Healing havens

The R&D Tax Credit aspects of hospital design and construction

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Hospitals are buildings that are seen as a significant part of the community, because they provide a place of safety and care for individuals in need. Over time, their design and construction has changed to create a safer, more relevant and more efficient building for patients.

New types of technology and building standards have affected how hospitals are being built. Over time, building codes are updated to ensure that structures are able to support our constantly changing environment. Developing new hospital designs and utilizing modern technology provides designers with the opportunity to create improved hospitals and meet the challenging needs of current and future patients.

Enacted in 1981, the Federal Research and Development (R&D) Tax Credit allows a credit of up to 13 percent of eligible spending for new and improved products and processes. Qualified research must meet the following four criteria:

1. New or improved products, processes or software
2. Technological in nature
3. Elimination of uncertainty
4. Process of experimentation

Eligible costs include employee wages, cost of supplies, cost of testing, contract research expenses, and costs associated with developing a patent. On Dec. 18, 2015, President Obama signed the bill making the R&D Tax Credit permanent. Beginning in 2016, the R&D credit can be used to offset Alternative Minimum tax and startup businesses can utilize the credit against $250,000 per year in payroll taxes.

Flexibility & Expansion

Flexibility is a significant aspect of a hospital design due to the constant changes and requirements that exist in the healthcare industry. There always are changes in the developments of diseases, introduction of new treatments and implementation of new technology.

A building must be able to support all of these evolving aspects in order for a hospital to properly function. To provide the flexibility of a building, designs should contain mechanical and electrical systems that can be modified. Plans should include generic room sizes and the implementation of modular concepts for laying out rooms and spaces. In order to account for these changes, the core design of a hospital should be easy to adapt to any required additions or renovations in the future.

To create a flexible structure for a hospital, rooms should be designated as soft and hard spaces and laid out accordingly. Soft spaces, such as an office, should be built next to a hard space which can be an operating room. The designated soft spaces should be easy to renovate in the future in order to expand certain hospital departments that need more room. Another form of creating flexible buildings is to construct a standardized room that can be used for various activities. This uniform room easily can be changed to support a different functional use when required.

Infection-Free Environment

It is imperative that a hospital is designed to provide a sanitized and clean environment. Certain spaces, furniture, lighting fixtures and hospital equipment should be chosen and positioned in a way that prevents any dirt or germs from sticking onto surfaces. Special materials, such as antimicrobial surfaces, should be utilized to provide a sterile environment. It also is important for

a hospital to implement a ventilation system that provides controlled circulation in order to maintain the air quality.

Negative Air Pressure Rooms

Negative air pressure systems usually are utilized in hospital rooms that serve to contain any form of contaminants from patients in the room. The Center for Disease Control and Prevention (CDC) has established certain guidelines that healthcare facilities should adhere to when installing or upgrading air handling units. Isolating these harmful contaminants, such as bacteria and viruses decreases the chance of individuals in other rooms coming in contact with any germs and becoming infected.

Hospital rooms that usually contain negative air pressure include ER waiting rooms, airborne infection isolation rooms, restrooms, radiology waiting rooms, janitors' closets and autopsy rooms. Negative air pressure rooms allow air to flow into the room, but won't let any air escape the room. Positive air pressure rooms, such as operating rooms, are the opposite of negative pressure rooms and allow air to flow out of the room.

Current Design & Construction Trends

The "2016 Hospital Construction Survey" was conducted by Health Facilities Management to get a better insight on activities occurring within the healthcare industry. Approximately 200 hospitals of various types participated in the survey. There has been an increasing growth in patient involvement in relation to the process of designing a hospital.

More than half of the voters (63 percent) said they included patients and/or the community in the design process. A hospital is intended to provide support and services to the community it serves, so it's important for hospitals to understand what patients, medical professionals and visitors feel are important to their design needs.

Many hospitals are focusing on expansions or renovations rather than new construction. A large reason for this conversion is due to the high cost of new construction for outdated hospital facilities. The average cost of a construction project is around $400 per square foot, while in New York City the cost is a high amount of $1,200 per square foot.

Hospitals are looking to reduce costs when updating their facilities and implementing expansions and/or renovations is an effective solution. Many of the expansions and/or renovations for hospitals focus on adding ambulatory care projects, emergency departments and surgery divisions, and the transition from standard patient rooms to critical care beds.

To improve an existing hospital, the top efficient categories of equipment that are replaced or upgraded were air handlers and ventilation systems. Hospitals have to maintain a sterilized environment to decrease the amount of exposure patients may receive to any contaminants. Other types of technology that are upgraded are nurse call systems, fire alarms, sprinkler systems, security systems and patient

CIRCLE NO. 55

monitoring systems. All of these systems are used daily, so it's imperative they are monitored to ensure the systems are working properly.

Resilient Hospital Designs

Natural hazards are unforeseen events that can greatly affect the operations and building structure of a hospital. There have been some devastating events that have occurred within the previous years which have had a large effect on the change in the structure and design of hospitals. Depending on the location of a hospital, designs can vary due to the environment the building exists in. For example, some areas are prone to flooding, while others may be affected by earthquakes. Hospitals in these different environments require different building designs to withstand certain natural hazards.

Earthquakes

Seismic standards are developed in order for buildings to stay upright during any earthquakes and its potential aftershocks. California is a state that is prone to many earthquakes, which is why the state requires strict building standards when designing a structure, because the building has to withstand probable seismic activity. The University of California, Los Angeles (UCLA), constructed a medical center that was designed to stand up against an 8.0 Richter Magnitude earthquake or greater. When designing the building, architects had to follow standards for creating a structure that would be able to withstand a 70-mph wind speed and heavy rain conditions.

To provide a resilient structure, steel beams that each weighed 20-25 tons were installed to construct the frame of the building. Before the design was constructed at the site, it was tested at the University of Nevada, Reno, which has an area dedicated to testing designs against simulations of earthquakes with high magnitudes. It can be challenging to design a hospital that meets all of the required performance standards, but with proper planning and testing procedures a strong structure can be built to protect against earthquakes.

Prefabrication

One of the construction methods to create a quicker and more efficient construction process is to prefabricate certain parts of the building. Utilizing BIM software in combination with prefabricating materials is beneficial for projects, especially ones that have to be completed within a small timeframe. BIM modeling software can help architects and hospital owners save time and money by determining if there are any clashes that exist before constructing a facility. While this may provide a quicker process, it requires a large amount of coordination and planning.

Coordination is required early on during the construction process to determine that the right materials and equipment contain the right measurements and are being laid out correctly. When the prefabricated units are put in the building, they have to be able to fit and function properly with the existing building. For some units, construction workers have to connect electrical and mechanical systems to the units, which is where the importance of planning comes in.

Use of Natural Light

Hospitals should provide an aesthetically pleasing and comfortable environment for patients, as well as doctors. A facility should contain the appropriate lighting, ease of movement around the building and appropriate wall colors. Providing natural light and outdoor views can positively affect how a patient is feeling. Rooms and equipment should be spaced out in a way that gives physicians the quickest route to each room and ease of access to medical equipment when caring for patients.

Design and construction trends always are changing and improving to meet the growing needs of current and future patients. There are many factors that designers have to consider when designing a hospital. The building should provide a comfortable and sterile environment for patients, as well as, doctors. The structure of a building should have a flexible design in order for future expansions and improvements to occur.

With the implementation of new technology and construction designs, hospitals have become improved to create more efficient and durable buildings. Research and Development Tax Credits area available for designers who are involved in developing hospitals due to activities such as designing innovative buildings and utilizing modern technology. **FC**

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