

\$PT-%u15A: Heating, Ventilating, and Air Conditioning%%U

%%U15A GENERAL INSTRUCTIONS%%U

%%U15A GENERAL REQUIREMENTS%%U

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.

%%U15A DEFINITIONS%%U

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.

%%U15A PREBID SITE VISIT%%U

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.

%%U15A MATERIAL AND WORKMANSHIP%%U

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.

%%U15A COORDINATION%%U

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.

%%U15A ORDINANCES AND CODES%%U

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.

%%U15A PROTECTION OF EQUIPMENT AND MATERIALS%%U

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.

%%U15A SUBSTITUTIONS%%U

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.

%%U15A 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. HIGHLIGHT, MARK, LIST OR INDICATE THE MATERIALS, PERFORMANCE CRITERIA AND ACCESSORIES THAT ARE BEING PROPOSED. SUBMIT SHOP DRAWINGS AS EARLY AS REQUIRED TO SUPPORT THE PROJECT SCHEDULE. ALLOW FOR TWO WEEKS ENGINEER REVIEW TIME PLUS MAILING TIME PLUS A DUPLICATION OF THIS TIME FOR RESUBMITTAL IF REQUIRED.

SUBMITTALS AND SHOP DRAWINGS SHALL NOT CONTAIN HEI'S FIRM NAME OR LOGO, NOR SHALL IT CONTAIN THE HEI'S ENGINEERS' SEAL AND SIGNATURE. THEY SHALL NOT BE COPIES OF HEI'S WORK PRODUCT. IF THE CONTRACTOR DESIRES TO USE ELEMENTS OF SUCH PRODUCT, REFER TO PARAGRAPH "ELECTRONIC DRAWING FILES" FOR PROCEDURES TO BE USED.

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. LABEL THE CATALOG DATA WITH THE EQUIPMENT IDENTIFICATION ACRONYM OR NUMBER AS USED ON THE DRAWINGS AND INCLUDE PERFORMANCE CURVES, CAPACITIES, SIZES, WEIGHTS, MATERIALS, FINISHES, WIRING DIAGRAMS, ELECTRICAL REQUIREMENTS AND DEVIATIONS FROM SPECIFIED EQUIPMENT OR MATERIALS. FOR EQUIPMENT WITH MOTOR STARTERS OR VFDS, INCLUDE SHORT CIRCUIT CURRENT RATINGS. MARK OUT INAPPLICABLE ITEMS. SHOP DRAWINGS WILL BE RETURNED WITHOUT REVIEW IF THE ABOVE MENTIONED REQUIREMENTS ARE NOT MET.

REFER TO DIVISION 1 FOR ACCEPTANCE OF ELECTRONIC SUBMITTALS FOR THIS PROJECT. FOR ELECTRONIC SUBMITTALS, CONTRACTOR SHALL SUBMIT THE DOCUMENTS IN ACCORDANCE WITH THE PROCEDURES SPECIFIED IN DIVISION 1. CONTRACTOR SHALL NOTIFY THE ARCHITECT AND ENGINEER THAT THE SHOP DRAWINGS HAVE BEEN POSTED. IF ELECTRONIC SUBMITTAL PROCEDURES ARE NOT

DEFINED IN DIVISION 1, CONTRACTOR SHALL INCLUDE THE WEBSITE, USER NAME AND PASSWORD INFORMATION NEEDED TO ACCESS THE SUBMITTALS. FOR SUBMITTALS SENT BY E-MAIL, CONTRACTOR SHALL COPY THE ARCHITECT AND ENGINEER'S DESIGNATED REPRESENTATIVES. CONTRACTOR SHALL ALLOW THE ENGINEER REVIEW TIME AS SPECIFIED ABOVE IN THE CONSTRUCTION SCHEDULE. CONTRACTOR SHALL SUBMIT ONLY THE DOCUMENTS REQUIRED TO PURCHASE THE MATERIALS AND/OR EQUIPMENT IN THE ELECTRONIC SUBMITTAL AND SHALL CLEARLY INDICATE THE MATERIALS, PERFORMANCE CRITERIA AND ACCESSORIES BEING PROPOSED. GENERAL PRODUCT CATALOG DATA NOT SPECIFICALLY NOTED TO BE PART OF THE SPECIFIED PRODUCT WILL BE REJECTED AND RETURNED WITHOUT REVIEW.

