAINING WITH AT LEAST 7 DAYS' ADVANCE NOTICE.

15A 1-13 SPARE PARTS

FURNISH TO OWNER, WITH RECEIPT, THE FOLLOWING SPARE PARTS FOR THE EQUIPMENT FURNISHED FOR THIS PROJECT:

A. ONE SET OF SPARE FILTERS OF EACH TYPE REQUIRED FOR EACH UNIT. IN ADDITION TO THE SPARE SET OF FILTERS, INSTALL NEW FILTERS PRIOR TO TESTING, ADJUSTING, AND BALANCING WORK AND BEFORE TURNING SYSTEM OVER TO OWNER.

B. FURNISH ONE COMPLETE SET OF BELTS FOR EACH FAN.

C. FURNISH THREE OPERATING KEYS FOR EACH TYPE OF AIR OUTLET AND INLET THAT REQUIRE THEM.

15A 1-14 WARRANTIES

WARRANT EACH SYSTEM AND EACH ELEMENT THEREOF AGAINST ALL DEFECTS DUE TO FAULTY WORKMANSHIP, DESIGN OR MATERIAL FOR A PERIOD OF 12 MONTHS FROM DATE OF SUBSTANTIAL COMPLETION, UNLESS SPECIFIC ITEMS ARE NOTED TO CARRY A LONGER WARRANTY IN THE CONSTRUCTION DOCUMENTS OR MANUFACTURER'S STANDARD WARRANTY EXCEEDS 12 MONTHS. REMEDY ALL DEFECTS, OCCURRING WITHIN THE WARRANTY PERIOD(S), AS STATED IN THE GENERAL CONDITIONS AND DIVISION 1.

WARRANTIES SHALL INCLUDE LABOR AND MATERIAL. MAKE REPAIRS OR REPLACEMENTS WITHOUT ANY ADDITIONAL COSTS TO THE OWNER.

PERFORM THE REMEDIAL WORK PROMPTLY, UPON WRITTEN NOTICE FROM THE ENGINEER OR OWNER.

AT THE TIME OF SUBSTANTIAL COMPLETION, DELIVER TO THE OWNER ALL WARRANTIES, IN WRITING AND PROPERLY EXECUTED, INCLUDING TERM LIMITS FOR WARRANTIES EXTENDING BEYOND THE ONE YEAR PERIOD, EACH WARRANTY INSTRUMENT BEING ADDRESSED TO THE OWNER AND STATING THE COMMENCEMENT DATE AND TERM.

15A 1-15 CUTTING AND PATCHING

PERFORM CUTTING OF WALLS, FLOORS, CEILINGS, ETC. AS REQUIRED TO INSTALL WORK UNDER THIS SECTION. OBTAIN PERMISSION FROM THE ARCHITECT PRIOR TO CUTTING. DO NOT CUT OR DISTURB STRUCTURAL MEMBERS WITHOUT PRIOR APPROVAL FROM THE ARCHITECT. CUT HOLES 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. REPAIR AND REFINISH AREAS DISTURBED BY WORK TO THE CONDITION OF ADJOINING SURFACES IN A MANNER SATISFACTORY TO THE ARCHITECT.

15A 1-16 ROUGH-IN

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

15A 1-17 CONCRETE BASES

PROVIDE CONCRETE BASES FOR EQUIPMENT WHERE INDICATED ON THE DRAWINGS AND AS SPECIFIED HEREIN. CONCRETE BASES SHALL HAVE CHAMFERED EDGES. SIZE OF PAD SHALL BE A MINIMUM OF 4" GREATER THAN THE FOOTPRINT OF THE EQUIPMENT THAT IT IS SUPPORTING AND SHALL HAVE A MINIMUM HEIGHT OF 3-1/2".

CONSTRUCT EQUIPMENT BASES AND HOUSEKEEPING PADS OF A MINIMUM 28 DAY, 4000 PSI CONCRETE CONFORMING TO AMERICAN CONCRETE INSTITUTE STANDARD BUILDING CODE FOR REINFORCED CONCRETE (ACI 318-99) AND THE LATEST APPLICABLE RECOMMENDATIONS OF THE ACI STANDARD PRACTICE MANUAL. CONCRETE SHALL BE COMPOSED OF CEMENT CONFORMING TO ASTM C 150 TYPE I, AGGREGATE CONFORMING TO ASTM C33, AND POTABLE WATER. EXPOSED EXTERIOR CONCRETE SHALL CONTAIN 5 TO 7 PERCENT AIR ENTRAINMENT.

UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE STRUCTURAL DRAWINGS, REINFORCE EQUIPMENT BASES AND HOUSEKEEPING PADS WITH NO. 4 REINFORCING BARS CONFORMING TO ASTM A 615 OR 6X6 - W2.9 X W2.9 WELDED WIRE MESH CONFORMING TO ASTM A185. PLACE REINFORCING BARS 24" ON CENTER WITH A MINIMUM OF TWO BARS EACH DIRECTION

PROVIDE GALVANIZED ANCHOR BOLTS FOR EQUIPMENT PLACED ON CONCRETE EQUIPMENT BASES AND HOUSEKEEPING PADS OR ON CONCRETE SLABS. ANCHOR BOLTS SIZE, NUMBER AND PLACEMENT SHALL BE AS RECOMMENDED BY THE MANUFACTURER OF THE EQUIPMENT.

15A 1-18 STRUCTURAL STEEL

STRUCTURAL STEEL USED FOR SUPPORT OF EQUIPMENT, DUCTWORK AND PIPING SHALL BE NEW, CLEAN, AND CONFORM TO ASTM DESIGNATION A-36.

