MECHANICAL SPECIFICATIONS - ROOFTOP UNIT

23 05 00 - COMMON WORK RESULTS FOR HVAC

1.1 STANDARDS:

A. COMPLY WITH ALL APPLICABLE CODES, SPECIFICATIONS, LOCAL ORDINANCES, INDUSTRY STANDARDS, UTILITY COMPANY REGULATIONS AND THE APPLICABLE REQUIREMENTS OF THE FOLLOWING NATIONALLY ACCEPTED CODES AND STANDARDS:
   1. UNDERWRITERS' LABORATORIES, INC., UL.
   2. AIR MOVING & CONDITIONING ASSOCIATION, AMCA.
   3. AMERICAN STANDARDS ASSOCIATION, ASA.
   4. AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR-CONDITIONING ENGINEERS, INC., ASHRAE.
   5. AMERICAN SOCIETY OF MECHANICAL ENGINEERS, ASME.
   6. AMERICAN SOCIETY OF PLUMBING ENGINEERS, ASPE.
   7. AMERICAN SOCIETY OF TESTING MATERIALS, ASTM.
   8. AMERICAN WATER WORKS ASSOCIATION, AWWA.
   9. NATIONAL BUREAU OF STANDARDS, NBS.
   10. NATIONAL FIRE PROTECTION ASSOCIATION, NFPA.
   11. SHEET METAL & AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION, SMACNA.
   12. UNDERWRITERS' LABORATORIES, INC., UL.

1.2 INSTALLATION:

A. GENERAL: SEQUENCE, COORDINATE, AND INTEGRATE THE VARIOUS ELEMENTS OF MECHANICAL SYSTEMS, MATERIALS, AND EQUIPMENT. COMPLY WITH THE FOLLOWING REQUIREMENTS:
   1. COORDINATE MECHANICAL, PLUMBING AND FIRE PROTECTION SYSTEMS, EQUIPMENT, AND MATERIALS INSTALLATION WITH OTHER BUILDING COMPONENTS.
   2. VERIFY ALL DIMENSIONS BY FIELD MEASUREMENTS.
   3. ARRANGE FOR CHASES, SLOTS, AND OPENINGS IN OTHER BUILDING COMPONENTS DURING PROGRESS OF CONSTRUCTION, TO ALLOW FOR MECHANICAL INSTALLATIONS.
   4. COORDINATE THE INSTALLATION OF REQUIRED SUPPORTING DEVICES AND SLEEVES TO BE SET IN POURED IN PLACE CONCRETE AND OTHER STRUCTURAL COMPONENTS, AS THEY ARE CONSTRUCTED.
   5. SEQUENCE, COORDINATE, AND INTEGRATE INSTALLATIONS OF MECHANICAL MATERIALS AND EQUIPMENT FOR EFFICIENT FLOW OF THE WORK. GIVE PARTICULAR ATTENTION TO LARGE EQUIPMENT REQUIRING POSITIONING PRIOR TO CLOSING IN THE BUILDING.
   6. WHERE MOUNTING HEIGHTS ARE NOT DETAILED OR DIMENSIONED, INSTALL SYSTEMS, MATERIALS, AND EQUIPMENT TO PROVIDE THE MAXIMUM HEADROOM POSSIBLE.
   7. COORDINATE CONNECTION OF MECHANICAL SYSTEMS WITH EXTERIOR UNDERGROUND AND OVERHEAD UTILITIES AND SERVICES. COMPLY WITH REQUIREMENTS OF GOVERNING REGULATIONS, FRANCHISED SERVICE COMPANIES, AND CONTROLLING AGENCIES. PROVIDE REQUIRED CONNECTION FOR EACH SERVICE.
   8. INSTALL SYSTEMS, MATERIALS, AND EQUIPMENT TO CONFORM WITH ARCHITECTURAL ACTION MARKINGS ON SUBMITTAL, INCLUDING COORDINATION DRAWINGS, TO GREATEST EXTENT POSSIBLE. CONFORM TO ARRANGEMENTS INDICATED BY THE CONTRACT DOCUMENTS, RECOGNIZING THAT PORTIONS OF THE WORK ARE SHOWN ONLY IN DIAGRAMMATIC FORM. WHERE COORDINATION REQUIREMENTS CONFLICT WITH INDIVIDUAL SYSTEM REQUIREMENTS, RESOLVE CONFLICTS AND ROUTE PROPOSED SOLUTION TO THE ARCHITECT FOR REVIEW AND APPROVAL.
   9. INSTALL SYSTEMS, MATERIALS, AND EQUIPMENT LEVEL AND PLUMB, PARALLEL AND PERPENDICULAR TO OTHER BUILDING SYSTEMS AND COMPONENTS, WHERE INSTALLED EXPOSED IN FINISHED SPACES.
   10. INSTALL MECHANICAL EQUIPMENT TO FACILITATE SERVICING, MAINTENANCE, AND REPAIR OR REPLACEMENT OF EQUIPMENT COMPONENTS. AS MUCH AS PRACTICAL, CONNECT EQUIPMENT FOR EASE OF DISCONNECTING, WITH MINIMUM OF INTERFERENCE WITH OTHER INSTALLATIONS. EXTEND GREASE FITTINGS TO AN ACCESSIBLE LOCATION AND LABEL.
   11. INSTALL ACCESS PANEL OR DOORS WHERE UNITS ARE CONCEALED BEHIND FINISHED SURFACES.
   12. INSTALL SYSTEMS, MATERIALS, AND EQUIPMENT GIVING RIGHT OF WAY PRIORITY TO SYSTEMS REQUIRED TO BE INSTALLED AT A SPECIFIED SLOPE.