%%U15A ELECTRONIC DRAWING FILES

IN PREPARATION OF SHOP DRAWINGS OR RECORD DRAWINGS, CONTRACTOR MAY, AT HIS OPTION, OBTAIN ELECTRONIC DRAWING FILES IN AUTOCAD OR DXF FORMAT ON **CD-ROM DISK, DVD DISK, FLASH DRIVE OR DIRECT DOWNLOAD**, 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.

%%U15A OPERATION AND MAINTENANCE INSTRUCTIONS%%U

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).

%%U15A TRAINING%%U

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.

%%U15A SPARE PARTS%%U

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

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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.

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%%U15A WARRANTIES%%U

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.

%%U15A CUTTING AND PATCHING%%U

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.

%%U15A ROUGH-IN%%U

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

%%U15A STRUCTURAL STEEL%%U

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.

%%U15A ACCESS DOORS%%U

CONTRACTOR TO FIELD DETERMINE REQUIRED LOCATIONS FOR ACCESS OR MAINTENANCE OF INSTALLED EQUIPMENT, VALVES, DAMPERS, ETC. AND PROVIDE ACCESS DOORS IN CEILINGS, WALLS, ETC. WHERE INDICATED OR REQUIRED. OBTAIN ARCHITECT'S APPROVAL OF TYPE, SIZE, LOCATION AND COLOR BEFORE ORDERING. PROVIDE CONCEALED HINGES, SCREWDRIVER-TYPE LOCK, ANCHOR STRAPS; MANUFACTURED BY MILCOR, ZURN, TITUS, OR EQUAL.

%%U15A PENETRATIONS%%U

PROVIDE SLEEVES FOR PIPES PASSING THROUGH ABOVE GRADE CONCRETE OR MASONRY WALLS, CONCRETE FLOOR OR ROOF SLABS. SLEEVES ARE NOT REQUIRED FOR CORE DRILLED HOLES IN EXISTING MASONRY WALLS, CONCRETE FLOORS OR ROOFS. PROVIDE 10 GAUGE GALVANIZED STEEL SLEEVES FOR SLEEVES 6" AND SMALLER. PROVIDE GALVANIZED SHEET METAL SLEEVES FOR LARGER THAN 6". SCHEDULE 40 PVC SLEEVES ARE ACCEPTABLE FOR INSTALLATION IN AREAS WITHOUT RETURN AIR PLENUMS.

SEAL ELEVATED FLOOR, EXTERIOR WALL AND ROOF PENETRATIONS WATERTIGHT AND WEATHERTIGHT WITH NON-SHRINK, NON-HARDENING COMMERCIAL SEALANT. PACK WITH MINERAL WOOL AND SEAL BOTH ENDS WITH MINIMUM OF 1/2" OF SEALANT. SEAL AROUND PENETRATIONS OF FIRE RATED ASSEMBLIES. COORDINATE FIRE RATINGS AND LOCATIONS WITH THE ARCHITECTURAL DRAWINGS. REFER TO ARCHITECTURAL SPECIFICATIONS FOR FIRE STOPPINGS. PROVIDE A PRODUCT SCHEDULE FOR UL LISTING, LOCATION, WALL OR FLOOR RATING AND INSTALLATION DRAWING FOR EACH PENETRATION FIRE STOP SYSTEM.

EXTEND PIPE INSULATION FOR INSULATED PIPE THROUGH FLOOR, WALL AND ROOF PENETRATIONS, INCLUDING FIRE RATED WALLS AND FLOORS. THE VAPOR BARRIER SHALL BE MAINTAINED. SIZE SLEEVE FOR A MINIMUM OF 1" ANNULAR CLEAR SPACE BETWEEN INSIDE OF SLEEVE AND OUTSIDE OF INSULATION.