SUPPORT MECHANICAL COMPONENTS FROM THE BUILDING STRUCTURE. DO NOT SUPPORT MECHANICAL COMPONENTS FROM CEILINGS, OTHER MECHANICAL OR ELECTRICAL COMPONENTS, AND OTHER NON-STRUCTURAL ELEMENTS.

15A 1-20 PENETRATIONS

SEAL MECHANICAL FLOOR, EXTERIOR WALL AND ROOF PENETRATIONS WATERTIGHT AND WEATHERTIGHT. SEAL 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.

15A 1-21 AIR FILTERS

PROVIDE FARR 30/30 PLEATED, THROWAWAY TYPE FILTERS, UNLESS OTHERWISE INDICATED. AIR UNIT SHALL HAVE NEW FILTERS INSTALLED WHEN IT IS OPERATED BEFORE FINAL ACCEPTANCE. FILTERS SHALL BE MANUFACTURED BY AMERICAN AIR FILTER, FARR, FLANDERS, OR APPROVED EQUAL.

IF HVAC EQUIPMENT IS USED DURING THE CONSTRUCTION PERIOD, CONTRACTOR SHALL PROVIDE ONE SET OF FILTERS WHEN THE UNIT IS STARTED AND REPLACE FILTERS WHEN NEEDED, BUT NOT LESS THAN EVERY MONTH. ON THE DAY OF SUBSTANTIAL COMPLETION, THE CONTRACTOR SHALL CLEAN THE UNIT AND PROVIDE A NEW SET OF FILTERS IN THE UNIT.

15A 1-22 MOTORS AND STARTERS

PROVIDE MOTORS AND STARTING EQUIPMENT WHERE NOT FURNISHED WITH THE EQUIPMENT PACKAGE. MOTORS SHALL HAVE COPPER WINDINGS, CLASS B INSULATION, AND STANDARD SQUIRREL CAGE WITH STARTING TORQUE CHARACTERISTICS SUITABLE FOR THE EQUIPMENT SERVED. MOTORS FOR AIR HANDLING EQUIPMENT SHALL BE SELECTED FOR QUIET OPERATION. EACH MOTOR SHALL BE CHECKED FOR PROPER ROTATION AFTER ELECTRICAL CONNECTION HAS BEEN COMPLETED. PROVIDE DRIPPROOF ENCLOSURE FOR LOCATIONS PROTECTED FROM WEATHER AND NOT IN AIR STREAM OF FAN; AND TOTALLY ENCLOSED FAN COOLED ENCLOSURE FOR MOTORS EXPOSED TO WEATHER. MOTORS SHALL BE MANUFACTURED BY CENTURY, GENERAL ELECTRIC, WESTINGHOUSE, LOUIS ALLIS, OR APPROVED EQUAL.

PROVIDE EVERY MOTOR, EXCEPT FRACTIONAL HORSEPOWER SINGLE PHASE MOTORS WITH AN APPROVED TYPE OF "BUILT-IN" THERMAL OVERLOAD PROTECTION, WITH A MOTOR STARTER. EACH STARTER SHALL BE PROVIDED WITH OVERLOAD HEATERS SIZED TO THE MOTOR RATING, AND EVERY THREE PHASE MOTOR STARTER SHALL HAVE OVERLOAD HEATERS IN EACH PHASE. AMBIENT COMPENSATED HEATERS SHALL BE INSTALLED WHEREVER NECESSARY. UNLESS NOTED OTHERWISE, MOTOR STARTERS SHALL BE FURNISHED BY THE DIVISION 15 CONTRACTOR FOR INSTALLATION AND CONNECTION BY THE DIVISION 16 CONTRACTOR. STARTERS SHALL BE ALLEN-BRADLEY, CLARK, FURNAS, SQUARE D, OR APPROVED EQUAL.

15A 1-23 ELECTRICAL WIRING

LINE VOLTAGE WIRING SHALL BE PROVIDED BY DIVISION 16. LINE VOLTAGE CONTROL AND INTERLOCK WIRING FOR MECHANICAL SYSTEMS SHALL ALSO BE PROVIDED BY DIVISION 16 CONTRACTOR. LOW VOLTAGE CONTROL WIRING SHALL BE PROVIDED BY THE DIVISION 15 CONTRACTOR. FURNISH WIRING DIAGRAMS TO THE DIVISION 16 CONTRACTOR AS REQUIRED FOR PROPER EQUIPMENT HOOKUP. COORDINATE WITH THE DIVISION 16 CONTRACTOR THE ACTUAL WIRE SIZING AMPS FOR MECHANICAL EQUIPMENT (FROM THE EQUIPMENT NAMEPLATE) TO ENSURE PROPER INSTALLATION.