B. PAINTING
   1. PROPERLY PREPARE SURFACES TO RECEIVE PAINT. THOROUGHLY CLEAN SURFACES REQUIRING PRIME PAINTING OF RUST, LOOSE SCALE, OIL, GREASE AND DIRT BY THE USE OF WIRE BRUSHES, SOLVENT AND OTHER REQUIRED MEANS. PRIME PREPARED SURFACES AND FINISH WITH TWO COATS OF EXTERIOR OIL BASE PAINT. VERIFY PRIMER AND PAINT ARE RATED FOR APPLICATION.
   2. REMOVE SPLATTERED PAINT FROM MECHANICAL EQUIPMENT AND REPAIR DAMAGE TO FACTORY PAINTED FINISHES.

1.3 SUBMITTALS
A. SUBMIT UNDER PROVISIONS OF DIVISION 23 SECTION "COMMON RESULTS FOR HVAC, REVIEW OF MATERIALS AND DIVISION 01 SECTION "GENERAL REQUIREMENTS."
B. PRODUCT DATA: MANUFACTURER'S INSTALLATION INSTRUCTIONS, DESCRIPTIVE LITERATURE, OPERATING INSTRUCTIONS, AND MAINTENANCE AND REPAIR DATA.
C. SUBMIT WARRANTY DOCUMENTATION.

