engineering

Engineering challenges for building diagnostic outpatient facilities

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As the healthcare industry evaluates the ultimate impact of the Obama Health Care Plan, medical entrepreneurs see opportunities to build and create outpatient care facilities in what they perceive to be growth areas. A similar situation occurred under the Clinton administration when entrepreneurs built a flurry of outpatient clinics to draw what were known as "bumps and bruises" and "well care patients" away from hospital emergency rooms to local neighborhood clinics. As the market continues to change, the current trend is to build outpatient ambulatory surgery and diagnostic treatment centers, once again drawing patients away from hospitals to neighborhood facilities.

This new trend creates unique challenges especially for the MEP engineering design community. The first challenge is to find an available space that has an adequate floor plate, head room, and public access. Once this has been determined, the engineer must evaluate the minimum code acceptable for the mechanical and electrical systems that need to be installed into a proposed space. Some primary issues of concern would be: adequate electrical power, access to roof tops, or acceptable exposures to install HVAC systems, which require large quantities of air for ventilation, mandated air exchanges and heat dissipation.

There are many factors to evaluate in the development of an outpatient ambulatory surgery and diagnostic treatment center, but ultimately the MEP infrastructure to support such a facility has a major impact on the successful development of the center.

Second is the issue of the emergency power required for these outpatient settings. Generally, self-contained battery packs suffice to provide 90 minutes of emergency egress lighting. For increased levels of patient care such as sedated or non-self preserving patients, additional emergency power is required. Once again, batteries, in the configuration of an uninterruptable power supply or UPS, can provide 90 minutes of service so a patient can be safely evacuated to an operable medical facility. In larger centers which provide surgical procedures, consideration for emergency generators raise concerns of the location of the emergency generator set, fuel supplies, noise and exhaust gas discharge.

A third issue is the need for medical gases, in the form of oxygen, vacuum and medical air. Usually, local portable cylinders provide oxygen and local portable vacuum pumps suffice. However, in larger facilities, central systems, consisting of manifolded oxygen cylinder systems with automatic changeover, are required; and a duplex vacuum pump and receiver should be provided with the appropriate medical gas alarms.

In addition, high tech radiology equipment compounds HVAC cooling and electrical loads for a facility.

To deal with these issues, one must consider magnetic and radio frequency shielding, process cooling systems for Magnetic Resource Imaging (MRI), Cryogen exhaust, and step-up transformers to provide 480 volt supply for CT Scanners and similar equipment.

Another challenge to be addressed is heating the facility. If a heating media, such as steam or hot water, is available on a reasonable schedule matching the facility's hours of operation, the solution is to provide fin tube radiation, reheat codes, etc. In some cases, heating is excluded from the lease and other solutions must be investigated. Electrical heating is least expensive to install but more expensive to operate. Oil or gas fired boilers can provide a ready source of steam or hot water and they are less costly to operate but more costly to install. However, with steam or hot water systems, the routing and termination of a flue becomes an issue.

The engineer must make provisions in the design for various communications systems and services including voice and data, nurse call, security and CCTV systems.

Fire protection for these types of facilities is usually provided in the form of a wet pipe sprinkler system connected to municipal sources or to building supplies if available. This may raise issues of adequate supply and pressure. And, in the case of an MRI, a pre-action system is required increasing the cost of the installation.

For fire alarm and smoke detection, the engineer must include in the design pull stations, horns, strobes, area and duct mounted smoke detectors with the appropriate control cabinets and central office monitoring in some cases.

Naturally, there are many factors to evaluate in the development of an outpatient ambulatory surgery and diagnostic treatment center, but ultimately the MEP infrastructure to support such a facility has a major impact on the successful development of the center.

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