15A 1-24 REFRIGERANT AND OIL

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

15A 1-25 FINAL TESTING AND ADJUSTMENTS

FINAL SYSTEM TESTING, BALANCING AND ADJUSTMENTS SHALL BE PERFORMED BY A CONTRACTOR CERTIFIED BY THE NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB), ASSOCIATED AIR BALANCE COUNCIL (AABC) OR OTHER APPROVED AGENCY. PERFORM TEST READINGS ON FANS, UNITS, COILS, ETC. AND ADJUST EQUIPMENT TO DELIVER SPECIFIED AMOUNTS OF AIR. PREPARE TESTING AND BALANCING REPORT LOG SHOWING AIR SUPPLY QUANTITIES, AIR ENTERING AND LEAVING TEMPERATURES AND PRESSURES, FAN AND UNIT TEST READINGS, MOTOR VOLTAGE AND AMP DRAWS, ETC., AND SUBMIT SIX COPIES OF THE FINAL COMPILATION OF DATA TO THE ARCHITECT FOR EVALUATION AND APPROVAL BEFORE FINAL INSPECTION OF THE PROJECT. BALANCE AIR SYSTEMS TO WITHIN PLUS OR MINUS 10 PERCENT FOR TERMINAL DEVICES AND BRANCH LINES AND PLUS OR MINUS 5 PERCENT FOR MAIN DUCTS AND AIR HANDLING EQUIPMENT OF THE AMOUNT OF AIR SHOWN ON THE DRAWINGS. FURTHER ADJUSTMENTS SHALL BE MADE TO OBTAIN UNIFORM TEMPERATURE IN SPACES. ADJUST EQUIPMENT TO OPERATE AS INTENDED BY THE SPECIFICATION. ALIGN BEARINGS AND REPLACE BEARINGS THAT HAVE DIRT OR FOREIGN MATERIAL IN THEM WITH NEW BEARINGS WITHOUT ADDITIONAL COST TO THE OWNER. BALANCE CONTRACTOR SHALL INCLUDE IN THE REPORT ANY IMPROPERLY INSTALLED OR MISSING BALANCING DEVICES THAT WOULD NEGATIVELY IMPACT THE SYSTEM OPERATION.

ADJUST THERMOSTATS AND CONTROL DEVICES TO OPERATE AS INTENDED. ADJUST BURNERS, PUMPS, FANS, ETC. FOR PROPER AND EFFICIENT OPERATION. CERTIFY TO ARCHITECT THAT ADJUSTMENTS HAVE BEEN MADE AND THAT SYSTEM IS OPERATING SATISFACTORILY. 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.

15A 1-26 EQUIPMENT FURNISHED BY OTHERS

PROVIDE NECESSARY EQUIPMENT AND ACCESSORIES THAT ARE NOT PROVIDED BY THE EQUIPMENT SUPPLIER OR OWNER TO COMPLETE INSTALLATION OF COOKING EQUIPMENT, WASHING EQUIPMENT, ETC., FURNISHED BY OTHERS, IN LOCATIONS AS INDICATED ON THE DRAWINGS AND/OR DESCRIBED IN THE GENERAL NOTES TO THIS CONTRACTOR. EQUIPMENT AND ACCESSORIES NOT PROVIDED BY THE EQUIPMENT SUPPLIER MAY INCLUDE FLUES, VENTS, INTAKES, ASSOCIATED ROOF JACKS AND CAPS TO OUTDOORS, DAMPERS, IN-LINE FANS, ROOF FANS, CONTROL INTERLOCKS, ETC. AS REQUIRED FOR PROPER OPERATION OF THE COMPLETE SYSTEM IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.

CONTRACTOR SHALL BE RESPONSIBLE FOR CORRECT ROUGH-IN DIMENSIONS, AND SHALL VERIFY SAME WITH ARCHITECT AND/OR EQUIPMENT SUPPLIER PRIOR TO SERVICE INSTALLATIONS.

15A 1-28 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 1-29 VIBRATION ISOLATION

MANUFACTURERS: PROVIDE VIBRATION ISOLATION EQUIPMENT AND MATERIALS BY A SINGLE MANUFACTURER. APPROVED MANUFACTURERS PROVIDED THEIR SYSTEMS ARE IN COMPLIANCE WITH THE SPECIFIED DESIGN AND PERFORMANCE REQUIREMENTS INCLUDE AMBER BOOTH, KINETICS NOISE CONTROL, MASON INDUSTRIES, INC., VIBRATION ELIMINATOR CO., INC., AND VIBRATION MOUNTING AND CONTROLS.

GENERAL REQUIREMENTS: SELECT VIBRATION ISOLATORS BY THE WEIGHT DISTRIBUTION TO PRODUCE UNIFORM DEFLECTION. VIBRATION ISOLATORS SHALL HAVE EITHER KNOWN UN-DEFLECTED HEIGHTS OR CALIBRATION MARKINGS SO THAT, AFTER ADJUSTMENT, THE STATIC DEFLECTION CAN BE VERIFIED, THUS DETERMINING THAT THE LOAD IS WITHIN THE PROPER RANGE OF THE ISOLATOR. ISOLATORS SHALL OPERATE IN THE LINEAR PORTION OF THEIR LOAD VERSUS DEFLECTION CURVES. SPRING ISOLATORS SHALL HAVE 50 PERCENT EXCESS CAPACITY WITHOUT BECOMING COIL BOUND. COAT VIBRATION ISOLATORS WITH FACTORY-APPLIED PAINT. COAT VIBRATION ISOLATORS EXPOSED TO WEATHER AND OTHER CORROSIVE ENVIRONMENTS WITH FACTORY-APPLIED CORROSION RESISTANCE PROTECTION. INSTALL AND ADJUST VIBRATION ISOLATORS IN ACCORDANCE WITH MANUFACTURERS WRITTEN INSTRUCTIONS.

PIPE CONNECTIONS. FLEXIBLE PIPING CONNECTORS SHALL BE INSTALLED TO CONNECT PIPING TO RECIPROCATING OR ROTATING EQUIPMENT. FABRICATE FLEXIBLE PIPING CONNECTORS FROM STAINLESS STEEL, BRONZE OR RUBBER MATERIALS AS SUITABLE FOR SYSTEM FLUID. FLEXIBLE PIPING CONNECTORS SHALL BE BELLOWS, SPHERICAL OR BRAIDED HOSE TYPE AS RECOMMENDED BY THE MANUFACTURER FOR THE APPLICATION.

