SECTION 15732 - PACKAGED ROOFTOP AIR-CONDITIONING UNITS
PART 1 - GENERAL
1.1 SECTION REQUIREMENTS
A. Submittals: Product Data and Shop Drawings.
B. Comply with ASHRAE 15.
C. EER: Equal to or greater than prescribed by ASHRAE 90.1, "Energy Efficient Design of New Building, except Low Rise Residential Buildings."
D. Warranties: Submit a written warranty, signed by the manufacturer, agreeing to the repair or replacement of components that fail within 5 years of Substantial Completion.
PART 2 - PRODUCTS
2.1 PACKAGED UNITS, 5 TO 20 TONS
A. Factory assembled and tested, consisting of compressors, condensers, evaporator coils, condenser and evaporator fans, refrigeration and temperature controls, filters, and dampers.
1. Refer to Rooftop Heating/Cooling Unit Schedule on drawing M200 for capacities, and manufacturers.
2. Evaporator Fans: Belt-driven, forward curved centrifugal.
3. Exhaust/Relief Fans: Direct drive, forward curved centrifugal or propeller.
4. Condenser Fans: Direct drive propeller.
5. Refrigerant Coils: Aluminum fins and copper coil.
6. Compressors: Serviceable hermetic or fully hermetic, with safety controls, hot gas bypass, and timed off controls.
7. Heat Exchangers: Gas fired, with gas controls, electronic ignition, high limit cutout, and forced draft proving switch.
8. Economizer controls (Low-Leak Comparative Enthalpy, 100% capacity).
9. Low ambient controls.
10. Smoke Detectors: Photoelectric.
11. Operating Controls: Two stage heating and two stage cooling on units 8-1/2 tons and over.
12. Roof curb.
13. Control Wiring from T-stat to rooftop unit: Shall be 18ga / 7 conductor, rated for plenum applications.
14. Control Wiring from T-stat to remote sensor: Shall be a separate 18ga / 2 conductor shielded, rated for plenum applications.
PART 3 - EXECUTION
3.1 INSTALLATION
A. Install units level and plumb and firmly anchored.
B. Connect gas piping to burner with pipe same size as gas train inlet, and provide union with sufficient clearance for burner removal and service.
C. Connect to supply and return hydronic piping with shutoff valve and union or flange at each connection.
D. Install ducts to termination in roof mounting frames. Terminate return air duct through roof structure.
E. Connect units to wiring systems and to ground.
END OF SECTION 15732

