PART 1 - GENERAL

1.1 OVERVIEW

A. This section includes requirements for calculating HVAC cooling and heating loads.

B. Load calculations must be performed in accordance with the latest ASHRAE Handbook of Fundamentals.

C. The HVAC system shall include all energy, distribution and control systems required to provide a completely functional heating, ventilating and air conditioning system for the Project. The systems described within this document are provided to aid the A/E in the design of the Project and are not intended to address every HVAC component required.

PART 2 - DESIGN CRITERIA

2.1 OUTDOOR DESIGN CONDITIONS

A. Outdoor design conditions for HVAC load calculations at facilities located in Houston and at Smithville and Bastrop shall be based on the following Design Criteria. This data is not for heating, cooling, or air cooled condenser coil sizing.

	Houston	Smithville / Bastrop
Cooling Dry Bulb	96°F	99.9°F
Cooling Wet Bulb	77.1°F	73.1°F
Heating Dry Bulb	33.6°F	27.9°F

A. The following outdoor design data is for the sizing of heating, cooling, air cooled condenser coils, and cooling towers.

	Houston	Smithville / Bastrop
Cooling Dry Bulb	96°F	100°F
Cooling Wet Bulb	80 F	78°F
Heating Dry Bulb	20°F	20°F
Ambient Dry Bulb for Condenser Coil	105°F	105°F

2.2 INDOOR DESIGN CONDITIONS FOR OFFICE AND ADMINISTRATIVE AREAS

A. As a guide, indoor design conditions shall be based on the following Design Criteria:

Application	Summer Dry Bulb (°F)	Winter Dry Bulb (°F)	Relative Humidity (%)
Office, Conference, Administrative Support, Corridors, Public Areas, Elevator Machine Rooms	74°F ± 2°F	69°F ± 2°F	<60
Toilet Rooms	74°F ± 4°F	69°F ± 4°F	<60
Intermediate Distribution Rooms (IDR/IDF) and Main Distribution Rooms (MDR/MDF), Audio/Video Rack Rooms	Maximum of 72°F	No heating required	40-70

Application	Summer Dry Bulb (°F)	Winter Dry Bulb (°F)	Relative Humidity (%)
Equipment Rooms	55°F - 80°F	55°F - 80°F	<60

1. Confirm indoor design conditions of telecommunications rooms with Design Guideline Element D5030, Telecommunications. Refer to Element D3041 Air Handling Distribution for HVAC equipment requirements.

2. Occasional deviations beyond stated design conditions may occur; however, such deviations should not affect the intended function of the space.

3. Humidification for control shall be provided only for applications where indicated.

4. Coordinate environmental requirements for special equipment in accordance with manufacturer's recommendations.

2.3 INTERNAL LOADS

A. As a guide, base preliminary HVAC system loads to size equipment on the following lighting and equipment loading for the various spaces, unless actual lighting and equipment loads are known.

Application	Lighting (Watts/Square Foot)	Equipment (Watts/Square Foot)
Corridors, Public Areas	Note "a"	0.5
Office Areas	Note "a"	2.5
Conference Rooms	Note "a"	1.0

Food Service	Note “a”	20.0 (Base on Actual)
Equipment Rooms	**Note “a”**	**Base on Actual**
Storage Rooms	Note “a”	0.0
Toilet Rooms	Note “a”	0.0
Patient Care Support	Note “a”	1.0

a. Refer to Space-by-Space Method Table in ANSI/ASHRAE/IESNA Standard 90.1 for lighting watts/square foot.

b. Confirm with Owner on lighting power densities for certain applications that may exceed ANSI/ASHRAE/IESNA Standard 90.1 requirements.

B. When calculating HVAC system loads for selecting airside equipment, incorporate the following safety margins, unless directed otherwise by Owner during the Schematic Design phase:

1. Apply a 10 percent safety factor to sensible and latent BTUH design loads for patient, conference, auditorium and waiting rooms.
2. For selected outside air handling equipment apply a 10 percent sensible safety factor for cooling coil and fan capacity.
3. Confirm with Owner if adjustments to safety margins need to be considered for future expansion or flexibility in space programming. Coordinate with Owner during Programming to identify and document specific project requirements.

C. When calculating HVAC system loads for selecting cooling and heating generating systems such as heat exchangers and pumps, base equipment selection on peak cooling and heating generating loads with no safety factor, since the additional 10 percent safety factor should already exist in the system load requirements.

D. IDR/IDF/MDR/MDF room loads shall be calculated based on designed racks plus 20 percent for future expansion. Prior to the racks being designed the engineer shall assume a rack load of 3kW per rack and four racks per IDR/IDF room and 12 racks per MDR/MDF room. The engineer shall add another 20% on these assumed loads for future capacity.