ISOLATOR TYPES

A. TYPE WP (WAFFLE PADS): PROVIDE 5/16 INCH THICK NEOPRENE PADS RIBBED OR WAFFLED ON BOTH SIDES. MANUFACTURE PADS WITH BRIDGE BEARING QUALITY NEOPRENE, AND SELECT FOR A MAXIMUM DUROMETER OF 50 AND DESIGNED FOR 15 PERCENT STRAIN. INCORPORATE STEEL LOAD-SPREADING PLATES WHERE REQUIRED BETWEEN THE EQUIPMENT AND THE NEOPRENE PAD. IF THE ISOLATOR IS BOLTED TO THE STRUCTURE, INSTALL A NEOPRENE VIBRATION ISOLATION WASHER AND SLEEVE (UNIROYAL TYPE 620/660 OR AS APPROVED) SHALL BE INSTALLED UNDER THE BOLT HEAD BETWEEN THE STEEL WASHER AND THE BASE PLATE. PROVIDE MASON INDUSTRIES TYPE W OR EQUAL.

B. TYPE SPNH (SPRING AND NEOPRENE HANGERS): PROVIDE A STEEL SPRING IN SERIES WITH A NEOPRENE ISOLATING ELEMENT. THE SPRING SHALL HAVE A MINIMUM ADDITIONAL TRAVEL TO SOLID EQUAL TO 50 PERCENT OF THE SPECIFIED DEFLECTION. THE NEOPRENE ELEMENT SHALL HAVE A STATIC DEFLECTION OF NOT LESS THAN 0.3 INCHES WITH A STRAIN NOT EXCEEDING 15 PERCENT. UNLESS OTHERWISE SPECIFIED, THE STATIC DEFLECTION OF SPNH HANGERS SHALL BE 2 INCHES. SPRING DIAMETER AND HANGER BOX HOLE SIZE SHALL BE LARGE ENOUGH TO PERMIT THE HANGER ROD TO SWING THROUGH A 30 DEGREE ARC. PROVIDE NEOPRENE SLEEVE WHERE THE LOWER HANGER ROD PASSES THROUGH THE STEEL HANGER BOX, SUCH THAT THE HANGER ROD CANNOT CONTACT THE STEEL HANGER. THE DIAMETER OF THE CLEAR HOLE IN THE HANGER BOX SHALL BE AT LEAST 3/4 INCH LARGER THAN THE DIAMETER OF THE HANGER ROD. WHEN INSTALLED, DO NOT COCK THE SPRING ELEMENT AND DO NOT ALLOW THE HANGER BOX TO ROTATE THROUGH A FULL 360 DEGREE ARC WITHOUT ENCOUNTERING OBSTRUCTIONS. PROVIDE MASON INDUSTRIES TYPE 30N OR EQUAL.

15A 1-30 PIPE AND VALVE MARKERS

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.

15A 2 INSULATION AND SHEET METAL WORK

15A 2-1 DUCT INSULATION

PROVIDE DUCT LINER IN RECTANGULAR SUPPLY AND RETURN AIR DUCTWORK. LINER SHALL BE 1-1/2"(MINIMUM R-8.0) THICK, 3 POUND DENSITY FIBERGLASS, CERTAINTEED CORP. "TOUGHGARD" OR OWENS-CORNING "AEROFLEX DUCT LINER". LINER SURFACE SHALL SERVE AS A BARRIER AGAINST INFILTRATION OF DUST AND DIRT, SHALL MEET ASTM C 1338 FOR FUNGI RESISTANCE AND SHALL BE CLEANABLE USING DUCT CLEANING METHODS AND EQUIPMENT OUTLINED BY NORTH AMERICAN INSULATION MANUFACTURERS ASSOCIATION (NAIMA) DUCT CLEANING GUIDE. INSTALL WITH LINER ADHESIVE AND MECHANICAL FASTENERS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. DUCTWORK SIZES SHOWN ON DRAWINGS ARE INSIDE CLEAR DIMENSIONS. INCREASE SHEET METAL BY LINER THICKNESS IN BOTH DIRECTIONS WHERE LINER IS INSTALLED.

COVER CONCEALED RIGID ROUND AND RECTANGULAR SUPPLY AND RETURN AIR DUCTWORK, ROUND OUTSIDE AIR DUCTWORK, AND ROUND AND RECTANGULAR EXHAUST AND RELIEF AIR DUCTWORK WITHIN 10 FEET OF EXTERIOR DISCHARGE OUTLETS WITH 2" (MINIMUM R-8.0) THICK DUCT WRAP, CERTAINTEED OR EQUAL OWENS-CORNING, 3/4 POUND DENSITY, WITH HEAVY-DUTY FOIL-SCRIM-KRAFT FACING, AND WITH JOINTS TAPED WITH 3" WIDE FOIL TAPE.

INSULATING MATERIALS, ADHESIVES, COATINGS, ETC., SHALL NOT EXCEED FLAME SPREAD RATING OF 25 AND SMOKE DEVELOPED RATING OF 50 PER ASTM E 84. CONTAINERS FOR MASTICS AND ADHESIVES SHALL HAVE U.L. LABEL.

15A 2-2 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 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. COORDINATE ROUTING OF DUCTWORK WITH OTHER CONTRACTORS SUCH THAT PIPING, ELECTRICAL CONDUIT, AND ASSOCIATED SUPPORTS ARE NOT ROUTED THROUGH THE DUCTWORK.

CONSTRUCT SUPPLY DUCTS TO MEET SMACNA POSITIVE PRESSURE OF 2" W.G. CONSTRUCT RETURN, OUTDOOR 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.

