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HVAC DESIGN CRITERIA

75°F COOLING (MINIMUM ALLOWED BY 2015 IECC, SECTION C302.1)
72°F HEATING (MAXIMUM ALLOWED BY 2015 IECC, SECTION C302.1)

HUMIDITY CONTROL: THIS PROJECT HAS NO DIRECT CONTROL OF HUMIDITY

OUTDOOR DESIGN CONDITIONS (SUGAR LAND, TEXAS) PER 2015 IECC:

- 96°F DB, 80.5°F WB SUMMER; 28°F DB WINTER
- 7357 DEGREE DAYS COOLING; 1371 DEGREE DAYS HEATING
- CLIMATE ZONE 2A

CODE INFORMATION:

APPLICABLE CODES INCLUDE BUT ARE NOT LIMITED TO:
CITY OF SUGAR LAND BUILDING CODE: 2015 IBC, AMENDED
CITY OF SUGAR LAND MECHANICAL CODE: 2015 IMC, AMENDED
CITY OF SUGAR LAND COMMERCIAL ENERGY CONSERVATION CODE:
2015 IECC AMENDED

OUTSIDE AIR REQUIREMENTS: PER 2015 IMC

BEDROOM/LIVING ROOM: 5 CFM PER PERSON, 0.06 CFM PER SQ.FT.
LOBBIES/PREFUNCTION: 7.5 CFM PER PERSON, 0.06 CFM PER SQ.FT.
DINING ROOMS: 7.5 CFM PER PERSON, 0.18 CFM PER SQ.FT.
OFFICE SPACE: 5 CFM PER PERSON, 0.06 CFM PER SQ.FT.
CORRIDORS: 0 CFM PER PERSON, 0.06 CFM PER SQ.FT.
MULTIPURPOSE ASSEMBLY: 5 CFM PER PERSON, 0.06 CFM PER SQ.FT.
STORAGE: 0 CFM PER PERSON, 0.12 CFM PER SQ.FT.

ENERGY CODE PER 2015 IECC CHAPTER 4 (NOT ASHRAE 90.1) - MANDATORY

SUGAR LAND IS ZONE 2A WARM-HUMID

C403.2.1 Calculation of heating and cooling loads. Engineer has performed HVAC load calculations using Trace 700

C403.2.2 Equipment sizing. The output capacity of heating and cooling equipment shall be not greater than the loads calculated in accordance with Section C403.2.1. A single piece of equipment providing both heating and cooling shall satisfy this provision for one function with the capacity for the other function as small as possible, within available equipment options.

Exceptions:

1. Required standby equipment and systems provided with controls and devices that allow such systems or equipment to operate automatically only when the primary equipment is not operating.
2. Multiple units of the same equipment type with combined capacities exceeding the design load and provided with controls that have the capability to sequence the operation of each unit based on load.

C403.2.3 HVAC equipment performance requirements. Equipment shall meet the minimum efficiency requirements of Tables C403.2.3.

C403.2.4 HVAC system controls. Each heating and cooling system shall be provided with thermostatic controls.

C403.2.4.1 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.

C403.2.4.1.1 Heat pump supplementary heat. Heat pumps having supplementary electric resistance heat shall have controls that, except during defrost, prevent supplementary heat operation where the heat pump can provide the heating load.

C403.2.4.1.2 Deadband. 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.

Exceptions:

1. Thermostats requiring manual changeover between heating and cooling modes.
2. Occupancies or applications requiring precision in indoor temperature control as approved by the code official.

C403.2.4.1.3 Set point overlap restriction. Where a zone has a separate heating and a separate cooling thermostatic control located within the zone, a limit switch, mechanical stop, or direct digital control systems with software programming shall be provided with the capability to prevent the heating set point from exceeding the cooling set point and to maintain a deadband in accordance with Section C403.2.4.1.2.

C403.2.4.2 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

C403.2.4.2.1 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.

C403.2.4.2.2 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.

C403.2.4.2.3 Automatic start capabilities. Automatic start controls shall be provided for each HVAC system. The controls shall be capable of automatically adjusting the daily start time of the HVAC system in order to bring each space to the desired occupied temperature immediately prior to scheduled occupancy.

C403.2.4.3 Shutoff dampers. Outdoor air intake and exhaust openings and stairway and shaft vents shall be provided with Class I motorized dampers. The dampers shall have an air leakage rate not greater than 4 cfm/ft² of damper surface area at 1.0 inch water gauge and shall be labeled by an approved agency when tested in accordance with AMCA 500D for such purpose.

Outdoor air intake and exhaust dampers shall be installed with automatic controls configured to close when the systems or spaces served are not in use or during unoccupied period warm-up and setback operation, unless the systems served require outdoor or exhaust air in accordance with the International Mechanical Code or the dampers are opened to provide intentional economizer cooling.