SECTION 15810 - DUCTS AND ACCESSORIES
PART 1 - GENERAL
1.1 SECTION REQUIREMENTS
A. Submittals: Product Data for fire and smoke dampers.
B. Comply with NFPA 90A for systems serving spaces more than 25,000 cu. ft. in volume or building Types II, IV, and V construction more than 3 stories in height.
C. Comply with UL 181 and UL 181A for ducts and closures.
D. Testing, Adjusting, and Balancing Agency Qualifications: AABC certified (to be furnished by Tenant).
PART 2 - PRODUCTS
2.1 DUCTS
A. Spiral Duct: Spiral Lock Seam, without insulation, G90 galvanized finish, ASTM A-653/924
1. Basis of Design Manufacturers: Lindab SPIRIDsafe, alternates to the basis of design must be submitted for review.
2. Fittings: Factory produced standing seam construction with internal sealing. Fittings with a major axis of 36" or smaller shall be 20 gauge. Fittings with a major axis of 37"-48" shall be 18 gauge.
B. Galvanized Steel Sheet: Forming steel, ASTM A 653/653M, G90 coating designation.
C. Duct Liner: ASTM C 1071, Type II, with an airstream surface coated with a temperature resistant coating. Thickness: 1-1/2 inch. R-value : 8.
1. Adhesive: ASTM C 916, Type I.
2. Mechanical Fasteners: Galvanized steel pin, length as required to penetrate liner plus a 1/8 inch projection maximum into the airstream.
D. Joint and Seam Tape: Comply with UL 181A.
E. Joint and Seam Sealant: Comply with UL 181A.
F. Rectangular Metal Duct Fabrication: Comply with SMACNA's "HVAC Duct Construction Standard" for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
2.2 ACCESSORIES
A. Volume Control Dampers: Factory fabricated volume control dampers, complete with required hardware and accessories. Single blade and multiple opposed blade, standard leakage rating, and suitable for horizontal or vertical applications.
B. Fire Dampers: Factory-fabricated fire dampers, complete with required hardware and accessories. UL labeled according to UL 555, "Fire Dampers".
C. Flexible Connectors: Flame retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.
D. Flexible Ducts: Factory fabricated, insulated, round duct, with an outer jacket enclosing 2 inch thick, glass fiber insulation. R-value: 6.0, around a continuous inner liner.
PART 3 - EXECUTION
3.1 INSTALLATION
A. Duct System Pressure Class: Construct and install each duct system with 2 inch positive and negative duct pressure classifications.
B. Conceal ducts from view in finished and occupied spaces. Except where noted as exposed duct.
C. Avoid passing through electrical equipment spaces and enclosures.
D. Support and connect metal ducts according to SMACNA's "HVAC Duct Construction Standard".
E. Install duct accessories according to applicable portions of details of construction as shown in SMACNA's "HVAC Duct Construction Standard".
F. Install liner and/or insulation on ductwork per the material schedule on sheet M0010.
G. Install volume control dampers in lined duct with methods to avoid damage to liner and to avoid erosion of duct liner.
H. Install fire and smoke dampers according to manufacturer's UL approved written instructions.
I. Install fusible links in fire dampers.
J. Provide saddle taps at tees for exposed ductwork.
3.2 TESTING, ADJUSTING, AND BALANCING
A. The Tenant will supply an independent balancing agent to test and adjust the HVAC installation. The balance agent will be responsible for any pulley or belt changes required.
B. The GC is to have trained staff available during the balancing to correct issues noted by the balance agent.
C. The balance agent is to balance air flow within distribution systems, including mains, branches, and terminals to indicated quantities +/- 10%. The hood exhaust systems shall be balanced to a tolerance of -0+10% and the make-up air system to a tolerance of -10+0%.
D. The balancing agent to supply a copy of the balance report to the Tenant, engineer and general contractor for review.
END OF SECTION 15810

SECTION 15840 - AIR TERMINAL UNITS
PART 1 - GENERAL
1.1 SUMMARY
A. Section includes:
1. Fan-powered terminal units.
B. Related Sections:
1. Section 230923 - Direct-Digital Control System for HVAC: Controls remote from unit.
2. Section 260503 - Equipment Wiring Connections: Execution requirements for electrical connections to air terminal units specified by this Section.
1.2 SUBMITTALS
A. Product Data: Submit data indicating configuration, general assembly, and materials used in fabrication. Include catalog performance ratings indicating airflow, static pressure, heating coil capacity and NC designation. Include electrical characteristics and connection requirements.
B. Manufacturer's Installation Instructions: Submit support and hanging details, and service clearances required.
PART 2 - PRODUCTS
2.1 FAN POWERED VARIABLE VOLUME UNITS
A. Manufacturers:
1. Refer to the schedule in the design documents for the basis of design
2. Substitutions will be reviewed for acceptance.
B. Identification: Furnish each air terminal unit with identification label and airflow indicator. Include unit nominal airflow, maximum factory-set airflow and minimum factory-set airflow and coil type.
C. Basic Assembly:
1. Casings: Minimum 22 gage galvanized steel.
2. Lining: Minimum 1 inch thick neoprene or vinyl coated glass fiber insulation, 1.5 lb./cu ft density, meeting NFPA 90A requirements and UL 181 erosion requirements. Face lining with Mylar film.
3. Plenum Air Inlets: Round stub connections and S slip and drive connections for duct attachment.
4. Plenum Air Outlets: S-slip and drive connections.
D. Basic Unit:
1. Configuration: Air volume damper assembly and fan in parallel arrangement inside unit casing. Locate control components inside protective metal shroud.
2. Volume Damper: Construct of galvanized steel with peripheral gasket and self-lubricating bearings; maximum damper leakage: 2 percent of design air flow at 1 inch inlet static pressure.
3. Mount damper operator to position damper as indicated on Drawings.
E. Automatic Damper Operator:
1. Electric Actuator: 24 volt with remote temperature read and reset capability.
F. Fan Assembly:
1. Fan: Forward curved centrifugal type with direct drive permanent-split-capacitor type, thermally protected motor.
2. Speed Control: Infinitely adjustable with electronic controls.
3. Isolation: Fan/motor assembly on rubber isolators.
G. Electric Heating Coil:
1. Construction: UL listed, slip-in type, open coil design, integral control box factory wired and installed, with:
a. Primary and secondary over-temperature protection.
b. Minimum airflow switch.
H. Wiring:
1. Factory mount and wire controls. Mount electrical components in control box with removable cover. Incorporate single point electrical connection to power source.
2. Factory mount transformer for control voltage on electric and electronic control units. Furnish terminal strip in control box for field wiring of thermostat and power source.
3. Wiring Terminations: Wire fan and controls to terminal strip. Furnish terminal lugs to match branch-circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box.
4. Disconnect Switch: Factory mount [non-fused disconnect switch.
I. Controls: Electronic Controls: Contain in NEMA 250 Type 1 enclosure with access panel sealed from airflow and mounted on side of unit. Factory mount controls and thermostat.
J. Thermostat: Electronic.
K. Sequence of Operation: Refer to the drawings.
PART 3 - EXECUTION
3.1 EXAMINATION
A. Verify ductwork is ready for air terminal installation.
3.2 INSTALLATION
A. Connect to ductwork in accordance with Section 233100.
B. Install ceiling access doors or locate units above easily removable ceiling components.
C. Support units individually from structure. Do not support from adjacent ductwork.
D. Support air terminal units connected by flexible duct independently of flexible duct.
E. Install transition piece to match flexible duct size to inlet or outlet of variable air volume terminal.
F. Install minimum of 5 ft of 1 inch thick lined ductwork downstream of units.
3.3 ADJUSTING
A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design flow to 0 percent full flow. Set units with heating coils for minimum 50 percent full flow. Include schedule when there are more than one of each size unit.
Consider the following examples when developing Project schedule.
END OF SECTION 15840

