

**MECHANICAL GENERAL NOTES:**

- PRIOR TO SUBMITTING BID VISIT THE JOB SITE AND BECOME FULLY ACQUAINTED WITH THE EXISTING CONDITIONS OF THE PROJECT. REVIEW THE GENERAL NOTES, SPECIFICATIONS AND OTHER DRAWINGS FOR ADDITIONAL REQUIREMENTS WHICH MAY NOT BE SPECIFICALLY CALLED OUT IN THIS PORTION OF THE CONSTRUCTION DOCUMENTS. NOTIFY ARCHITECT, ENGINEER AND/OR OWNER OF CONFLICTS OR DISCREPANCIES PRIOR TO SUBMISSION OF BID. PROVIDE SEISMIC RESTRAINTS AS NEEDED FOR THE MECHANICAL SYSTEMS IN THE PROJECT BASED ON THE SEISMIC ANALYSIS REQUIRED BY THE SPECIFICATIONS.
- EXISTING CONDITIONS WERE TAKEN FROM ORIGINAL DRAWINGS AND SITE VISITS AND MAY NOT REFLECT EXACT "AS-BUILT" CONDITIONS. FIELD VERIFY EXISTING CONDITIONS PRIOR TO SUBMISSION OF FINAL BIDS. COORDINATE NEW WORK AND DEMOLITION WITH OTHER DISCIPLINES AND EXISTING CONDITIONS PRIOR TO CONSTRUCTION. COORDINATE THE INSTALLATION OF THE MECHANICAL SYSTEMS WITH OTHER TRADES TO ENSURE A NEAT AND ORDERLY INSTALLATION. INSTALL DUCTWORK AND PIPING AS TIGHT TO STRUCTURE AS POSSIBLE. COORDINATE THE TRADES TO AVOID CONFLICTS. COORDINATE INSTALLATION OF DUCTWORK AND PIPING TO AVOID CONFLICTS WITH ELECTRICAL PANELS, LIGHTING FIXTURES, ETC. ANY MODIFICATIONS REQUIRED DUE TO LACK OF COORDINATION WILL BE THE RESPONSIBILITY OF THE CONTRACTOR AT NO EXTRA COST TO THE OWNER.
- WHERE SHUTDOWN OF EXISTING SYSTEMS IS REQUIRED DURING NEW WORK, COORDINATE SHUTDOWN TIME AND DURATION WITH THE OWNER TO MINIMIZE DOWNTIME. NOTIFY OWNER SEVEN (7) DAYS PRIOR TO INTERRUPTION OF SERVICE.
- DURING INSTALLATION OF NEW WORK, AVOID DAMAGING EXISTING SURFACES AND EQUIPMENT TO REMAIN. REPAIR DAMAGE CAUSED DURING CONSTRUCTION AT NO EXTRA COST TO THE OWNER.
- PROVIDE TEMPORARY BARRIERS TO CONTAIN DUST AND DEBRIS RESULTING FROM THE PERFORMANCE OF THE WORK TO THE AREA WHERE WORK IS BEING PERFORMED.
- ALL MECHANICAL EQUIPMENT SHOWN ON THE MECHANICAL PLANS SHALL BE PROVIDED BY DIVISION 23 UNLESS OTHERWISE NOTED.
- NEW MECHANICAL EQUIPMENT, DUCTWORK AND PIPING ARE SHOWN AT APPROXIMATE LOCATIONS. FIELD MEASURE FINAL DUCTWORK AND PIPING LOCATIONS PRIOR TO FABRICATION AND MAKE ADJUSTMENTS AS REQUIRED TO FIT THE DUCTWORK AND PIPING WITHIN THE AVAILABLE SPACE. VERIFY THAT FINAL EQUIPMENT LOCATIONS MEET MANUFACTURER'S RECOMMENDATIONS REGARDING SERVICE CLEARANCE AND PROPER AIRFLOW CLEARANCE AROUND EQUIPMENT.
- REFER TO ARCHITECTURAL DRAWINGS FOR RELATED CONSTRUCTION DETAILS AS APPLICABLE TO THE HVAC SYSTEM. VERIFY CHASES AND PENETRATIONS SHOWN ON ARCHITECTURAL DRAWINGS THAT ARE INTENDED FOR DUCTWORK AND PIPING MEET REQUIREMENTS.
- COORDINATE LOCATION OF ROOF MOUNTED HVAC EQUIPMENT AND ROOF PENETRATIONS WITH THE ARCHITECTURAL AND STRUCTURAL DRAWINGS.
- INDOOR AIR QUALITY MEASURES: PROTECT INSIDE OF (INSTALLED AND DELIVERED) DUCTWORK AND HVAC UNITS FROM EXPOSURE TO DUST, DIRT, PAINT AND MOISTURE. REPLACE INSULATION THAT HAS BECOME WET AT ANY TIME DURING CONSTRUCTION, DRYING THE INSULATION IS NOT AN ACCEPTABLE OPTION. REMOVE DEBRIS OF INTERNAL FIBERGLASS INSULATION. REMOVE DEBRIS FROM CEILING/RETURN AIR PLENUM INCLUDING DUST. AN INDEPENDENT, PROFESSIONAL DUCT CLEANING COMPANY SHALL VACUUM CLEAN ANY DUCTWORK CONNECTED TO HVAC UNITS THAT WERE OPERATED DURING THE CONSTRUCTION PERIOD AFTER NEW FILTERS ARE INSTALLED AND THE SYSTEM IS TURNED OVER TO THE OWNER. THE INTERNAL SURFACES AND ASSOCIATED COILS OF ANY HVAC UNITS THAT WERE OPERATED SHALL ALSO BE CLEANED.
- INSTALL DUCTWORK AND PIPING PARALLEL TO BUILDING OR CLEAN LINES UNLESS OTHERWISE SHOWN OR NOTED.
- OVERHEAD HANGERS AND SUPPORTS FOR EQUIPMENT, DUCTWORK AND PIPING SHALL BE FASTENED TO BUILDING JOISTS OR BEAMS. DO NOT ATTACH HANGERS AND SUPPORTS TO THE ABOVE FLOOR SLAB OR ROOF EXCEPT WHERE CONCRETE INSERTS IN CONCRETE SLABS ARE ALLOWED BY THE SPECIFICATIONS.
- COORDINATE LOCATION OF EQUIPMENT SUPPORTS WITH LOCATION OF EQUIPMENT ACCESS PANELS/DOORS TO ENABLE SERVICE OF EQUIPMENT AND/OR FILTERS.
- SEAL PENETRATIONS THROUGH THE BUILDING COMPONENTS IN ACCORDANCE WITH THE CONTRACT SPECIFICATIONS. FIREPROOF PENETRATIONS THROUGH FIRE RATED COMPONENTS IN ACCORDANCE WITH U.L. REQUIREMENTS.
- COORDINATE THE EXACT MOUNTING SIZE AND FRAME TYPE OF DIFFUSERS, REGISTERS AND GRILLS WITH THE SUPPLIER TO MEET THE CEILING, WALL AND DUCT INSTALLATION REQUIREMENTS.
- ADJUST LOCATION OF CEILING DIFFUSERS, REGISTERS AND GRILLS AS REQUIRED TO ACCOMMODATE FINAL CEILING GRID AND LIGHTING LOCATIONS.
- DUCTWORK CROSSING FIRE RATED WALLS OR OTHER FIRE RATED ASSEMBLIES SHALL BE MINIMUM 26 GAUGE SHEET METAL.
- PROVIDE FIRE OR FIRE/SMOKE DAMPERS, AS APPLICABLE, IN DUCTWORK AT CEILING AND WALLS AT LOCATIONS SHOWN ON THE PLANS. FIRE AND FIRE/SMOKE DAMPERS SHALL CONFORM TO NFPA AS APPLICABLE. COORDINATE SLEEVE LENGTH WITH REQUIREMENTS OF INSTALLATION LOCATION.
- DUCTWORK CROSSING FIRE RATED WALLS OR OTHER FIRE RATED ASSEMBLIES SHALL BE MINIMUM 26 GAUGE SHEET METAL.
- PROVIDE FIRE OR FIRE/SMOKE DAMPERS, AS APPLICABLE, IN DUCTWORK AT CEILING AND WALLS AT LOCATIONS SHOWN ON THE PLANS. FIRE AND FIRE/SMOKE DAMPERS SHALL CONFORM TO NFPA AS APPLICABLE. COORDINATE SLEEVE LENGTH WITH REQUIREMENTS OF INSTALLATION LOCATION.
- PROVIDE WALL OR DUCT ACCESS PANELS OR DOORS FOR ACCESS TO FIRE AND FIRE/SMOKE DAMPERS. ACCESS PANEL OR DOOR SHALL BE MINIMUM SIZE OF 10" BY 10" AND SHALL BE INSTALLED WITHIN 12" OF DAMPER. PROVIDE A REMOVABLE DUCT SECTION WHERE DUCT SIZE IS TOO SMALL FOR A 10" BY 10" ACCESS DOOR.
- LOCATE AND SET THERMOSTATS AND HUMISTATS AT LOCATIONS SHOWN ON PLANS. VERIFY EXACT LOCATIONS WITH ARCHITECT PRIOR TO INSTALLATION. INSTALL DEVICES WITH TOP OF DEVICE AT MAXIMUM 48" AFF TO MEET THE SPECIFICATIONS UNLESS NOTED OTHERWISE ON PLANS. PROVIDE INSULATED BACKING FOR THERMOSTATS MOUNTED ON EXTERIOR BUILDING WALLS. INSTALL WIRING IN CONDUIT TO THERMOSTATS AND HUMISTATS. PROVIDE CONDUIT IN THE WALL FROM THE JUNCTION BOX TO 6" ABOVE THE CEILING.
- COORDINATE THE LOCATION AND ELEVATION OF WALL MOUNTED DEVICES WITH PRESENTATION BOARDS, DISPLAY CABINETS, SHELVES OR OTHER COMPONENTS SHOWN ON THE ARCHITECTURAL DRAWINGS THAT ARE TO BE INSTALLED UNDER OTHER DIVISIONS. CONTRACTOR WILL NOT BE REIMBURSED FOR RELOCATION OF WALL MOUNTED DEVICES CAUSED BY A LACK OF COORDINATION.
- PROVIDE A MANUAL BALANCING DAMPER IN EACH DUCT TAKEOFF FROM SUPPLY, RETURN, OUTDOOR AND EXHAUST AIR DUCTS.
- PROVIDE A PREFABRICATED 45 DEGREE, HIGH EFFICIENCY, RECTANGULAR AROUND BRANCH DUCT TAKEOFF FITTING FOR BRANCH DUCT CONNECTIONS AND TAKE-OFFS TO INDIVIDUAL DIFFUSERS, REGISTERS AND GRILLS. PROVIDE WITH INTEGRAL MANUAL BALANCING DAMPER AND LOCKING QUADRANT WHERE INDICATED ON PLANS.
- BRANCH DUCTWORK TO AIR OUTLETS SHALL BE SAME SIZE AS OUTLET NECK SIZE UNLESS OTHERWISE NOTED.
- REFER TO SPECIFICATIONS FOR DUCTWORK AND PIPING INSULATION REQUIREMENTS. DUCT SIZES ON MECHANICAL PLANS INDICATE CLEAR INSIDE AIRFLOW DIMENSIONS. INCREASE SHEET METAL SIZES ACCORDINGLY TO ACCOUNT FOR THICKNESS OF DUCT LINER.
- FLEXIBLE DUCTWORK SHALL NOT EXCEED 5' IN LENGTH AND SHALL BE INSTALLED AND SUPPORTED TO AVOID SHARP BENDS AND SAGGING. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
- PROVIDE EQUIPMENT VENTS AND FLUES PER EQUIPMENT MANUFACTURER'S RECOMMENDATIONS AND EQUIPMENT SPECIFICATIONS. KEEP PENETRATIONS THROUGH ROOF AT MINIMUM OF 10" FROM HVAC EQUIPMENT FRESH AIR INLETS AND 2'-0" FROM ROOF PARAPETS.
- PROVIDE A NEW SET OF AIR FILTERS IN UNITS PRIOR TO TESTING, ADJUSTING AND BALANCING AND BEFORE TURNING SYSTEM(S) OVER TO OWNER.
- FIELD VERIFY THAT THE EXISTING EQUIPMENT INCLUDING ACCESSORIES BEING REUSED FOR THIS PROJECT IS NOT DAMAGED AND IS IN GOOD WORKING ORDER. REPORT ANY DEFICIENCIES TO THE OWNER OR ARCHITECT. SUBMIT TO THE OWNER AND ARCHITECT A WRITTEN REPORT DESCRIBING TESTS PERFORMED TO VERIFY OPERATION AND RESULTS OF THE TESTS.
- CLEAN EXISTING EQUIPMENT AND EQUIPMENT COMPONENTS BEING REUSED FOR THIS PROJECT. PROVIDE NEW FILTERS FOR EXISTING AIR HANDLING EQUIPMENT PRIOR TO STARTUP OF EQUIPMENT. NEW FILTERS SHALL BE COMPATIBLE WITH THE EXISTING EQUIPMENT AND EQUAL IN PERFORMANCE TO THE EXISTING FILTERS AT NEW CONDITION UNLESS OTHERWISE NOTED. CLEAN STRAINERS IN PIPING SYSTEMS PRIOR TO STARTUP.
- LUBRICATE EXISTING EQUIPMENT BEING REUSED FOR THIS PROJECT IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS. OBTAIN INSTRUCTIONS FROM MANUFACTURER IF THEY ARE NOT AVAILABLE AT THE SITE.

**MECHANICAL SYMBOLS**

THIS IS A MASTER LEGEND AND NOT ALL SYMBOLS OR ABBREVIATIONS ARE USED.

STANDARD MOUNTING HEIGHT		HVAC DUCTWORK AND ACCESSORIES	
<p>THERMOSTATS (USER ADJUSTABLE/TOP OF DEVICE) 48" CONTROLS (TOP OF DEVICE) 48"</p> <p>USE THE DEFAULT MOUNTING HEIGHTS SHOWN ABOVE UNLESS NOTED OTHERWISE IN THE SPECIFICATIONS OR ELSEWHERE. MOUNTING HEIGHTS LISTED ARE ABOVE FINISHED FLOOR (AFF) OR ABOVE FINISHED GRADE (AFG) TO TOP OF DEVICE. ALL DEVICES SHALL BE INSTALLED IN COMPLIANCE WITH CURRENT ADA AND LOCAL REQUIREMENTS.</p>	<p>LINEAR SLOT DIFFUSER</p> <p>INSULATED FLEXIBLE DUCT (MAX. 5'-0" LONG)</p> <p>BRANCH DUCT WITH 45° RECTANGLE-ROUND BRANCH FITTINGS AND MANUAL VOLUME DAMPER</p> <p>ELBOW WITH TURNING VANES</p> <p>BRANCH DUCT WITH BELL-MOUTH FITTING &amp; MANUAL VOLUME CONTROL DAMPER</p> <p>RETURN, EXHAUST, OR OUTSIDE AIR DUCT UP</p> <p>RETURN, EXHAUST, OR OUTSIDE AIR DUCT DOWN</p> <p>SUPPLY AIR DUCT UP</p> <p>SUPPLY AIR DUCT DOWN</p> <p>EQUIPMENT WITH FLEXIBLE DUCT CONNECTION</p> <p>10" (NECK SIZE) CS0-1 (TYPE) 300 CFM (CFM OF SUPPLY DIFFUSER OR REGISTER)</p> <p>24x24 (NECK SIZE) CEG-1 (TYPE) 800 CFM (CFM OF EXHAUST GRILLE)</p> <p>MANUAL VOLUME DAMPER</p> <p>SQUARE TO ROUND TRANSITION</p> <p>DUCT MOUNTED SMOKE DETECTOR (SD=SUPPLY/RO-RETURN)</p> <p>RISER DESIGNATION</p> <p>FIRE DAMPER</p> <p>FIRE SMOKE DAMPER</p> <p>SMOKE DAMPER</p> <p>VOLUME DAMPER</p> <p>MOTORIZED DAMPER</p> <p>BACKDRAFT DAMPER</p>	<p>HWP HEATING WATER PUMP IN WC INCHES OF WATER</p> <p>L LOUVER LAT LEAVING AIR TEMPERATURE LDB LEAVING DRY BULB LWB LEAVING WET BULB LWT LEAVING WATER TEMPERATURE MAU MAKE-UP AIR UNIT MAX MAXIMUM MBH 1000 BTU PER HOUR MD MOTORIZED DAMPER MFR MANUFACTURER MIN MINIMUM NIA NOT APPLICABLE NIC NORMALLY CLOSED NIO NORMALLY OPEN NOM NOMINAL NC NOISE CRITERIA NF NOT FINISHED NIC NOT IN CONTRACT OA OUTSIDE AIR PICV PRESSURE INDEP. CONTROL VALVE PROVIDE FURNISH AND INSTALL</p> <p>QTY QUANTITY RA RETURN AIR RC ROOM CRITERIA REB REBILTING REA RELIEF AIR RF RETURN FAN REF REFRIGERANT RH RELATIVE HUMIDITY RH ROOF HOOD RPM REFRIGERANT PER MINUTE RTU ROOFTOP UNIT SA SUPPLY AIR SCP STEAM CONDENSATE PUMP SD SMOKE DUCT DETECTOR SD SUPPLY DUCT SP WATER PUMP SH SENSIBLE HEAT CAPACITY SOW SCOPE OF WORK ST STATIC PRESSURE STM STEAM TRAP STB TO BE DETERMINED TCIC TEMPERATURE CONTROLS CONTRACTOR TCP TEMPERATURE CONTROL PANEL TF TRANSFER FAN TFA TO FLOOR ABOVE TFB TO FLOOR BELOW THT TOTAL HEAT CAPACITY TSP TOTAL STATIC PRESSURE TT TEMPERATURE TYP TYPICAL UF UNDERFLOOR UG UNDERGROUND US UNDERSLAB UH UNIT HEATER UNO UNLESS NOTED OTHERWISE VAV VARIABLE AIR VOLUME VEL VELOCITY VFD VARIABLE FREQUENCY DRIVE VRF VARIABLE REFRIGERANT VVR VARIABLE REFRIGERANT VOLUME W WITH W/O WITHOUT WB WET BULB WC WATER COLUMN WPD WATER PRESSURE DROP XP EXPLOSION PROOF</p>	