Stairway and shaft vent dampers shall be installed with automatic controls configured to open upon the activation of any fire alarm initiating device of the building's fire alarm system or the interruption of power to the damper.

Exception: Gravity (nonmotorized) dampers shall be permitted to be used as follows:

1. In buildings less than three stories in height above grade plane.
2. In buildings of any height located in Climate Zones 1, 2 or 3.
3. Where the design exhaust capacity is not greater than 300 cfm.

Gravity (nonmotorized) dampers shall have an air leakage rate not greater than 20 cfm/ft² where not less than 24 inches in either dimension and 40 cfm/ft² where less than 24 inches in either dimension. The rate of air leakage shall be determined at 1.0 inch water gauge when tested in accordance with AMCA 500D for such purpose. The dampers shall be labeled by an approved agency.

C403.2.6 Ventilation. Ventilation, either natural or mechanical, shall be provided in accordance with Chapter 4 of the International Mechanical Code. 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.

C403.2.8 Kitchen exhaust systems.

Replacement air introduced directly into the exhaust hood cavity shall not be greater than 10 percent of the hood exhaust airflow rate. Conditioned supply air delivered to any space shall not exceed the greater of the following:

1. The ventilation rate required to meet the space heating or cooling load.
2. The hood exhaust flow minus the available transfer air from adjacent space where available transfer air is considered that portion of outdoor ventilation air not required to satisfy other exhaust needs, such as restrooms, and not required to maintain pressurization of adjacent spaces.
3. Where total kitchen hood exhaust airflow rate is greater than 5,000 cfm, each hood shall be a factory-built commercial exhaust hood listed by a nationally recognized testing laboratory in compliance with UL 710. Each hood shall have a maximum exhaust rate as specified in Table C403.2.8 and shall comply with one of the following:
4. Not less than 50 percent of all replacement air shall be transfer air that would otherwise be exhausted.
5. Demand ventilation systems on not less than 75 percent of the exhaust air that are capable of not less than a 50-percent reduction in exhaust and replacement air system airflow rates, including controls necessary to modulate airflow in response to appliance operation and to maintain full capture and containment of smoke, effluent and combustion products during cooking and idle.
6. Listed energy recovery devices with a sensible heat recovery effectiveness of not less than 40 percent on not less than 50 percent of the total exhaust airflow.

Where a single hood, or hood section, is installed over appliances with different duty ratings, the maximum allowable flow rate for the hood or hood section shall be based on the requirements for the highest appliance duty rating under the hood or hood section.

Exception: Where not less than 75 percent of all the replacement air is transfer air that would otherwise be exhausted

C403.2.9 Duct and plenum insulation and sealing. Supply and return air ducts and plenums shall be insulated with a minimum of R-6 insulation where located in unconditioned spaces and where located outside the building with a minimum of R-8 insulation in Climate Zones 1 through 4 and a minimum of R-12 insulation in Climate Zones 5 through 8. Where located within a building envelope assembly, the duct or plenum shall be separated from the building exterior or unconditioned or exempt spaces by a minimum of R-8 insulation in Climate Zones 1 through 4 and a minimum of R-12 insulation in Climate Zones 5 through 8.

Exceptions:

1. Where located within equipment.
2. Where the design temperature difference between the interior and exterior of the duct or plenum is not greater than 15°F.
3. Ducts, air handlers and filter boxes shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded fabric systems or tapes.

C403.2.9.1 Duct construction. Ductwork shall be constructed and erected in accordance with the International Mechanical Code.

C403.2.9.1.1 Low-pressure duct systems. 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.

Exception: Locking-type longitudinal joints and seams, other than the snap-lock and button-lock types, need not be sealed as specified in this section

403.2.10 Piping insulation. Piping serving as part of a heating or cooling system shall be thermally insulated in accordance with Table C403.2.10.

Exceptions: 1. Factory-installed piping within HVAC equipment tested and rated in accordance with a test procedure referenced by this code. 2. Factory-installed piping within room fan-coils and unit ventilators tested and rated according to AHRI 440 (except that the sampling and variation provisions of Section 6.5 shall not apply) and AHRI 840, respectively. 3. Piping that conveys fluids that have a design operating temperature range between 60°F and 105°F. 4. Piping that conveys fluids that have not been heated or cooled through the use of fossil fuels or electric power. 5. Strainers, control valves, and balancing valves associated with piping 1 inch or less in diameter. 6. Direct buried piping that conveys fluids at or below 60°F.

C403.2.10.1 Protection of piping insulation. Piping insulation exposed to the weather shall be protected from damage, including that due to sunlight, moisture, equipment maintenance and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted.

C403.2.11 Mechanical systems commissioning and completion requirements.

Mechanical systems shall be commissioned and completed in accordance with Section C408.2.