SEAL DUCTWORK WITH HEAVY LIQUID SEALANT, HARDCAST IRONGRIP 601, DESIGN POLYMER DP 1010 , UNITED MCGILL DUCT SEALER OR APPROVED EQUAL, APPLIED ACCORDING TO SEALANT MANUFACTURER'S INSTRUCTIONS. FOR DUCTS WITH PRESSURE CLASSIFICATION OF 2" W.G. 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. TAPES AND MASTICS SHALL BE LISTED AND LABELED IN ACCORDANCE WITH UL 181A.

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.

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, NAILOR INDUSTRIES, CESCO, LOUVERS & DAMPERS, POTTORFF OR APPROVED EQUAL, WHERE SHOWN ON DRAWINGS AND WHEREVER NECESSARY FOR COMPLETE CONTROL OF AIR FLOW. SPLITTER DAMPERS SHALL BE CONTROLLED BY LOCKING QUADRANTS; PROVIDE YOUNG REGULATOR OR VENTLOK END BEARINGS FOR THE DAMPER ROD. RECTANGULAR VOLUME DAMPERS SHALL BE OPPOSED BLADE 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 6.5 CFM/SQUARE FOOT IN FULL CLOSED POSITION AT 4" WG PRESSURE DIFFERENTIAL ACROSS DAMPER. REFERENCE MANUFACTURER AND MODEL NUMBER FOR OUTSIDE AIR DAMPERS IS RUSKIN MODEL CD-50. PROVIDE "SPIN-IN" FITTING WITH STANDOFF CONNECTION AND VOLUME DAMPER FOR ROUND DUCTWORK BRANCH TAKEOFFS TO INDIVIDUAL AIR DEVICES.

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
28" THRU 36"	22
38" THRU 50"	20
52" THRU 60"	18

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. CONTINUOUSLY WELD FITTINGS LARGER THAN 24" IN DIAMETER. FITTING GAUGE SHALL BE 22 GAUGE FOR 36" 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 3" 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 8B, THERMAFLEX TYPE G-KM, OR EQUAL (FIRE RETARDANT POLYETHYLENE) PROTECTIVE VAPOR BARRIER, U.L.181 CLASS 1, ACOUSTICAL INSULATED DUCT, 2" (R-6.0) FIBERGLASS INSULATION. PROVIDE CPE LINER 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. INSTALL FLEXIBLE DUCT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS. AT A MINIMUM, INSTALL TWO WRAPS OF DUCT TAPE AROUND 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 2-4 FLUES

WHERE FLUES ARE INDICATED ON THE DRAWINGS, PROVIDE SELKIRK METALBESTOS MODEL QC OR RV OR EQUAL BY METAL-FAB, SIMPSON OR VAN-PACKER, TYPE "B" DOUBLE WALL GAS VENT FLUES FROM THE VARIOUS ITEMS OF GAS-FIRED EQUIPMENT UP TO FLUE CAPS ABOVE THE ROOF. SINGLE WALL FLUES ARE UNACCEPTABLE. FLUES SHALL BE COMPLETE WITH NECESSARY FITTINGS, CONNECTORS, FLASHING CONE, STORM COLLAR, THIMBLE SUPPORTS, GUY WIRES, AND OTHER ACCESSORIES, AND SHALL BE INSTALLED AS RECOMMENDED BY THE MANUFACTURER, AND IN CONFORMANCE WITH APPLICABLE CODES. FLASH FLUES WATERTIGHT AT THE ROOF LINE.

15A 2-7 AIR DEVICES

PROVIDE AIR DEVICES AS SCHEDULED ON DRAWINGS, MANUFACTURED BY CARNES, E.H. PRICE, KRUEGER, NAILOR INDUSTRIES OR TITUS. 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.

15A 2-10 LOUVERS, PLENUMS, SCREENS

PROVIDE INTAKE AIR LOUVER BY RUSKIN MODEL ELF375X OR EQUAL GREENHECK, AMERICAN WARMING & VENTILATING, CESCO, INDUSTRIAL LOUVERS OR LOUVERS & DAMPERS AS SCHEDULED ON THE DRAWINGS. COORDINATE EXACT SIZE AND LOCATION WITH ARCHITECTURAL DRAWINGS. LOUVER SHALL BE STATIONARY, WITH MILL FINISH. LOUVER SHALL HAVE EXTRUDED ALUMINUM BLADES, 0.080" WALL THICKNESS, 45 DEGREE BLADE ANGLE, BLADES ON 5" CENTERS; FRAME SHALL BE EXTRUDED ALUMINUM, 0.080" WALL THICKNESS; WITH EXPANDED FLATTENED ALUMINUM BIRDSCREEN. PROVIDE LOUVER WITH A MINIMUM FREE AREA OF 45 PERCENT, WITH A MAXIMUM AIR PRESSURE DROP OF 0.1" AT SCHEDULED AIRFLOW.

CONSTRUCT PLENUM WITH GALVANIZED STEEL FRAMING MEMBERS AND GALVANIZED SHEETMETAL, BRACED WITH GALVANIZED ANGLES. GAUGES AND BRACING SHALL CONFORM TO SMACNA RECOMMENDATIONS FOR DUCTWORK OF LIKE SIZES. WHERE ACCESS DOORS ARE SHOWN PROVIDE HINGED DOORS WITH #202 VENTLOK LATCH. MAKE WATERTIGHT CONNECTION TO LOUVER, SLOPING BOTTOM OF PLENUM TO DRAIN WATER TO WEEPHOLES IN BOTTOM OF LOUVER.