**MECHANICAL DEMOLITION GENERAL NOTES:**

- COORDINATE ALL DEMOLITION WITH WHAT IS SHOWN ON ARCHITECTURAL PLANS. NOTIFY ARCHITECT OF ANY DISCREPANCIES.
- PRIOR TO SUBMITTING BID, VISIT THE JOB SITE AND BECOME FULLY ACQUAINTED WITH THE EXISTING CONDITIONS OF THE PROJECT. REVIEW GENERAL NOTES, SPECIFICATIONS AND OTHER DRAWINGS FOR ADDITIONAL REQUIREMENTS THAT MAY NOT BE SPECIFICALLY CALLED OUT IN THIS PORTION OF THE CONSTRUCTION DOCUMENTS. NOTIFY ARCHITECT, ENGINEER OR OWNER, AS DEFINED IN BID DOCUMENTS, OF CONFLICTS OR DISCREPANCIES PRIOR TO SUBMISSION OF BID.
- OWNER RETAINS RIGHTS OF SALVAGE FOR EQUIPMENT AND FIXTURES TO BE REMOVED. COORDINATE WITH OWNER THE EQUIPMENT AND FIXTURES TO BE SALVAGED AND THE LOCATION FOR STORAGE. AVOID DAMAGE TO SALVAGED EQUIPMENT, FIXTURES AND DEVICES DURING DEMOLITION WORK AND DURING TRANSPORT TO OWNER'S DESIGNATED STORAGE LOCATION.
- REMOVE ITEMS SHOWN HEAVY-LINED DASHED, AND/OR NOTED TO BE REMOVED.
- AVOID DAMAGING EXISTING SURFACES AND EQUIPMENT TO REMAIN FOR NEW INSTALLATION. REPAIR DAMAGE CAUSED DURING WORK AT NO EXTRA COST TO THE OWNER.
- SEAL PENETRATIONS THROUGH FLOORS, WALLS, CEILINGS AND ROOFS WHERE MECHANICAL COMPONENTS ARE REMOVED AND WHERE THE FINAL PENETRATION IS NOT INSTALLED. REPAIR DAMAGED SURFACES TO MATCH ADJACENT AREAS OR AS INDICATED ON THE ARCHITECTURAL DRAWINGS.
- REMOVE HANGERS AND SUPPORTS WHERE DUCTWORK, PIPING AND/OR EQUIPMENT ARE REMOVED AND THE EXISTING HANGERS AND SUPPORTS ARE NOT USED FOR THE NEW INSTALLATION.
- INSTALL PERMANENT PIPING WHERE DUCTWORK AND PIPING IS REMOVED AND THE EXISTING TAPS ARE NOT USED FOR THE NEW INSTALLATION. WHERE DUCTWORK AND PIPING ARE REMOVED AND THE EXISTING TAPS WILL BE USED FOR THE NEW INSTALLATION, INSTALL TEMPORARY CAPS TO PROTECT THE INTERIOR SURFACES UNTIL NEW DUCTWORK AND PIPING ARE INSTALLED.
- INSPECT EXISTING EQUIPMENT TO REMAIN TO VERIFY THAT EQUIPMENT IS OPERATING PROPERLY. NOTIFY OWNER OF DAMAGED AND/OR MALFUNCTIONING COMPONENTS.
- WHERE SHUTDOWN OF EXISTING SYSTEMS IS REQUIRED DURING DEMOLITION, COORDINATE SHUTDOWN TIME AND DURATION WITH OWNER TO MINIMIZE DOWNTIME. NOTIFY OWNER SEVEN (7) DAYS PRIOR TO INTERRUPTION OF SERVICE.
- CEASE WORK AND IMMEDIATELY NOTIFY THE OWNER SHOULD ANY HAZARDOUS MATERIALS BE ENCOUNTERED DURING THE PERFORMANCE OF THE WORK.
- REMOVAL, RECOVERY, RECYCLING, AND DISPOSAL OF REFRIGERANT, CONTAINED IN ANY EQUIPMENT TO BE REMOVED, SHALL BE PERFORMED IN STRICT ACCORDANCE WITH CURRENT EPA GUIDELINES.

**MECHANICAL TITLE 24 NOTES:**

- CONTRACTOR SHALL COMPLETE COMMISSIONING OF ALL MECHANICAL SYSTEMS FOR BUILDINGS 10,000 SQUARE FEET OR GREATER AND PER OUTLINED IN THE OWNERS PROJECT REQUIREMENTS AND BASIS OF DESIGN. COMMISSIONING SHALL ALSO INCLUDE ALL THE REQUIREMENTS SET FORTH IN 2019 CALIFORNIA ENERGY CODE SECTION 5.410.2.
- CONTRACTOR SHALL COMPLETE COMMISSIONING OF ALL MECHANICAL SYSTEMS FOR BUILDINGS 10,000 SQUARE FEET OR LESS AND PER OUTLINED IN THE OWNERS PROJECT REQUIREMENTS AND BASIS OF DESIGN. COMMISSIONING SHALL ALSO INCLUDE ALL THE REQUIREMENTS SET FORTH IN 2019 CALIFORNIA ENERGY CODE SECTIONS 5.410.4
- ALL FIRE PLACES SHALL BE DIRECT-VENT SEALED COMBUSTION GAS, SEALED WOOD-BURNING FIREPLACE, SEALED WOOD-STOVE, OR PELLET STOVE AND SHALL COMPLY WITH 2019 CALIFORNIA ENERGY CODE SECTION 5.503
- TESTING AND ADJUSTING OF SYSTEMS SHALL BE REQUIRED AND SUBJECT TO SECTION 903.1. IN ADDITION TO TESTING AND ADJUSTING, BALANCE THE SYSTEM IN ACCORDANCE WITH THE PROCEDURES DEFINED BY THE TESTING ADJUSTING AND BALANCING BUREAU NATIONAL STANDARDS, THE NATIONAL ENVIRONMENTAL BALANCING BUREAU PROCEDURAL STANDARDS, ASSOCIATED AIR BALANCE COUNCIL NATIONAL STANDARDS OR AS APPROVED BY THE CITY OF IRVINE.
- A FINAL REPORT FOR THE TESTING AND ADJUSTING OF ALL NEW SYSTEMS SHALL BE COMPLETED AND PROVIDED TO THE FIELD INSPECTOR PRIOR TO FINAL APPROVAL. THIS REPORT SHALL BE SIGNED BY THE INDIVIDUAL RESPONSIBLE FOR TESTING THESE SERVICES.
- PROVIDE THE BUILDING OWNER OR REPRESENTATIVE WITH DETAILED OPERATING AND MAINTENANCE INSTRUCTIONS AND COPIES OF WARRANTIES/WARRANTIES FOR GUIDE TO THE 2019 CALIFORNIA GREEN BUILDING STANDARDS CODE (NONRESIDENTIAL) FOR EACH SYSTEM. O & M INSTRUCTIONS SHALL BE CONSISTENT WITH OSHA REQUIREMENTS IN OCCR, TITLE 8, SECTION 5142, AND OTHER RELATED REGULATIONS.
- INCLUDE A COPY OF ALL INSPECTION VERIFICATIONS AND REPORTS REQUIRED BY THE CITY OF IRVINE.
- HALONS AND CFC'S SHALL NOT BE USED IN ANY PIECE OF HVAC EQUIPMENT.
- ALL NEW DUCTS AND OTHER NEW RELATED AIR DISTRIBUTION COMPONENTS SHALL BE COVERED WITH TAPE, PLASTIC, OR SHEET METAL UNTIL THE FINAL STARTING OF HEATING, COOLING, OR VENTILATING EQUIPMENT.
- VENTILATED SPACES IN BUILDINGS SHALL MEET THE MINIMUM REQUIREMENTS OF SECTION 121 OF THE CALIFORNIA ENERGY CODE AND CHAPTER 4 OF THE CALIFORNIA MECHANICAL CODE.
- USE ONLY THE PERMANENT HVAC SYSTEM DURING CONSTRUCTION TO MAINTAIN AREAS OF ADDITION AND ALTERATION WITHIN THE REQUIRED TEMPERATURE RANGE FOR MATERIAL AND EQUIPMENT INSTALLATION. IF THE PERMANENT HVAC SYSTEM WILL BE USED DURING CONSTRUCTION, COMPLY WITH 2019 CALIFORNIA ENERGY CODE SECTION 5.504.1 AND 5.504.3.
- ALL ADHESIVE, SEALANTS AND CAULKING SHALL NOT EXCEED SCAQMD RULE 118 VOC LIMITS AND COMPLY WITH 2019 CALIFORNIA SECTION 5.504.4 GUIDELINES. SUBMIT DOCUMENTATION TO ARCHITECT FOR APPROVAL. INCLUDE MANUFACTURER'S PRODUCT SPECIFICATION AND FIELD VERIFICATION REPORTS OF ALL ON-SITE PRODUCT CONTAINERS AND RETAIN DOCUMENTATION AT THE JOB SITE DURING CONSTRUCTION.
- ALL OUTSIDE AIR AND RETURN AIR FILTERS SHALL BE LABELED, BE MINIMUM MERV 13, BE PROVIDED WITH WRITTEN MAINTENANCE RECOMMENDATIONS, AND BE INCLUDED AS PART OF THE O&M MANUAL AS REQUIRED PER 2019 CALIFORNIA ENERGY CODE SECTION 5.504.5.3. IF THE HVAC SYSTEM IS USED DURING CONSTRUCTION, REPLACE ALL FILTERS IMMEDIATELY PRIOR TO OCCUPANCY.
- PROVIDE APPROVED CO2 MONITORING SYSTEM MEETING THE REQUIREMENTS OF 2019 CALIFORNIA ENERGY CODE SECTION 120 (C)(4) AND 2019 CALIFORNIA ENERGY CODE SECTION 5.506.2.

**MECHANICAL EMS NOTES:**

- COORDINATE ALL CONTROLS, EQUIPMENT ACCESSORIES, AND ASSOCIATED WORK WITH EMS VENDOR PRIOR TO ALL EQUIPMENT PURCHASES AND INSTALLATION.
- GENERAL CONTRACTOR IS RESPONSIBLE FOR COORDINATING WITH EMS VENDOR TO PROVIDE A FULLY FUNCTIONAL SYSTEM AT START-UP. FAILURE TO COORDINATE CONTROLS AND EQUIPMENT ACCESSORIES WILL BE THE RESULTING IN MODIFICATIONS SHALL BE RESPONSIBILITY OF THE CONTRACTOR AT NO EXTRA COST TO THE OWNER.
- GENERAL CONTRACTOR SHALL PROVIDE, AS APPLICABLE, WITH FACTORY INSTALLED BACNET OPEN BOARD CONTROLLER WITH SUPPLY AND OUTSIDE AIR TEMPERATURE SENSORS.
- PROVIDE ALL MOTORIZED DAMPERS ON PLAN, AS APPLICABLE, TO BE ABLE TO CONNECT TO ACTUATOR PROVIDED BY EMS VENDOR. MOTORIZED DAMPERS SHALL BE ACCESSIBLE FROM WITHIN SPREADER DUCT ACCESS PANELS. REFER TO SPECIFICATIONS FOR MORE INFORMATION.
- PROVIDE ALL VARIABLE FREQUENCY DRIVES ON PLAN, AS APPLICABLE, TO BE ABLE TO ACCEPT A 0-10VDC SPEED SIGNAL AND START/STOP SIGNAL FROM THE EMS. VARIABLE FREQUENCY DRIVES SHALL BE FACTORY PROVIDED AND WALL MOUNTED.
- THERMOSTATS AND SENSORS SHALL BE FURNISHED BY EMS VENDOR AND INSTALLED BY DIVISION 26 CONTRACTOR UNLESS NOTED OTHERWISE.
- OUTDOOR SENSOR ASSEMBLY FOR ECONOMIZER CONTROL IS PROVIDED BY EMS VENDOR. PROVIDE CHASE LARGE ENOUGH FOR 1/4" POLY TUBE AND (2) WIRE PULLS FOR EMS CONTROLS.
- PROVIDE ALL ECONOMIZER MIXING BOXES ON PLAN, AS APPLICABLE, WITHOUT CONTROLS AND A FACTORY INSTALLED ACTUATOR CAPABLE OF ACCEPTING A 2-10VDC OR 4-20mA ANALOG CONTROL SIGNAL.

**MECHANICAL LANDLORD NOTES:**

- EQUIPMENT, EXHAUST FANS, AND UTILITY VENTS CANNOT BE HIGHER THAN THE PARAPET WALL IN THE ROOF WELL AREA.
- ALL ROOF EQUIPMENT VENTS AND ASSOCIATED CONDUIT LINES INSTALLED DURING THE TENANT IMPROVEMENT CONSTRUCTION ON THE ROOF MUST BE PAINTED. PAINT SPEC WILL BE PROVIDED BY THE PROPERTY TEAM.
- EQUIPMENT AND VENTS CAN ONLY BE INSTALLED INSIDE THE ROOF WELL AREA. NO EQUIPMENT AND VENTS SHALL BE PLACED AT MANSARD ROOF AREA.
- ELECTRICAL CONDUITS AND CONDENSATE DRAIN LINES MUST IMMEDIATELY PENETRATE ROOF AND RUN ALONG THE UNDERSIDE OF THE ROOF STRUCTURE. ALL CONDENSATE DRAINS MUST RUN INSIDE TENANTS PREMISES AND DRAIN TO EITHER A FLOOR DRAIN OR INSIDE THE TENANTS PREMISES.
- IF ANY ROOF PENETRATIONS ARE MADE, LANDLORD'S ROOFING CONSULTANT (IRC) MUST INSPECT THE PATCHING/FLASHING. ANY ROOF REPAIRS MUST BE COMPLETED BY THE LANDLORD'S ROOFER (RED POINTE ROOFING). REFER TO LANDLORD CONTRACT SHEET FOR CONTACT INFO.

**COMMISSIONING / FUNCTIONAL TESTING:**

CONTRACTOR'S BID SHALL INCLUDE PROVISIONS TO PROVIDE ALL SERVICES RELATED TO THE COMMISSIONING AND FUNCTIONAL TESTING OF MECHANICAL SYSTEMS INCLUDING A COMMISSIONING PLAN, FUNCTIONAL TESTING, AND RELATED DOCUMENTATION, REPORTS, AND OWNER TRAINING. THIS INCLUDES RETAINING THE SERVICES OF A 3RD PARTY REGISTERED DESIGN PROFESSIONAL OR APPROVED AGENCY. REFER TO THE LATEST ADOPTED EDITION OF THE APPLICABLE ENERGY CODE FOR MORE INFORMATION. CONTRACTOR SHALL COMPLETE ALL RELATED COMMISSIONING REQUIREMENTS PRIOR TO FINAL INSPECTIONS IN ACCORDANCE WITH THE CONSTRUCTION DOCUMENTS, CODE, AND MANUFACTURER'S INSTRUCTIONS.

V2.01



MBH PROJECT: 58849



01/27/2023

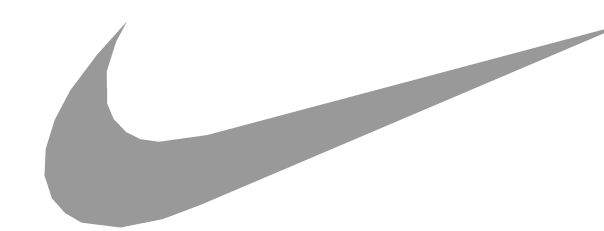
No.	Description	Date
	75% SET	03/14/2022
	90% SET	04/04/2022
	PERMIT/BID/LL REVIEW SET	04/14/2022
4	PERMIT AMENDMENT/ REVISED BID	12/22/2022
5	Issue For Construction	01/27/2023

**NIKE BY IRVINE**  
880 Spectrum Center Dr.  
Irvine, CA 92618

Project Number	
Drawn By	HENDERSON
Checked By	HENDERSON

**MECHANICAL LEGENDS AND GENERAL NOTES**

**M-000**



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MBH PROJECT: 55849



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01/27/2023

No.	Description	Date
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MECHANICAL HVAC PLAN

M-100

THE DUCTWORK LAYOUT INDICATED ON THE DRAWINGS IS SCHEMATIC AND SHOWS DESIGNED INTENT ONLY. PRIOR TO FABRICATION AND INSTALLATION OF DUCTWORK, DIVISION 23 SHALL HAVE A QUALIFIED, EXPERIENCED SKETCHER PREPARE AND SUBMIT SHEET METAL SHOP DRAWINGS. SHOP DRAWINGS SHALL TAKE INTO ACCOUNT ALL EXISTING CONDITIONS, INCLUDING BUT NOT LIMITED TO, STRUCTURAL MEMBERS, CONDUITS AND PIPING TO REMAIN. SHOP DRAWINGS SHALL ALSO TAKE INTO ACCOUNT ALL NEW DESIGN CONDITIONS, INCLUDING BUT NOT LIMITED TO, STRUCTURAL MEMBERS, PIPING, CEILINGS, SOFFIT HEIGHTS, AND LIGHT FIXTURES.

SHOP DRAWINGS SHALL INDICATE ALL REVISIONS TO THE LAYOUT REQUIRED TO ACCOMMODATE THE EXISTING CONDITIONS AND/OR MAINTAIN THE CEILING HEIGHTS AND CLEARANCES REQUIRED. NOTIFY THE ARCHITECT AND ENGINEER OF ANY LOCATION WHERE THE DESIGN INTENT CANNOT BE MET PRIOR TO FABRICATION AND INSTALLATION OF DUCTWORK. REVISIONS TO DUCTWORK, EQUIPMENT, CONDUIT AND/OR PIPING REQUIRED BY CONTRACTOR'S FAILURE TO SUBMIT PROPERLY PREPARED SHOP DRAWINGS SHALL BE THE RESPONSIBILITY OF DIVISION 23 AT NO ADDITIONAL COST TO THE CLIENT OR DELAY TO THE PROJECT SCHEDULE.

GENERAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING TO ARCHITECT, ENGINEER, LANDLORD, AND BUILDING OFFICIAL INSPECTOR A FINAL TEST AND BALANCE REPORT PER THE SPECIFICATIONS. PROVIDE TEST AND BALANCE REPORT TO ARCHITECT, ENGINEER, AND LANDLORD PRIOR TO THE FINAL BUILDING INSPECTION.

LANDLORD REQUIREMENTS:  
LANDLORD APPROVED ROOFING CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING ALL CUTS THROUGH THE EXISTING ROOF, MODIFYING EXISTING OPENINGS, AND/OR ALTERING CURB FLASHING AT GENERAL CONTRACTOR'S EXPENSE. COORDINATE WITH GENERAL CONTRACTOR.

EMS CONTROLS:  
CONTRACTORS ARE RESPONSIBLE FOR COORDINATING ALL EQUIPMENT CONTROLS WITH EMS VENDOR PRIOR TO PURCHASE AND INSTALLATION. CONTRACTORS SHALL COORDINATE WITH EMS VENDOR TO PROVIDE ALL NECESSARY EQUIPMENT AND ACCESSORIES FOR A FULLY FUNCTIONING SYSTEM.

