

Guidelines for Design:

Mapping the Ideal Clinical Engineering Department

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It has been an almost magical meeting with your administrator. You have been invited to meet with the architects and space planners next week, not to discuss a new clinical area and the required medical technology, but to discuss space and design for a new clinical engineering department and biomed shop space.

Unfortunately, more often than not, the bubble bursts fairly quickly when during the space planning meeting you are asked dozens of questions about what you do, how you do it, what space you need, why, where are the standards, etc. Unlike most other hospital areas, there is no set state or federal standards for square footage for clinical engineering (or facility engineering) support services.

When an architect or space planner meets with a nurse to discuss a new intensive care unit (ICU), the architect already has some ideas as to the requirements for square footage of an intensive care unit area and patient room, number of power receptacles, medical gasses, and other support systems required. Unfortunately, that information is typically not available for the architect for your new clinical engineering department and shop.

The most referenced document for hospital space planning is typically the American Institute of Architects' (AIA) *Guidelines for Design and Construction of Hos-*

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Check Points

What does an ideal workspace for a clinical engineering department look like? Some questions to ask yourself and your colleagues include:

- ✓ Where is the department today and where will it be in 10 years?
- ✓ How do I design space to meet that future functional need?
- ✓ Where is the department located in relation to other support services?

pital and Health Care Facilities. Last published in 2001, the new edition will be published in March of 2006. The *Guidelines* are referenced by space planners, architects, engineers, and healthcare professionals throughout the United States and in other countries who are planning new or renovated healthcare construction. Authorities in 42 states, the Joint Commission (JCAHO), and several federal agencies use the *Guidelines* as a reference code or standard when reviewing construction designs and plans and completed healthcare facilities.

Based on experience, there are some basic fundamental space information you can review and provide to the architectural team. The first is the functions that are required for the department. Typical functions for a modern clinical engineering department include:

- Technician work space
- Manager office
- Administrative / clerical space
- File storage
- Equipment decontamination area
- Library
- Parts storage
- Receiving / packing area

- Mechanical work area
- Special hazards (radiation, lasers, etc.) work area
- Conference / educational area
- Secure FDA IT server area
- Break area
- Locker room

Each of these functional areas has space assigned to that function. Later, specifics related to that function (electricity, medical gas, network, etc.) are specified and included in the architectural, mechanical, and electrical drawings.

The average space per technician should be 120 square feet. If you currently have five technicians, that is the minimum space you will require. However, consider space for future technicians. It is also appropriate to add space for one spare bench to support outside vendors, interns, and maybe the occasional working manager. If you are a small shop with less than four technicians, consider 400 square feet as the minimum technical work space.

The manager's office should be attached to the shop and separated via a door with 120 square feet. Further consider if you require administrative area for a secretary (now or in the future) or someplace to store documents, phones, computers, mail boxes, etc. Typically, you need to add some administrative space to the main shop. Also consider where to store paper files, service manuals, packing slips, etc. While we continue to move more and more documentation to electronic means, there is still significant paper in most hospitals and space for numerous file drawers should be considered.

There should be a dedicated receiving area for receiving and unpacking new equipment. The same area should be used for packing items to be shipped out. A packing and unpacking area requires significant space, a garbage receptacle, some form of storage for boxes, shipping supplies, tape, and all those peanut (or equivalent) materials for shipping. This area should be about 240 square feet for most shops. This space is dependent on how close the biomed shop is to the receiving dock, the ability of the dock to store crates, and in general the size of the hospital and the number of items you receive and ship out. Consider oversize or double doors to provide access to this area.

The library area should be large enough to accommodate a conference table, projector, and screen. This could be shared with another department, but the library materials themselves (operation manuals, service manu-

Space Planning for Mechanical, Electrical Needs

In addition to specifying the space, you need to add any special systems that need to be considered and included in the mechanical and electrical specifications. Some examples include:

- All medical gas systems found in the OR, (oxygen, high pressure nitrogen, suction, medical and lab air, nitrous oxide, and scavenging)
- At least one 220 volt receptacle for new technologies
- Sufficient power receptacles—at bench top height. There should be two quads receptacles for each bench location at a minimum
- Two telephone and two data outlets per bench location. Add more data, phone, and power than you think you need. Some receptacles should be on emergency power circuits.
- Adequate lighting on a couple of switches so a technician can be adjusting a monitor, without the entire shop being in the dark. Some lighting should be on emergency power.
- Specify basic safety features such as eye wash station and hand wash sink in the main shop.
- Air conditioning and ventilation should be designed to reflect the number of equipment items that may be undergoing repair at one time in the shop. This is typically more than would be specified based on the number of staff and square footage.

als, etc.) need to be on shelves in the clinical engineering department. Ideally one of those spacesaver (or equivalent) systems should be integrated into your plan and used to store all your library materials; the space can also be shared with parts storage. As vendors go more toward PDF and online manuals, you gain parts storage area. Depending on your storage needs, a combined library and storage area (less conference room) is about 200 square feet.

Do not forget a mechanical bench area, unless facilities engineering is located near the biomed shop. If you are separate you will need grinder, drill press, and bench vise with a good six-foot work surface—so the mechanical bench is another 100 or so square feet.

Consider a staff break area. This area should include a microwave, refrigerator, and place for staff to eat (away from their workbenches). This could be the conference room.

Also consider space for lockers for staff members to place lab coats, winter coats, boots, purses, etc. If you have a large staff, consider a dedicated changing area and locker room.

Infectious disease will be a significant issue in future. If the biomed shop will not be located in very close proximity to central sterile processing, consider a dedicated room for decontamination. This room should be easy to clean, include two very deep sinks plus a hand wash sink. It should have spray nozzles for cleaning; shelf area for air drying and some form of separate exhaust and ventilation system. This room should be clearly separated into contaminated and clean storage areas.

If you presently or in the future plan on maintaining anesthesia machines, respiratory ventilators, portable radiographic units, lasers, OR tables, or fluoroscopic C-arms then ensure you have added the space to work on these larger items. This may be additional space in the main technician area or a separate room. A separate room may be the best means of assuring shop safety by controlling nitrous oxide exhaust, radiation exposure, and working with laser light.

Another specialized room may be one to manage the servers and other technical IT infrastructure the clinical engineering department is responsible for. If there is not currently secure server space specific to devices, this would be an appropriate time to consider creating such a space. This space should have adequate air conditioning, emergency power, and other features as any specific server space in the hospital.

Many architects want to install permanent casework and cabinetry. Some of this cabinetry is of value, especially when custom fit for the room. It is recommended to not have permanent work benches installed. Purchase good work benches that are “mobile” so their configuration can be changed as the services the department provide change. This assures maximum future space efficiency.

Space planning is the first part of a long construction process. Any square footage recommendation you provide may be reduced dependent on the budget and other needs. Assure that in the planning stages you request what is needed. There will be opportunities to compromise space in the future of the design. ■