SECTION 15855 - DIFFUSERS, REGISTERS, AND GRILLES
PART 1 - GENERAL
1.1 SECTION REQUIREMENTS
A. Submittals: None.
PART 2 - PRODUCTS
2.1 OUTLETS AND INLETS
A. All air terminal devices:
1. Refer to Grills, Registers, and Diffusers Schedule for equipment schedule
2. Manufacturer: As scheduled
3. Material: As scheduled.
4. Finish: As scheduled.
5. Mounting: As scheduled.
PART 3 - EXECUTION
3.1 INSTALLATION
A. Coordinate location and installation with duct installation and installation of other ceiling and wall mounted items.
B. Locate ceiling diffusers, registers, and grilles, as indicated on the architectural "reflected ceiling plans." Unless otherwise indicated, locate units in center of acoustical ceiling panels.
END OF SECTION 15855

CALIFORNIA GREEN BUILDING STANDARDS CODE
5.410 BUILDING MAINTENANCE AND OPERATION
5.410.4 TESTING AND ADJUSTING:
Testing and adjusting of systems installed shall be required for buildings less than 10,000 square feet or new systems to swerve an addition or alteration subject to Section 303.1.
5.410.4.2 SYSTEMS:
Develop a written plan of procedures for testing and adjusting systems. Systems to be included for testing and adjusting shall include at a minimum, as applicable to the project:
1. HVAC systems and controls
2. Indoor and outdoor lighting and controls
3. Water heating systems
4. Renewable energy systems
5. Landscape irrigation systems
6. Water reuse systems
5.410.4.3 PROCEDURES:
Perform testing and adjusting procedures in accordance with manufacturer's specifications and applicable standards of each system.
5.410.4.3.1 HVAC BALANCING:
In addition to testing and adjusting, before a new space-conditioning system serving a building or space is operated for normal use, the system shall be balanced in accordance with the procedures defined in the Testing Adjusting and Balancing Bible, National Standards; the National Environmental Balancing Bureau Procedural Standards; Associated Air Balance Council; or local standards approved by the enforcing agency.
5.410.4.4 REPORTING:
After completion of testing, adjusting and balancing, provide a final report with the signature of the individual responsible for performing these services.
5.410.4.5 OPERATION AND MAINTENANCE MANUAL:
Provide the building owner or representative with required operating and maintenance instructions and copies of guaranties/warranties for each system. O&M instructions shall be consistent with OSHA requirements in CCR, Title 8, Section 5142, and other related regulations.
5.410.4.5.1 INSPECTIONS AND REPORTS:
Include a copy of all inspection verification and reports required by the enforcing agency.

