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HVAC DESIGN CRITERIA
 INDOOR TEMPERATURE
 75°F COOLING (MINIMUM ALLOWED BY 2009 IECC, SECTION 302.1)
 72°F HEATING (MAXIMUM ALLOWED BY 2009 IECC, SECTION 302.1)

HUMIDITY CONTROL: THIS PROJECT HAS NO DIRECT CONTROL OF HUMIDITY

OUTDOOR DESIGN CONDITIONS (SUGAR LAND, TEXAS) PER 2009 IECC TABLE 302.2: 96°F DB, 80°F WB SUMMER;
 28°F DB WINTER. 1365 DEGREE DAYS HEATING; 3058 DEGREE DAYS COOLING; CLIMATE ZONE 2A

CODE INFORMATION:
 APPLICABLE CODES INCLUDE BUT ARE NOT LIMITED TO:

2009 INTERNATIONAL BUILDING CODE
 2009 INTERNATIONAL MECHANICAL CODE (IMC)
 2009 IECC COMMERCIAL ENERGY CONSERVATION CODE:

OUTSIDE AIR REQUIREMENTS- 2009 IMC
 MULTIPURPOSE ASSEMBLY : 0.5 CFM PER PERSON & .06 CFM/SQ. FT.
 NURSING ROOM: 25 CFM PER PERSON
 OFFICE SPACES: 0.5 CFM PER PERSON & 0.06 CFM/SQ.FT.
 DINING ROOMS: 7.5 CFM PER PERSON & 0.18 CFM/SQ.FT.
 CORRIDORS: 0.06 CFM/SQ.FT.

ENERGY CODE PER 2009 IECC CHAPTER 5
 SUGAR LAND IS ZONE 2 WARM-HUMID

503.2.1 Calculation of heating and cooling loads. Engineer has performed HVAC load calculations using Elite or Trace
 503.2.3 HVAC equipment performance requirements. Equipment shall meet the minimum efficiency requirements of Tables 503.2.3
 503.2.4 HVAC system controls. Each heating and cooling system shall be provided with thermostatic controls
 503.2.4.1 Thermostatic controls. The supply of heating and cooling energy to each zone shall be controlled by individual thermostatic controls capable of responding to temperature within the zone. Where humidification or dehumidification or both is provided, at least one humidity control device shall be provided for each humidity control system.

503.2.4.2 Set point overlap restriction. Where used to control both heating and cooling, zone thermostatic controls shall provide a temperature range or deadband of at least 5°F within which the supply of heating and cooling energy to the zone is capable of being shut off or reduced to a minimum.

503.2.4.3 Off-hour controls. Each zone shall be provided with thermostatic setback controls that are controlled by either an automatic time clock or programmable control system.
 Exceptions: 1. Zones that will be operated continuously. 2. Zones with a full HVAC load demand not exceeding 6,800 Btu/h and having a readily accessible manual shutoff switch.

503.2.4.3.1 Thermostatic setback capabilities. Thermostatic setback controls shall have the capability to set back or temporarily operate the system to maintain zone temperatures down to 55°F or up to 85°F.

503.2.4.3.2 Automatic setback and shutdown capabilities. Automatic time clock or programmable controls shall be capable of starting and stopping the system for seven different daily schedules per week and retaining their programming and time setting during a loss of power for at least 10 hours. Additionally, controls shall have a manual override that allows temporary operation of the system for up to 2 hours; a manually operated timer capable of being adjusted to operate the system for up to 2 hours; or an occupancy sensor.

503.2.4.4 Shutoff damper controls. Both outdoor air supply and exhaust ducts shall be equipped with motorized dampers that will automatically shut when the systems or spaces served are not in use. Exceptions: 1. Gravity dampers shall be permitted in buildings less than three stories in height. 2. Gravity dampers shall be permitted for buildings of any height located in climate zones 1, 2, and 3. Gravity dampers shall be permitted for outside air intake or exhaust airflows of 300 cfm or less.

503.2.5 Ventilation. Where mechanical ventilation is provided, the system shall provide the capability to reduce the outdoor air supply to the minimum required by Chapter 4 of the International Mechanical Code.

503.2.7 Duct and plenum insulation and sealing. All supply and return air ducts and plenums shall be insulated with a minimum of R-5 insulation when located in unconditioned spaces and with a minimum of R-8 insulation when located outside the building. Exceptions: When the design temperature difference between the interior and exterior of the duct or plenum does not exceed 15°F. All joints, longitudinal and transverse seams and connections in ductwork, shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes.

503.2.7.1.1 Low-pressure duct systems. All longitudinal and transverse joints, seams and connections of supply and return ducts operating at a static pressure less than or equal to 2 inches w.g. shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's installation instructions.

