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BROWN MISSIONARY BAPTIST CHURCH

DESIGN DEVELOPMENT: MECHANICAL & PLUMBING NARRATIVE

DESIGN AMBIENT CONDITIONS: SOUTHAVEN, MISSISSIPPI

ASHRAE MEAN COINCIDENT 1% DATA SUMMER & WINTER 99%

Summer: 98F DB / 80F WB @ 1% Design Wet-Bulb
Winter: 13F DB @ 99%

DESIGN INDOOR TEMPERATURE:

Summer: 75F & 50% RH
Winter: 78F & 50% RH

CODES:

Work shall comply with codes, rules, ordinances, and regulations of authorities, bodies, associations, and governments having jurisdiction. Specifically the following requirements shall be complied with their entirety.

1. State of Tennessee Codes, Rules, Regulations, Statutes, and Ordinances.
2. City of Memphis Codes, Rules, Regulations, Statutes, and Ordinances.
3. National Fire Protection Association (NFPA) – applicable requirements.
4. National Board of Fire Underwriters.
5. National Electrical Code – applicable requirements.
6. State and National Environmental Protection Agency.
7. Other Codes and Standards as outlined in each Section of the Specifications.
8. American with Disabilities Act (ADA).
9. State Department of Health.

DESIGN STANDARDS:

Standards are described by reference to various associations. These are in addition, but not limited, to those listed below:

AIA	American Institute of Architects
AGA	American Gas Association
ANSI	American National Standards Institute
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
AWS	American Welding Society
AWWA	American Water Works Association

CISPI	Cast Iron Soil Pipe Institute
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriters Laboratories
PDEMTennessee	Department of Environmental Management
NEC	National Electrical Code

HEATING, COOLING, & VENTILATING SYSTEMS:

There will be four primary zones of heating and cooling which are as follows:

Zone #1: Serves the Lower Level Floor Plan: This space will be heated and cooled by variable volume refrigerant flow heat pump system that is served by a constant volume fan coil with variable refrigerant flow capable of simultaneous heating or cooling in each of the tempering zones. Ventilation air will be provided by a 100% outdoor air rooftop unit with an integral heat recovery wheel. It is intended that this system will provide ventilation for all zones that are heated and cooled by a variable refrigerant flow heat pump system.

Zone #2: Serve's the Ground Level Sanctuary, Balcony and Chancel areas. This zone will be served by two natural gas rooftop units with the components as outlined below. The units will have integral condensing, and compressor units as outlined below.

Zone #3: Area's surrounding the Sanctuary will be heated and cooled by a Variable Refrigerant Flow Heat Pump System as previously outline in Zone #1. Large exterior glass area heat loss will be offset utilizing electric convector baseboard heating with integral thermostats.

Zone #4: Entrance Vestibules will be tempered by electric Cabinet Unit Heaters as manufactured by "Berko" or "Marley". Cooling will be provided by the Variable Refrigerant Flow Heat Pump System.

Rooftop Units will include the following components:

1. Supply Fan.
2. Exhaust / Relief Air Fan
3. Compressor/condenser section
4. Primary and secondary filter sections with 30/30 primary filters on smaller units and 30/30 efficient primary filters with 85% efficient secondary filters on larger Rooftop systems.
5. DX cooling coil 53 LAT DB, 61 LWB. Note: LAT must include motor heat gain.
6. DX reheat coil (used for dehumidification)
7. Motorized outside and relief air dampers
8. Stainless steel drip pan.
9. Variable Frequency Drive (where required)
10. Stainless steel gas burner section.

11. Multiple compressors that will continue to operate should one compressor de-energize during operation. Allowing system redundancy.
12. 14" high roof curbs to be installed by roofing contractor for warranty.
13. Duct flex connections on supply and return openings at unit.
14. Disconnect and 115 volt electrical convenience connection for each unit.
15. Access doors at each air handling unit housing section.
16. Dual refrigerant circuits for efficient part load operation.
17. Scroll compressors.
18. 100% Outside Air Economizer with Motorized Dampers
19. Through the curb and through the base electrical and gas connections.
20. Full perimeter base rails with built in rigging capabilities.
21. Two stage cooling with independent circuits and split-face evaporator coil.
22. Liquid line filter-dryers.
23. Phase Monitor.
24. Single point power connection.
25. Slide-out Condensate Drain Pan.
26. Slide out Blower/ Motor Assembly.
27. Hinged Access Panels.
28. Air Handling Unit Voltage shall be 480 Volts, 3 Phase, 60 cycle.
29. Ventilation Rooftop Units shall be provided with a enthalpy heat recovery wheel.