PROVIDE PREFABRICATED ROOF CURBS MANUFACTURED BY CUSTOM CURB, INC., PATE COMPANY, THYCURB OR APPROVED EQUAL. PROVIDE ROOF CURB 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 CANT; COVER OF WEATHER-RESISTANT, WEATHER-PROOF MATERIAL AND PIPE COLLAR OF WEATHER-RESISTANT MATERIAL WITH STAINLESS STEEL PIPE CLAMPS.

PROVIDE BOX FRAMES FOR RECTANGULAR OPENINGS WELDED 12 GAUGE GALVANIZED STEEL ATTACHED TO FORMS AND OF A MAXIMUM DIMENSION ESTABLISHED BY THE ARCHITECT. NOTIFY THE GENERAL CONTRACTOR OR

ARCHITECT BEFORE INSTALLING ANY BOX OPENINGS NOT SHOWN ON THE ARCHITECTURAL OR STRUCTURAL DRAWINGS.

SEAL CONCRETE OR MASONRY EXTERIOR WALL PENETRATIONS BELOW GRADE WITH "WALL PIPES" AND MECHANICAL SLEEVE SEALS. PROVIDE CAST IRON "WALL PIPES" WITH INTEGRAL WATERSTOP RING MANUFACTURED BY JOSAM, JAY R. SMITH, WADE, WATTS OR ZURN. PROVIDE MODULAR MECHANICAL SLEEVE SEALS, MANUFACTURED BY THUNDERLINE / LINK SEAL, CALPICO, INC. AND METRAFLEX.

SEAL ELEVATED CONCRETE SLAB WITH WATER PROOF MEMBRANE PENETRATIONS WITH "WALL PIPES" AND WATER PROOF SEALANT. SECURE WATERPROOF MEMBRANE FLASHING BETWEEN "WALL PIPE" CLAMPING FLANGE AND CLAMPING RING. PROVIDE CAST IRON "WALL PIPES" WITH INTEGRAL WATERSTOP RING MANUFACTURED BY JOSAM, JAY R. SMITH, WADE, WATTS OR ZURN.

PROVIDE SLEEVES FOR HORIZONTAL PIPE PASSING THROUGH OR UNDER FOUNDATION. SLEEVES SHALL BE CAST IRON SOIL PIPE TWO NOMINAL PIPE SIZES LARGER THAN THE PIPE SERVED.

PROVIDE SCHEDULE 40 PVC PIPE SLEEVES FOR VERTICAL PRESSURE PIPE PASSING THROUGH CONCRETE SLAB ON GRADE. SLEEVES SHALL BE ONE NOMINAL PIPE SIZE LARGER THAN THE PIPE SERVED AND TWO PIPE SIZES LARGER THAN PIPE SERVED FOR DUCTILE IRON PIPES WITH RESTRAINING RODS. SEAL WATER-TIGHT WITH SILICONE CAULK.

PROVIDE 1/2" THICK CELLULAR FOAM INSULATION AROUND PERIMETER OF NON-PRESSURE PIPE PASSING THRU CONCRETE SLAB ON GRADE. INSULATION SHALL EXTEND TO 2" ABOVE AND BELOW THE CONCRETE SLAB.

%%U15A AIR FILTERS%%U

PROVIDE FARR 30/30, PLEATED, THROWAWAY TYPE FILTERS, OR SIMILAR AS MANUFACTURED BY AMERICAN AIR FILTER, FLANDERS OR APPROVED EQUAL, UNLESS OTHERWISE INDICATED. AIR UNITS SHALL HAVE NEW FILTERS INSTALLED WHEN THEY ARE OPERATED BEFORE FINAL ACCEPTANCE.

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.

%%U15A MOTORS AND STARTERS%%U

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 CONTROLLED BY VARIABLE FREQUENCY DRIVES SHALL BE RATED FOR VOLTAGE PEAKS AND MINIMUM RISE TIMES IN ACCORDANCE WITH NEMA MG1, PART 31. 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.

%%U15A ELECTRICAL WIRING%%U

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.

%%U15A REFRIGERANT AND OIL%%U

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

%%U15A FINAL TESTING AND ADJUSTMENTS%%U

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.

%%U15A EQUIPMENT FURNISHED BY OTHERS%%U

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.