5.504 POLLUTANT CONTROL
5.504.1 TEMPORARY VENTILATION:
Ventilate permanent HVAC system that will be used during construction if necessary to condition the building or areas of addition or alteration within the required temperature range for materials and equipment installation. If the HVAC system is used during construction, use return air filters with a Minimum Efficiency Reporting Value (MERV) of 8, based on ASHRAE 52.2-1999, or an average efficiency of 30% based on ASHRAE 52.2. Replace air filters immediately prior to occupancy, or, if the building is occupied at alteration, at the conclusion of construction.
5.504.3 COVERING OF DUCT OPENINGS AND MECHANICAL EQUIPMENT DURING CONSTRUCTION:
At the time of rough installation and during storage on the construction site until final startup of the heating, cooling and ventilating equipments, all duct openings and related air distribution component openings shall be covered with tape, plastic, sheet metal, or other methods acceptable to the enforcing agency to reduce the amount of dust, water and debris which may collect in the system.

5.508 OUTDOOR AIR QUALITY
5.508.1 OZONE DEPLETION AND GREENHOUSE GAS REDUCTIONS:
New installations of HVAC, refrigeration, and fire suppression equipment shall comply with Section 5.508.1.1 and 5.508.1.2.
5.508.1.1 CHLOROFLUOROCARBONS (CFCS):
Install HVAC, refrigeration and fire suppression equipment that do not contain CFCs.
5.508.1.2 HALONS:
Install HVAC, refrigeration and fire suppression equipment that do not contain Halons.

HVAC GENERAL NOTES

A GENERAL NOTES APPLY TO HVAC SHEETS.
B WORK SHALL COMPLY WITH STATE AND LOCAL CODE REQUIREMENTS AS APPROVED AND AMENDED BY THE AUTHORITY HAVING JURISDICTION, INCLUDING APPLICABLE SECTIONS OF NFPA, THE MECHANICAL CODE, AND ANY INTERIM AMENDMENTS AT THE TIME OF THE PROPOSAL. PURCHASE PERMITS ASSOCIATED WITH THE WORK. OBTAIN INSPECTIONS REQUIRED BY CODE. SEE ARCHITECTURAL COVER SHEET FOR THE PREVAILING CODES.
C CONTRACTOR AND SUBCONTRACTORS SHALL REVIEW A COMPLETE SET OF THE CONSTRUCTION DOCUMENTS.
D COORDINATE WORK WITH THE WORK OF OTHER TRADES, EQUIPMENT FURNISHED BY OTHERS, REQUIREMENTS OF THE OWNER, AND OF THE EXISTING CONDITIONS AT THE PROJECT SITE.
E DRAWINGS FOR THE MECHANICAL WORK ARE DIAGRAMMATIC, SHOWING THE GENERAL LOCATION, TYPE, LAYOUT, AND EQUIPMENT REQUIRED. THE DRAWING SHALL NOT BE SCALED FOR EXACT MEASUREMENTS, REFER TO ARCHITECTURAL DRAWINGS FOR DIMENSIONS. REFER TO MANUFACTURER'S STANDARD INSTALLATION DRAWINGS FOR EQUIPMENT CONNECTIONS AND INSTALLATION REQUIREMENTS. PROVIDE DUCTWORK, CONNECTIONS, OFFSETS, ACCESSORIES, AND MATERIALS NECESSARY FOR A COMPLETE SYSTEM.
F DUCT DIMENSIONS ON PLANS INDICATE DIMENSIONS OF INTERNAL FREE AREA.
G PERFORATED CEILING DIFFUSERS SHALL BE 2-WAY UNLESS NOTED OTHERWISE.
H COORDINATE ALL WORK WITH THE OWNER'S CONSTRUCTION CONSULTANT PRIOR TO CONSTRUCTION.
I UNLESS NOTED OTHERWISE, PROVIDE RECTANGULAR DUCT ELBOWS GREATER THAN 45° SHALL BE RADIUS ELBOWS WITH DOUBLE-THICKNESS TURNING VANES AND RECTANGULAR DUCT ELBOWS 45° OR LESS SHALL BE RADIUS ELBOWS WITH AN INSIDE RADIUS OF AT LEAST 1/2 THE WIDTH OF THE DUCT.
J PROVIDE AIR FILTERS WITH NEW, CLEAN MERV 13 AIR FILTERS AT TURNOVER.
K ALL MATERIALS USED ABOVE CEILING SHALL BE PLENUM RATED.