2.0 TESTING, ADJUSTING AND BALANCING

A. GENERAL CONTRACTOR SHALL PAY TAB AGENCY UNDER AND ALLOWANCE OF $15,000/-INCLUDED WITHIN THE TOTAL CONTRACT PRICE.
B. TESTING, ADJUSTING AND BALANCING CONTRACTOR FOR THE AIR SIDE HVAC SYSTEMS SHALL BE SELECTED AND PAID BY THE OWNER, THROUGH A SEPARATE CONTRACT INDICATED IN THE DOCUMENTS. BALANCING CONTRACTOR SHALL REPORT DIRECTLY TO OWNER'S PROJECT MANAGER.
C. HVAC SYSTEMS ACCEPTANCE TESTING, AND BALANCING DATA GATHERING, ANALYSIS AND REPORTING WILL NOT BE DONE BY THE CONSTRUCTION MECHANICAL CONTRACTOR.
D. THE CONSTRUCTION MECHANICAL CONTRACTOR IS TO PROVIDE OPERATIONAL AND ACCESS SUPPORT, I.E., DATA, SCHEDULES ETC. FOR THE AIRSIDE TAB CONTRACTOR.
E. SYSTEMS SHALL BE COMPLETE AND OPERATIONAL FOR TAB CONTRACTOR TO PERFORM HIS WORK ON.
F. PERFORM TESTING AND BALANCING PROCEDURES ON EACH SYSTEM IDENTIFIED, IN ACCORDANCE WITH THE DETAILED PROCEDURES OUTLINED IN THE REFERENCED STANDARDS.
G. SEAL DUCTS AND PIPING, AND TEST FOR AND REPAIR LEAKS.
H. MARK EQUIPMENT SETTINGS, INCLUDING DAMPER CONTROL POSITIONS, VALVE INDICATORS, FAN SPEED CONTROL LEVERS, AND SIMILAR CONTROLS AND DEVICES, TO SHOW FINAL SETTINGS. MARK WITH PAINT OR OTHER SUITABLE, PERMANENT IDENTIFICATION MATERIALS.
I. RETEST, ADJUST, AND BALANCE SYSTEMS SUBSEQUENT TO SIGNIFICANT SYSTEM MODIFICATIONS, AND RESUBMIT TEST RESULTS.
J. TEST AND ADJUST MECHANICAL SYSTEMS FOR SOUND AND VIBRATION IN ACCORDANCE WITH THE DETAILED INSTRUCTIONS OF THE REFERENCED STANDARDS.
K. RECORD ALL DATA OBTAINED DURING TESTING, ADJUSTING, AND BALANCING IN ACCORDANCE WITH, AND ON THE FORMS RECOMMENDED BY THE REFERENCED STANDARDS, AND AS APPROVED ON THE SAMPLE REPORT FORMS.
L. PREPARE REPORT OF RECOMMENDATIONS FOR CORRECTING UNSATISFACTORY MECHANICAL PERFORMANCES WHEN SYSTEM CANNOT BE SUCCESSFULLY BALANCED.

23 31 00 DUCTWORK

A. SHEET METAL DUCTWORK

1. FURNISH AND INSTALL SHEET METAL DUCTWORK, SHEET METAL DUCTWORK HANGERS AND SUPPORTS, FIRE DAMPERS, FLASHING AND ALL NECESSARY ACCESSORIES AS SHOWN ON THE DRAWINGS AND AS SPECIFIED HEREIN.
2. SMACNA STANDARDS: COMPLY WITH SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION (SMACNA), 1985 EDITION, RECOMMENDATIONS FOR FABRICATION, CONSTRUCTION, DETAILS AND INSTALLATION PROCEDURES, EXCEPT AS OTHERWISE INDICATED ON THE DRAWINGS OR IN THESE SPECIFICATIONS.
3. ASHRAE STANDARDS: COMPLY WITH AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR CONDITIONING ENGINEERS (ASHRAE) RECOMMENDATIONS, EXCEPT AS OTHERWISE INDICATED ON THE DRAWINGS OR IN THESE SPECIFICATIONS.

B. RECTANGULAR SHEET METAL DUCTWORK:

1. DUCTWORK MATERIALS: PROVIDE MATERIALS WHICH ARE FREE FROM VISUAL IMPERFECTIONS INCLUDING PITTING, SEAM MARKS, ROLLER MARKS, OIL CANNING, STAINS, DISCOLORATION AND OTHER IMPERFECTIONS, INCLUDING THOSE WHICH WOULD IMPAIR PAINTING.
2. GAUGES, RECTANGULAR DUCTWORK: FABRICATE STEEL DUCTWORK (GALVANIZED AND STAINLESS, IF ANY) FROM THE MINIMUM GAUGES FOR SIZES UP TO THE CORRESPONDING MAXIMUM LONG-SIDE DIMENSIONS AS INDICATED IN SMACNA DUCT MANUAL "LOW VELOCITY SYSTEMS" (1985 EDITION).
3. ALL LONGITUDINAL DUCT SEAMS AND JOINTS SHALL BE SNAP-LOCK AT THE CORNERS AND STANDING LOCKSEAM IN SIDES BETWEEN CORNERS. SEAL ALL LONGITUDINAL AND TRAVERSE JOINTS UPSTREAM OF ALL AIR VALVES WITH HARD-CAST TAPE JOINT SEALANT.