503.2.8 Piping insulation. All piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table 503.2.8. Exceptions: 1. Factory-installed piping within HVAC equipment. 2. Piping that conveys fluids that have a design operating temperature range between 55°F and 105°F. 3. Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power. 4. Runout piping not exceeding 4 feet in length and 1 inch in diameter between the control valve and HVAC coil.

503.2.9 HVAC system completion. Prior to the issuance of a certificate of occupancy, the design professional shall provide evidence of system completion in accordance with:

- 503.2.9.1 Air system balancing. Each supply air outlet and zone terminal device shall be equipped with means for air balancing in accordance with the requirements of Chapter 6 of the International Mechanical Code. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors 25 hp and larger.
- 503.2.9.3 Manuals. The construction documents shall require that an operating and maintenance manual be provided to the building owner by the mechanical contractor. The manual shall include, at least, the following: 1. Equipment capacity (input and output) and required maintenance actions. 2. Equipment operation and maintenance manuals. 3. HVAC system control maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings, at control devices or, for digital control systems, in programming comments. 4. A complete written narrative of how each system is intended to operate.

WIND LOAD & EQUIPMENT ANCHORAGE

EXTERIOR HVAC EQUIPMENT SHALL BE SECURELY FASTENED IN PLACE. SUPPORTS SHALL BE DESIGNED AND CONSTRUCTED TO SUSTAIN VERTICAL AND HORIZONTAL LOADS WITHIN THE STRESS LIMITATIONS SPECIFIED IN THE BUILDING CODE FOR A WIND SPEED OF 100 MPH, 3 SECOND GUST. EXTERIOR DUCTS SHALL BE SUPPORTED IN A LIKE MANNER.

HVAC GENERAL NOTES (APPLY TO ALL SHEETS)

- DRAWINGS ARE DIAGRAMMATIC; CONFIRM DIMENSIONS AND LOCATIONS IN THE FIELD.
- RUNOUTS TO INDIVIDUAL AIR DEVICES ARE SAME SIZE AS AIR DEVICE NECK.
- DUCT SIZES SHOWN ARE FREE AREA
- SEE ARCHITECTURAL REFLECTED CEILING PLANS FOR TYPE OF CEILING AND LOCATION OF CEILING DEVICES.
- SEE ARCH ELEVATIONS FOR LOCATION OF WALL MTD DEVICES
- PLENUMS ARE CROWDED AND NOT ALL OBSTACLES ARE INDICATED. ALLOW FOR ADDITIONAL DUCT OR PIPE OFFSETS OR TRANSITIONS NOT INDICATED ON DRAWINGS
- SEAL ALL PENETRATIONS OF FLOORS, RATED WALLS, EXTERIOR WALLS
- CONTRACTOR SHALL SUBMIT DRWGS FOR ALL PERMITS IN A TIMELY MANNER AND PAY ALL PERMIT FEES
- PROVIDE ANY REQUIRED TEMPORARY UTILITIES
- SELECT AND INSTALL ALL EQUIPMENT TO PROVIDE CLEARANCE AROUND ALL HVAC EQUIPMENT CONFORMING TO MANUFACTURER'S MINIMUM RECOMMENDED SPACE FOR MAINTENANCE AND/OR AIR FLOW AND SUFFICIENT TO ALLOW INSPECTION, SERVICE, REPAIR OR REPLACEMENT WITHOUT REMOVING ELEMENTS OF PERMANENT CONSTRUCTION OR DISABLING THE FUNCTION OF FIRE RESISTANCE RATED ASSEMBLIES.
- DO NOT RUN DUCT OR PIPE ABOVE ELECTRICAL PANELS

HVAC SPECIFICATIONS

23 05 00 BASIC MECHANICAL REQUIREMENTS

Warranty: Guarantee labor and materials for 1 year. Warranties begin upon Owner's acceptance of substantial completion of the installation.

Shop drawings: Submit complete information on all equipment, air devices, valves, duct accessories and controls. Submit complete ductwork and piping shop drawings, based on approved equipment and field observation of building conditions. Submit detailed layout of mechanical rooms and yards. Incomplete submittals will be returned to the contractor unreviewed. No time extensions or cost increases will be allowed for delays caused by return of incomplete submittals.

Operations and maintenance instructions: Provide 3 copies of operation and maintenance manuals to Owner. Provide within 90 days after the date of system acceptance. These manuals shall be in accordance with industry-accepted standard such as ASHRAE Guideline 1 and shall include, at a minimum, the following: (a) Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance. (b) Operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified. (c) Names and addresses of at least one service agency. (d) HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in programming comments. (e) A complete narrative of how each system is intended to operate, including suggested setpoints. Provide instruction on system operation to Owner's representatives.