PROVIDE BIRDSCREENS AND/OR INSECT SCREEN ON LOUVER, DUCTS, HOODS, FANS, AND OPENINGS TO THE OUTDOORS AS SCHEDULED AND/OR NOTED ON THE DRAWINGS. BIRDSCREENS SHALL BE 1/2" MESH INSECT SCREENS SHALL BE ALUMINUM MESH.

15A 2-[illegible] EXHAUST AIR SYSTEMS

PROVIDE CEILING MOUNTED EXHAUST FANS AS SCHEDULED ON THE DRAWINGS, OR EQUAL COOK, GREENHECK, CARNES, TWIN CITY FANS, ACME OR PENNBARRY COMPLETE WITH ISOLATED BLOWER UNIT AND CEILING GRILLE. PROVIDE DISCONNECT SWITCH, BACKDRAFT DAMPER, DISCHARGE DUCT, ROOF GOOSENECK, AND NEOPRENE VIBRATION ISOLATORS WITH ALL-THREAD HANGING RODS.

15A 3 HVAC EQUIPMENT

15A 3-4 CONDENSING UNITS [1.5-6 TONS]

PROVIDE SPLIT SYSTEM, AIR COOLED CONDENSING UNITS AS SCHEDULED ON THE DRAWINGS, MANUFACTURED BY TRANE. COMPLETE WITH FACTORY INSTALLED HERMETIC OR SEMI-HERMETIC MOTOR/COMPRESSOR ASSEMBLY WITH INTERNAL SPRING VIBRATION ISOLATION, BUILT-IN THERMAL OVERLOAD PROTECTION, AND CRANKCASE HEATER; TOP DISCHARGE CONDENSER FAN AND MOTOR LOW AMBIENT CONTROLS FOR OPERATION TO 25°F; ANTI-SHORT CYCLE TIMERS; TIME DELAY RELAYS; FACTORY INSTALLED LIQUID LINE DRIER AND LOW PRESSURE SWITCH; FULL REFRIGERANT HOLDING CHARGE; AND WEATHERTIGHT HOUSING CONSTRUCTED OF ZINC COATED, HEAVY GAUGE, GALVANIZED STEEL WITH WEATHER-RESISTANT BAKED ENAMEL FINISH AND FACTORY INSTALLED CONDENSER COIL GUARDS. UNIT SHALL CARRY A FIVE YEAR GUARANTEE ON THE COMPRESSOR AND REFRIGERANT CIRCUIT, AND A ONE YEAR GUARANTEE ON THE REMAINING COMPONENTS. PROVIDE 3-1/2" THICK CONCRETE SLAB FOR CONDENSING UNIT LOCATED ON GRADE.

15A 3-6 AIR HANDLING UNITS WITH GAS HEAT [AND DX COIL, 1.5-5 TONS]

PROVIDE SPLIT SYSTEM, AIR HANDLING UNITS AS SCHEDULED ON THE DRAWINGS, MANUFACTURED BY TRANE. CONFIGURATION COMPLETE WITH ZINC COATED, HEAVY GAUGE, GALVANIZED STEEL CABINET WITH WEATHER-RESISTANT BAKED ENAMEL FINISH; INTERNALLY INSULATED; ACCESS DOORS; DIRECT EXPANSION COOLING COIL SECTION OF ALUMINUM/COPPER CONSTRUCTION; CONDENSATE DRAIN PAN; STATICALLY AND DYNAMICALLY BALANCED CENTRIFUGAL FAN SECTION WITH BUILT-IN MOTOR THERMAL OVERLOAD PROTECTION; FACTORY INSTALLED AND WIRED CONTROLS AND SINGLE POINT ELECTRICAL POWER CONNECTION; MAGNETIC MOTOR STARTERS AND CONTRACTORS AS REQUIRED; AIR FILTER RACK WITH 1" THICK HEPA THROWAWAY FILTERS; PROVIDE GAS FURNACE WITH CODE REQUIRED INTEGRAL SAFETY FEATURES AND CONTROLS. 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. DIVISION 16 CONTRACTOR SHALL PROVIDE A UL LISTED DUCT TYPE SMOKE DETECTOR IN SUPPLY AIR AND RETURN AIR DUCTWORK TO SHUT DOWN FAN COIL UNIT UPON DETECTION OF SMOKE. PROVIDE SPRING VIBRATION ISOLATORS AND ALL-THREAD HANGING RODS FOR HORIZONTAL INSTALLATION.

15A 3-14 GAS UNIT HEATERS

PROVIDE WHERE INDICATED ON THE DRAWINGS, STANDARD TYPE, GAS-FIRED, PROPELLER UNIT HEATERS, MANUFACTURED BY REZNOR. NO SUBSTITUTIONS ALLOWED, FURNISH WITH CAPACITIES NOTED, AND COMPLETE WITH AUTOMATIC PILOT, MAIN AND PILOT SHUTOFF COCKS, ELECTRIC GAS VALVE, INTEGRAL DRAFT DIVERTER, GAS PRESSURE REGULATOR, AND WITH 100 PERCENT AUTOMATIC GAS SHUTOFF CONTROL. PROVIDE HEATER FAN MOTORS RATED FOR 120 VOLT, 60 CYCLE, SINGLE PHASE OPERATION AND EACH FURNISHED COMPLETE WITH A MANUAL MOTOR STARTER WITH OVERLOAD HEATERS SIZED TO THE MOTOR LOAD. CONTROL EACH UNIT HEATER BY THE USE OF A HONEYWELL LINE VOLTAGE THERMOSTAT, PENDANT MOUNTED FROM CONDUIT ON AN ELECTRICAL BOX, 9" BELOW THE HEATER CASING.