%%U15A MISCELLANEOUS REMODELING WORK%%U

REMOVE ALL UNUSED EQUIPMENT, DUCTWORK, PIPING AND ASSOCIATED SUPPORTS. CAP DUCTWORK AND PIPING AT MAINS AND SEAL AIR AND WATER TIGHT.

PROVIDE ITEMS OF HVAC SYSTEMS MODIFICATION REQUIRED BECAUSE OF BUILDING REMODELING, AS NOTED ON THE DRAWINGS OR NECESSARY FOR PROPER OPERATION. MATCH EXISTING MATERIALS AND CONSTRUCTION TECHNIQUES WHEN MODIFYING EXISTING SYSTEMS UNLESS SPECIFIED OTHERWISE. COORDINATE ADDITIONAL REQUIREMENTS WITH GENERAL CONTRACTOR AND ARCHITECT.

SEAL AIRTIGHT EXISTING DUCTWORK REQUIRED TO BE ABANDONED IN PLACE OR NOT IN USE AT THE TERMINATION OF THE WORK.

CAP AND SEAL WEATHERTIGHT EXISTING ROOF CURBS AND ROOF OPENINGS TO BE ABANDONED IN PLACE AS A RESULT OF EQUIPMENT REMOVAL.

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

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

%%U15A BUILDING OPERATION%%U

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.

%%U15A VIBRATION ISOLATION%%U

MANUFACTURERS: PROVIDE VIBRATION ISOLATION EQUIPMENT AND MATERIALS BY A SINGLE MANUFACTURER. IF TYPE AND DEFLECTION FOR SPECIFIC EQUIPMENT IS NOT SPECIFIED WITHIN THE CONTRACT DOCUMENTS, REFERENCE ASHRAE HANDBOOK "HVAC APPLICATIONS" OR PROVIDE PER MANUFACTURER'S RECOMMENDATIONS. 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. PROVIDE FLEXIBLE CONNECTORS FOR PIPING SYSTEM CONNECTIONS ON EQUIPMENT SIDE OF SHUTOFF VALVES FOR ALL PUMPS, MECHANICAL EQUIPMENT SUPPORTED OR SUSPENDED BY SPRING ISOLATORS, AND WHERE INDICATED ON DRAWINGS. 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

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TYPE SPNM (SPRING AND NEOPRENE MOUNTS): PROVIDE FREE-STANDING AND LATERALLY STABLE STEEL SPRING WITHOUT A HOUSING. DESIGN SPRINGS SO THE RATIO OF THE HORIZONTAL TO VERTICAL SPRING CONSTANT IS BETWEEN ONE AND TWO. THE SPRING DIAMETER SHALL BE NOT LESS THAN 80% OF THE COMPRESSED HEIGHT OF THE SPRING AT RATED LOAD. LOADED SPRINGS SHALL HAVE A MINIMUM ADDITIONAL TRAVEL TO SOLID EQUAL TO 50% OF THE SPECIFIED STATIC DEFLECTION. UNLESS OTHERWISE SPECIFIED, THE MINIMUM STATIC DEFLECTION OF SPNM ISOLATORS FOR EQUIPMENT MOUNTED ON GRADE SLABS SHALL BE 1 INCH, AND THE MINIMUM STATIC DEFLECTION FOR EQUIPMENT MOUNTED ABOVE GRADE LEVEL SHALL BE 2 INCHES. BOND TWO TYPE WP ISOLATION PADS SANDWICHING A 16 GAUGE STAINLESS OR GALVANIZED STEEL SEPARATOR PLATE TO THE ISOLATOR BASEPLATE. UNLESS OTHERWISE SPECIFIED, ISOLATORS NEED NOT BE BOLTED TO THE FLOOR FOR INDOOR INSTALLATIONS. IF THE BASE PLATES ARE BOLTED TO THE STRUCTURE, INSTALL A NEOPRENE VIBRATION ISOLATION WASHER AND SLEEVE (UNIROYAL TYPE 620/660 OR AS APPROVED) UNDER THE BOLT HEAD BETWEEN THE STEEL WASHER AND THE BASE PLATE. PROVIDE MASON INDUSTRIES TYPE SLFH OR EQUAL.