C. ROUND SHEET METAL DUCTWORK:

1. DUCT GAUGES, GIRTH REINFORCING, GIRTH JOINTS, LONGITUDINAL SEAMS, ETC. SHALL BE IN ACCORDANCE WITH THE SMACNA MANUAL. ROUND SHEET METAL SUPPLY AIR DUCTWORK SHALL BE FABRICATED USING SPIRAL SEAMS ONLY WITH BEADED SLEEVED JOINTS. ELBOWS SHALL BE STAMPED OR SEGMENTED AND TEES SHALL BE 45 DEGREES LATERAL TAPS WITH WELDED JOINTS. ADJUSTABLE FITTINGS OR DRAW BAND JOINT CONNECTION WILL NOT BE ACCEPTABLE.

D. FLEXIBLE CONNECTION:

FLEXIBLE CONNECTION SHALL BE PROVIDED IN DUCTWORK CONNECTED TO THE INLETS AND/OR OUTLETS OF ALL AIR HANDLING UNITS, FANS, ETC. FLEXIBLE CONNECTION MATERIALS SHALL BE THERMAFLEX OR APPROVED EQUAL. SEWING OR STAPLING OF JOINTS WILL NOT BE PERMITTED, ENDS OF FABRIC MUST BE OVERLAPPED 2" AND GLUED . PROVIDE AT LEAST ONE-INCH SLACK AT ALL FLEXIBLE CONNECTIONS.

E. FLEXIBLE DUCTWORK:

1. FLEXIBLE DUCT SHALL BE A FACTORY GLASS FIBER INSULATED ASSEMBLY WITH VAPOR BARRIER JACKET AND A MAXIMUM THERMAL CONDUCTANCE OF 0.23 BTU/HR PER SF PER OF. FLEXIBLE DUCT SHALL BE CONSTRUCTED OF REINFORCED ALUMINUM FOIL FABRIC MECHANICALLY LOCKED INTO A SPIRAL ALUMINUM HELIX SUITABLE FOR A POSITIVE WORKING PRESSURE OF AT LEAST 6" W.G. IT SHALL REQUIRE NO MORE THAN TWO 90° ELBOWS AS INSTALLED. THE FLEXIBLE DUCT ASSEMBLY SHALL BE LISTED CLASS I BY THE UNDERWRITERS' LABORATORY AT A FLAME SPREAD OF NOT OVER 25 AND A SMOKE DEVELOPED RATE OF NOT OVER 50 AND SHALL COMPLY WITH NFPA STANDARD 90A.
2. FLEXIBLE DUCT CLAMPS SHALL BE STAINLESS STEEL WITH SWIVEL ACTION SCREW. MAXIMUM LENGTH OF FLEXIBLE DUCT SHALL NOT EXCEED 6 FEET INCLUDING ALL BENDS.
3. THERMAFLEX DUCTWORK OF EQUAL CONSTRUCTION WILL BE ACCEPTABLE.