C408.2.2 Systems adjusting and balancing. HVAC systems shall be balanced in accordance with generally accepted engineering standards. Air and water flow rates shall be measured and adjusted to deliver final flow rates within the tolerances provided in the product specifications. Test and balance activities shall include air system and hydronic system balancing.

WIND LOAD & EQUIPMENT ANCHORAGE

As defined under 2012 UMC 1106.2 <<2012 IBC 301.15>>. Based on Risk Category I, the wind speed is 130 mph. 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 ASCE 7-10 Chapter 29. Applicable vertical and lateral coefficients shall be applied.

Exterior ducts and pipes 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 UNLESS OTHERWISE NOTED.
- 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 DRAWINGS FOR ALL PERMITS IN A TIMELY MANNER AND PAY ALL PERMIT FEES.
- PROVIDE ANY REQUIRED TEMPORARY UTILITIES.
- THE LISTING OF PRODUCT MANUFACTURERS, MATERIALS AND METHODS ARE THE BASIS OF DESIGN AND ARE INTENDED TO ESTABLISH A STANDARD OF QUALITY. THE ENGINEER SHALL BE THE SOLE JUDGE OF QUALITY AND EQUIVALENCE OF EQUIPMENT, MATERIALS AND METHODS. WHERE SUBSTITUTED OR ALTERNATIVE EQUIPMENT IS PROPOSED ON THE PROJECT BEFORE BIDDING, IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO VERIFY THAT THE EQUIPMENT WILL FIT THE SPACE AVAILABLE, INCLUDING ALL REQUIRED CODE AND MAINTENANCE CLEARANCES, AND TO COORDINATE ALL EQUIPMENT REQUIREMENTS WITH OTHER CONTRACTORS.
- 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.
- ALL WORK IN OR ABOVE OCCUPIED AREAS SHALL BE AT OWNERS CONVENIENCE AND MAY BE DURING EVENINGS OR WEEKENDS. SCHEDULE ALL SERVICE INTERRUPTIONS IN ADVANCE WITH OWNER.
- ONLY OWNER'S REPRESENTATIVE MAY SHUT OFF EQUIPMENT OR DISCONNECT UTILITIES.
- BEFORE SUBMITTING A BID, IT WILL BE NECESSARY FOR EACH CONTRACTOR WHOSE WORK IS INVOLVED TO VISIT THE SITE AND ASCERTAIN FOR HIMSELF THE CONDITIONS TO BE MET IN INSTALLING THE WORK AND MAKE PROVISIONS FOR THE CONDITIONS IN HIS FINAL PRICE. FAILURE OF THE CONTRACTOR TO COMPLY WITH THIS REQUIREMENT SHALL NOT BE CONSIDERED JUSTIFICATION FOR THE OMISSION OR FAULTY INSTALLATION OF ANY WORK COVERED BY THE CONTRACT DOCUMENTS. THE BID SHALL INCLUDE ALL THE WORK REQUIRED OR NECESSARY TO COMPLY WITH THE WORK SHOWN ON THE DRAWINGS AND IDENTIFIED IN THE SPECIFICATIONS. NO EXTRAS WILL BE ALLOWED FOR CONDITIONS THAT COULD BE READILY OBSERVED.

THIS IS A PHASED PROJECT- SEE ARCHITECTURAL PLANS FOR PHASING

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 Revit Format (using the same software version the project was designed in), plus full size hard copy. Revit models 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 furred in units. Pans to be minimum 24 gage 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, contractor may provide a float switch in the overflow pan, instead of discharge piping. Float switch shall shut unit off if standing water is detected in the overflow drain pan. 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

Air vents at high points; drains at low points. Provide dielectric unions between dissimilar metals. Piping inside environmental air plenums shall meet the flame and smoke requirements of section 23 07 19.

- 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.
- Refrigerant relief – schedule 40 ASTM A 53 black steel or copper; 150 psi.

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. If pipe is insulated, support shall be on exterior of insulation. Provide shield to prevent acute compression of insulation.

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-foot maximum spacing.

Supports for duct and air devices within rated ceiling or floor assemblies shall be per the UL listing.

Provide concrete or prefabricated pads for all ground mounted equipment. Flash and seal equipment and pipe stacks. Pad thicknesses shall be sufficient to allow required condensate drain trap depth.

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.

23 05 93 TESTING, ADJUSTING AND BALANCING (TAB) FOR HVAC

Balance may be by a qualified employee of the mechanical contractor. Technician shall be AABC or NEBB certified.

Balance in accordance with NEBB Procedural Standards –1999 Procedural Standards for Building Systems, or AABC 2002 Associated Air Balance Council Test and Balance Procedures.

Adjust system to achieve air quantities shown, then adjust volumes to provide constant temperature (±2 °F) throughout the zone. Adjust fan sheaves, when applicable and where available. Calibrate all thermostats. Mark setpoints on all dampers and valves. Return to project at 1 and 3 month intervals after completion to make balance adjustments in response to Owner's perceived comfort.