HANG GAS-FIRED HEATERS FROM SUPPORTING ANGLES CONNECTING TO THE STRUCTURE ABOVE WITH 1/2" STEEL ALL-THREAD ROD, IN AN APPROVED MANNER. LOCATE EACH UNIT HEATER SO THERE WILL BE VERTICAL CLEARANCE OF NOT LESS THAN 6" FROM THE TOP OF THE UNIT TO A COMBUSTIBLE MATERIAL. GARAGE CEILING IS 14'-0" AFF. AND HEIGHT OF THE UNIT HEATER IS 41". THIS PUTS THE BOTTOM OF THE HEATER AT 12'-0" AFF. ALSO, WHERE POSSIBLE, RUN OF AT LEAST 3 FEET MEASURED ALONG THE CENTERLINE OF THE VENT PIPE, FROM THE HEATER TO THE POINT WHERE THE VENT PIPE PIERCES OR PASSES THROUGH COMBUSTIBLE MATERIAL.

15A 3-22 REFRIGERANT PIPING AND INSULATION

PROVIDE ASTM B 88, TYPE L OR ASTM B 280, TYPE ACR HARD DRAWN COPPER REFRIGERANT PIPING, CLEANED AND SEALED AT THE FACTORY, AND SPECIFICALLY DESIGNED FOR REFRIGERANT. FITTINGS SHALL BE HARD DRAWN AND HAVE LONG RADIUS TURNS. SOLDER JOINTS WITH "SILFOS" (15 PERCENT SILVER, 5 PERCENT PHOSPHORUS, 80 PERCENT COPPER, 1300 DEGREES FAHRENHEIT FLOW TEMPERATURE). SOLDER JOINTS WITH A SLOW STREAM OF DRY NITROGEN PASSING THROUGH THE PIPING.

INSULATE SUCTION LINES WITH 3/4" FOAMED PLASTIC INSULATION, ARMAFLEX OR EQUAL. PIPING INSULATION SHALL HAVE A FLAME SPREAD OF 25 OR LESS, AND A SMOKE DEVELOPED RATING OF 50 OR LESS WHEN TESTED IN ACCORDANCE WITH ASTM E84. COAT INSULATION THAT IS EXPOSED TO THE ELEMENTS WITH A PROTECTIVE SEALER. INSTALL AND SUPPORT PIPING TO KEEP NOISE AND VIBRATION TO A MINIMUM. SUPPORT AND SECURE PIPING TO UNISTRUT TYPE SUPPORTS SO THAT NO VIBRATION PASSES TO THE BUILDING STRUCTURE. PIPE ATTACHMENTS SHALL BE COPPER-PLATED OR HAVE NONMETALLIC COATING FOR ELECTROLYTIC PROTECTION WHERE ATTACHMENTS ARE IN DIRECT CONTACT WITH COPPER TUBING. INSTALL A SUPPORT WITHIN ONE FOOT OF EACH CHANGE OF DIRECTION. MOUNT PIPE HANGERS AROUND THE OUTSIDE OF THE INSULATION WITH SADDLES TO PREVENT HANGERS FROM RUPTURING THE INSULATION. REPLACE INSULATION THAT IS CUT OR BROKEN BY THE HANGERS.

RUN REFRIGERANT LINES PARALLEL AND PERPENDICULAR TO WALL AND FLOOR LINES AND TO APPEAR STRAIGHT AND IN GOOD ORDER. PITCH SUCTION LINES DOWN SLIGHTLY (1" IN 20') TOWARDS THE COMPRESSOR. PROVIDE OIL TRAPS AT THE BASE OF VERTICAL SUCTION RISERS OVER 6 FEET HIGH.

INSTALL LIQUID LINE SIGHT GLASSES IN LIQUID LINES NEAREST THE CONDENSING UNITS. FACTORY MOUNT EXPANSION VALVES WITH THE SENSING BULBS SHIPPED LOOSE. FIELD MOUNT EXPANSION VALVE BULB AFTER REFRIGERANT PIPING IS COMPLETE (DAMAGE MAY OCCUR IF BULBS COME IN CONTACT WITH HEAT).

FOR SYSTEMS OF 5 TON CAPACITY AND SMALLER, THE CONTRACTOR SHALL HAVE THE OPTION TO PROVIDE COPPER REFRIGERANT TUBING LINE SET SIZED AS RECOMMENDED BY EQUIPMENT MANUFACTURER AND OF LENGTH AS REQUIRED FOR THE INSTALLATION. PROVIDE 3/4" THICK FOAMED PLASTIC INSULATION, ARMAFLEX OR EQUAL, ON THE SUCTION LINE. PROVIDE QUICK-CONNECT FLARE TUBING COMPRESSION FITTINGS OR SOLDER CONNECTIONS AS REQUIRED TO MATCH THE CONNECTIONS OF THE CONDENSING UNIT AND EVAPORATOR COIL.

15A 3-23 SYSTEM EVACUATION AND CHARGING

BLOW OUT REFRIGERATION LINES WITH DRY NITROGEN AT A SUITABLE PRESSURE BEFORE MAKING FINAL CONNECTION AT THE CONDENSING UNIT OR COIL TO ENSURE AGAINST DIRT, SCALE, OR OTHER FOREIGN MATERIAL BEING IN THE LINES. DRAW A VACUUM TO 29" OF MERCURY. BREAK THIS VACUUM BY CHARGING DRY REFRIGERANT GAS INTO THE SYSTEM, RAISING THE PRESSURE TO 0 PSIG. REPEAT THE LATTER TWO STEPS FOR A TRIPLE EVACUATION BEFORE THE FINAL EVACUATION IS STARTED. MAKE FINAL EVACUATION BY REDUCING THE SYSTEM ABSOLUTE PRESSURE TO A MAXIMUM OF 0.5 MILLIMETERS (500 MICRONS) AND ALLOWING THE PUMP TO RUN AT THIS PRESSURE FOR A MINIMUM OF TWO HOURS.