TEMPERATURE CONTROLS:  
EMS VENDOR SHALL FURNISH SENSORS AND CONTROL COMPONENTS AS INDICATED ON PLANS AND AS NECESSARY TO ACCOMPLISH THE INTENT OF THE DRAWINGS. ALL CONTROLS SHALL BE TIED INTO THE EMS SYSTEM UNLESS NOTED OTHERWISE.

GENERAL CONTRACTOR SHALL INSTALL CARRIER FURNISHED TEMPORARY THERMOSTATS AND FEED THE WIRING DOWN INTO THE SPACE FOR START UP AND CONTROL OF RTU'S UNTIL THE EMS SYSTEM IS OPERABLE. REFER TO M3.9 FOR CARRIER CONTACT INFORMATION.

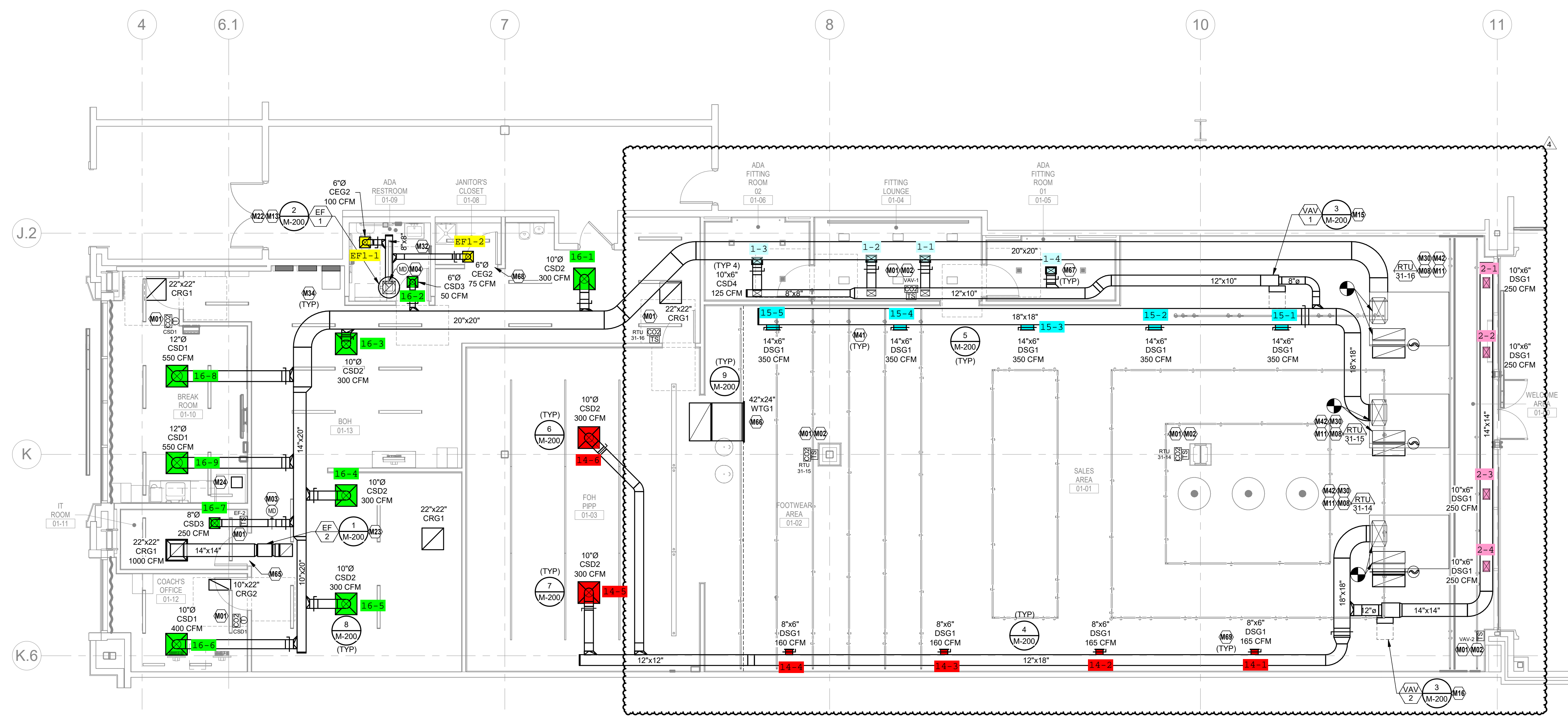
PROVIDE RFID DUCTWORK MESH OVER TRANSFER GRILLS BELOW 15'-0" AFF BETWEEN THE STOCKROOM AND THE SALES FLOOR, IF APPLICABLE.

KEYNOTES ARE PROTOTYPICAL. MISSING KEYNOTE NUMBERS INDICATE A PROTOTYPICAL NOTE IS NOT USED OR REMOVED.

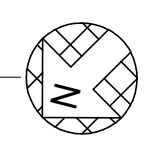
MECHANICAL PLAN NOTES

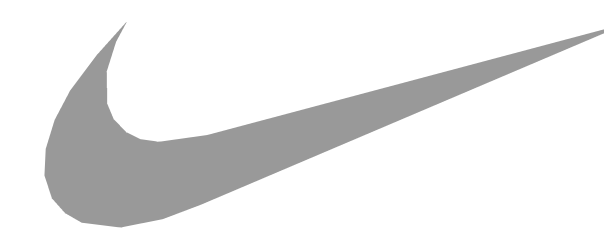
- M01 ALL THERMOSTATS AND SENSORS ARE FURNISHED BY EMS VENDOR AND INSTALLED BY DIVISION 26. UNLESS NOTED OTHERWISE, DIVISION 26 SHALL COORDINATE EXACT DEVICE QUANTITIES, LOCATIONS, AND POWER CONNECTION(S) REQUIREMENTS WITH EMS VENDOR PRIOR TO CONSTRUCTION. M02 DO NOT INSTALL SENSORS ON WALL GRAPHICS. CONFIRM LOCATIONS OF SENSORS WITH FM PRIOR TO INSTALLATION.
- M03 INSTALL DAMPER AND ACTUATOR IN LOCATION INDICATED. DAMPER FURNISHED BY DIVISION 23. ACTUATOR FURNISHED BY EMS VENDOR.
- M04 MOTORIZED DAMPER SHALL BE PROVIDED INTEGRAL TO EXHAUST FAN AND ACCESSIBLE THROUGH FAN ON ROOF. MOTORIZED DAMPER IS SHOWN ON PLAN FOR REFERENCE ONLY. REFER TO MECHANICAL SCHEDULES FOR MORE DETAILS.
- M08 COORDINATE EXISTING UNIT CONTROLS AND ANY NECESSARY ACCESSORIES/CONNECTIONS WITH EMS VENDOR. COORDINATE WITH EQUIPMENT MANUFACTURER TO PROVIDE NEW BACNET OPENBOARD CONTROLLER FOR EMS INTERFACE.
- M11 COORDINATE LOCATION OF EXISTING ROOF-MOUNTED HVAC EQUIPMENT WITH LANDLORD PRIOR TO CONSTRUCTION. LANDLORD SHALL CONFIRM ADEQUATE ACCESS AND CLEARANCES ARE PROVIDED FOR ALL ROOF-MOUNTED HVAC EQUIPMENT.
- M13 COORDINATE LOCATION OF NEW ROOF-MOUNTED HVAC EQUIPMENT WITH LANDLORD PRIOR TO CONSTRUCTION. LANDLORD SHALL CONFIRM ADEQUATE ACCESS AND CLEARANCES ARE PROVIDED FOR ALL ROOF-MOUNTED HVAC EQUIPMENT.
- M15 PROVIDE NEW VAV BOX IN SUPPLY AIR DUCT SERVING FITTING ROOMS. INSTALL VAV BOX IN ACCESSIBLE LOCATION AND COORDINATE CONTROLS WITH EMS VENDOR PRIOR TO ORDERING.
- M16 PROVIDE NEW VAV BOX IN SUPPLY AIR DUCT SERVING SOLAR ZONE(S). INSTALL VAV BOX IN ACCESSIBLE LOCATION AND COORDINATE CONTROLS WITH EMS VENDOR PRIOR TO ORDERING.
- M22 PROVIDE NEW ROOF-MOUNTED EXHAUST FAN AS SCHEDULED FOR GENERAL RESTROOM EXHAUST. INSTALL ROOF-MOUNTED FAN IN EXISTING FAN LOCATION AND REUSE ROOF PENETRATION. COORDINATE EXACT LOCATION PRIOR TO CONSTRUCTION.
- M23 EXHAUST FAN SERVES TO PROVIDE TRANSFER AIR ONLY AND SHALL DISCHARGE AIR INTO THE PLENUM. FAN SHALL BE PROVIDED WITH INTEGRAL GRAVITY BACKDRAFT DAMPER.
- M24 INSTALL VAV POWER MODULE FOR CONTROL OF OFFICE VAV DIFFUSERS IN AN ACCESSIBLE LOCATION ABOVE THE CEILING. DIVISION 26 CONTRACTOR SHALL PROVIDE 120V POWER TO MODULE. REFER TO ELECTRICAL DRAWINGS FOR DETAILS.
- M30 ROUTE SHEET METAL RETURN AIR DUCT AS SHOWN WITH TERMINATION DIRECTED UPWARD. SIZE PLENUM FULL SIZE OF RETURN AIR INLET. PROVIDE DUCT LINER IN RETURN AIR DUCTWORK FOR SOUND ATTENUATION.
- M32 ROUTE EXHAUST AIR DUCTWORK TO NEW ROOF MOUNTED EXHAUST FAN. COORDINATE EXACT ROUTING WITH STRUCTURE AND OTHER OBSTACLES. ADJUST ROUTING TO MATCH.
- M34 DO NOT ROUTE DUCTWORK OVER ELECTRICAL EQUIPMENT. NOTIFY ENGINEER OF CONFLICTS IN FIELD.
- M41 COORDINATE DUCT ROUTING WITH LIGHTS AND STRUCTURE. ROUTE ALL SALES DUCTWORK AT SAME ELEVATION BELOW UNDERSIDE OF DECK.
- M42 ROUTE SUPPLY DUCTWORK TO EXISTING DUCT DROP AND TRANSITION DUCTWORK IN RISER AS NECESSARY.
- M65 LOUVERED DOOR FOR MAKEUP AIR BY GENERAL CONTRACTOR. REFER TO ARCHITECTURAL DRAWINGS FOR MORE INFORMATION.
- M66 PROVIDE GRILLE ON WALL FOR TRANSFER AIR. MOUNT AS HIGH AS POSSIBLE WITHIN STRUCTURE AND INSTALL WITH BLADES ANGLED UP TOWARDS STRUCTURE FOR REDUCED VISIBILITY.
- M67 COORDINATE LOCATION OF FITTING ROOM DIFFUSERS WITH LIGHTS, SPRINKLERS, SPEAKERS, AND OTHER CEILING DEVICES FOR A NEAT AND ORDERLY INSTALLATION. INSTALL CEILING DEVICES IN-LINE WITH EACH OTHER WHERE POSSIBLE.
- M68 PROVIDE 1" UNDERCUT ON DOOR TO ALLOW FOR MAKEUP AIR TRANSFER.
- M69 INSTALL DUCT-MOUNTED DIFFUSERS WITH BLADES ANGLED AT 45° TOWARDS THE SALES FLOOR. DUCT-MOUNTED DIFFUSERS SHALL HAVE INTEGRAL DAMPER ADJUSTABLE FROM FACE OF DEVICE.

INSTALL DUCTWORK AND PIPING AS TIGHT TO STRUCTURE AS POSSIBLE. COORDINATE WITH OTHER TRADES TO AVOID CONFLICTS. COORDINATE INSTALLATION OF DUCTWORK AND PIPING TO AVOID CONFLICTS WITH ELECTRICAL PANELS, LIGHTING FIXTURES, ETC. NOTIFY CONSTRUCTION PROJECT MANAGER OF CONFLICTS.



1 HVAC PLAN  
3/16" = 1'-0"





NIKE INC.  
ONE BOWERMAN DRIVE  
BEAVERTON, OR 97005



960 Atlantic Ave  
Alameda, CA 94501  
Tel 510 865 8663  
Fax 510 865 1611

MBH PROJECT: 55849

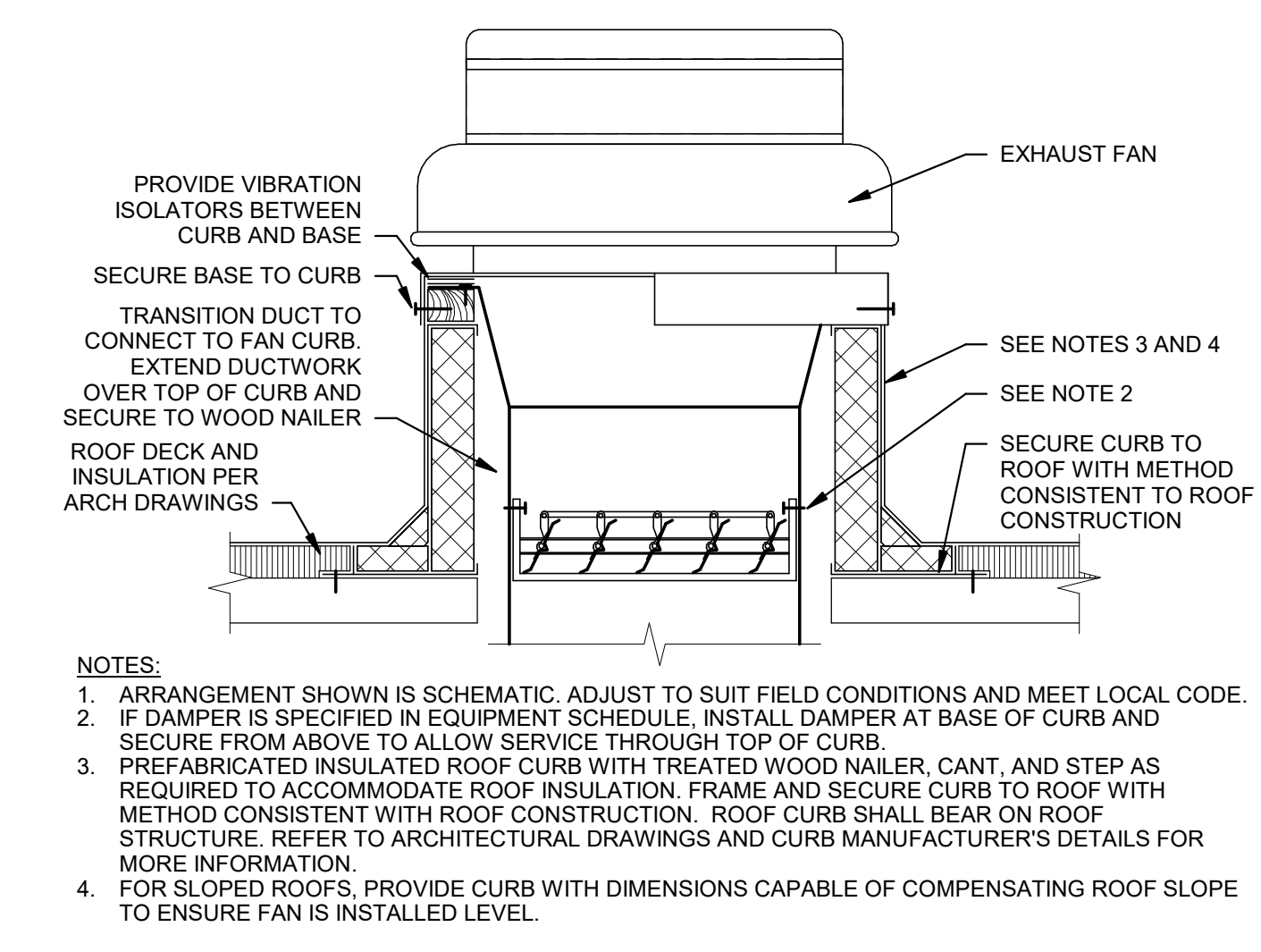


HENDERSON ENGINEERS  
8345 LENEVA DRIVE, SUITE 300  
LENEXA, KS 66214  
TEL 913.742.5000 FAX 913.742.5001  
WWW.HENDERSONENGINEERS.COM  
2150005162