Submit report (NEBB or AABC format) and include –

- General data: Nameplate data on all equipment. Outside air temp; cfm each supply, exhaust and return grille and actual room temperatures and humidities vs. setpoints
- Fans: Volume and static pressure; fan rpm and amps
- DX air handlers, fan coils or furnaces: supply and return air temp, volume and static pressure; fan rpm and amps. Outside air cfm.
- DX condensing units: Condensing air temp, units amps

Air systems shall be balanced to meet air quantities shown at each air device; and, in a manner to first minimize throttling losses in the effected system. Then, for fans with fan system power greater than 1 HP, fan speed shall be adjusted to meet design flow conditions.

HVAC control systems shall be tested to ensure that control elements are calibrated, adjusted, and in proper working condition. Submit test documentation.

23 07 13 DUCT INSULATION

Flame spread less than 25, smoke developed less than 50 as per ASTM E84, NFPA 255, UL273. Minimum required installed R values for non-residential projects (excluding film resistance) are:

1. In non-conditioned attics, garages or crawl spaces (i.e. outside the building envelope insulation): Supply R8; Return R8; Exhaust or relief: R6; Conditioned outside air R8

External duct wrap: foil face rigid or flexible fiberglass with vapor retarder. R value stenciled on outside. ASTM A96 Water Vapor Permeance: 0.5 perms maximum. Mold Growth per ASTM C1338- No Growth. GREENGUARD Environmental Institute Certified. Vapor Retarder Jacket conforming to ASTM C 1136 Type II: Foil Scrim Kraft (FSK), or White polypropylene– scrim–kraft (PSK). 2" Staple flange on longitudinal seam. Adhere to duct with vapor barrier type adhesive. Overlap all joints. Vapor seal all joints or breaks with reinforcing mesh imbedded in vapor barrier coating.

Vapor Barrier Coating: Vimasco Vapor-Block 749, Foster 30-65, Childers Chil-Perm #CP-34, or equivalent.
Reinforcing mesh: Foster Mast-a-Fab, Childers Chil Glas #10, or equivalent.

Insulate backs of supply diffusers when in attics or when ceiling plenum is not used for return air.

23 07 16 HVAC EQUIPMENT INSULATION

Flame spread less than 25, smoke developed less than 50 as per ASTM E84, NFPA 255, UL 273.

23 07 19 HVAC PIPING INSULATION

Pipe insulations, mastics and jackets located in environmental air plenums shall have maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.

Primary condensate drains inside buildings: 3/4" Armaflex for entire length. No insulation required outdoors. Insulation of secondary (overflow) condensate drains not required.

Refrigerant suction line piping: 1" Armaflex; Rated up to -40°F and having a ASTM E84 25/50 across all used insulation thicknesses

- Outdoor Applications - Painted with manufacturer's recommended water retardant ultraviolet solar radiation protective coating. Exterior cladding may be applied to lines with no degradation to performance and with engineer's approval.
- Exposed Indoor Applications - Black or white with paintable surface. Final finish color to be determined by architect.

23 08 00 COMMISSIONING OF HVAC

All projects less than 480,000 Btu/h cooling capacity and 600,000 Btu/h combined service water-heating and space-heating capacity or with systems that serve individual dwelling and sleeping units: Test and balance contractor shall observe HVAC control systems and document that all control elements are calibrated, adjusted, and in proper working condition.

23 09 23 ELECTRIC CONTROLS FOR HVAC

Electric, programmable multistage thermostats, automatic changeover, battery backup.

When indicated, provide Carrier T-55 Space Temperature Sensor (or approved equal) and Carrier EDGE 33SC2PP2S-02 Programmable thermostat zone controller (or approved equal). See sequence of operation.

OPTIMUM CARE
SUGAR LAND, TEXAS



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Revision Schedule

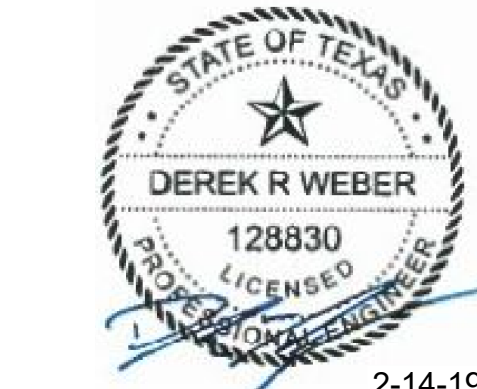
#	Date	Description
	10-26-18	PERMIT, PRICING, AND CONSTRUCTION
	02-14-19	City Comments

Project No.

MECHANICAL SPECS

Sheet No.

M3.1



2-14-19



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