REPEAT THE PROPER AMOUNT OF REFRIGERANT CHARGE PER THE MANUFACTURER'S RECOMMENDATIONS. RECORD THE AMOUNT OF REFRIGERANT BY WEIGHT CHARGED INTO THE SYSTEM FOR EACH CIRCUIT RECORDED TO THE NEAREST 1/4 POUND ON TAGS AND ATTACH TAGS TO THE LIQUID LINE NEAR THE CONDENSING UNIT. REFRIGERANT SHALL BE SUPPLIED BY THE HVAC CONTRACTOR.

15A 4 TEMPERATURE CONTROLS

15A 4-1 GENERAL REQUIREMENTS

PROVIDE A SYSTEM OF TEMPERATURE CONTROLS INCLUDING THERMOSTATS, CONTROL PANELS, TIME SWITCHES, OVERRIDE TIMERS, DAMPER MOTORS, AND RELAYS REQUIRED TO PROVIDE THE DESIRED SEQUENCE OF OPERATION. PROVIDE INTEGRATED WIRING DIAGRAMS SHOWING INTERCONNECTIONS BETWEEN FIELD INSTALLED EQUIPMENT AND PACKAGE WIRING FURNISHED WITH THE HVAC EQUIPMENT.

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

15A 4-2 EQUIPMENT

MANUFACTURERS AND MODEL NUMBERS ARE LISTED FOR REFERENCE AS TO QUALITY AND FEATURES REQUIRED FOR THE CONTROL DEVICES. PROVIDE CONTROL DEVICES BY BARBER-COLMAN, HONEYWELL, JOHNSON CONTROLS, TRANE OR WHITE RODGERS WITH QUALITY AND FEATURES AS INDICATED.

SEVEN DAY PROGRAMMABLE, OCCUPIED/UNOCCUPIED THERMOSTATS FOR MULTIPLE STAGES OF HEATING AND COOLING SHALL BE HONEYWELL SERIES T7350 OR EQUAL WITH INTEGRAL SUBBASE. INSTALL THERMOSTATS AT 48" AFF TO MEET ADA REQUIREMENTS UNLESS OTHERWISE NOTED ON THE PLANS.

PROVIDE DAMPER OPERATOR FOR EACH AUTOMATIC DAMPER WITH SUFFICIENT CAPACITY TO OPERATE THE DAMPER UNDER ALL CONDITIONS AND TO GUARANTEE TIGHT CLOSE-OFF OF DAMPERS AGAINST 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. DAMPER OPERATORS SHALL BE MANUFACTURED BY BELIMO, JOHNSON CONTROLS OR APPROVED EQUAL.

DIVISION 16 SHALL PROVIDE DUCT TYPE SMOKE DETECTORS WITH UL LISTING (OR HEAT DETECTORS, IF PERMITTED BY CODE) FOR EACH UNIT TO SHUT DOWN SUPPLY FAN UPON ACTIVATION. 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 5 SEQUENCE OF OPERATION

15A 5-1 AIR HANDLING UNIT CONTROL

DURING OCCUPIED HOURS, OPERATE AIR HANDLING UNIT SUPPLY FAN CONTINUOUSLY AND OPEN OUTDOOR AIR DAMPER TO MINIMUM POSITION TO MAINTAIN MINIMUM VENTILATION CYCLE STAGE(S) OF DX COOLING AND HEATING TO MAINTAIN ROOM THERMOSTAT SET POINT (75 DEGREES FAHRENHEIT COOLING, 70 DEGREES FAHRENHEIT HEATING). DUCT MOUNTED SMOKE DETECTORS SHALL BE PROVIDED AND AND SHALL SHUTDOWN THE UNIT UPON ALARM.

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

15A5-2 RESTROOM EXHAUST FAN CONTROL

EXHAUST FANS EF-1 AND EF-2 SHALL BE INTERLOCKED WITH LIGHT SWITCH. FAN SHALL BE ENERGIZED WHEN LIGHT IS ON AND DE-ENERGIZED WHEN LIGHT IS OFF.

15A5-3 GARAGE EXHAUST FAN CONTROL

EXHAUST FAN EF-3 SHALL BE INTERLOCKED WITH WALL SWITCH AND MOTORIZED OUTSIDE AIR DAMPER AND FAN SHALL BE ENERGIZED WHEN WALL SWITCH IS ON AND DE-ENERGIZED WHEN WALL SWITCH IS OFF.

15A5-4 GARAGE OSCILLATING SUPPLY FAN CONTROL

SUPPLY FANS SF-1 THROUGH SF-4 SHALL BE INTERLOCKED WITH WALL SWITCH AND SHALL BE ENERGIZED WHEN WALL SWITCH IS ON AND DE-ENERGIZED WHEN WALL SWITCH IS OFF.

15A5-5 GARAGE UNIT HEATING

UNIT HEATERS UH-1 AND UH-2 SHALL ENERGIZE TO MAINTAIN THERMOSTAT SET POINT AND SHALL DE-ENERGIZE WHEN SPACE SET POINT IS REACHED.

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Revisions
1/23/20 - Prototype Update
1 4/1/20 - City Comments
2 4/9/20 - T2 Client Rev.

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