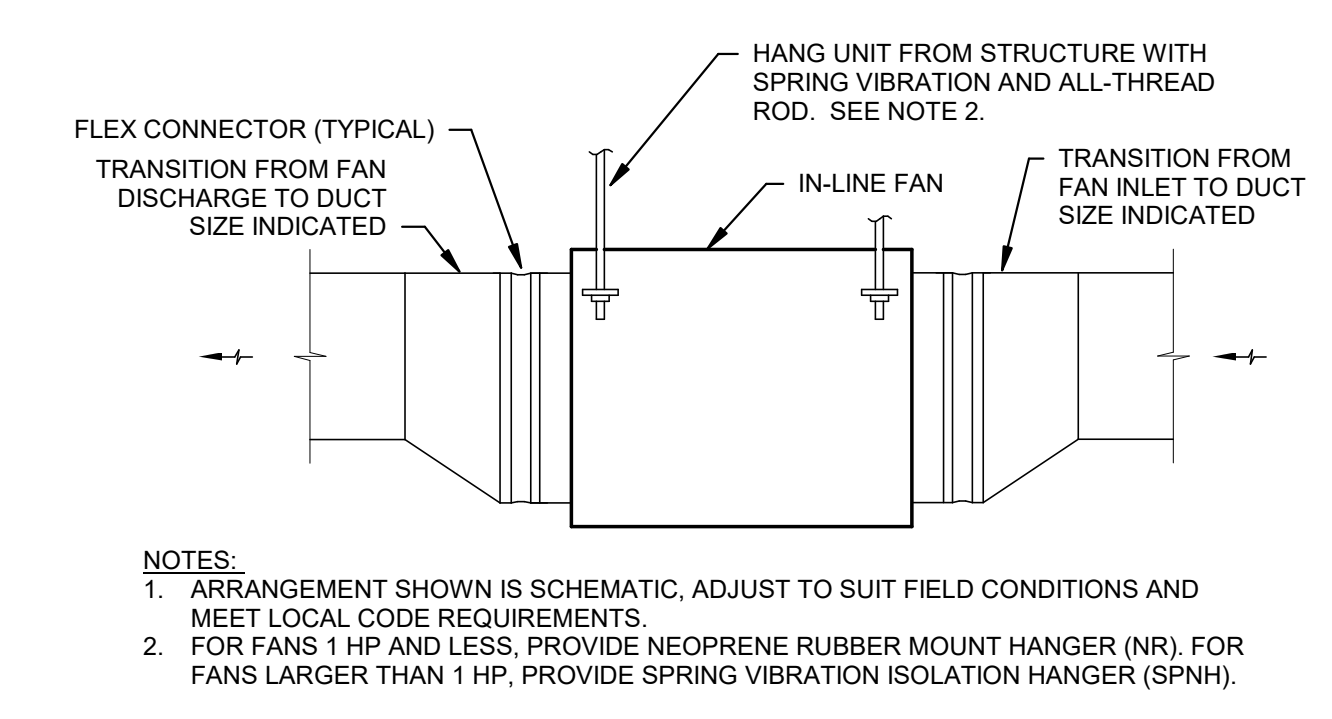


01/27/2023

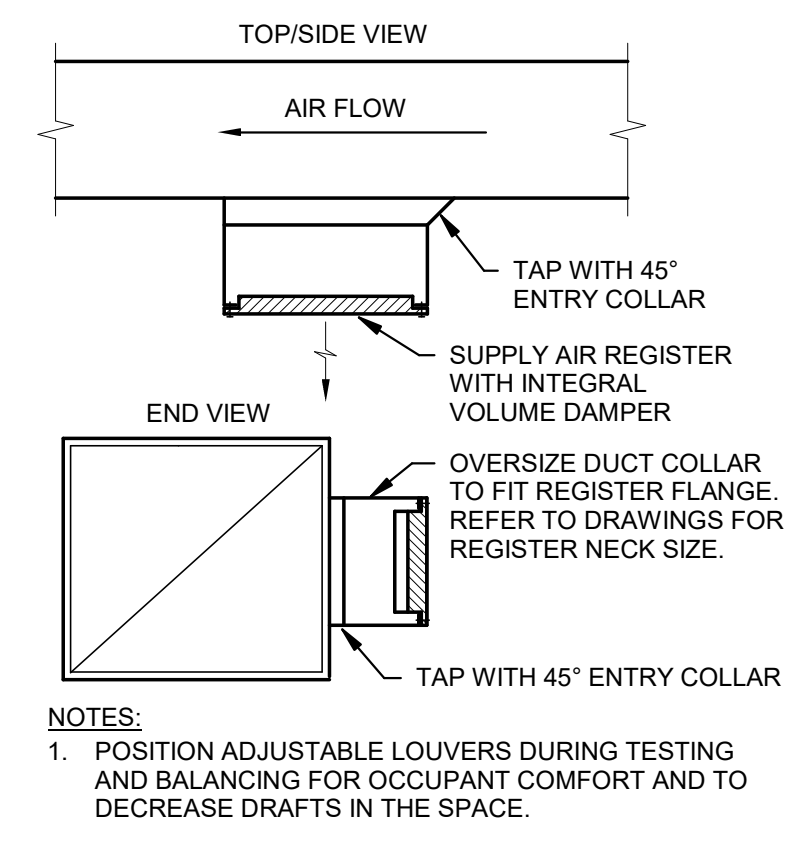
No.	Description	Date
	75% SET	03/14/2022
	90% SET	04/04/2022
	PERMIT/BID/LL REVIEW SET	04/14/2022
4	PERMIT AMENDMENT/REVISED BID	12/22/2022
5	Issue For Construction	01/27/2023



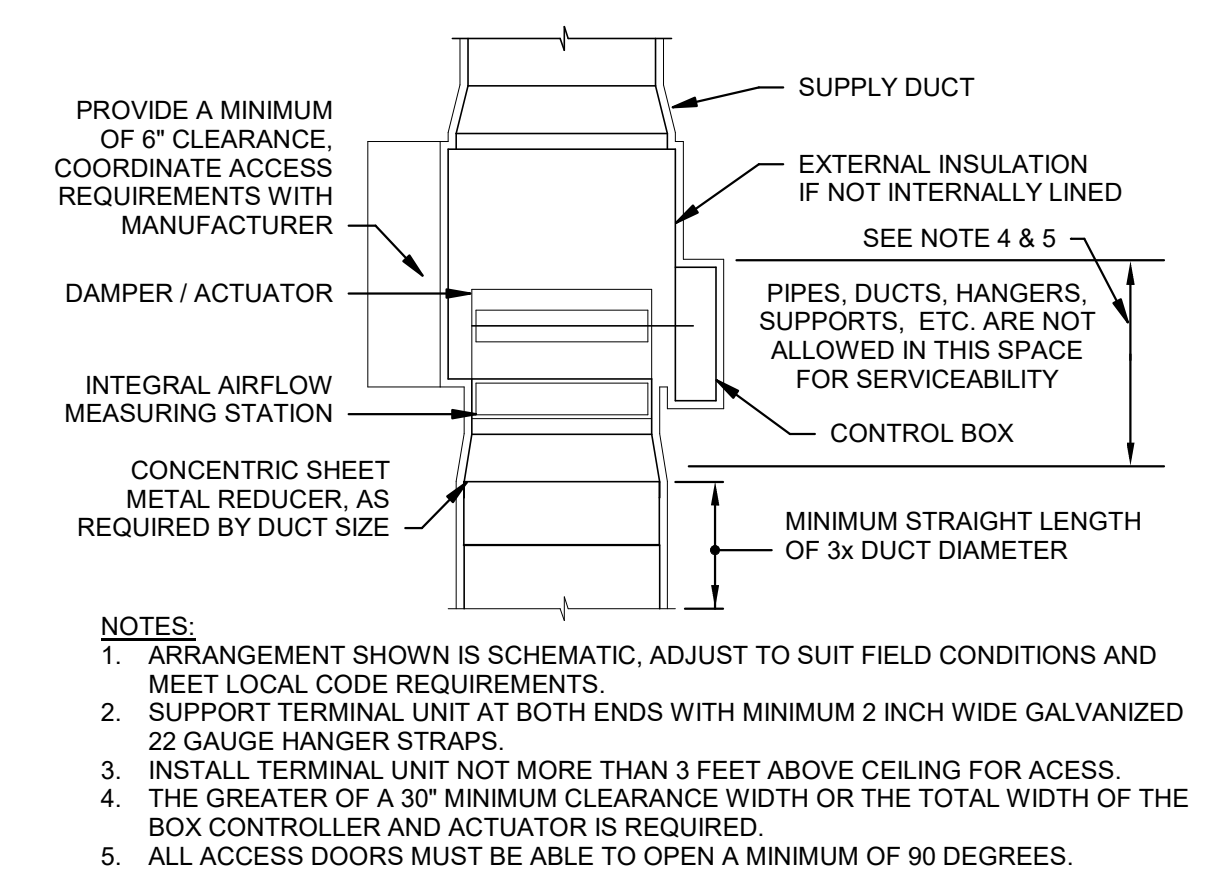
2 ROOF-MOUNTED DOWNBLAST FAN DETAIL  
NTS