Variable Refrigerant Flow Heat Pump includes but is not limited to the following:

1. Voltage to the Outdoor Variable Refrigerant Flow Heat Pumps is 480 Volts, 3 Phase, 60 Cycle.
2. Voltage to the Indoor Heat Pump Supply Fan is 208, single phase, 60 cycle.
3. All refrigerant tubing within and outside of building shall be copper piping or tubing and fully insulated.
4. All Terminal Heat Pump Supply Fans shall be provided with a condensate line and piped to the nearest storm drain riser or indirect connection to a janitors sink floor drain.
5. Contractor shall estimate 65 High Static Ducted Heat Pumps.
6. 15 – 4 Way Cassette Heat Pumps.
7. 16 Outdoor Units.
8. 30 Heat Recovery Units for LG manufactured units. Other manufacturers will require a heat recovery unit for each heat pump supply fan in order to heat and cool at the same time. Approximately 80 Units required for other Manufacturers.

9. Approved Manufacturers:

- A. LG (Basis of Design)
Contact: Mr. J. P. Heisseerer
Validated Custom Solutions
6128 North College Avenue

Indianapolis, Indiana 46220
Phone: 317 4460-5537
Email: jp@vc-solutions.com

- B. Sanyo
 - C. Daikin
 - D. Mitsubishi
10. Contractors must be certified by the manufacturer's installation and service programs in order to install the above referenced variable refrigerant flow systems.
 11. Each heat pump supply fan must have a dedicated thermostat to serve the heat pump system.

Standard Unit Controller: (Simplicity Control Board)

1. Each rooftop unit shall have an integrated low-ambient control, anti-short cycle protection, lead-lag, fan on and fan off delays, low voltage protection, on board diagnostic and fault code display.
2. Safety Monitoring: Monitors the high and low-pressure switches, the freestats, the gas valve, and temperature and limit switch on gas system. The control board will alarm on ignition failures, safety lockouts, and repeated limit switch trips.
3. All Rooftop Units shall have DDC control and be interfaced to a Building Management System (BMS) with stand alone computer, printer, graphics, and point list. The control system shall be open protocol with either BacNet or LonWorks. The total integrated system of fully operational and functional elements, including equipment, software, programming, and associated materials, to be provided by Division BMS Contractor and to be interfaced to the associated work of the other related trades. Equipment included consist of a standalone server, printer, monitor, graphics programs and shall be capable of trend setting and trouble shooting and diagnosing problems using the monitor and control points designated for each rooftop system.

Following are Air Handling Unit Manufacturers that are scheduled on this project. Manufacturers must comply too the level of quality as defined and outlined in the basis of design system. Coordinate any value engineering alternatives with HCO, Inc. mechanical project engineer prior to bidding. If alternatives are not pre-approved they will be rejected.

1. AAON (Basis of Design)
2. Valent
3. Johnson Control
4. Carrier
5. Lennox
6. Trane

Following is the projected number of Rooftop Air Handling systems and the temperature zones they serve: At this stage in the design the design concept is flexible and a few units may require revision to the areas they serve. Possibly eliminating a couple of units by combining the areas they serve. This will be fine tuned during the Construction Document submittal.

Rooftop Air Handling Units and Zones Served

1. RTU-1 Sanctuary & Chancel, Demand Ventilation, Variable Volume
2. RTU-2 Sanctuary & Chancel, Demand Ventilation, Variable Volume
3. VRTU-3 Ventilation Rooftop Unit, Variable Volume, North Side
4. VRTU-4 Ventilation Rooftop Unit, Variable Volume, South Side

Limiting energy costs is of primary importance in the design, ASHRAE ventilation requirements will be complied with through a design technique referred to as "demand ventilation". Demand ventilation is a control and sensor program that measures the concentration of carbon dioxide in the air and then, through its sensor located in the return air duct, sends a signal to the rooftop unit controller increasing the outside air and exhausting additional relief air thus increasing the ventilation in the occupied space. This sequence allows the system to flush the toxins from the temperature zone served by the rooftop unit. Some perimeter rooms with glass and exterior walls will be provided with electric duct heaters to allow better space control for the occupants.

Temperature control will be through a DDC (Direct Digital Control) system. A control panel will be installed for each air handling unit. The controller receives data from sensors within the air distribution system and provides two functions, 1. Monitors and controls the air handling unit, 2. Serves as a relay to a future Building Management System, where the data is continually received allowing some measurement points to over ride the system to maximize operation and demand for heating and cooling. HCO, INC. recommends the manufacturer of the air handling system integrate the temperature control vendors product during the rooftop unit construction. This saves field time installation and a higher quality control for a complete uninterruptible system. This construction work will not require a Building Management System. Provide Open Protocol components so that a BMS may be added in the future.

Exhaust System:

Exhaust will be provided for toilet rooms, janitor's closets, electrical rooms, kitchen, and special areas such as baptismal dressing rooms. All ductwork extending out from an exhaust fan will be internally insulated for a minimum of 20 feet to provide an acoustic barrier from the exhaust fan. All exhaust fans will be roof mounted with counter balanced back draft dampers. Each exhaust fan will be provided with a disconnect switch at the fan for safety. Operation of exhaust fans will be coordinated with the

rooftop unit serving that specific zone. Another control option is to interface the fan start-stop with the bathroom light switch.