2.4 OCCUPANT DENSITY

A. Base occupant density in accordance with ASHRAE Standard 62.1. Confirm this number of occupants with the Facility Program or Pre-Design Report as space programming is finalized.

2.5 OCCUPANT HEAT REJECTION

A. In general, use heat gain rates for occupants listed in ASHRAE Handbook of Fundamentals. Use heat gains for the type of activity typical to the space uses.

2.6 BUILDING ENVELOPE

A. Refer to the Design Guideline Element B for wall, roof, and glass construction criteria, where applicable.

B. Roof and glass U values must meet or exceed the values noted in ANSI/ASHRAE/IESNA Standard 90.1 latest state adopted version.

2.7 BUILDING OCCUPANCY

A. Mechanical systems for general office/administration areas will operate during normal business hours with unoccupied setback capability. Confirm areas that require 24-hour/7 day air conditioning with the Owner's Project Manager, including but not limited to, telecommunications and elevator machine rooms.

B. General operating hours will be 7am – 6pm Monday through Friday, however, confirm intended operating hours with the Owner's Project Manager.

2.8 BUILDING VENTILATION

A. Supply air to occupied spaces will use a mixture of return air and pretreated outside air, unless noted otherwise herein.

B. Outside air requirements shall be based on ASHRAE Standard 62.1 and where applicable, Department of State Health Services (DSHS) guidelines. Outside air quantities must also be based on maintaining a minimum overall building net pressurization.

C. Utilize a combination of directly supplied conditioned air and transferred make-up air to toilet rooms and janitor's closets via air devices and transfer jumper ducts (as needed) to maintain design temperature and to provide make-up air for exhaust requirements. **Where toilet rooms include two or more fixtures (toilets or urinals), provide ventilation occupancy controls to reduce exhaust flow during unoccupied periods (for example: via 2-position control damper in exhaust ductwork tied to light switch with time delay feature).**

D. Condition stairwells with exterior envelope resulting in significant heat gains or losses. Do not condition stairwells with no significant heat gains or losses (interior stairs).

2.9 SYSTEM ZONING

A. In determining zones for air handling unit service, consider the following:

1. Structural and architectural building constraints and layout.

2. Functional use of the space; similar occupancies may be served from a single air handling unit, while other functions such as food service/dining or conference centers should be provided with dedicated units.

3. Discuss proposed air handling unit zoning with Owner during the Schematic Design Phase.

B. In general, terminal unit zoning will be as follows:

1. Maximum four (4) offices per perimeter zone temperature control. Do not exceed 1500 CFM per terminal unit when serving offices.

2. Maximum six (6) offices per interior zone temperature control; maximum 1200 square feet per zone. Do not exceed 1500 CFM per terminal unit when serving offices.

3. Zone areas in accordance with functional use of the space and similar occupancies.
4. Zone open office areas separate from individual, enclosed offices.
5. Exterior corner zones shall be served by dedicated terminal units.
6. Zone waiting rooms and lobby area separate from other rooms.
7. Each conference room, including sub-dividable rooms, must have individual terminal unit and temperature controls.
8. Audio/video rack rooms shall each be served by dedicated terminal units. Refer to actual equipment loads and associated environmental characteristics to determine if a fan-coil unit or computer room air handling unit will be required for conditioned air supply.
9. IDF/MDF rooms shall be served by a dedicated fan coil unit.
10. Zone areas with high concentration of equipment loads separate from general office areas.

2.10 BUILDING PRESSURE RELATIONSHIPS

A. Toilet rooms, locker rooms, food service, and janitor's closets will be at a negative pressure with respect to adjacent spaces.

B. Design overall building pressurization to be slightly positive on every floor to reduce infiltration. Net positive pressurization (outside air less exhaust air) should be equal to between 5 and 15 percent of total supply air flow, depending on envelope design and construction. Note that tighter buildings are eligible for less net pressurization.

C. The A/E shall ensure that make-up air required to maintain negative pressure and excess air to maintain positive pressure are available and considered in the air balance calculations.

D. Where ASHRAE requires a particular static pressure differential be maintained between the room adjacent spaces, the A/E shall calculate the offset between supply air and exhaust air as needed to maintain that pressure. A control strategy shall be designed to track that offset.

PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

3.1 GENERAL

A. The A/E shall submit calculations and economic analysis for review upon request by the Owner.

PART 4 - PRODUCTS

4.1 GENERAL

A. Refer to Owner's Master Construction Specifications. These are available on the Owner's Design Guidelines website: http://www2.mdanderson.org/depts/cpm/standards/specs.html

B. Specify air curtains at loading dock doors that open to air-conditioned spaces for buildings whose loading dock will be utilities daily.

PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	20190301	Original Issuance	
Rev. 1			

END OF ELEMENT D3001