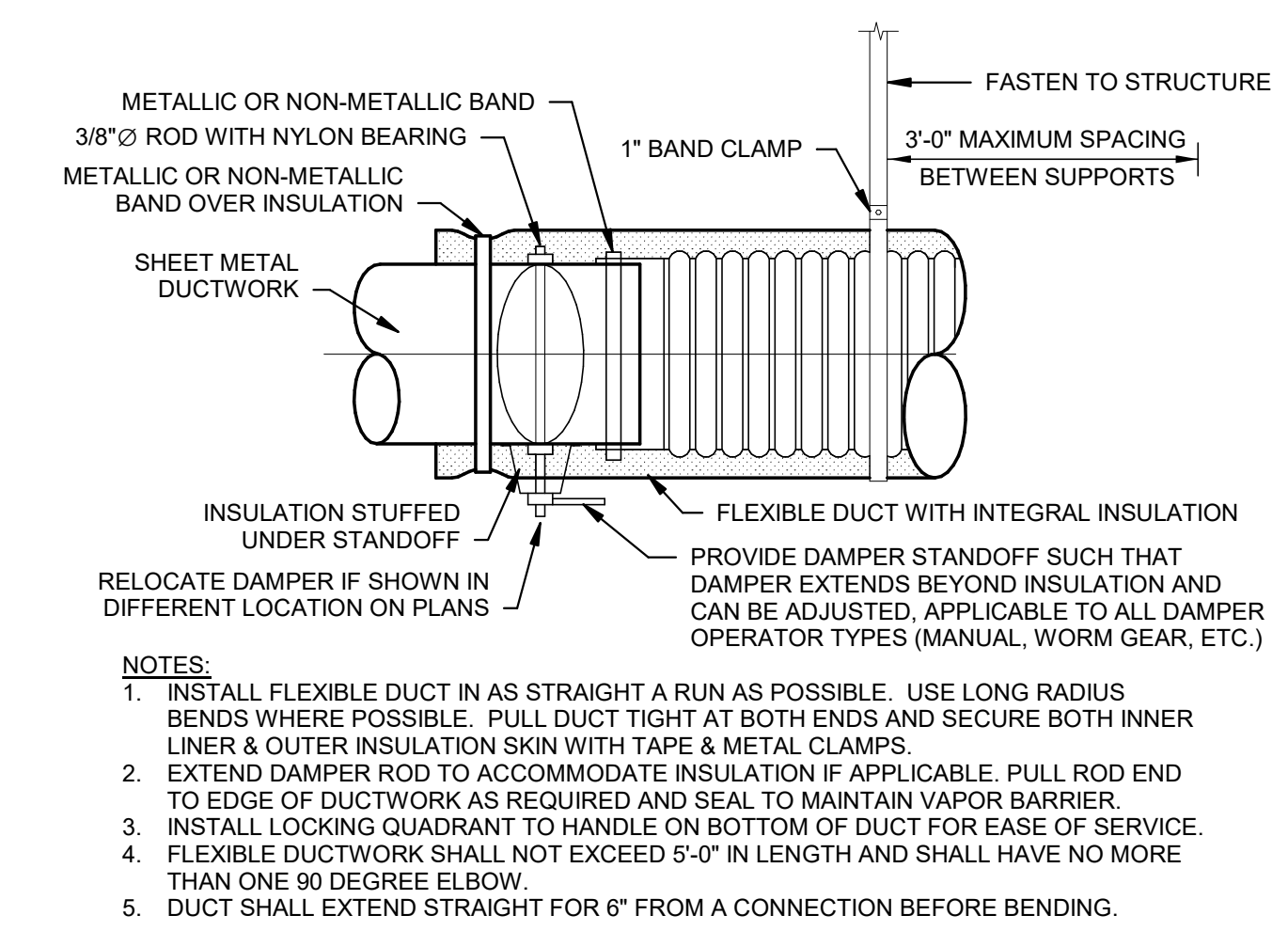
1 IN-LINE DUCT-MOUNTED FAN DETAIL  
NTS



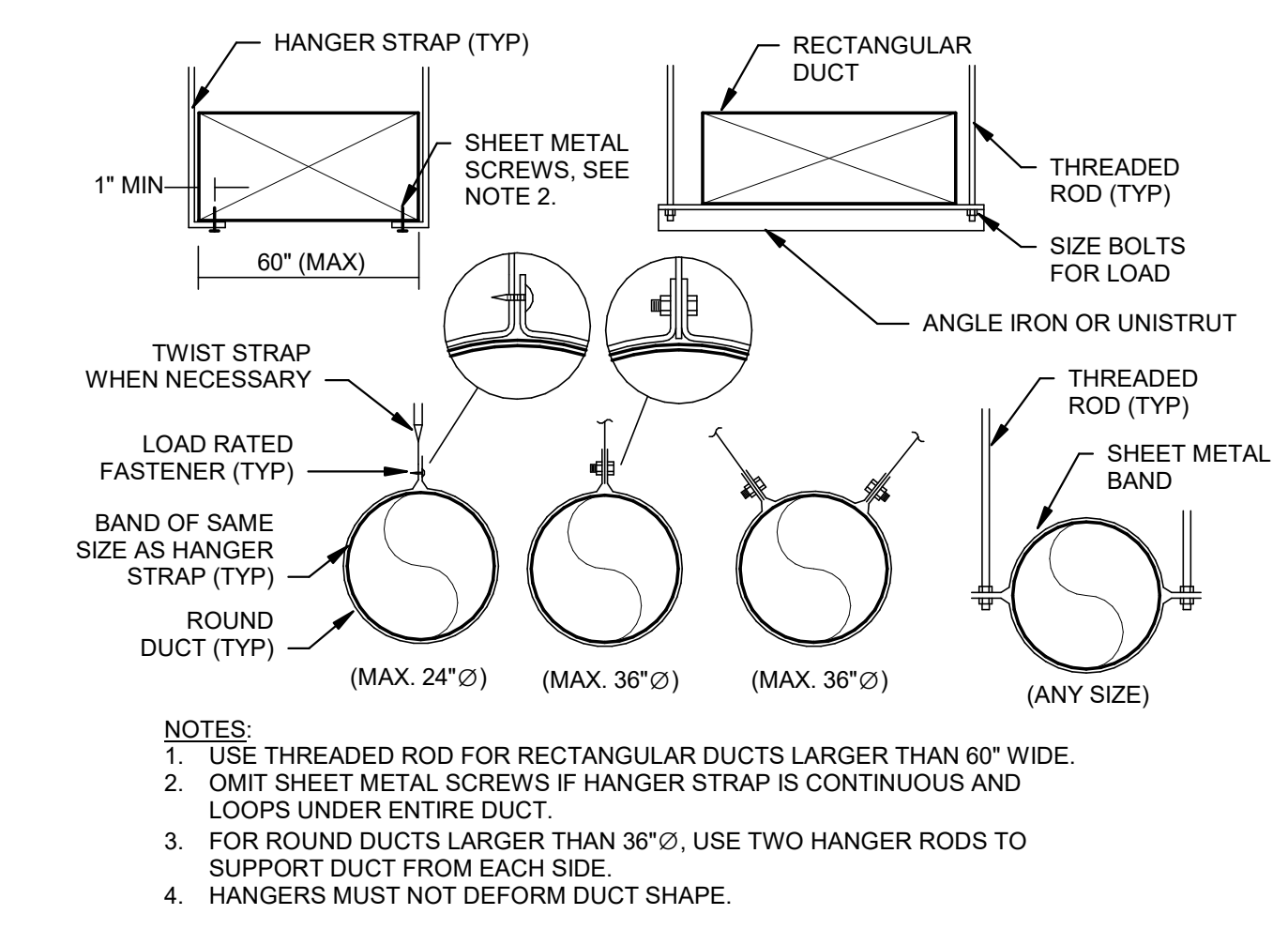
4 REGISTER MOUNTING TO RECTANGULAR DUCT DETAIL  
NTS



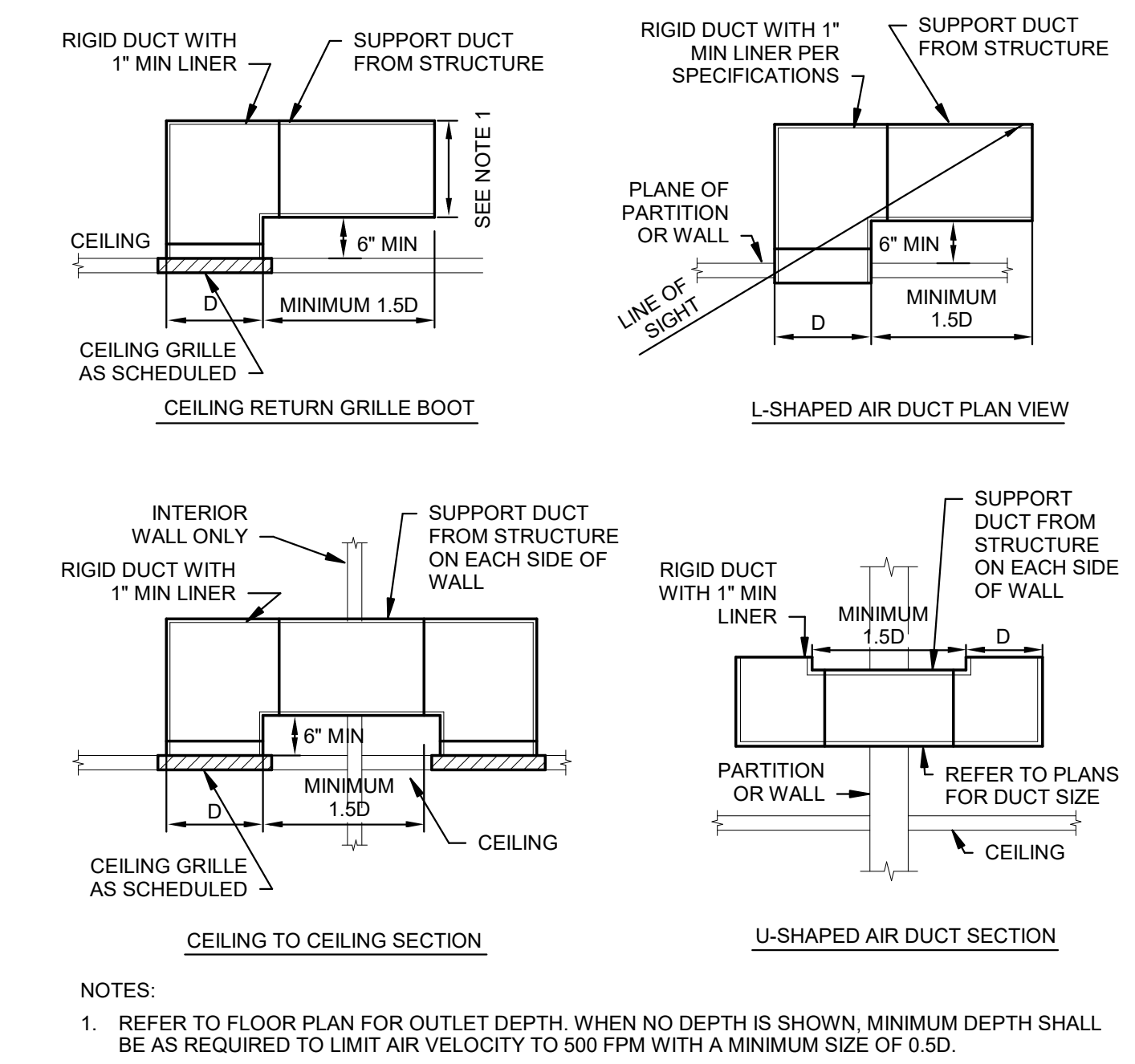
3 SINGLE DUCT VAV TERMINAL UNIT - COOLING ONLY DETAIL  
NTS



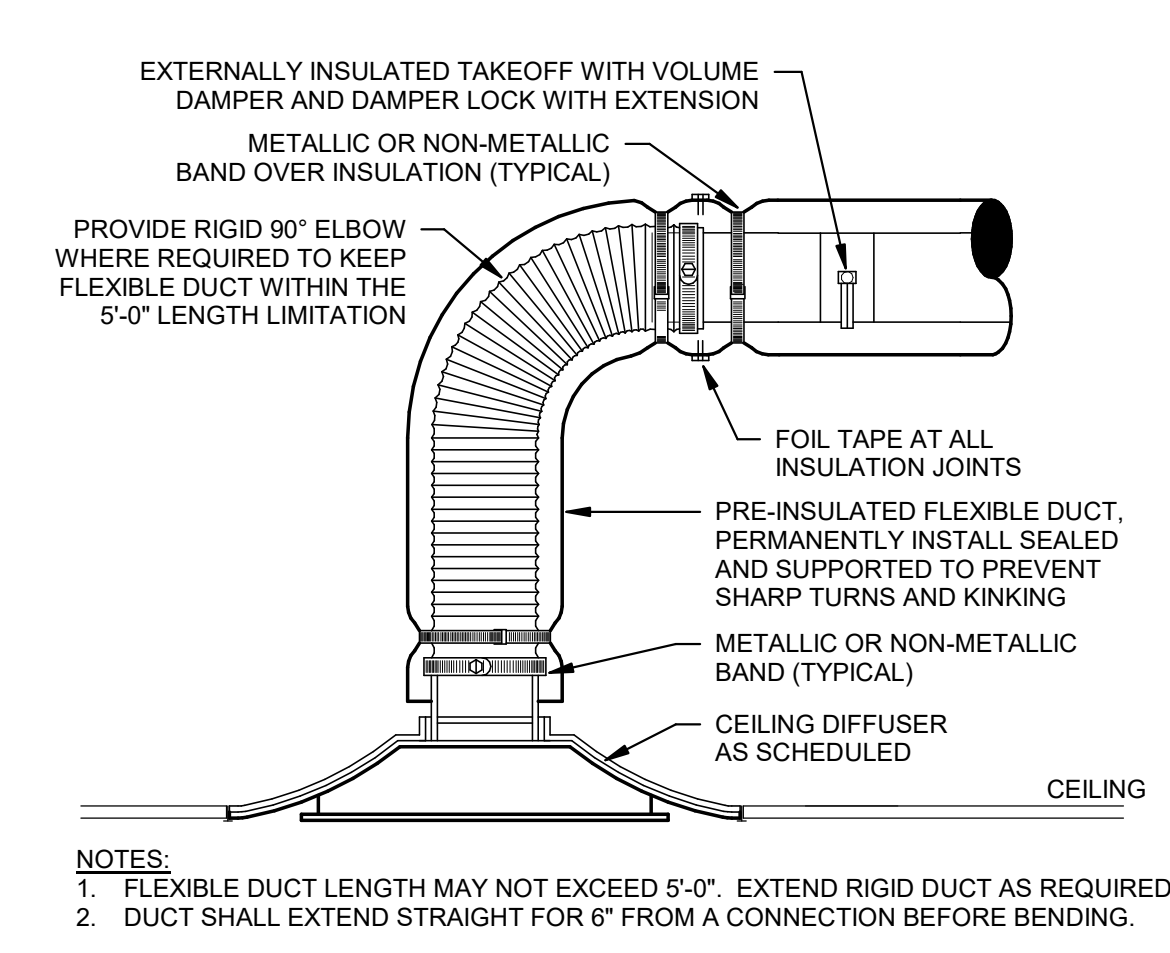
6 DAMPER AND FLEX DUCTWORK CONNECTION DETAIL  
NTS



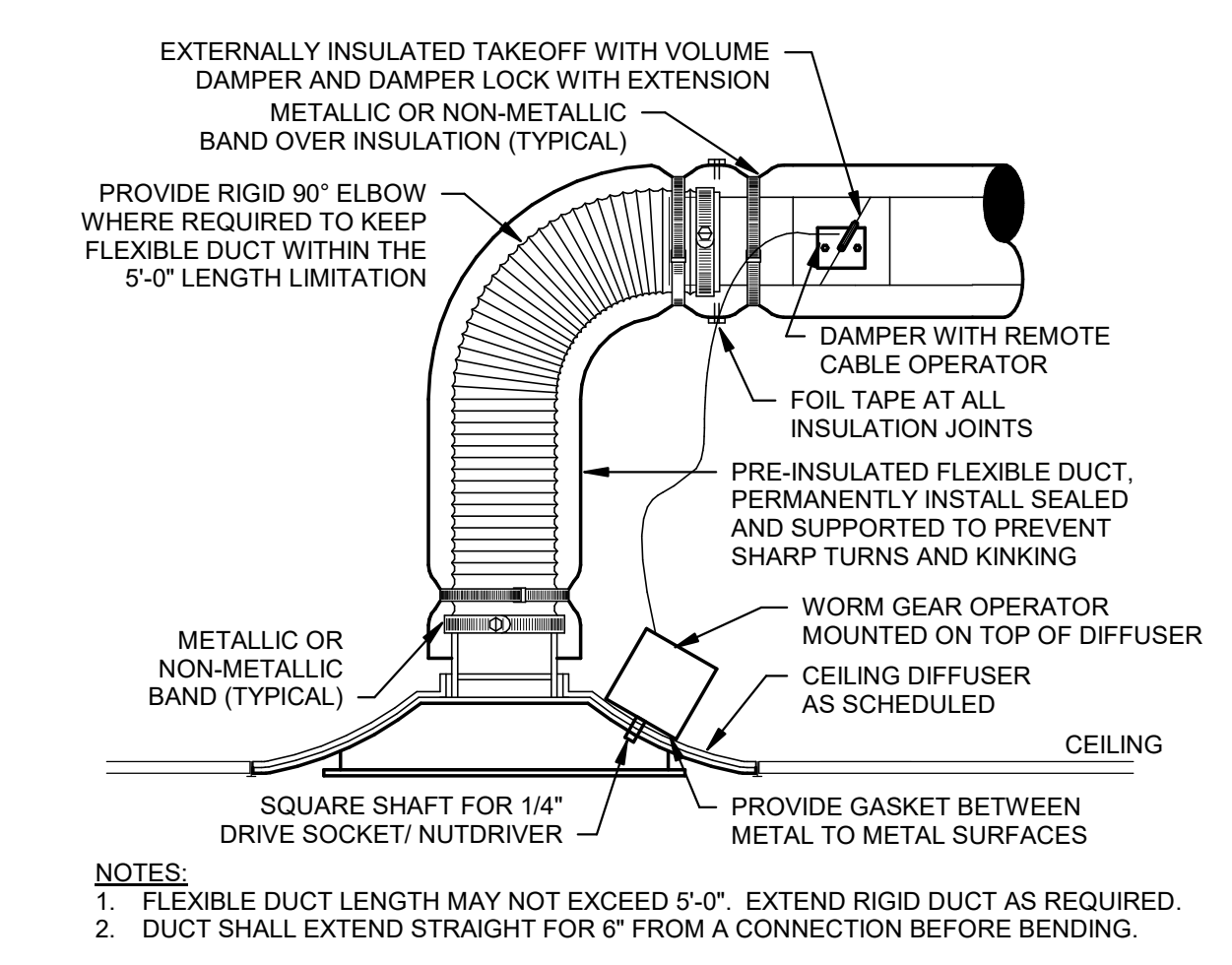
5 DUCT HANGER - LOWER ATTACHMENT DETAILS  
NTS



9 RETURN/TRANSFER AIR DUCT DETAIL  
NTS



8 LAY-IN CEILING DIFFUSER DETAIL  
NTS



7 HARD CEILING DIFFUSER DETAIL  
NTS

NIKE BY IRVINE  
880 Spectrum Center Dr.  
Irvine, CA 92618

Project Number  
Drawn By HENDERSON  
Checked By HENDERSON

MECHANICAL DETAILS

M-200

ROOFTOP UNIT CONTROL MATRIX							
CONTROL FEATURE	UNITS	RTU 31-14	RTU 31-15	RTU 31-16	POINT TYPE INTERFACE WITH DDC (READ/WRITE)	NOTES	BY
		SETPOINT OR Y/N	SETPOINT OR Y/N	SETPOINT OR Y/N			
BUILDING AUTOMATION SYSTEM (BAS)							
ENERGY MANAGEMENT SYSTEM INTERFACE		Y	Y	Y	BACNET		A
SETPONTS							
COOLING - OCCUPIED COOLING SETPOINT	"F	72	72	72	READWRITE		
COOLING - UNOCCUPIED COOLING SETPOINT	"F	77	77	77	READWRITE		
COOLING - MINIMUM COOLING SUPPLY AIR TEMPERATURE (SAT) SETPOINT	"F	50	50	50	READWRITE		
COOLING - LOCKOUT TEMPERATURE SETPOINT	"F	55	55	55	READWRITE		
DEAD BAND - MINIMUM HEATING AND COOLING TEMPERATURE SETPOINT DIFFERENCE	"F	5	5	5			
HEATING - OCCUPIED HEATING SETPOINT	"F	70	70	70	READWRITE		
HEATING - UNOCCUPIED HEATING SETPOINT	"F	60	60	60	READWRITE		
HEATING - MAXIMUM HEATING SUPPLY AIR TEMPERATURE (SAT) SETPOINT	"F	120	120	120	READWRITE		
HEATING - LOCKOUT TEMPERATURE SETPOINT	"F	55	55	55	READWRITE		
PROGRAMMED CONTROL FEATURES							
DEMAND CONTROL VENTILATION (DCV) HIGH ALARM SETPOINT - CO2 SENSOR FEEDBACK	PPM	750	750	750	READWRITE		
EQUIPMENT ACCESSORIES AND CONTROLS							
OUTSIDE AIR DAMPER - MOTOR OPERATED (MODULATING)	Y	Y	Y	Y	READ POSITION	M	
INTEGRATED ECONOMIZER - DIFFERENTIAL DRY BULB AND DIFFERENTIAL ENTHALPHY	Y	Y	Y	Y	READWRITE	G, H	
ECONOMIZER FAULT DETECTION AND DIAGNOSTICS (FDD) SYSTEM	Y	Y	Y	Y	READ	O	
RELIEF - BAROMETRIC DAMPER	Y	Y	Y	Y			
RELIEF - CONSTANT VOLUME POWERED EXHAUST FAN	Y	Y	Y	Y	READ STATUS	N, O	
COOLING COIL (DX - STAGED)	Y	Y	Y	Y	READ STATUS	E, F	
HEAT PUMP COIL WITH REVERSING VALVE	Y	Y	Y	Y	READ STATUS	K	
HEAT PUMP AUXILIARY HEATING COIL	Y	Y	Y	Y	READ STATUS	K	
SUPPLY FAN CONTROL METHOD	Y	Y	Y	Y			
ON DURING OCCUPIED HOURS	Y	Y	Y	Y		B	
UNIT START AND FAN OFF DELAY	Y	Y	Y	Y		B	
OPTIMUM START SEQUENCE	Y	Y	Y	Y		O	
VARIABLE VOLUME - 2-SPRIN FAN CONTROL	Y	Y	Y	Y		C	
SAFETIES, INTERLOCKS, AND ALARMS	Y	Y	Y	Y	READ STATUS	C	
RETURN AIR SMOKE DETECTOR - FIRE SAFETY SHUTDOWN	Y	Y	Y	Y	READ	D	
SAFETY CHAIN - SAFETY SHUTDOWN	Y	Y	Y	Y	READ	D	
SAT ALARM - SAFETY SHUTDOWN	Y	Y	Y	Y	READ	D	
SPT ALARM - SAFETY SHUTDOWN	Y	Y	Y	Y	READ	D	

EMS VENDOR SHALL PROVIDE CONTROL PANEL, RELAYS, THERMOSTATS, TEMPERATURE SENSORS, HUMIDITY SENSORS, AND/OR CO2 SENSORS WHERE SHOWN ON THE DRAWINGS AND AS REQUIRED TO FACILITATE THE SCHEDULED SEQUENCE OF OPERATION. EACH UNIT SHALL CONTROL BASED ON ITS OWN INTERNAL SAFETIES, TIME DELAYS, AND SEQUENCES UNLESS NOTED OTHERWISE. COORDINATE WITH OWNER FINAL BUILDING AND EQUIPMENT SCHEDULES DURING STARTUP.