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%%U15A MECHANICAL IDENTIFICATION%%U

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 MAINTENANCE 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 FOLLOWING 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.

%%U15A DUCT INSULATION, DUCTWORK, ACCESSORIES, FLUES AND FANS%%U

%%U15A DUCT INSULATION%%U

PROVIDE DUCT LINER IN FIRST 10 FEET OF RECTANGULAR SUPPLY AND RETURN AIR DUCTWORK. LINER SHALL BE 2" THICK, 3 POUND DENSITY FIBERGLASS, MINIMUM **R-8.0** CERTAINTEED CORP. "TOUGHGARD" OR EQUIVALENT OWENS-CORNING OR KNAUF LONG TEXTILE FIBER 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 DUCTWORK WITH 2" THICK, 3/4 POUND DENSITY, MINIMUM **R-6.0** DUCT WRAP, CERTAINTEED OR EQUIVALENT OWENS-CORNING OR KNAUF WITH HEAVY-DUTY FOIL-SCRIM-KRAFT FACING, AND WITH JOINTS TAPED WITH 3" WIDE FOIL TAPE AS FOLLOWS:

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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 10 FEET OF EXTERIOR DISCHARGE.

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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 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.

FOR SUPPLY AND RETURN DUCTWORK THAT IS LOCATED EXTERIOR TO THE BUILDING, INSULATION SHALL CONSIST OF ONE OF THE FOLLOWING THREE OPTIONS:

A. 2" THICKNESS OF ARMATUFF FLEXIBLE ELASTOMERIC INSULATION (R-8.0) OR EQUIVALENT MEETING ASTM C534 WITH 12 MILS THICK UV RESISTANT CLADDING LAMINATED AT FACTORY. COVER ALL SEAMS WITH ARMATUFF SEAL TAPE.

B. 2" THICKNESS OF ARMAFLEX FLEXIBLE ELASTOMERIC INSULATION (R-8.0) OR EQUIVALENT MEETING ASTM C534 WITH 20 GAUGE CORRUGATED ALUMINUM JACKET WITH ALUMINUM FITTING COVERS AND MINIMUM THREE ALUMINUM ATTACHMENT BANDS PER SECTION.

C. 2" THICKNESS OF ARMAFLEX FLEXIBLE ELASTOMERIC INSULATION (R-8.0) OR EQUIVALENT MEETING ASTM C534 WITH 15.5 MILS THICK VENTURECLAD PLUS UV RESISTANT CLADDING.

INSTALL EXTERIOR DUCTWORK WITH SUFFICIENT SLOPE TO ENSURE THAT WATER CANNOT POND ANYWHERE ON THE DUCT. DRAINAGE MUST BE ACHIEVED BY SLOPING DUCTWORK – NOT BY VARYING THE INSULATION THICKNESS. LOCATE LONGITUDINAL SEAMS OF OUTER SHELL (ALUMINUM, FLEXIBLE ELASTOMERIC, OR CLADDING AS APPLICABLE) AT BOTTOM OF DUCT. INSTALL CLADDING IN STRICT CONFORMANCE WITH CLADDING MANUFACTURER'S INSTRUCTIONS.

%%U15A DUCTWORK%%U

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 NON-VAV 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 1" W.G. CONSTRUCT EXHAUST DUCTWORK DOWNSTREAM OF FANS TO MEET SMACNA POSITIVE PRESSURE OF 1" W.G.

DUCTWORK ABOVE ROOF OR OTHERWISE EXTERIOR TO BUILDING SHALL BE MINIMUM #18 GAUGE WITH LONGITUDINAL AND TRANSVERSE JOINTS WELDED OR SEALED AIRTIGHT WITH WEATHERPROOF HEAVY LIQUID SEALANT APPLIED ACCORDING TO MANUFACTURER'S INSTRUCTIONS.