F. MANUAL DAMPERS:

1. ALL DUCT TAPS WILL BE PROVIDED WITH A DAMPER FOR BALANCING.
2. MANUAL DAMPERS SHALL HAVE A MINIMUM 16 GAUGE GALVANIZED STEEL CHANNEL FRAME WITH MOUNTING FLANGES AND AXLES SET IN OIL IMPREGNATED BRONZE BEARINGS. AXLES SHALL BE MINIMUM OF ½" IN DIAMETER AND SHALL BE INTERLOCKED WITH BLADES TO POSITIVELY ELIMINATE SLIPPAGE.
3. BLADES SHALL BE MINIMUM OF 16 GAUGE GALVANIZED STEEL. MANUAL DAMPERS SHALL HAVE A MINIMUM OF FOUR BREAKS RUNNING THE ENTIRE LENGTH OF THE DAMPER TO ASSURE RIGIDITY AND TIGHT CLOSE OFF. BLADES SHALL BE ON CENTERS NO GREATER THAN 9" AND NO BLADE SHALL EXCEED 48" IN LENGTH. ALL BLADES SHALL BE INTERCONNECTED TO ACT IN UNISON FOR OPPOSED BLADE OPERATION.
4. SINGLE BLADE DAMPERS SHALL BE USED FOR DUCTWORK LESS THAN 12 INCHES FOR THE LARGER DIMENSION.
5. ALL MANUAL DAMPERS OF 12-INCH DIAMETER OR LESS SHALL BE PROVIDED WITH LOCK-IN QUADRANT HANDLES.

G. THERMAL INSULATION FOR DUCTWORK

1. INSULATION FOR SUPPLY AIR DUCTWORK AND OUTSIDE AIR DUCT SHALL BE AS FOLLOWS:
   - CONCEALED ABOVE CEILING SHALL BE 2" GLASS FIBER FLEXIBLE WITH KRAFT PAPER VAPOR JACKET WITH MINIMUM R-VALUE OF 6 PER IECC 2015 REQUIREMENTS.
2. INSULATION: ASTM C553; FLEXIBLE, NONCOMBUSTIBLE BLANKET.
   - 'K VALUE: ASTM C518, 0.25 AT 75 DEGREES F.
   - MAXIMUM SERVICE TEMPERATURE: 250 DEGREES F.
   - MAXIMUM SERVICE TEMPERATURE: 250 DEGREES F.
   - MAXIMUM MOISTURE ABSORPTION: 0.20 PERCENT BY VOLUME.
   - DENSITY: 2.0 LB./CU.FT.
   - THICKNESS: 2".
3. VAPOR BARRIER JACKET
   - KRAFT PAPER REINFORCED WITH GLASS FIBER YARN AND BONDED TO ALUMINIZED FILM.
   - MOISTURE VAPOR TRANSMISSION: ASTM E96; 0.02 PERM.

H. DOUBLE WALL DUCTWORK
1. ALL DOUBLE WALL DUCTWORK AND FITTINGS SHALL BE CONSTRUCTED WITH AN OUTER GALVANIZED WALL AND A PERFORATED INNER GALVANIZED LINER.
2. DUCTWORK WILL BE SPIRAL SEAM CONSTRUCTION MADE FROM G-90 OR BETTER GALVANIZED STEEL CONFORMING TO ASTM A653/A653M AND A924/A924M STANDARDS, LOCK-FORMING QUALITY (LFQ).
3. PROVIDE A FACTORY-APPLIED SURFACE PROTECTION SUCH AS OIL OR A PAINT-GRIP ON ALL GALVANIZED STEEL TO BE USED FOR DUCTWORK THAT WILL BE PAINTED.
4. PROVIDE A PERFORATED INNER LINER WITH 3/32 INCH DIAMETER HOLES, STAGGERED ON 3/16 INCH CENTERS, HAVING A 23% OPEN AREA. IN RECTANGULAR DUCTS, WRAP DUCT ENDS OF EACH DUCT SECTION AT EACH JOINT WITH LINING AND TACK WELD LINING TO OUTER SHELL TDC FLANGE.
5. PROVIDE A 1 INCH FIBERGLASS INSULATION MATERIAL BETWEEN THE INNER LINER AND THE OUTER WALL, WRAPPED IN A MYLAR LINING. THE INSULATION MATERIAL SHALL HAVE A MAXIMUM THERMAL CONDUCTIVITY OF 0.27 (BTU-INHR. SQ. FT. DEGREE F) AND SHALL MEET THE UL FLAME SPREAD RATING OF 25 AND SMOKE DEVELOPMENT RATING OF 50.
6. ELBOWS SHALL BE WELDED SEAM, STANDING SEAM, OR GORED CONSTRUCTION.
7. DIVERGING AND CONVERGING FLOW FITTINGS SHALL BE CONSTRUCTED WITH RADIUSED ENTRANCES WITHOUT ANY PROJECTIONS INTO THE AIR FLOW AREA OF THE MAIN OR BRANCH DUCT.
8. FLANGE CONNECTIONS ARE TO BE USED FOR ROUND DUCTWORK SIZES 36 INCHES OR GREATER AND FOR ALL FLAT OVAL DUCTS WITH A MAJOR AXIS GREATER THAN 42 INCHES.
9. PROVIDE LOCKFORMER TDC FLANGES ON RECTANGULAR DUCTS.
10. PROVIDE MINIMUM OUTER WALL DUCT CONSTRUCTION GAUGES FOR ROUND, FLAT OVAL, AND RECTANGULAR DUCT SYSTEMS WITH PRESSURES UP TO 2 INCHES W.C., MATCHING THOSE LISTED FOR SINGLE WALL DUCTS.
11. PROVIDE 26 GAUGE PERFORATED LINER FOR DUCTS WITH INNER LINER DIMENSIONS OF 24 INCHES OR LESS. PROVIDE 22 GAUGE PERFORATED LINER FOR DUCTS WITH INNER LINER DIMENSIONS OF 25 INCHES UP TO 84 INCHES.