- NOTES:
- EMS SHALL PROVIDE REMOTE SETPOINT ADJUSTMENT, SCHEDULING, AND MONITORING OF THE POINTS LISTED IN THE SCHEDULE FOR EACH UNIT. THE RTU SHALL BE SCHEDULED WITH A MINIMUM OF AN OCCUPIED AND UNOCCUPIED SCHEDULE. ADDITIONAL UNIT SCHEDULES SHALL BE AVAILABLE FOR REMOTE IMPLEMENTATION IF REQUIRED.
  - THE SUPPLY FAN SHALL RUN CONTINUOUSLY IN OCCUPIED MODE AND SHALL CYCLE ON AND OFF IN UNOCCUPIED MODE. A UNIT START DELAY IS USED WHEN TRANSITIONING FROM UNOCCUPIED TO OCCUPIED. FAN OFF DELAY ALLOWS THE SUPPLY FAN TO CONTINUE TO OPERATE AFTER HEATING AND COOLING STOPS.
  - VIA FACTORY VFD, THE CARRIER RTU OPEN BOARD SHALL DETERMINE FAN SPEED REQUIRED FOR HEATING AND COOLING. FACTORY VFD SHALL CONTROL TO 2 FAN SPEEDS. LOW SPEED SHALL NOT EXCEED 60% OF FULL SPEED AND SHALL DRAW NO MORE THAN 40% OF FAN POWER AT FULL SPEED. DURING FAN ONLY OR SINGLE STAGE COOLING, SUPPLY FAN SHALL OPERATE AT LOW SPEED. DURING HEATING, SECOND STAGE COOLING, DEHUMIDIFICATION OR FULL ECONOMIZER OPERATION, FAN SHALL OPERATE AT HIGH SPEED.
  - IF A LOCAL UNIT CONTROL ALARM IS ACTIVE, THE SUPPLY FAN TURNS OFF IMMEDIATELY REGARDLESS OF OCCUPANCY STATE OR DEMAND.
  - COOLING STAGES ARE CONTROLLED BY THE CARRIER RTU OPEN COOLING CONTROL PID LOOP AND COOLING STAGES CAPACITY ALGORITHM. THEY CALCULATE THE REQUIRED NUMBER OF STAGES OF THE PRECEDING CONDITIONS ARE MET. THE DAMPER SHALL REMAIN OPEN UNTIL THE SPACE IS SATISFIED OR THE EFFECTIVE UNOCCUPIED COOLING SETPOINT IN UNOCCUPIED MODE. THE FOLLOWING CONDITIONS MUST BE TRUE FOR THE COOLING ALGORITHM TO OPERATE:
    - THE OUTDOOR AIR TEMPERATURE IS GREATER THAN THE COOLING LOCKOUT TEMPERATURE SETPOINT.
    - THE SUPPLY FAN HAS BEEN ON FOR AT LEAST 30 SECONDS.
    - THE UNIT HAS A VALID SUPPLY AIR TEMPERATURE INPUT.
    - THE UNIT HAS A VALID SPACE TEMPERATURE INPUT.
    - HEATING MODE IS NOT ACTIVE AND THE TIME GUARD BETWEEN MODES HAS EXPIRED.
    - ECONOMIZER IS UNAVAILABLE OR ECONOMIZER IS ACTIVE AND THE FOLLOWING ARE TRUE: (1) ECONOMIZER IS GREATER THAN 85% OPEN, (2) SUPPLY AIR TEMPERATURE IS GREATER THAN 5 DEGREES ABOVE THE MINIMUM COOLING SAT SETPOINT, AND (3) SPACE TEMPERATURE IS GREATER THAN 0.5 DEGREES ABOVE THE EFFECTIVE OCCUPIED TEMPERATURE SETPOINT.
  - WHEN THE COOLING ALGORITHM PRECONDITIONS ARE MET, THE COMPRESSORS ARE ENERGIZED IN STAGES, AS APPLICABLE. ANTI-RECYCLE TIMERS ARE EMPLOYED TO PROTECT THE EQUIPMENT FROM SHORT-CYCLING. THERE ARE FIXED THREE-MINUTE MINIMUM ON-TIMES AND FIVE-MINUTE OFF-TIMES FOR EACH COMPRESSOR OUTPUT.
  - DURING COMPRESSOR OPERATION, THE RTU OPEN CONTROL LOGIC MAY REDUCE THE NUMBER OF ACTIVE STAGES IF THE SUPPLY AIR TEMPERATURE FALLS BELOW THE MINIMUM COOLING SAT SETPOINT. A COMPRESSOR STAGED OFF IN THIS FASHION MAY BE STARTED AGAIN AFTER THE NORMAL TIME-GUARD PERIOD HAS EXPIRED IF THE SUPPLY AIR TEMPERATURE HAS INCREASED ABOVE THE MINIMUM COOLING SAT SETPOINT.
  - THE SYSTEM SHALL UTILIZE THE FACTORY MODULATING ECONOMIZER FOR FREE COOLING WHEN OUTDOOR AIR CONDITIONS ARE SUITABLE. FOR THE ECONOMIZER TO OPERATE DURING OCCUPIED HOURS, THE FOLLOWING CONDITIONS MUST BE TRUE:
    - OUTDOOR AIR TEMPERATURE IS LESS THAN THE SPACE TEMPERATURE AND LESS THAN THE ECONOMIZER HIGH OUT LOCKOUT SETPOINT.
    - THE INDOOR FAN HAS BEEN ON FOR AT LEAST 30 SECONDS.
    - THE UNIT HAS A VALID SUPPLY AIR TEMPERATURE INPUT.
    - THE UNIT HAS A VALID SPACE TEMPERATURE INPUT.
    - OUTDOOR AIR ENTHALPHY IS LESS THAN THE SPACE ENTHALPHY. (ENTHALPHY STATUS SHALL READ "LOW").
  - IF ANY OF THE PRECEDING CONDITIONS ARE NOT TRUE AND THE SUPPLY FAN IS ON HIGH SPEED, THE ECONOMIZER SHALL BE SET TO THE DCV MINIMUM OUTDOOR AIR DAMPER POSITION (TBD BY TAB CONTRACTOR) IF ANY OF THE PRECEDING CONDITIONS ARE NOT TRUE AND THE SUPPLY FAN IS ON LOW SPEED. THE ECONOMIZER SHALL BE SET TO THE LOW FAN ECONOMIZER MINIMUM DAMPER POSITION (TBD BY TAB CONTRACTOR). IF ALL OF THE PRECEDING CONDITIONS ARE TRUE, THE ECONOMIZER PID LOOP SHALL MODULATE THE DAMPER. THE ECONOMIZER POSITION SHALL BE REDUCED AS THE SUPPLY AIR TEMPERATURE FALLS TO WITHIN 5 DEGREES OF THE MINIMUM COOLING SAT SETPOINT, BUT SHALL NEVER CLOSE BELOW THE DCV MINIMUM OUTDOOR AIR DAMPER POSITION.
  - DURING UNOCCUPIED HOURS, UNOCCUPIED FREE COOLING SHALL BE ENABLED. THE ECONOMIZER SHALL REMAIN CLOSED UNLESS THE FOLLOWING CONDITIONS ARE TRUE:
    - OUTDOOR AIR TEMPERATURE IS BELOW THE ECONOMIZER HIGH OUT LOCKOUT SETPOINT.
    - OUTDOOR AIR TEMPERATURE IS LESS THAN THE SPACE TEMPERATURE.
    - OUTDOOR AIR ENTHALPHY IS LESS THAN THE SPACE ENTHALPHY. (ENTHALPHY STATUS SHALL READ "LOW").
  - IF ALL OF THE PRECEDING CONDITIONS ARE TRUE AND THE SPACE TEMPERATURE RISES 1 DEGREE ABOVE THE EFFECTIVE UNOCCUPIED COOLING SETPOINT, THE SUPPLY FAN SHALL START AND THE ECONOMIZER DAMPER SHALL OPEN AS NECESSARY TO COOL THE SPACE. THE DAMPER SHALL REMAIN OPEN UNTIL THE SPACE IS SATISFIED OR THE PRECEDING CONDITIONS ARE NO LONGER TRUE. IF ANY OF THE PRECEDING CONDITIONS ARE NOT TRUE, THE ECONOMIZER SHALL CLOSE COMPLETELY.
  - HEATING STAGES ARE CONTROLLED BY THE CARRIER RTU OPEN HEATING CONTROL PID LOOP AND HEATING STAGES CAPACITY ALGORITHM. THEY CALCULATE THE REQUIRED NUMBER OF STAGES NEEDED TO SATISFY THE SPACE BY COMPARING THE SPACE TEMPERATURE TO THE EFFECTIVE OCCUPIED HEATING SETPOINT IN OCCUPIED MODE AND THE EFFECTIVE UNOCCUPIED HEATING SETPOINT IN UNOCCUPIED MODE. THE FOLLOWING CONDITIONS MUST BE TRUE FOR THE HEATING ALGORITHM TO OPERATE:
    - OUTDOOR AIR TEMPERATURE IS LESS THAN THE HEATING LOCKOUT TEMPERATURE SETPOINT.
    - THE SUPPLY FAN HAS BEEN ON FOR AT LEAST 30 SECONDS.
    - THE UNIT HAS A VALID SUPPLY AIR TEMPERATURE INPUT.
    - THE UNIT HAS A VALID SPACE TEMPERATURE INPUT.
    - HEATING MODE IS NOT ACTIVE AND THE TIME GUARD BETWEEN MODES HAS EXPIRED.
  - WHEN THE HEATING ALGORITHM PRECONDITIONS ARE MET, THE HEAT IS ENERGIZED IN STAGES, AS APPLICABLE. ANTI-RECYCLE TIMERS ARE EMPLOYED TO PROTECT THE EQUIPMENT FROM SHORT-CYCLING. THERE ARE FIXED ONE-MINUTE MINIMUM ON AND OFF TIMES FOR EACH HEATING OUTPUT.
  - DURING HEATING OPERATION, THE RTU OPEN CONTROL LOGIC MAY REDUCE THE NUMBER OF ACTIVE STAGES IF THE SUPPLY AIR TEMPERATURE EXCEEDS THE MAXIMUM HEATING SAT SETPOINT. A HEAT STAGE TURNED OFF IN THIS FASHION MAY BE STARTED AGAIN AFTER THE NORMAL TIME-GUARD PERIOD HAS EXPIRED IF THE SUPPLY AIR TEMPERATURE HAS DECREASED BELOW THE MAXIMUM HEATING SAT SETPOINT.
  - THE SYSTEM SHALL UTILIZE A CO2 SENSOR FOR THE SALES AREA, FITTING ROOM, STOCKROOM AND EACH OFFICE. HIGHEST READING WILL BE TAKEN FOR OFFICE DCV CONTROL. DCV IS CONTROLLED BY THE INDOOR AIR CO2 ALGORITHM. THE ALGORITHM CALCULATES THE CO2 MINIMUM DAMPER POSITION USING A PID LOOP. THE CALCULATED CO2 MINIMUM DAMPER POSITION IS THEN COMPARED AGAINST THE DCV MINIMUM POSITION SETPOINT AND THE LARGEST VALUE BECOMES THE FINAL MINIMUM DAMPER POSITION. DURING OCCUPIED HOURS, THE INDOOR AIR CO2 SENSING SHALL BE ENABLED. THE FOLLOWING CONDITIONS MUST BE TRUE FOR THE INDOOR AIR CO2 ALGORITHM TO OPERATE:
    - THE SUPPLY FAN HAS BEEN ON FOR AT LEAST 30 SECONDS.
    - THE UNIT HAS A VALID CO2 SENSING READING.
  - IF ALL OF THE PRECEDING CONDITIONS ARE TRUE, THE FACTORY OUTDOOR AIR DAMPER SHALL MODULATE BETWEEN ITS MINIMUM (ABS. MIN. O/A) AND MAXIMUM (MAX. O/A CFM) POSITION (TBD BY TAB CONTRACTOR). THE SYSTEM SHALL START TO MODULATE THE DAMPER OPEN WHEN CO2 LEVEL RISES TO 100 PPM (ADJUSTABLE) ABOVE AMBIENT CO2 LEVEL (400 PPM) AND SHALL CONTINUE TO OPEN TO ITS MAXIMUM POSITION AS CO2 LEVEL RISES TO AND ABOVE THE DCV HIGH ALARM SETPOINT. AS THE CO2 LEVEL DROPS, THE DAMPER SHALL START TO MODULATE TO ITS MINIMUM POSITION. DURING UNOCCUPIED HOURS, THE INDOOR AIR CO2 SENSING SHALL BE DISABLED.
  - POWERED EXHAUST FAN SHALL STAGE ON AND OFF ACCORDING TO DAMPER POSITION.
  - DEVICE SHALL BE EXISTING TO REMAIN OR FIELD INSTALLED FOR OPERATION SUBJECT TO THE RTU OPEN CONTROLLER.

**EXISTING EQUIPMENT REFURBISH CHECKLIST (VERIFY FOR ALL UNITS):**

- REPLACE AIR FILTERS AND CLEAN OUTDOOR AIR INLET SCREENS.
- ADJUST FAN(S) AS NEEDED TO ENSURE FAN(S) ARE CENTERED TO THEIR HOUSING.
  - CHECK BLADES FOR EXCESSIVE RUSTING AND FOR THE CHIPS, CRACKS AND DIRT BUILDUP THAT CAUSE NOISE AND VIBRATION.
  - PROVIDE PROPOSAL TO REPAIR DAMAGE IF NOTICED.
  - IF MOTOR BEARINGS ARE NOT PERMANENTLY LUBRICATED, LUBRICATE PER MANUFACTURER WRITTEN DIRECTION.
- REPLACE FAN BELTS AND ADJUST BELT TENSION PER MANUFACTURER WRITTEN DIRECTION. INSPECT THE HEAT EXCHANGER FOR RUSTS OR CRACKS. GASES COULD CONTAMINATE THE BUILDING'S AIR SUPPLY. INSPECT BURNERS, IGNITER, AND COMBUSTION SECTION.
  - CHECK THE GAS PRESSURE AND TEST FOR LEAKS
  - PROVIDE PROPOSAL TO REPAIR DAMAGE / ISSUES TO HEAT EXCHANGER
- WASH AND FLUSH BOTH SIDES OF THE COILS. WASH TOWARD THE RETURN-AIR SECTION TO REMOVE FOREIGN MATERIAL.
- CLEAN CONDENSATE DRAIN PAN AND CONDENSATE TRAP.
- CHECK THE REFRIGERANT CHARGE. BEFORE CHECKING, RUN THE UNIT FOR 15 MINUTES IN THE COOLING MODE TO STABILIZE SYSTEM PRESSURE. IF A SUBSTANTIAL ADJUSTMENT IS INDICATED, CHECK FOR REFRIGERANT LEAKS OR INSUFFICIENT AIRFLOW ACROSS THE COILS.
- CHECK FOR VOLTAGE IMBALANCES AND HIGH AMPERAGE. VOLTAGE IMBALANCES SHOULD NOT EXCEED 1% - A GREATER IMBALANCE CAN CONTRIBUTE TO OVERHEATING AND PREMATURE MOTOR FAILURE. ALSO CHECK FOR LOOSE WIRING AND CONNECTIONS, AND CORRODED OR FRAYED WIRES. HIGH AMPERAGE DRAW COULD SIGNAL A MECHANICAL PROBLEM, SUCH AS WORN BEARINGS/RODS, OR IT COULD INDICATE A REFRIGERATION ISSUE. NOTIFY OWNER OF ELECTRICAL ISSUES.
- MAKE SURE ALL PANELS ARE FASTENED PROPERLY IN PLACE.

**EMS INSTALLATION CHECKLIST**

- ITEMS ON EMS CHECK-OFF LIST MUST BE COMPLETED PRIOR TO EMS AND GBS COMMISSIONING AT THE END OF THE JOB. SOME ITEMS LISTED BELOW MAY NOT BE APPLICABLE.
- COORDINATE EQUIPMENT STARTUP WORK WITH COMFORT SYSTEMS USA. EMAIL: PAUL.SAWYER@COMFORTSYSTEMSUSA.COM OFFICE: 317-246-5170
- EMS CHECKLIST**
- REVIEW EMS PRINT SET AND INSTALL EMS OPUS PANEL AND LCP AS DESCRIBED IN THE EMS PRINT SET.
  - REVIEW EMS PRINT SET AND PULL ALL WIRE AND TERMINATE ON DEVICES AS DESCRIBED IN THE EMS PRINT SET.
  - REVIEW EMS PRINT SET AND INSTALL ALL EMS HVAC CONTROLS AS DESCRIBED IN THE EMS PRINT SET.
  - REVIEW EMS PRINT SET AND INSTALL ALL EMS LIGHTING CONTROLS AS DESCRIBED IN THE EMS PRINT SET.
  - REVIEW EMS PRINT SET AND WATTS TOPPER SUBMITTAL AND INSTALL THE WATTS TOPPER LIGHTING SYSTEM AND PULL ALL WIRE AS DESCRIBED IN THE EMS PRINT SET AND WATTS TOPPER SUBMITTAL.

**EMS CONTRACTORS:**

CONTRACTORS ARE RESPONSIBLE FOR COORDINATING ALL EQUIPMENT CONTROLS WITH EMS VENDOR PRIOR TO PURCHASE AND INSTALLATION. CONTRACTORS SHALL COORDINATE WITH EMS VENDOR TO PROVIDE ALL NECESSARY EQUIPMENT AND ACCESSORIES FOR A FULLY FUNCTIONING SYSTEM.

**PROJECT DESIGN CONDITIONS**

CLIMATE CONDITIONS				BUILDING OPERATING HOURS:			
WEATHER STATION:	EL TORO MCAS, CA, USA			MONDAY - FRIDAY	TBD BY OWNER		
CLIMATE ZONE:	3B			SATURDAY	TBD BY OWNER		
HEATING (DB):	99.6%	43.2	"F	SUNDAY	TBD BY OWNER		
DESIGN HEATING CONDITIONS (DB):		43.2	"F	HOLIDAY	TBD BY OWNER		
HUMIDIFICATION (DP / HR / MCB):	99.6%	10.4	"F / 9.5	grlb 59.4 "F			
DEHUMIDIFICATION (DB / MCB):	0.4%	91.9	"F / 91.9	"F			
DESIGN COOLING CONDITIONS (DB / MCB):	0.4%	66.4	"F / 98.5	grlb 79.1 "F			
DEHUMIDIFICATION (DP / HR / MCB):	0.4%	66.4	"F / 98.5	grlb 79.1 "F			

UNIT / SPACE DESCRIPTION	SET POINTS												SPACE OPERATING HOURS				NOTES
	COOLING / DEHUMIDIFICATION				HEATING				HUMIDIFICATION				ZONE VENTILATION RESET				
	OCC "F	UNOCC "F	MAX RH %	MIN RH %	OCC "F	UNOCC "F	MIN RH %	MAX RH %	CONTROL METHOD	BASE PPM	MAXIMUM PPM	M F	SAT	SUN	A-D		
RTU1 - BACK OF HOUSE	72	77	60%	NA	70	60	NA	NA	CO2	400	750	TBD	TBD	TBD	A-D		
RTU2 SALES FLOOR	72	77	60%	NA	70	60	NA	NA	CO2	400	750	TBD	TBD	TBD	A-D		
RTU3 SALES FLOOR	72	77	60%	NA	70	60	NA	NA	CO2	400	750	TBD	TBD	TBD	A-D		

NOTES:

- ZONE LEVEL VENTILATION RESET / DEMAND CONTROL VENTILATION (DCV) CONTROL METHOD: CARBON DIOXIDE SENSOR (CO2).
- ZONE LEVEL SET POINT CONDITIONS SHALL BE AS SCHEDULED UNLESS OTHERWISE SCHEDULED OR NOTED ON THE DRAWINGS FOR ROOM SPECIFIC SPACE CONDITIONS.
- ZONE LEVEL OCCUPANCY HOUR SCHEDULE SHALL BE PER BUILDING OPERATING HOURS UNLESS OTHERWISE SCHEDULED.
- ZONE LEVEL CONTROLS SHALL BE CAPABLE OF OPERATING WITH INDEPENDENT OCCUPANCY SCHEDULES.

**OUTSIDE AIR REQUIREMENTS, 2019 CMC AND CEC**

SYSTEM DESIGNATION	SYSTEM TYPE	SINGLE-ZONE SYSTEMS		MULTI-ZONE SYSTEMS		FLOOR AREA SERVED BY SYSTEM [Aa] (SF)	SYSTEM AVERAGED AREA-BASED OUTDOOR AIR RATE (CFM/SF)	SYSTEM POPULATION [Pa] (PEOPLE)	SYSTEM AVERAGED PEOPLE-BASED OUTDOOR AIR RATE (CFM/PP)	CMC REQUIRED O/A (CFM)	CEC REQUIRED O/A (CFM)	CODE THAT SETS MAX OUTSIDE AIRFLOW	CODE REQUIREMENTS			DESIGN VALUES			NOTES
		VENTILATION ZONE ASSOCIATED WITH SYSTEM	WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS [Ez]	SYSTEM VENTILATION EFFICIENCY [Ev]	REQUIRED O/A INTAKE FLOW [Voi] (CFM)								MIN O/A INTAKE FLOW [Voi] (CFM)	ABS MIN O/A INTAKE FLOW [Voi] (CFM)	MIN O/A INTAKE FLOW [Voi] (CFM)	ABS MIN O/A INTAKE FLOW [Voi] (CFM)			
RTU 31-14, 31-15	MULTI-ZONE	-	-	0.83	3.512	50	0.12	50	7.5	953	869	CEC	963	841	1,000	850	850	A - D	
RTU 31-16	MULTI-ZONE	-	-	N/A	1,472	15	0.21	15	15.0	179	342	CEC	342	200	350	200	200	A - D	
TOTALS													1,295	1,041	1,350	1,050			

- NOTES:
- VENTILATION CALCULATIONS BASED ON 2019 CALIFORNIA MECHANICAL CODE AND 2019 CALIFORNIA ENERGY CODE.
  - SYSTEM POPULATIONS BASED ON MAX SEATING AND/OR CODE BASED ON MAXIMUM VALUES.
  - MULTI-ZONE RECIRCULATING SYSTEMS: CALCULATOR TAKES THE MAXIMUM OUTSIDE AIRFLOW REQUIRED BETWEEN THE CMC AND CEC ON A SYSTEM LEVEL. THE CMC CALCULATION USED TO DETERMINE VENTILATION AIRFLOW IN COMPLIANCE WITH VPP AND SECTION 404.0. VENTILATION RATE SHOWN IS ACTUAL CALIBRATED WITH CORRECTION FACTORS INCLUDED. EACH ZONE IS CALCULATED WITH ITS WORST CASE ZONE AIR DISTRIBUTION EFFECTIVENESS (HEATING/COOLING) AS PART OF CALCULATIONS TO FIND EV.
  - THE ABSOLUTE MINIMUM OUTSIDE AIRFLOW (ABS MIN O/A) DESIGN VALUE IS THE DEMAND CONTROL VENTILATION (DCV) DESIGN AIRFLOW VALUE.