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. 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. TAPES 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 SEAL 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, 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 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 **["SPIN-IN" FITTING WITH DOUBLE BEARING VOLUME DAMPER]** **["SPIN-IN" FITTING WITH STANDOFF CONNECTION AND VOLUME DAMPER]** FOR ROUND DUCTWORK BRANCH TAKEOFFS TO INDIVIDUAL AIR DEVICES. OMIT DAMPER AT TAKEOFF FITTING WHEN 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.):

%%USIZE%%U	%%UDUCT GAUGE%%U	%%UFITTING GAUGE%%U
14" & UNDER	26	24
15" THRU 26"	24	22
28" THRU 36"	22	20
38" THRU 50"	20	20

LINDAB SPIROSAFE, LEWIS & LAMBERT OR APPROVED EQUAL FACTORY-MANUFACTURED ROUND DUCTWORK AND FITTINGS MAY BE SUBSTITUTED FOR SPECIFIED ROUND BRANCH DUCTWORK, AT CONTRACTORS 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, 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.

%%U15A FLEXIBLE DUCT%%U

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, M-KE, OR EQUAL (FIRE RETARDANT POLYETHYLENE) PROTECTIVE VAPOR BARRIER, U.L.181 CLASS 1, ACOUSTICAL INSULATED DUCT, **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 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 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.

%%U15A AIR DEVICES%%U

PROVIDE AIR DEVICES AS SCHEDULED ON DRAWINGS, MANUFACTURED BY CARNES, E.H. PRICE, KRUEGER, NAILOR 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 OPPOSED BLADE DAMPERS FOR SUPPLY AIR REGISTERS AND EXHAUST AIR REGISTERS UNLESS INDICATED OTHERWISE.

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.

%%U15A EXHAUST AIR SYSTEMS%%U

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.

PROVIDE ROOF MOUNTED DOWNBLAST EXHAUST FANS AS SCHEDULED ON THE DRAWINGS, OR EQUAL ACCUREX, 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, DRAIN TROUGH, BIRDSCREEN AND PATE PREFABRICATED ROOF CURB WITH MINIMUM HEIGHT OF 12 INCHES FOR ROOFS WITH NO INSULATION, 14" FOR ROOFS WITH INSULATION OR AS SCHEDULED ON THE DRAWINGS.

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.

%%U15A HVAC EQUIPMENT%%U

%%U15A ROOFTOP UNITS (GAS FIRED HEAT) [3-25 TONS]%%U

PROVIDE ELECTRIC COOLING, GAS HEATING ROOFTOP UNITS AS SCHEDULED ON THE DRAWINGS, MANUFACTURED BY TRANE, CARRIER, AAON, LENNOX, JOHNSON CONTROLS, DAIKIN, 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 COOLING AND CONDENSING COILS, MINIMUM SEER OR EER RATING (COOLING) 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; ALUMINIZED STEEL HEAT EXCHANGER, [80] PERCENT 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 PERCENT SAFETY GAS SHUTOFF, DIRECT SPARK IGNITION SYSTEM; BUILT-IN THERMAL OVERLOAD PROTECTION ON MOTORS AND COMPRESSORS; MOTORIZED OUTDOOR AIR DAMPER (50 PERCENT MAX.) ; WEATHERTIGHT HOUSING CONSTRUCTED OF ZINC COATED, HEAVY GAUGE, GALVANIZED STEEL WITH WEATHER-RESISTANT BAKED ENAMEL FINISH; MINIMUM INSULATED DOWNFLOW [STANDARD] [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 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 AND WIRE UL LISTED DUCT TYPE SMOKE DETECTORS AS REQUIRED BY CODE TO SHUT DOWN ROOFTOP UNIT UPON DETECTION OF SMOKE. PROVIDE UNIT COMPLETE WITH MANUFACTURER'S ONE YEAR GUARANTEE ON COMPONENTS PLUS AN ADDITIONAL FOUR YEAR GUARANTEE ON THE COMPRESSORS AND HEAT EXCHANGERS.

%%U15A GAS UNIT HEATERS%%U

PROVIDE WHERE INDICATED ON THE DRAWINGS, STANDARD TYPE, GAS-FIRED, PROPELLER UNIT HEATERS, MANUFACTURED BY HASTINGS, REZNOR, TRANE, OR MODINE, FURNISHED 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 WALL AS SHOWN ON PLANS.

