

# Element D Services

Heating, Ventilating, and Air  
Conditioning

## D304105 HVAC MRI Air Handling Distribution

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### PART 1 - GENERAL

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#### 1.1 OVERVIEW

- A. This section supplements Design Guideline Element D3041 on air handling distribution with specific criteria for projects involving design of MRI spaces.
- B. Refer to Design Guideline Element D3041 for the following:
  - 1. General design criteria related to outside air pre-treatment units, terminal units, air devices, motor requirements and ductwork.
  - 2. Special Contract Document Requirements and products applicable to the Project.
- C. HVAC requirements for the MRI suite vary widely with the capacity and make of the imaging unit. Information pertaining to indoor design conditions, internal heat gain, and shielding against the Radio Frequency (RF) and EMI (Electro-Magnetic Interference) etc. shall be obtained from the equipment manufacturer during the Project Design Development phase.

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### PART 2 - DESIGN CRITERIA

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#### 2.1 GENERAL

- A. Central air handling system or single computer room air handling units serving the MRI shall be able to maintain the MRI space at 74 +/- 2 degrees F dry bulb, and the relative humidity at 50 percent. The electronic modules that power and controls of the MRI machinery are to be maintained at the manufacturer's recommended temperature and relative humidity conditions.
- B. The MRI electronics room and other associated computer support areas are served by dedicated air conditioning system to maintain temperature and humidity requirements. Any office / administrative space shall be served by a separate air handling system **unless approved by the owner**. Refer to Design Guideline Element D3041.
- C. HVAC equipment for MRI Suites shall be on emergency power. Refer also to Section D3000 for additional emergency power requirements.

#### 2.2 MRI SUITE AIR HANDLING SYSTEM

- A. MRI Gantry Room:
  - 1. Provide a dedicated, air-handling unit to serve the examination room and other spaces associated with the MRI suite. Depending upon the specific needs of various spaces, conditioned air shall be supplied by either constant or variable air volume terminal units serving as temperature control zones. Note the following guidelines:

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- a. An automatic emergency 100 percent exhaust system, in the gantry room, to remove helium gas during an accidental spill. The minimum capacity of the exhaust system shall be 12 air changes per hour. The gas shall be discharged at the highest point of the building. The oxygen sensors shall activate the exhaust system when the level of oxygen drops below a predetermined level. It is usually 18 percent.
- b. Provide separate vents to remove helium gas produced during boil-off and quench of the magnet. While the boil-off is a normal venting phenomenon, the quench occurs when a super conductive magnet becomes resistive. Coordinate sizes of HVAC equipment, including pressure drops with the magnet manufacturer using their quench vent sizing tools. Helium liquid turns into gas and will occupy high volume.
- c. The air distribution ductwork shall be constructed of either FRP or aluminum material to maintain the integrity of the magnetic field.
- d. Return duct mounted temperature and humidity sensors are to be used to control and monitor MRI room. The devices are to be located downstream of the duct wave guides which are located at the duct penetration. Coordinate location of the oxygen sensor with the owner.

### B. Computer Room:

1. The air supply outlets shall be located at the floor level with the air directed toward the cabinet inlets. The return air inlets shall be located at the ceiling level, above the cabinets, and near equipment exhaust.
2. The physical location of the cooling unit should be coordinated with the magnetic field line and should be located at a distance to maintain the integrity of the magnetic field or not be affected by the intensity of the magnetic field.
3. The supply air entering the computer room shall meet the minimum and maximum temperature and humidity requirements set forth by the manufacturer of the MRI to comply with the manufacturers warranty requirements.
4. Provide water sensor capable of providing alarms locally and also the BAS on the raised deck and under the raised flooring (where a raised floor is provided). The alarm shall sound upon detection of water on the floor.

### C. MRI Cooling Units:

1. Dedicated closed-loop water-cooling equipment shall be provided remove the heat generated by the MRI and control equipment. The cooling equipment shall comprise of a dedicated air-cooled, chiller, circulating pump and interconnecting piping, valves, and indicating flow meter are required. If a central chilled water system is available with in the building, then interconnecting piping, valves, and indicating flow meter are required.
2. The pH level, total solid content, total hardness, and alkalinity of the circulating water shall be within the limits prescribed by the equipment manufacturer.

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3. The limits of the inlet water temperature, pressure drop through the equipment, and maximum inlet water pressure shall be in accordance with the equipment manufacturer's specification requirements and may require a separate chilled water loop isolated with plate and frame heat exchangers. Where a separate chilled water loop is provided it shall have N+1 redundancy on all major components (heat exchangers, pumps, etc).
4. Water piping design and installation shall meet "Radio Frequency" (RF) requirements. Piping routed and supported in walls and chases shall be provided with clearly marked and identified access doors for servicing valves and other piping specialties.

### 2.3 TERMINAL UNITS

- A. Distribution of conditioned air to each zoned room or corridor shall be controlled by a constant volume terminal unit equipped with a hot water reheat coil.
- B. Constant volume terminal units must have air flow rate settings to achieve either positive or negative room pressurization requirements. The offset between supply and exhaust airflow rates shall be minimum 80 CFM to allow transfer air at each door entrance.

### 2.4 AIR DEVICES

- A. Interior and general supply air ceiling devices shall be aluminum Omni directional square panel face diffusers are to be used for the MRI and Computer room spaces.
- B. Size the diffuser on delivery of design air flow rate within the established noise criteria limit. Supply air throw velocities shall not exceed 1.5 feet per second at a room elevation 6 feet above the finished floor.
- C. Laminar flow diffusers are to be located over the gantry where the patient will be receiving intravenous injections equipped with 99.97 percent HEPA filters where required to trap particles of 0.3 micron. These same devices are to be used at room locations. Coordinate with owner to verify in which spaces these injections may occur.

### 2.5 DUCTWORK

- A. Refer to Design Guideline Element D304102 Laboratory Air Handling Distribution.

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## PART 3 - SPECIAL CONTRACT DOCUMENT REQUIREMENTS

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### 3.1 GENERAL

- A. If there are adjacent structures where airborne effluent has the potential to affect the Project, the A/E shall evaluate the need for a building wind tunnel study, to aid in finalizing the height and location of the outside air intake.
- B. Consider the use of heat pipe in the design of the system where the sensible and latent heat from outside air is transferred to the exhaust air, and cross contamination will not occur between the two air streams.

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### 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>

### PART 5 - DOCUMENT REVISION HISTORY

Issue	Date	Revision Description	Reviser
	20190301	Original Issuance	
Rev. 1			

END OF ELEMENT D304105