Dehumidification:

De-humidification will occur through the DX reheat coil. The refrigerant from the compressors will circulate through the reheat coil as it returns to the condensers and compressors allowing a higher temperature gradient to de-humidify the air.

Ductwork:

All ductwork shall be fabricated from galvanized steel and internally lined for noise attenuation. Supply ductwork will be provided with internal insulation and external insulation. All return air ductwork will be internally lined with 1" thick, 1½ lb. density insulation. Exhaust ducts are to be lined for a minimum of 20 feet from the exhaust fan. The ductwork will be designed for medium pressure on systems utilizing VAV terminal Units. All other systems will be low velocity design. Each diffuser shall be connected by hard ducts in lieu of flexible ductwork in all areas. There will be some exceptions to this in areas where obstacles may not allow a hard duct to be routed. To control air noise at diffusers the maximum neck velocity of a diffuser shall not exceed 800 fpm with a maximum noise level below 35 NC.

PLUMBING SYSTEM DESIGN:

Plumbing fixtures will be installed as shown and located on the architectural drawings. The plumbing design shall comply with all applicable codes. Floor drains located in public restrooms and mechanical rooms will be provided with trap primers to prevent sewer gas from venting into finished rooms. Type L copper will be utilized for domestic water distribution. To reduce cost of copper piping PEX piping will be utilized where pipe sizes allow for its installation. Shock absorbers will be provided for all fixture groups to prevent water hammer. Insulation will be provided for all domestic water piping. Each branch line will be provided with an isolation valve so a zone can be isolated without having to disengage the entire plumbing system. Plumbing fixtures will be vitreous china. Water Closets will be floor set as manufactured by American Standard Model Madera Elongated Flush Valve Toilet, Number 2234.015. Handicapped water closet shall be American Standard Madera 16 1/8" High Elongated Flush Valve. Number 2305.100. Both toilets will be provided with exposed manual flushometers as Manufactured by Sloan Model Royal II No.115/115. All urinals will be wall hung with exposed manual flushometers Sloan Model Royal II, No. 186-0.5. The Owner may want to consider installing a battery powered infrared sensor flushometer for automatic flushing. A recommendation for pricing would be Sloan Regal Model 110-SMO Optima. Refer to enclosed attachment. Urinal shall be manufactured by American Standard, vitreous china siphon-jet. Model; Trimbrook with Sloan flushometer 1 GPM. Lavatories will be American Standard, Vitreous China Countertop Model 0498.400. Basis of design lavatory trim shall be American Standard Heritage Model 5401.172H Center set Lavatory Faucet with metal pop up drain. Owner may want to consider an electronic faucet Lithium Battery operated CR-2 with a 4 year life expectancy as an alternative option. Below and above grade sanitary and storm piping will be schedule 40 PVC 1 pipe. Piping will be fire and smoke rated PVC pipe. Water distribution will be copper

type L or Cross-linked Polyethylene (PEX) for water piping from ¾" to 2". Domestic Hot Water will be provided by two methods depending on demand. For small toilet rooms with a single sink an electric instantaneous heater will be utilized. The basis of design is Eemax "Flow Controlled" electric instantaneous water heaters Model EX8208. Typical size will be 208 Volt, 8.3 KW, 40 Amps. Refer to enclosed attachment for reference. For toilet rooms with a bank of lavatories HCO, INC. is proposing utilizing Eemax Shower Units Series Three at 208V, 28 KW, 120 Amp, point of use water heater No storage water heaters are planned for this project. Janitor Closet mop service basins will be pre-cast terrazzo as manufactured by "Fiat", Model SB 30x30, Size: 30" x 30" x 6" high curb. Electric water coolers shall be as manufactured by "Sunroc" Model NWCA-8F-BL with a cooling capacity of 7.7 GPH 115 Volts, 4.5 Amps, 415 Rated Watts.

Utilities:

The sanitary system will be connected to the existing sanitary system located at South 58 Street at the south side of the church. The sanitary is proposed to exit the building in Mechanical Room 140. Mechanical Room 140 is also the location for other utilities to enter the Church. Gas and water service will also be brought to the building and provided with new meters to accommodate the demand load. Storm drainage will be drained to site retention ponds or run to the storm service near the church. Water softeners are not included for the design of this project. Underground sanitary and storm piping will be cast iron soil pipe and fittings, or steel pipe and fittings, or PVC pipe and fittings. Typically PVC pipe will be utilized in areas without heavy load requirements.

Fire Protection:

A dedicated 6" fire protection water line will be brought into the building. Water pressure test will determine whether a fire pump will be required or not. Recessed sprinkler heads are to be installed in finished areas, pendent type sprinkler heads will be specified in non-finished areas.

Closing Remarks:

Manufacturers listed are basis of design and are represented as to show the minimum level of quality for the equipment and material to be bid. Contractors have the option to base their bids on alternate manufacturers as long as the substitute vendor complies with the design intent of this Basis of Design Narrative and is approved by HCO, Inc. Project Engineer. Coordinate use of alternative manufacturers under contractor consideration for the project.