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 18" FROM THE TOP OF THE UNIT TO A COMBUSTIBLE MATERIAL, AND IF POSSIBLE, A 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.

%%U15A SYSTEM EVACUATION AND CHARGING%%U

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.

%%U15A PLENUM INSULATION%%U

PROVIDE FYREWAP 0.5 PLENUM INSULATION OR ETS SCHAEFER PLENUMSHIELD BLANKET TO ENCAPSULATE COMBUSTIBLE MATERIALS LOCATED WITHIN A FIRE-RATED RETURN AIR PLENUM WHERE PERMITTED BY AHJ. PLENUM INSULATION SHALL BE 1/2" THICKNESS, 6 TO 8 PCF DENSITY, CONSISTING OF A HIGH TEMPERATURE BIOSOLUBLE MATERIAL WITH ALUMINUM FOIL ENCAPSULATING MATERIAL AND FIBERGLASS REINFORCING SCRIM COVERING. PLENUM INSULATION SHALL BE RATED AND CERTIFIED PER UL 1887 (MODIFIED), ASTM E136 FOR NON-COMBUSTIBILITY AND ASTM E-84/UL 723 FOR SURFACE BURNING CHARACTERISTICS. PROVIDE MINIMUM 1-INCH OVERLAP AT ALL SEAMS AND JOINTS AND SECURE INSULATION WITH STAINLESS STEEL BANDING AT LOCATIONS AND INTERVALS PER MANUFACTURER'S

INSTRUCTIONS.

%%U15A TEMPERATURE CONTROLS%%U

%%U15A GENERAL REQUIREMENTS%%U

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. CONTROL WIRING SHALL BE SIZED TO ACCOMMODATE THE VOLTAGE DROP ASSOCIATED WITH THE DISTANCE BETWEEN THE CONTROL DEVICE AND THE CONTROLLER.

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.

%%U15A EQUIPMENT%%U

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 WALL OR DUCT MOUNTED HUMIDISTAT AS INDICATED ON THE DRAWINGS THAT IS COMPATIBLE WITH THE THERMOSTAT. HUMIDISTAT SHALL HAVE ACCURACY OF ± 2 PERCENT IN THE RANGE OF 20 TO 95 PERCENT RH. HUMIDISTAT SHALL BE HONEYWELL MODEL H7625 OR EQUAL.

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.

SMOKE DETECTORS FURNISHED AND INSTALLED AS INDICATED IN SECTION 15A PART 3 OR AS SCHEDULED ON THE PLANS 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".

PROVIDE **24 VOLT** TIMESWITCHES HONEYWELL SERIES ST7009 OR EQUAL PROGRAMMABLE TYPE WITH 7-DAY PROGRAMMING WITH UP TO TWO "ONS" AND "OFFS" PER DAY. BATTERY BACKUP SHALL PROVIDE 48 HOURS OF MEMORY RETENTION. OVERRIDE TIMER SWITCHES SHALL BE SPRING WOUND, 6-HOUR, NORMALLY OPEN TYPE.

%%U15A SEQUENCE OF OPERATION%%U

WHEN SPACE HUMIDITY RISES ABOVE HUMIDITY SETPOINT AND THERE IS NO CALL FOR COOLING, ACTIVATE THE COOLING SYSTEM TO REMOVE MOISTURE AND MODULATE THE HOT GAS REHEAT COIL TO MAINTAIN SPACE TEMPERATURE.

%%U15A ROOFTOP UNIT CONTROL (NO ECONOMIZER)%%U

DURING OCCUPIED HOURS, OPERATE ROOFTOP UNIT SUPPLY FAN CONTINUOUSLY AND OPEN OUTDOOR AIR DAMPER TO MINIMUM POSITION TO MAINTAIN MINIMUM VENTILATION. CYCLE STAGE(S) OF COOLING AND HEATING TO MAINTAIN ROOM THERMOSTAT SET POINT (75 DEGREES FAHRENHEIT COOLING, 72 DEGREES FAHRENHEIT HEATING). SMOKE DETECTORS SHALL SHUTDOWN UNIT UPON ALARM.