MATERIAL SCHEDULE

CATEGORY	APPLICATION	ALLOWABLE MATERIAL
DUCT	EXPOSED SUPPLY	RECT. LINED OR ROUND AS SHOWN. PAINTED TO MATCH DECK
	EXPOSED RETURN	RECTANGULAR, PAINTED TO MATCH DECK
	EXPOSED GEN. EXHAUST	RECTANGULAR, PAINTED TO MATCH DECK
	CONCEALED, SUPPLY	RECT. OR ROUND AS SHOWN, LINED OR INSULATED
	CONCEALED, RETURN	RECT. OR ROUND AS SHOWN, LINED OR INSULATED
	CONCEALED, GEN. EXHAUST	RECT. OR ROUND AS SHOWN

HVAC ABBREVIATIONS

AFF	ABOVE FINISHED FLOOR
AFG	ABOVE FINISHED GRADE
AHU	AIR HANDLING UNIT
BC	BLOWER COIL
CD	CEILING DIFFUSER
ER	EXHAUST REGISTER
EXTG	EXISTING
GD	GRAVITY DAMPER
LV	LOUVER
MD	MOTORIZED DAMPER
OBD	OPPOSED BLADE DAMPER
RG	RETURN GRILLE
RTU	ROOFTOP UNIT
SR	SUPPLY REGISTER
TEF	TENANT EXHAUST FAN
VSC	VARIABLE SPEED CONTROL

HVAC SYMBOLS

CEILING DIFFUSER
CEILING-MOUNTED RETURN OR EXHAUST REGISTER
SUPPLY REGISTER
RETURN REGISTER
FLEXIBLE DUCT
MITERED CORNER WITH TURNING VANES
W/H — DUCTWORK INTERNAL FREE DIMENSIONS (WIDTH/HEIGHT)
RECTANGULAR TO ROUND DUCT TRANSITION
S — DUCT-MOUNTED SMOKE DETECTOR
M — MOTOR-OPERATED DAMPER
MANUAL VOLUME DAMPER
GREASE DUCT CLEANOUT
MITERED CORNER WITHOUT TURNING VANES
T — THERMOSTAT
S — REMOTE TEMPERATURE SENSOR
X — PLAN NOTE: SEE PLAN NOTES LISTED ON THE SAME SHEET FOR NOTE MEANING
CONNECT TO EXISTING
XX.# — EQUIPMENT TAG: SEE EQUIPMENT SCHEDULE ON SHEET M200 FOR EQUIPMENT INFORMATION
A/V — AUDIO/VISUAL REMOTE SMOKE DETECTOR ANNUNCIATOR WITH REMOTE KEY OPERATED RESET
12"ø/C01 / 550 — GRILL, REGISTER, OR DIFFUSER TAG: TAG / NECK SIZE / AIRFLOW (CFM)

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MECHANICAL SPECIFICATIONS

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ISSUANCE/REVISIONS
ISSUE FOR PERMIT 08/19/19
REV 1 PER CITY 08/21/19
REV 2 PER CITY 08/21/19
REV 3 PER CITY 08/26/19
REV 4 PER CITY 08/29/19
REV 5 PER CLIENT AND ISSUE FOR BID 08/30/19

PROFESSIONAL ENGINEER SEAL 031346 RICHARD T. JONES NORTH CAROLINA
Signed 08.30.2019

North Carolina Firm Registration
NCBOE: P-0612
Sec of State: 0909178

Drawn By	Checked By
CEJ	RTJ
Scale: 1/4" = 1'-0"	Date: 07.23.2019

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