23 06 08 - PACKAGE ROOFTOP HVAC SYSTEM (ELEC HEAT)

1.2 QUALITY ASSURANCE

A. EQUIPMENT SHALL BE LISTED OR LABELED BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) RECOGNIZED UNDER 29 CFR 1910.7.
B. TEST AND RATE COOLING SYSTEMS IN ACCORDANCE WITH ARI 210.
C. ASHRAE COMPLIANCE: APPLICABLE REQUIREMENTS IN ASHRAE 62.1, SECTION 5 - "SYSTEMS AND EQUIPMENT" AND SECTION 7 - "CONSTRUCTION AND STARTUP."
D. ASHRAE/IESNA 90.1 COMPLIANCE: APPLICABLE REQUIREMENTS IN ASHRAE/IESNA 90.1, SECTION 6 - "HEATING, VENTILATING, AND AIR-CONDITIONING."

1.3 WARRANTY

A. PROVIDE 5-YEAR UNCONDITIONAL PARTS AND 1-YEAR LABOR WARRANTY ON HEAT EXCHANGERS.
B. PROVIDE 5-YEAR UNCONDITIONAL PARTS AND 1-YEAR LABOR WARRANTY ON COMPRESSOR UNITS.

2.1 ACCEPTABLE MANUFACTURERS

A. CARRIER
B. TRANE
C. YORK

2.2 TYPE

A. PROVIDE ROOF-MOUNTED UNITS HAVING ELECTRIC HEATING ELEMENTS.
B. UNITS SHALL BE SELF-CONTAINED, PACKAGED, FACTORY ASSEMBLED AND PREWIRED, CONSISTING OF CABINET AND FRAME, SUPPLY FAN,ELECTRIC HEATING ELEMENTS, CONTROL, AIR FILTER, REFRIGERANT COOLING COIL, AND COMPRESSOR, CONDENSER COIL, AND FAN.

2.3 CABINET

A. SERVICE DOORS: HINGED ACCESS DOORS WITH NEOPRENE GASKETS.
B. CONDENSATE DRAIN PANS: FORMED SECTIONS OF GALVANIZED-STEEL SHEET DESIGNED FOR SELF-DRAINAGE. FABRICATE PANS AND DRAIN CONNECTION TO COMPLY WITH ASHRAE 62.1.
C. AIRSTREAM SURFACES: SURFACES IN CONTACT WITH THE AIRSTREAM SHALL COMPLY WITH REQUIREMENTS IN ASHRAE 62.1.