Record drawings: Within 90 days after the date of system acceptance, provide record drawings in AutoCAD or Revit (using the same software and version the project was designed in), plus full size hard copy. Project designed in Revit. Electronic backgrounds may be available from Engineer for a fee. Record drawings shall include as a minimum the installed location and performance data on each piece of equipment, air devices, control sensors, control panels, general configuration of duct and pipe distribution system including sizes, and the terminal air or water design flow rates.

Coordination: Provide Electrical Contractor with electrical requirements of approved equipment in sufficient time to order panel boards, disconnects, etc.

Access doors: Provide *Milcor* or equal as required for access to all valves, filters, controls, dampers or other devices requiring attention. Doors shall match wall or ceiling rating. Architect must approve location and appearance of all access doors. Access panels for fire or smoke dampers shall be operable without the use of tools.

Sleeves: Provide metal sleeves where pipes or control wiring penetrate walls

Overflow drain pans: Provide under all above-ceiling units. Pans to be minimum 24 gauge galvanized sheet steel; minimum 1-1/2" deep and not less than 3" larger than unit or coil dimensions. Provide separate 3/4" drain from pan to conspicuous location; provide escutcheon plates at ceiling penetrations. When allowed by local authority, may provide float switch in overflow pan instead of discharge piping; float switch shall shut unit off if water is detected. Pans equipped with float switch shall have screw cap nipple on bottom or side of pan to allow water to be drained from pan.

23 05 03 PIPES FOR HVAC PIPING AND EQUIPMENT

HVAC condensate drains: Inside building use insulated copper or galvanized steel in environmental air plenums. Inside (but not in environmental air plenums) may use insulated PVC. Outside building, use uninsulated UV-resistant PVC. Slope to outlet min 1/8" per foot. Provide trap (unless HVAC unit is internally trapped) and clean out plugs. Size condensate drain per applicable code; size shall not be less than outlet size of unit or less than 3/4 inches. Discharge condensate to an approved location inside or outside building. Do not discharge into a gutter system if that gutter discharges onto a public walk or street.

Copper pipe fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F. Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 - 1480 degrees F.

23 05 13 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

Test motors in accordance with NEMA MG 1, including winding resistance, no-load speed and current, locked rotor current, insulation high-potential test, and mechanical alignment tests.

Install securely on firm foundation. Mount ball bearing motors with shaft in any position. Install engraved plastic nameplates. Ground and bond motors.

Single Phase Motors: Permanent split-capacitor type where available, otherwise use split-phase start/capacitor run or capacitor start/capacitor run motor. Terminal lugs to match branch circuit conductor quantities, sizes and materials.

23 05 29 HANGERS AND SUPPORTS FOR HVAC PIPING & EQUIPMENT

Pipe, duct and equipment hangers and supports shall be per the local code. Support piping at a minimum every 10' or less for 1" and larger pipe, every 6' on 3/4" or smaller. With copper pipe use copper hangers or tape at contact point.

Support flex ducts per manufacturer's installation instructions (provide instructions for inspector review). Alternate acceptable flex duct support is 26 gage, 1.5 inch wide galvanized iron straps on 4 ft maximum spacing.

Roof curbs (required for all roof mounted equipment): Galvanized steel shell and base, mitered cant, insulation, wood nailer. Roof curbs shall match the roof pitch and shall be compatible with the roof type.

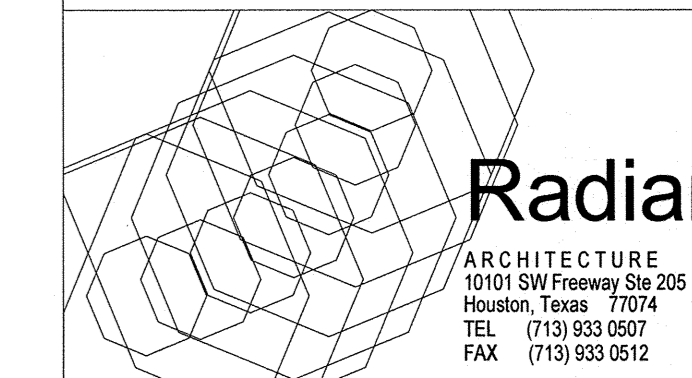
Provide concrete or prefabricated pads for all ground mounted equipment. Flash and seal equipment and pipe stacks.

Furnaces, fans and fan coils shall be suspended or supported with spring isolator unless internally isolated. Provide flexible duct connections at all air handlers and fans, unless internally isolated.

23 05 53 IDENTIFICATION FOR HVAC PIPING & EQUIPMENT

Equipment: Permanent label (stencil, metal tag or engraved plastic) with unit tag or name and area or space served.

OPTIMUM CARE
SUGAR LAND, TEXAS



Revision Schedule		
#	Date	Description
1	4-08-13	PERMIT, PRICING, AND CONSTRUCTION

Project No.

MECHANICAL SPECS

Sheet No.

M3.1