**HEAT PUMP ROOFTOP UNIT SCHEDULE (EXISTING TO REMAIN)**

MARK	MANUFACTURER	MODEL	SERIAL NUMBER	TONS	SUPPLY FAN		COOLING COIL										HEAT PUMP HEATING COIL										ELECTRICAL	MOOP	WEIGHT (LBS)	NOTES
					CFM	ESP (IN)	VFD (Y/N)	TH (MBH)	SH (MBH)	EAT (°F DB) (°F WB)	(°F DB) (°F WB)	REFR TYPE	MIN EFF (EER)	MIN NO STAGES	MIN OUT (MBH)	AMBIENT (DB)	EAT (°F DB) (°F DB)	LAT (°F DB) (°F DB)	MIN EFF (COP)	MIN O/A (CFM)	ABS MIN O/A (CFM)	MIN V/PH	MAX PRESS. DROP (IN W.C.)							
RTU 31-14	CARRIER	50HCDD8A2A	1817P93785	7.5	2,250	0.8	Y	61.1	41.2	73.6	62.5	56.9	53.2	R-410A	12	2	54.7	43.2	62.5	85.0	3.4	500	425	480/3	19	25	ETR	A - J		
RTU 31-15	CARRIER	50HCDD8A2A	1817P93786	7.5	2,250	0.8	Y	61.1	41.2	73.6	62.5	56.9	53.2	R-410A	12	2	54.7	43.2	62.5	85.0	3.4	500	425	480/3	19	25	ETR	A - J		
RTU 31-16	CARRIER	50HCDD8A2A	1817P93787	7.5	3,000	0.8	Y	69.2	56.8	72.8	61.4	55.8	53.4	R-410A	12	2	64.5	43.2	65.1	85.0	3.4	350	200	480/3	19	25	ETR	A - J		

MODEL NUMBERS AND NOMINAL TONS LISTED SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER. MODEL NUMBERS, OR NOMINAL TONS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

**NOTES:**

- ROOFTOP UNIT IS EXISTING TO REMAIN. CONTRACTOR SHALL FIELD VERIFY UNIT MATCHES SCHEDULE AND REFURBISH EQUIPMENT, AS NECESSARY, FOR "LIKE NEW" CONDITIONS.
- REFER TO ROOFTOP UNIT CONTROL MATRIX FOR CONTROL FEATURES, MODULES AND ACCESSORIES OF THE EQUIPMENT.
- PROVIDE NEW 2 INCH MERV 13, EFFICIENT PLEATED THROUGHWAY AIR FILTERS.
- SPECIFIED FAN ESP ACCOUNTS FOR DUCT LOSSES EXTERNAL TO UNIT.
- COOLING COIL LAT IS DESIGN LEAVING AIR TEMPERATURE OF COIL.
- VERIFY EXISTING UNITS ARE PROVIDED WITH GUARDS TO PROTECT CONDENSER COIL FROM HAIL OR OTHER DAMAGE. PROVIDE NEW OR REPLACE IF NECESSARY.
- ABS. MIN. O/A IS THE ABSOLUTE MINIMUM OUTSIDE AIR CFM USING VENTILATION RESET OR DEMAND CONTROL VENTILATION.
- PROVIDE CARRIER BACNET OPEN BOARD CONTROLLER WITH SUPPLY AND OUTSIDE AIR TEMPERATURE SENSORS. FIELD INSTALL AND COORDINATE ALL CONTROLS WITH EMS VENDOR PRIOR TO PURCHASE.
- IF NECESSARY, RETROFIT EXISTING MICROMETL ECONOMIZER WITH NEW TO MATCH UNIT MANUFACTURER.

**CARRIER NATIONAL ACCOUNT CONTACT**  
 MATT MURPHY  
 STRATEGIC ACCOUNT MANAGER  
 CARRIER CORPORATION  
 MOBILE: 630.235.1615  
 EMAIL: MATT.MURPHY@CARRIER.COM

**GRILLE, REGISTER, AND DIFFUSER SCHEDULE**

MARK	MANUFACTURER	SERVICE	MODEL	CONSTRUCTION TYPE	FACE TYPE	MOUNTING LOCATION	BORDER TYPE	FACE SIZE (IN)	MAX NC	MAX PRESS. DROP (IN W.C.)	NOTES
CEG2	TITUS	EXHAUST	PAR	STEEL	PERFORATED	CEILING	--	12x12	25	0.1	B, C, F, H
CRG1	TITUS	RETURN	PAR	STEEL	PERFORATED	CEILING	--	24x24	25	0.1	B, C, F, H
CRG2	TITUS	RETURN	PAR	STEEL	PERFORATED	CEILING	--	12x24	25	0.1	B, C, F, H
CS01	PRICE	SUPPLY	PRDGYD	STEEL	PLAQUE	CEILING	--	24x24	25	0.1	A, C, F, H, J
CS02	TITUS	SUPPLY	OMNI	STEEL	PLAQUE	CEILING	--	24x24	25	0.1	A, C, F, H
CS03	TITUS	SUPPLY	OMNI	STEEL	PLAQUE	CEILING	--	12x12	25	0.1	A, C, F, H
CS04	ARBA	SUPPLY	DRYWALL PRO	DRYWALL	PLAQUE	CEILING	--	6'x12'	25	0.1	A, C, F, H, L
DS01	TITUS	SUPPLY	301RL	STEEL	LOUVERED	DUCT SIDEWALL	--	--	--	--	B, C, E, H
WT01	TITUS	TRANSFER	350RL	STEEL	LOUVERED	WALL	--	--	--	--	B, D, G, H

MODEL NUMBERS SHALL NOT BE CONSIDERED COMPLETE AND MATERIAL SHALL NOT BE ORDERED BY MANUFACTURER AND MODEL NUMBERS ONLY. REVIEW THE COMPLETE DESCRIPTION, NOTES AND SPECIFICATIONS TO DETERMINE THE EXACT MATERIAL AND ACCESSORIES TO BE ORDERED. THE MANUFACTURERS LISTED ARE THE BASIS FOR THE DESIGN.

## Division 23: HEATING, VENTILATING, AND AIR CONDITIONING

### 1. GENERAL INSTRUCTIONS

#### A. GENERAL REQUIREMENTS

All requirements under Division 01 and the general and supplementary conditions of these specifications apply to this section and division. Where the requirements of this section and division exceed those of Division 01, this section and division take precedence. Become thoroughly familiar with all its contents as to requirements that affect this division, section, or both. Work required under this division includes all material, equipment, installation, transportation, services, and labor required to complete the entire system as required by the drawings and specifications, or reasonably inferred to be necessary to facilitate the function of each system as implied by the design and the equipment specified.

The specifications and drawings for the project are complementary, and any portion of work described in one part 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.

Drawings are graphic representations of the work upon which the contract is based. They show the materials and their relationship to one another, including sizes, shapes, locations, and connections. They convey the scope of work, indicating the intended general arrangement of the systems without showing all of the exact details as to elevations, offsets, control lines, and other installation requirements. Use the drawings as a guide when laying out the work and to verify that materials and equipment will fit into the designated spaces, and which when installed per manufacturer's requirements, will ensure a complete, coordinated, satisfactory, and proper operating system.

#### B. DEFINITIONS

Division References contained in this specification follow the numbering system defined in the Construction Specifications Institute (CSI) MasterFormat 2004 Edition. Specification Divisions 01 through 13 provided with this project may reference the CSI MasterFormat 1995 Edition. The corresponding division references between the 2004 Edition and 1995 Edition are as follows:

2004 Edition	1995 Edition
1. Division 21 - Fire Suppression	Division 15
2. Division 22 - Plumbing	Division 22
3. Division 23 - HVAC	Division 16
4. Division 25 - Electrical	Division 16
5. Division 27 - Communications	Division 16
6. Division 28 - Electronic Safety and Security	Division 16

Furnish: "to supply and deliver to the project site, ready for unloading, unpacking, assembly, installation and similar operations."

Install: "to perform all operations at the project site, including but not limited to, the actual unloading, unpacking, assembling, erecting, placing, anchoring, applying, working into position, finishing, curing, protecting, cleaning, testing, commissioning, starting up and similar operations, complete, and ready for the intended use."

Provide: "to furnish and install."

Furnished by Owner (or Owner-Furnished) or Furnished by Others: "an item furnished by the Owner or under other divisions or contracts, and installed under the requirements of this division, complete and ready for intended use, or furnished by others and services incident to the work necessary for proper installation and operation, include the installation under the warranty required by this division."

Engineer: Where referenced in this division, "Engineer" is the Engineer or Contractor and the Design Professional for the work under this division, and is a consultant, and an authorized representative of the Architect, as defined in the General and/or Supplementary Conditions. When used in this division, Engineer means increased involvement by and obligations to the Engineer in addition to those required by the obligations to the Architect.

AHJ: The local code and/or inspection agency (authority) having jurisdiction over the work.

QMAAT: Certified Acceptance Mechanism Testing. A professional certified to perform acceptance tests and complete the documentation required for nonresidential acceptance tests as required by the California Building Energy Efficiency Standards. Technician shall be certified in an authorized mechanical acceptance test technician certification program.

NRTL: Nationally recognized testing laboratory, as defined and listed by OSHA in 29 CFR 1910.7 (e.g., UL, ETL, CSA, and accepted to the AHJ over this project. Nationally recognized testing laboratories and standards listed as used only to represent the characteristics required and are not intended to restrict the use of other NRTLs that are acceptable to the AHJ and standards that meet the specified criteria.

Substitution: Changes in products, materials, equipment, and methods of construction due those required by the Contract Documents and proposed by Contractor. Substitutions include Value Engineering proposals.

1. Substitutions for Compliance: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.

2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

The terms "approved equal," "equivalent," or "equal" are used synonymously and shall mean "acceptable by or acceptable to the Engineer as equivalent to the item or manufacturer specified." The term "approve" shall mean labeled, listed, or both, by an NRTL, and acceptable to the AHJ over this project.

#### C. PREBID SITE VISIT

Prior to submitting bid, visit the site of the proposed work and become fully informed as to the conditions under which the work is to be done. Failure to comply with this requirement shall not be considered sufficient justification to request or obtain extra compensation over and above the contract price.

#### D. MATERIAL AND WORKMANSHIP

Provide new material, equipment, and apparatus under this contract unless otherwise stated herein, be of best quality normally used in the purpose in good commercial practice, and free from defects. Install material and equipment in accordance with the manufacturer's installation instructions. Model numbers listed in the specifications or shown on the drawings are not intended to designate the required item, written descriptions in the form govern model numbers.

Pipe, pipe fittings, pipe specialties and valves shall be manufactured in plants located in the United States or conform to or meet the specified ASTM and ANSI standards.

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 be designed and intended with respect to efficiency, capacity, noise level, etc. Abnormal noise caused by rattling equipment, piping, ducts, air movers and equals in related systems shall not be acceptable. Design and construction of equipment shall be of commercial specification grade in quality. Light duty and residential grade equipment shall not be accepted unless otherwise indicated.

Remove from the premises waste material present as a result of work, including carts, crumpled 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. Provide all additional cleanup and repair required for the performance of the work for the satisfaction of the public.

#### E. MANUFACTURERS

In other articles where lists of manufacturers are introduced, subject to compliance with requirements, provide products by one of the manufacturers specified.

Where a list is provided, manufacturers are listed alphabetically and not in accordance with any ranking or preference.

Where lists are not listed, provide products subject to compliance with requirements from manufacturers that have been actively involved in manufacturing the specified product for no less than 5 years.

#### F. COORDINATION

Coordinate work that of other trades so that the various components of the systems are 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 shall provide phases and sequences in building construction required for installation of the systems specified herein. Contractor shall coordinate with the design professional where phases and sequences are not specified. Contractor shall keep informed as to the work of other trades engaged in the construction of the project and shall execute work in a manner so as 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 shall be held responsible for errors that cannot be 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 item.

#### G. ORDINANCES AND CODES

Work performed under this contract shall, at a minimum, be in conformance with applicable national, state and local codes having jurisdiction. Equipment furnished and associated installation work performed under this contract shall be in strict conformance with current applicable codes adopted by the local AHJ, including any amendments and standards as set forth by the following:

- National Electrical Code (NEC)
- National Fire Protection Association (NFPA)
- Underwriters Laboratories (UL)
- Occupational Safety and Health Administration (OSHA)
- American Society of Mechanical Engineers (ASME)
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
- American National Standards Institute (ANSI)
- American Society of Testing and Materials (ASTM)

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. Where conflicts between various codes, ordinances, rules, and regulations exist, comply with the most stringent.

Promptly bring all conflicts observed between the codes, ordinances, rules, regulations, referenced standards, and these documents to the attention of the Architect and Engineer for final resolution. Contractor will be held responsible for any violation of the law.

Procure and pay for permits and licenses required for the completion of the work herein described. Where required, obtain, pay for, and furnish certificates of inspection to Owner.

#### H. PROTECTION OF EQUIPMENT AND MATERIALS

Store and protect from damage equipment and materials delivered to job site. For materials and equipment susceptible to changing weather conditions, dampness, or temperature variations, store inside in conditioned spaces. For materials and equipment not susceptible to these conditions, cover with waterproof, tear-resistant, heavy duty polyethylene plastic required to protect from rain, dust, dirt, paint, water, or physical damage. Replace insulation that has become wet at any time during construction. Overage insulation is not acceptable. Seal any tears in joints of interior fiberglass insulation. Equipment and material damaged by construction activities shall be repaired and Contractor shall furnish plastic covering and material of equal kind and quality as necessary to protect equipment and materials from damage.

Keep premises 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. Remove debris from ceiling/rafters/ceilings, including dust.

Plug, seal, 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. Remove temporary protection prior to starting equipment and turning the system over to the owner.

#### I. SUBSTITUTIONS

Materials, products, equipment, and systems described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by the proposed substitution. The base bid only includes only the products from manufacturers specifically named in the drawings and specifications. To request a substitution, request the Substitution Request Form from the Architect or Engineer. Complete and send the Substitution Request Form for each material, product, equipment, or system that is proposed to be substituted. The burden of proof of the merit of the proposed substitution is upon the proposer.

Unless stated otherwise in writing to the Engineer by the Contractor, Contractor warrants to the Engineer, Architect, and Owner the following:

- Proposed substitution has been fully investigated and determined to meet or exceed the specified Work in all respects unless stated otherwise in the substitution request.
- Proposed substitution is consistent with Contract Documents, results, including functional clearances, maintenance issues, and sourcing of replacement parts.
- Proposed substitution has received necessary approvals of authorities having jurisdiction.
- Same warranty will be furnished for proposed substitution as for specified Work.
- If accepted substitution fails to perform as required, Contractor shall replace substitute material or system with that which originally specified and bear costs incurred thereby.

Coordination, installation and changes in the Work as necessary for accepted substitution will be complete in all respects.

No substitutions will be considered unless the Substitution Request Form is completed and attached with the appropriate substitution documentation. 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 (10) calendar days prior to the date of receipt of bids.

If the proposed substitution is approved prior to receipt of bids, such approval will be stated in an addendum. Bidders shall rely upon approvals made in any other way. Verbal approval will not be given. No substitutions will be considered after the contract is awarded unless specifically provided in the contract documents.

#### J. SUBMITTALS

Assemble and submit for review shop drawings, material lists, manufacturer product literature for equipment to be furnished, and items requiring coordination between contractors under this contract. Provide submittals in sufficient detail so as to demonstrate compliance with these contract documents and the design concept. Prior to transmitting submittals, verify that the equipment submitted is mutually compatible and suitable for the intended use, will fit the available space, and maintain manufacturer recommended service conditions. If the size of equipment furnished makes necessary any change in location or configuration, submit a shop drawing showing the proposed layout.

Transmit submittals as early as required to support the project schedule. Allow for two weeks Engineer review time, plus total mailing time via air service, plus a duplication of this time for resubmittal, if required. Only resubmit those sections requested for resubmittal.

Submittals shall contain the project name, applicable specification section, submittal date, equipment identification acronym as used on the drawings, and the Contractor's stamp. The stamp shall certify that the submittal has been checked by the Contractor, complies with the drawings and specifications, and is coordinated with other trades. Manufacturer product literature shall include shop drawings, product data, performance sheets, samples and other submittals required by this division. Highlight, mark, list, or indicate the materials, performance options, and accessories that are being proposed. General product catalog data may be provided to the part of the specified product will be rejected and returned without review.

Submittals and shop drawings shall not contain the firm name, logo, seal, or signature of the Engineer. They shall not be copies of the work product of the Engineer. If the Contractor desires to use elements of such product, refer to paragraph "Electronic Drawing Files" for procedures to be used.

Separate submittals according to individual specification sections. Illegible submittals will be rejected and returned without review. Catalog data shall be properly bound, identified, indexed and tabbed in a 3-ring binder. Each item on model number shall be clearly marked and accessories identified. Label the catalog data with the equipment identification acronym 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 up unacceptable items. Shop drawings will be returned without review if the above mentioned requirements are not met.

Provide the quantity of materials specified by Division 01. If not indicated and lead-copy sets are provided, submit a minimum of six (6) copies. Refer to Division 01 for acceptance of electronic submittals for this project. For electronic submittals, Contractor shall submit the documents in accordance with the procedures specified in Division 01. Contractor shall notify the Architect and Engineer that the submittals have been posted. If submittal procedures are not defined in Division 01, Contractor shall identify the website, user name, and password information needed to access the submittals. For submittals sent by email, Contractor shall copy the designated representatives of the Architect and Engineer. Contractor shall allow for 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.

The checking and subsequent acceptance of submittals by the Engineer and/or Architect shall not relieve the Contractor from responsibility for deviations from the drawings and

specifications, errors in dimensions, details, size of members, or quantities, omissions of components or fittings, coordination of electrical requirements, and not coordinating items with actual building conditions and adjacent work. Proceed with the procurement and installation of equipment only after receiving approved shop drawings relative to each item.

#### K. 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 defined, from the manufacturer of a shipping and handling fee of \$20.00 per drawing and \$1.00 per sheet for each additional sheet. Contact the Architect for written approval of electronic drawing files and for the necessary agreement form and to specify shipping method and billing format. In addition to payment, the written authorization from the Architect and written agreement form from the Engineer must be received before electronic drawing files will be sent.

#### L. RECORD DRAWINGS (AS-BUILT DRAWINGS)

During progress of the work in this division, Contractor shall maintain an accurate record of all changes made during the installation of the system. Upon completion of the work, accurately transfer all record information to three identical sets of the approved shop drawings. Insert one set into each copy of the manual described below.

See Division 01 and General Conditions for additional information.

#### M. OPERATION AND MAINTENANCE INSTRUCTIONS

During the course of construction, collect and compile a complete brochure of equipment furnished and installed on this project, include operational and maintenance instructions, manufacturer's catalog sheets, wiring diagrams, parts lists, approved submittals and shop drawings, warranties, and descriptive literature as furnished by the equipment manufacturer. Include an inside cover sheet that lists the project name, date, Owner, Architect, Engineer, General Contractor, Sub-Contractor, and an index of contents.

Submit three copies of literature bound in approved binders with index and label separating equipment types and the Architect, for Engineer's review, at the termination of the work. Paper clips, staples, rubber bands, loose-leaf binding, and mailing envelopes are not considered approved binders. Final approval of systems installed under this contract shall be withheld until the equipment literature is reviewed and deemed complete by the Architect and Engineer. Instruct workers to save required literature stripped with the equipment itself for inclusion in this binder.

Refer to Record Drawings as described above.

Include to Division 01 for acceptance of electronic manuals for this project. For electronic manuals, refer to paragraph "Submittals" for requirements.

#### N. SPARE PARTS

Furnish to Owner, with receipt, the following spare parts for the equipment furnished for this project:

- One set of spare fuses of each type required for each unit. In addition to the spare set of fuses, install new fuses prior to testing, adjusting, and balancing work and before turning system over to Owner.

2. Install one complete set of belts for each fan.

3. Furnish three operating keys for each type of air outlet and inlet that require them.

#### O. TRAINING

At a time mutually agreed upon between the Owner and Contractor, provide the services of a factory trained and authorized representative to train Owner's designated personnel on the operation and maintenance of the equipment provided for this project.

Provide training to include, but not be limited to, an overview of the system and/or equipment as it relates to the facility as a whole, operation and maintenance procedures and schedules related to startup and shutdown, troubleshooting, servicing, preventive maintenance and appropriate operator intervention; and review of data included in the operation and maintenance manuals as required by the Architect.