2.4 FABRICATION

A. CABINET: STEEL WITH BAKED-ENAMEL FINISH, ACCESS DOORS OR REMOVABLE ACCESS PANELS WITH QUICK FASTENERS[,] [LOCKING DOOR-HANDLE TYPE] [SCREWDRIVER-OPERATED FLUSH-CAM TYPE]. STRUCTURAL MEMBERS SHALL BE 18 GAUGE (1.2 MM) THICK OR HEAVIER, WITH ACCESS DOORS OR REMOVABLE PANELS 20 GAUGE (0.9 MM) THICK OR HEAVIER.
B. INSULATION: NEOPRENE-COATED GLASS FIBER ON SURFACES WHERE CONDITIONED AIR IS HANDLED. PROTECT EDGES FROM EROSION.
C. SUPPLY FAN: CENTRIFUGAL TYPE, RUBBER MOUNTED, V-BELT DRIVE, ADJUSTABLE VARIABLE-PITCH MOTOR PULLEY, AND RUBBER-ISOLATED HINGE-MOUNTED MOTOR. COMPLETE FAN ASSEMBLY SHALL BE ISOLATED.
D. AIR FILTERS: 2 INCHES THICK, MERV-8, GLASS-FIBER DISPOSABLE MEDIA IN METAL FRAMES ARRANGED FOR EASY REPLACEMENT.

2.5 ELECTRIC HEATER

A. FINNED TUBE, HELICAL COIL, OR EXPANDED-STRIP HEATING ELEMENTS, EASILY ACCESSIBLE WITH PROTECTION AGAINST NO-FLOW OR LOW AIRFLOWS, SHORTS AND GROUNDS, AND FAILURE OF PROTECTION DEVICES.
B. PROVIDE HIGH-LIMIT TEMPERATURE CONTROL TO DE-ENERGIZE HEATING ELEMENTS.
C. PROVIDE CONTROLS TO START SUPPLY FAN BEFORE ELECTRIC ELEMENTS ARE ENERGIZED AND CONTINUE OPERATING UNTIL BONNET TEMPERATURE REACHES MINIMUM SETTING. INCLUDE SWITCH FOR CONTINUOUS FAN OPERATION.

2.6 REFRIGERATION SYSTEM

A. REFRIGERANT: R-410A.
B. CAPACITY CONTROL: HOT-GAS BYPASS REFRIGERANT CONTROL FOR CAPACITY CONTROL WITH CONTINUOUS DEHUMIDIFICATION ON A SINGLE COMPRESSOR.

2.7 EVAPORATOR COIL

A. PROVIDE COPPER-TUBE, ALUMINUM-FIN COIL ASSEMBLY WITH GALVANIZED DRAIN PAN AND CONNECTION, CAPILLARY TUBES, AND EXPANSION VALVE.
B. EVAPORATOR COILS SHALL BE LEAK TESTED TO 150 PSIG, PRESSURE TESTED TO 450 PSIG, AND QUALIFIED TO UL 1995 BURST TEST AT 1775 PSIG.

2.8 COMPRESSOR

A. PROVIDE HERMETIC OR SEMI-HERMETIC COMPRESSOR, 3600 RPM MAXIMUM, RESILIENTLY MOUNTED WITH POSITIVE LUBRICATION, CRANKCASE HEATER, HIGH- AND LOW-PRESSURE SAFETY CONTROLS, MOTOR-OVERLOAD PROTECTION, SERVICE VALVES, AND FILTER DRIER.
B. TIMED-OFF CIRCUIT SHALL LIMIT NUMBER OF COMPRESSOR STARTS TO 12 PER HOUR.
C. OUTDOOR THERMOSTAT SHALL ENERGIZE COMPRESSOR ABOVE 57 DEG F AMBIENT.
D. PROVIDE STEP CAPACITY CONTROL BY HOT GAS BYPASS.

2.9 CONDENSER

A. PROVIDE COPPER-TUBE, ALUMINUM-FIN COIL ASSEMBLY WITH SUB-COOLING ROWS.
B. PROVIDE DIRECT-DRIVE AXIAL FANS, RESILIENTLY MOUNTED WITH FAN GUARD, MOTOR-OVERLOAD PROTECTION, WIRED TO OPERATE WITH COMPRESSOR.
C. PROVIDE REFRIGERANT-PRESSURE SWITCH TO CYCLE CONDENSER FANS.
D. CONDENSER COILS SHALL BE LEAK TESTED TO 150 PSIG, PRESSURE TESTED TO 650 PSIG, AND QUALIFIED TO UL 1995 BURST TEST AT 1980 PSIG.