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.

%%U15A CONTROL DAMPER CONTROL%%U

THERMOSTAT SHALL MODULATE AUTOMATIC CONTROL DAMPER WITH AUTOMATIC CHANGEOVER BETWEEN COOLING AND HEATING MODE TO MAINTAIN SPACE TEMPERATURE SETPOINT. WHEN RTU OR AHU IS IN COOLING MODE, DAMPER SHALL MODULATE OPEN ON CALL FOR COOLING AND CLOSE ON CALL FOR HEATING. WHEN RTU OR AHU IS IN HEATING MODE, DAMPER SHALL MODULATE OPEN ON CALL FOR HEATING AND CLOSE ON CALL FOR COOLING.

%%U15A PUBLIC RESTROOM EXHAUST FAN CONTROL%%U

OPERATE EXHAUST FANS CONTINUOUSLY DURING OCCUPIED HOURS AND SHUT DOWN DURING UNOCCUPIED HOURS. PROVIDE A 7-DAY TIMECLOCK TO SWITCH EACH SYSTEM BETWEEN OCCUPIED AND UNOCCUPIED OPERATION.

%%U15A COMMISSIONING%%U

%%U15A COMMISSIONING REPORTS

THE CONTRACTOR SHALL PREPARE A PRELIMINARY REPORT OF COMMISSIONING TEST PROCEDURES. THE REPORT SHALL IDENTIFY DEFICIENCIES FOUND DURING THE TESTING REQUIRED BY THESE SPECIFICATIONS WHICH HAVE NOT BEEN CORRECTED AT THE TIME OF REPORT AND THE ANTICIPATED DATE OF CORRECTION. THE REPORT SHALL ALSO IDENTIFY DEFERRED TESTS WHICH CANNOT BE PERFORMED AT THE TIME OF REPORT PREPARATION DUE TO CLIMATIC CONDITIONS AND SHALL IDENTIFY REQUIRED CLIMATIC CONDITIONS AND ANTICIPATED DATE FOR THE PERFORMANCE OF EACH DEFERRED TEST. THE COMPLETE REPORT SHALL BE PROVIDED TO THE OWNER WITH A COPY TO THE ARCHITECT AND ENGINEER.

THE CONTRACTOR SHALL PREPARE A FINAL COMMISSIONING REPORT OF TEST PROCEDURES AND RESULTS. THIS REPORT SHALL IDENTIFY THE RESULTS OF ALL FUNCTIONAL PERFORMANCE TESTS; DISPOSITION OF ALL DEFICIENCIES FOUND DURING TESTING; DETAILS OF CORRECTIVE MEASURES USED OR PROPOSED TO CORRECT SUCH DEFICIENCIES; AND STEP-BY-STEP RECORD OF ALL FUNCTIONAL TEST PROCEDURES USED DURING THE COMMISSIONING PROCESS INCLUDING MEASURABLE CRITERIA FOR TEST ACCEPTANCE IDENTIFIED IN THESE SPECIFICATIONS. THE COMPLETE REPORT SHALL BE PROVIDED TO THE OWNER WITH A COPY TO THE ARCHITECT AND ENGINEER.

%%U15A ALTERNATES%%U

%%U15A DESCRIPTION

PROVIDE ALL WORK CONTEMPLATED UNDER THE DIFFERENT ALTERNATES TO INCLUDE LABOR, MATERIALS, EQUIPMENT AND SERVICES NECESSARY FOR AND INCIDENTAL TO THE COMPLETION OF WORK UNDER EACH PARTICULAR ALTERNATE. FURNISH SEPARATE BIDS FOR EACH ALTERNATE APPLICABLE TO CONTRACTOR'S PROPOSAL, STATING THE AMOUNT TO BE ADDED OR DEDUCTED FROM THE BASE BID IN CASE THE ALTERNATE IS ACCEPTED. COMPLY WITH APPLICABLE SECTIONS OF THE BASE SPECIFICATIONS FOR WORK REQUIRED BY THE ALTERNATE UNLESS OTHERWISE SPECIFIED. REFER TO THE ARCHITECTURAL PORTION OF THE SPECIFICATION.