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 training with Owner with at least 7 days advance notice.

#### P. WARRANTIES

Warrant each system and each element thereof against all defects due to faulty workmanship, design or material for a period of 12 months from date of Substantial Completion, unless specific terms 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 01.

Warranties shall include labor and material. Where an equipment manufacturer warrants material only, the mechanical contractor shall warrant labor for a period of 12 months from date of substantial completion and 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 an affidavit, in writing and properly executed, including time limits for warranties extending beyond the one year period and any actions the Owner must take in order to maintain warranty status. Each warranty instrument shall be addressed to the Owner and state the commencement date and term.

#### 2. GENERAL MATERIALS AND INSTALLATION

##### A. BUILDING OPERATION

Comply with the schedule of operations as outlined in the architectural portions of this specification. 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 (7) days in advance of work.

##### B. EXISTING EQUIPMENT REUSE AND REMOVAL

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 where covering. Plenum insulation shall be removed unless specifically noted on drawings with General Contractor and Architect.

Clean and refinish existing HVAC equipment intended for reuse as required for proper operation including replacement of filters, belts, motors, remote controls, and safety interlocks.

##### C. REINFORCEMENT DAMAGE

Repair streets, sidewalks, drives, parking, walks, finishes, and other facilities damaged in the course of the work. Repair materials shall match existing construction. Repair work shall meet all requirements of the local building department and meet the satisfaction of the Architect.

##### D. CUTTING AND PATCHING

Conform to the requirements of Division 01. Cut walls, floors, ceilings, and other portions of the facility as required to install work under this division. Obtain permission from the Architect and the design professional for the work. Support structural members without prior approval from the Architect and Structural Engineer. For steel members, allow six (6) inch clearance at all core and end locations with Architect and Structural Engineer prior to performing any work. Obtain approval from Architect and Structural Engineer for all core cuts and modifications at least four days prior to performing work. Procedures shall include entering and leaving work areas with appropriate safety precautions and to the satisfaction of the system controller. Patch around openings to match the adjacent construction including fire ratings, if applicable. Repair and refinish areas disturbed by work to the condition of adjoining surfaces in a manner satisfactory to the Architect.

##### E. ROUGH-IN

Coordinate without delay all roughing-in with other divisions. Conceal piping, conduit, and rough-in except in unfinished areas and where otherwise shown.

##### F. STRUCTURAL SUPPORT SYSTEMS

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.

##### G. PRE-ENGINEERED ROOF EQUIPMENT SUPPORTS AND CURBS

Provide fabricated equipment support rails and curb materials manufactured by ASES Industries, Custom Curb, Inc., Plate Company, Thybar or approved equal. Provide with fully treated galvanized steel and step to match roof insulation thickness, welded, minimum 18 gauge galvanized steel brackets sized to load bearing factors of equipment being supported. Provide minimum 1 1/2 inch thick curb, minimum 18 gauge galvanized steel, and minimum 18 gauge jacket with counterflashing where equipment does not fully cover the equipment support. Provide sloped roof equipment supports to enable level drainage. Provide right backing material behind curb to maintain curb level. Provide multiple support rails to uniformly support the equipment. Attach to roof structure according to manufacturer's installation instructions.

Attach equipment directly to pre-engineered roof equipment support using one of the following methods:

- Roof Curbs: Secure each corner of the equipment to the curb rail using a minimum of 4 lag screws, located along the length of the equipment. Alternatively, Secure equipment to the curb using hold-down brackets. Provide minimum 6 inch long, 14 gauge galvanized steel brackets sized to wrap around top of curb and under equipment base rail with sufficient fasteners between the equipment rail and curb. Secure bracket to equipment and curb rail using a minimum of 8 points of connection per bracket.
- Provide one bracket at each corner along the length of the unit.
- Provide seismic restraints in accordance with Article "Seismic Controls for MEPF Systems."

##### H. PENETRATIONS

Seal elevators, roof, exterior wall and roof penetrations weather-tight and weather-resistant with non-shrink, non-hardening commercial sealant. Pack with mineral wool and seal both ends with minimum 1/2 inch 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 an American National Standards Institute (ANSI) listed fire stop system.

Provide pre fabricated roof curb rails pipes and/or ductwork penetrates elevated slabs to the roof to the exterior. Provide cover over curb of weather-resistant material and seal duct or pipe penetrations through the curb. Provide pipe collar of weather-resistant material with stainless steel pipe clamps for piping penetrations.

Provide boxes 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 open openings not shown on the Architectural or Structural drawings.

##### I. EQUIPMENT FURNISHED BY OTHERS

Contractor shall be responsible for correct rough-in dimensions and shall verify them with Architect and/or equipment supplier prior to service installations.

##### J. SYSTEM TESTING, ADJUSTING, AND BALANCING

Upon completion of each phase of the installation, test each system in conformance with local code requirements and as noted below. Furnish labor and equipment required to test each system installed under this contract. Assume all costs involved in making the tests and repairing and/or replacing any damaged resulting therefrom.

Final system testing, balancing and adjustments (TAB) shall be performed by a Contractor certified by the National Environmental Balancing Bureau (NEBB), Associated Air Balance Council (AABC), or Testing, Adjusting and Balancing Bureau (TABBB). TAB shall be performed in accordance with the most current edition of the certified agencies procedural standard for testing, adjusting and balancing and shall comply with the strictest interpretation of that standard for execution and reporting of all TAB work.

Test, adjust, and balance equipment and systems included in the scope of work. Prepare testing and balancing report log using forms equivalent with the standard forms available from the TAB certification standard being followed. Adjust equipment to deliver specified flow amounts on the drawings. For air systems, include airflow supply quantities, entering and leaving temperatures, and pressures at design flow. For hydronic systems, include entering and leaving temperatures and pressures at design flow. Include fan and coil readings, motor voltage and amp draws, etc., and submit six copies of the final completed 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. TAB Contractor shall record space temperatures and make adjustments in airflow to maintain uniform volume temperature (no greater than +/- 3°F in spaces. Document temperatures and adjustments in TAB report. Balance hydronic systems to provide flow plus or minus 5 percent of flow specified on drawings as required for proper system operation. Adjust equipment to operate as intended by the specification. TAB report shall include a "report summary/remarks" section in accordance with the equipment standard and codes where applicable.

TAB Contractor shall be responsible to calibrate, test, and adjust automatic temperature control sensors, actuators and control devices. Check proper sequencing of interlock systems and operation of safety controls, adjust thermostats, and control setpoints, limits and time based adjustments to operate in accordance with the performance requirements of the Construction Documents. Adjust pumps, fans, etc. for proper and consistent operation. Certify to Architect that adjustments have been made and that system is operating satisfactorily. Calibrate, test, and adjust automatic temperature control systems, and operation of safety controls. Check proper sequencing of interlock systems, and operation of safety controls.

Division 23 contractor shall align bearings and replace bearings that have dirt or foreign material in them with new bearings without additional cost to the Owner.

##### K. VIBRATION ISOLATION

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 include Caldyn, Knetics Noise Control, Mason Industries, Inc., Vibration Eliminator Co., Inc., Vibration Mounting and Control, or Vibro-Acoustics, provided their systems are in compliance with the specified design and construction requirements.

General Requirements: Select vibration isolators by the weight distribution to produce uniform deflection. Vibration isolators shall have either known un-deflected heights or calibration curves 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 up unacceptable items. Shop drawings will be returned without review if the above mentioned requirements are not met.

Pipe connections: Provide flexible connectors for piping system connections on equipment side of shut off valves for all pumps, mechanical equipment supported or suspended by spring isolators, and where indicated on drawings. Fabricate flexible pipe connections from stainless steel or rubber materials as suitable for system fluid. Flexible piping connectors shall be listed, specified or tested hose type as recommended by the manufacturer for the application.

Isolator Types:

1. Type NR (Neoprene Bushing): Provide a neoprene, rubber-in-housing bushing for lightweight (less than 100 pounds), suspended equipment supported from structure with all thread rod and angle iron or Unistrut. Select for a maximum diameter of 50 and designed for 15 percent strain, with a static deflection of 0.15 inches. Provide Mason Industries type PBM or equal.

##### L. SEISMIC CONTROLS FOR MEPF SYSTEMS

Seismic Protection Criteria: R=II or III Contractor's Seismic Engineer to Determine. See Soil Category. Seismic Design Category: Determined from ASCE 7, most recent version.

The Contractor shall be responsible for determining the requirements for seismic bracing of mechanical, electrical, and plumbing systems. Seismic protection criteria used to determine seismic bracing requirements of all mechanical, electrical, and plumbing systems shall be determined by the applicable code adopted in the project jurisdiction. Where not already determined within a jurisdiction, the Contractor shall be responsible for contacting a licensed professional engineer to establish building site class, seismic design category, seismic zone, or any other criteria necessary to determine the requirements for seismic bracing on mechanical, electrical, and plumbing systems.

Seismic bracing of fire protection systems shall be installed in strict accordance with the provisions of NFPA 13 (2010 or later edition).

The Contractor shall determine the type and location of seismic bracing required for the mechanical, electrical, and plumbing elements shown on the drawings based on the established seismic criteria, the size and weight of the supported element, and the distance from element to the supported element.

Contractor shall submit the following shop drawings to the AHJ and the Engineer for review and approval:

1. Seismic analysis listing all applicable seismic design criteria.
2. Description of seismic catalog data of seismic bracing devices.
3. Shop drawings showing bracing type and location.
4. Installation details of all bracing used.

Calculations showing that the seismic restraints meet the seismic requirements. Shop drawings and calculations shall be signed and sealed by a registered professional engineer, licensed in the state of the project and employed by the manufacturer of the seismic bracing products. Calculations shall include brace loads, static seismic loads, and capacity of materials utilized for connections.

Seismic bracing, restraints, isolators, and isolation materials shall be of the same manufacturer, and shall be certified by the manufacturer. Approved manufacturers are: AmberBooth Company, Inc., BLH/Tricon, ISAT, Knetics Noise Control, Inc., Loos & Co., Inc., Mason Industries, Inc., Uni-Strut, or Vibro-Acoustics. Each device shall have a pre-approved number from California GSPHD or other recognized government agency showing maximum restraint ratings.

Seismic bracing measures to be applied to mechanical, electrical, and plumbing equipment/systems shall be installed in strict accordance with all applicable local, state, and/or federal codes as well as manufacturer's requirements. The most stringent code shall apply. All anchor connections to structure for support of mechanical and electrical equipment, regardless of the type of seismic restraints, shall be shown on shop drawings.

##### M. AIR FILTERS

Provide AP-10Hates, pleated, throwaway type filters, minimum MERV 13, or similar as manufactured by Air Filter, Inc., American Air Filter, Flanders, or approved equal unless otherwise indicated.

Temporary filters used to protect openings in ductwork and inside equipment when permanent HVAC equipment is used during the construction period shall be pleated, throwaway type filters, minimum MERV 8.

##### N. REFRIGERANT AND OIL

Provide full refrigerant and oil charge in new air conditioning refrigeration systems, and maintain it full for term of the guarantee.

##### O. IDENTIFICATION

Color numbered 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.

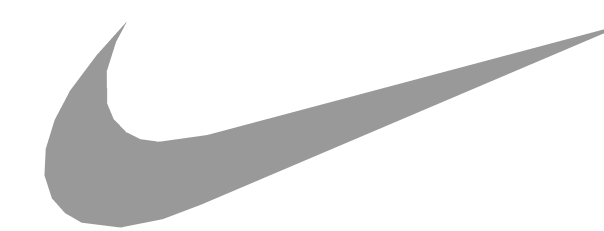
Color duct markers or provide stenciled signs and arrows indicating ductwork service and flow direction in black or white lettering for best contrast with duct or insulation color. Locate duct markers on each duct at least every 5 feet and on each elbow and on branch ducts more than 25 feet length and within 5 feet end of each side of wall, floor, and ceiling penetrations. Provide additional markers in congested areas or at multiple duct runs as required for clarity.

##### 3. DUCT INSULATION, DUCTWORK, ACCESSORIES, AND FANS

###### A. DUCT INSULATION

Provide fiberglass duct liner with fibers





**NIKE INC.**  
ONE BOWERMAN DRIVE  
BEAVERTON, OR 97005



960 Atlantic Ave  
Alameda, CA 94501  
Tel 510 865 8663  
Fax 510 865 1611

MBH PROJECT: 55849



**HENDERSON ENGINEERS**  
8345 LENEXA DRIVE, SUITE 300  
LENEXA, KS 66214  
TEL 913.742.5000 FAX 913.742.5001  
WWW.HENDERSONENGINEERS.COM  
2150006162



01/27/2023

No.	Description	Date
	75% SET	03/14/2022
	90% SET	04/04/2022
	PERMIT/BID/LL REVIEW SET	04/14/2022
4	PERMIT AMENDMENT/REVISED BID	12/22/2022
5	Issue For Construction	01/27/2023

STATE OF CALIFORNIA  
**Mechanical Systems**  
CALIFORNIA ENERGY COMMISSION

NRCC-MCH-E (Rev. 09/2020)  
CERTIFICATE OF COMPLIANCE  
Project Name: Nike Live - Irvine, CA Report Page: Page 7 of 9  
Project Address: 880 Spectrum Dr. Date Prepared: 2022-03-04

**P. DECLARATION OF REQUIRED CERTIFICATES OF VERIFICATION**  
Table Instructions: Selections have been made based on information provided in previous tables of this document. If any selection needs to be changed, please explain why in Table E. Additional Remarks. These documents must be completed by a HERS Rater and provided to the building inspector during construction. The final documents must be created by a HERS Providers registry, but drafts can be found online at [https://www.energy.ca.gov/title24/2019standards/2019\\_compliance\\_documents/Nonresidential\\_Documents/NRCV/](https://www.energy.ca.gov/title24/2019standards/2019_compliance_documents/Nonresidential_Documents/NRCV/)

YES	NO	Form/Title	Field Inspector	
			Pass	Fail
<input type="radio"/>	<input checked="" type="radio"/>	NRCV-MCH-04-H Duct Leakage Test NOTE: Must be completed by a HERS Rater	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input checked="" type="radio"/>	NRCV-MCH-24 Enclosure Air Leakage Worksheet NOTE: Must be completed by a HERS Rater	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input checked="" type="radio"/>	NRCV-MCH-27 High-rise Residential NOTE: Must be completed by a HERS Rater	<input type="checkbox"/>	<input type="checkbox"/>
<input type="radio"/>	<input checked="" type="radio"/>	NRCV-MCH-32 Local Mechanical Exhaust NOTE: Must be completed by a HERS Rater	<input type="checkbox"/>	<input type="checkbox"/>

CA Building Energy Efficiency Standards - 2019 Nonresidential Compliance: <http://www.energy.ca.gov/title24/2019standards> September 2020

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**Q. MANDATORY MEASURES DOCUMENTATION LOCATION**  
Table Instructions: Indicate where mandatory measures are documented in the plan set or construction documentation. For any mandatory measures that do not apply, mark the plan sheet or construction document location as "N/A", any active cells that are left blank will result in non-compliance in Table C.

01		02	
Compliance with Mandatory Measures documented through MCH Mandatory Measures Note Block:		Plan sheet or construction document location	
	No		
03		04	
Mandatory Measure		Plan sheet or construction document location	
Heating Equipment Efficiency per §110.1		M3.0	
Cooling Equipment Efficiency per §110.1		M3.0	
Furnace Standby Loss Control per §110.2(d)		N/A	
Duct Insulation per §120.4		M4.0	
Heating Hot Water Equipment Efficiency per §110.1		N/A	
Cooling Chilled and Condenser Water Equipment Efficiency per §110.1		N/A	
Open and Closed Circuit Cooling Towers conductivity of flow-based controls per §110.2(e)1		N/A	
Open and Closed Circuit Cooling Towers Flow Meter with analog output per §110.2(e)3		N/A	
Open and Closed Circuit Cooling Towers Overflow Alarm per §110.2(e)4		N/A	
Open and Closed Circuit Cooling Towers Efficient Drift Eliminators per §110.2(e)5		N/A	
Pipe Insulation per §120.3(i)		N/A	
Combustion air shutoff; combustion air fan controls and stack design and controls for boilers per §120.9		N/A	
Heat Pump with Supplementary Electric Resistance Heater Controls per §110.2(b)		N/A	
The air duct and plenum system is designed per §120.4(a)-(f)		M4.0	
Kitchen range hoods shall be rated for sound in accordance with Section 7.2 of ASHRAE 62.2		N/A	

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**DOCUMENTATION AUTHOR'S DECLARATION STATEMENT**  
I certify that this Certificate of Compliance documentation is accurate and complete.

Documentation Author Name: Ryan Inghram	Documentation Author Signature: <i>Ryan Inghram</i>
Company: Henderson Engineers, Inc	Signature Date: 3/4/2023
Address: 8345 Lenexa Drive, Suite 300	CEA/HERS Certification Identification (if applicable): N/A
City/State/Zip: Lenexa/KS/66214	Phone: 913-742-5000

**RESPONSIBLE PERSON'S DECLARATION STATEMENT**  
I certify the following under penalty of perjury, under the laws of the State of California:

- The information provided on this Certificate of Compliance is true and correct.
- I am eligible under Division 3 of the Business and Professions Code to accept responsibility for the building design or system design identified on this Certificate of Compliance (responsible designer).
- The energy features and performance specifications, materials, components, and manufactured devices for the building design or system design identified on this Certificate of Compliance conform to the requirements of Title 24, Part 1 and Part 6 of the California Code of Regulations.
- The building design features or system design features identified on this Certificate of Compliance are consistent with the information provided on other applicable compliance documents, worksheets, calculations, plans and specifications submitted to the enforcement agency for approval with this building permit application.
- I will ensure that a completed signed copy of this Certificate of Compliance shall be made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a completed signed copy of this Certificate of Compliance is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Designer Name: Brandon M. Elliott	Responsible Designer Signature: <i>B. Elliott</i>
Company: Henderson Engineers, Inc	Date Signed: 01/27/2023
Address: 8345 Lenexa Drive, Suite 300	License: 38639
City/State/Zip: Lenexa/KS/66214	Phone: 913-742-5000

CA Building Energy Efficiency Standards - 2019 Nonresidential Compliance: <http://www.energy.ca.gov/title24/2019standards> September 2020

Project Number

Drawn By HENDERSON

Checked By HENDERSON

**NIKE BY IRVINE**  
880 Spectrum Center Dr.  
Irvine, CA 92618

**MECHANICAL ENERGY CODE COMPLIANCE**

**M-501**

BRANDON M. ELLIOTT