2.10 FILTERS

A. PROVIDE 2 INCH THICK PLEATED FLAT FILTER MEDIA, WITH 25 PERCENT EFFICIENCY AS DETERMINED IN ACCORDANCE WITH ASHRAE 52. FILTER MEDIA SHALL BE TRI-DIM MEDIA, A SYNTHETIC MATERIAL THAT IS MOISTURE AND MOLD RESISTANT.
   1. FRAME: GALVANIZED STEEL.

2.11 DAMPERS

A. PROVIDE MOTORIZED OUTSIDE AND MANUAL RETURN AIR DAMPERS FOR FIXED OUTSIDE-AIR QUANTITY. MOTORIZED OUTSIDE AIR DAMPER SHALL CLOSE WHEN UNIT IS OFF.
B. PROVIDE BAROMETRIC RELIEF DAMPER CAPABLE OF RELIEVING UP TO 100% RETURN AIR AND CONTAIN SEALS THAT MEET ASHRAE 90.1-2016 AND IECC-2015 REQUIREMENTS.

2.12 ROOF CURBS (VERTICAL):

A. FULL PERIMETER ROOF CURB WITH EXHAUST CAPABILITY PROVIDING SEPARATE AIR STREAMS FOR ENERGY RECOVERY FROM THE EXHAUST AIR WITHOUT SUPPLY AIR CONTAMINATION.
B. FORMED GALVANIZED STEEL WITH WOOD NAILER STRIP AND SHALL BE CAPABLE OF SUPPORTING ENTIRE UNIT WEIGHT.

2.13 BASE OF UNIT SHALL HAVE A MINIMUM OF FOUR LOCATIONS FOR FACTORY THRU-THE-BASE ELECTRICAL CONNECTIONS (FACTORY-INSTALLED OR FIELD-INSTALLED) STANDARD. CONNECTIONS SHALL BE INTERNAL TO THE CABINET TO PROTECT FROM ENVIRONMENTAL ISSUES.

2.17 BASE RAIL

A. UNIT SHALL HAVE BASE RAILS ON A MINIMUM OF 2 SIDES.
B. HOLES SHALL BE PROVIDED IN THE BASE RAILS FOR RIGGING SHACKLES TO FACILITATE MANEUVERING AND OVERHEAD RIGGING.
C. HOLES SHALL BE PROVIDED IN THE BASE RAIL FOR MOVING THE ROOFTOP BY FORK TRUCK.
D. BASE RAIL SHALL BE A MINIMUM OF 16 GAUGE THICKNESS.

2.18 CONDENSATE PAN AND CONNECTIONS:

A. SHALL BE A SLOPED CONDENSATE DRAIN PAN MADE OF A NON-CORROSIVE MATERIAL.
B. SHALL COMPLY WITH ASHRAE STANDARD 62.
C. SHALL USE A NPT DRAIN CONNECTION AT THE END OF THE DRAIN PAN. CONNECTION SHALL BE MADE PER MANUFACTURER'S RECOMMENDATIONS.

3.1 INSTALLATION

A. MOUNT UNITS ON FACTORY-BUILT ROOF-MOUNTING FRAME PROVIDING WATERTIGHT ENCLOSURE TO PROTECT DUCTWORK AND UTILITY SERVICES.

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ISSUES AND REVISIONS

NO	DATE	DESCRIPTION
A	07-22-2019	ISSUE FOR PERMIT
B	08-16-2019	ISSUE FOR BID

STATE OF TEXAS
DAVIA ANN GERNAND
109903
LICENSED
PROFESSIONAL ENGINEER
16 AUG 2019

GH SCHOOL
4724 N MAIN STREET

SHEET TITLE
SPECIFICATION

SHEET NUMBER
M100

PROJECT # 19.02

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