

A Faculty Guide to Gross Lab Design

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This document is intended to help guide faculty members through the process of designing a new gross lab or renovating an existing gross lab. As the curriculum and budget of each institution will vary, this guide offers general recommendations only. Each faculty member will need to carefully consider how best to design a lab that supports their curricular needs within their budgetary constraints. In addition, as the laws and regulations pertaining to cadaver use differ by state and country, faculty members need to ensure that all laws and regulations are adhered to in their renovated or new laboratories. Good resources for obtaining this information include the Environmental Health and Safety (EH&S) representatives at your institution and the director of your Willd Body Program.

1) Getting started

Get involved as early as possible:

Faculty members should try to become involved in the design process as early as possible. Important decisions are often made early on in the design process (e.g., the type of ventilation system in the lab), so you will want to be involved in making those decisions. It's also important to involve representatives from your EH&S department as soon as possible, as they can provide insights into federal, state, and institutional regulations that may be relevant to the design process.

Assembling a design team:

Designing a gross lab entails an appreciable time commitment for all involved. Be prepared to manage your time wisely, and engage others to maximize planning efforts. In addition to architects, valuable partners may include the director of your Willd Body Program, EH&S and facilities management staff, AV specialists, other faculty members, and student focus groups.

Working with architects:

You will be working very closely with architects during the design process, and the success of the project is largely going to depend on how well you work together. If you are able to participate in selecting the architecture firm, there are a number of important qualities to look for. If you aren't involved in the decision-making process, try to communicate these preferred qualities to those making the selection:

- 1) The architects should be experienced in designing gross anatomy labs, as these are very unique spaces. The architects will identify possible vendors, equipment, and materials to use in the lab, so they need to be knowledgeable about the equipment and materials that are best suited to

- this type of lab environment. In addition, the architects should have expertise in designing a ventilation system for this type of lab.
- 2) The architects should be open to arranging site visits to view recently designed or renovated labs. This is a great way to help brainstorm about design ideas. If you have a limited budget, contact faculty members with newly designed or renovated labs and request photos. Note: the AAA is currently compiling photos for an online gallery, to be included in the gross lab design section of the AAA website.
 - 3) In addition to providing blueprints, it is best to work with architects who will also provide computer-generated images of the lab design. These models can help you visualize the space and will definitely inform decisions about the desired layout and materials to be used in the lab.
 - 4) It is highly recommended that architects build a mock-up of a lab station prior to the final approval of the design and materials. Blueprints and computer-generated images are great tools, but a lab station mock-up (e.g., including a table, lighting, computer screen, camera, flooring etc.) offers the best opportunity to vet a design in real space.

Assessing your needs:

Once you learn that a lab design or renovation is on your horizon, you should assess your needs. Consider the following questions:

- 1) How many students and faculty will be working in the lab at any given time?
- 2) How many cadavers will be present at any given time and do you need to design a separate space for cadaver storage?
- 3) What classes will be taught in the lab at any give time and over the course of the year and what types of activities will these classes include (lecture, dissection, prosection, demonstration, radiology exercises, surface anatomy exercises, etc.)?
- 4) Based on your experience teaching in gross labs, what design aspects (e.g., room layout, flooring, tables, sinks, lighting, AV system) worked best? What design aspects did not work well?

Consult with other faculty:

Once you have assessed your needs, talk to other faculty members who have recently gone through the process of designing or renovating a gross lab. They can provide valuable insights. Brainstorm some questions in advance and take notes during the interview. Some possible questions include: What works best about your new/renovated lab design? What would you change about your new/renovated lab design? Do you have any specific advice for me regarding potential pitfalls and how to avoid them? Keep in mind that each lab needs to be designed to fulfill the curricular needs of that particular institution, so it's helpful to get a sense of their curriculum (e.g., how many people use the space, how many classes take place in the lab and what activities occur in the lab?). Finally, keep a list handy of all the different components in the gross lab (e.g., lighting, flooring,

windows and window treatments, etc.), and ask for specific feedback and recommendations.

2. Specific design considerations

Dissection tables:

There are a number of options to consider, including standard dissecting tables with or without hoods, immersion tanks, and downdraft tables. A number of accessories can be added, including bookstands, leg supports, and drainage buckets. In order to determine which type of table is best for your lab, consider: 1) the embalming solution used by your Willd Body Program and the resulting exposure levels to formaldehyde and other hazardous chemicals in the lab, 2) the ventilation system to be implemented in the lab and its ability to control exposure levels (e.g. of formaldehyde), 3) the length of time the donors will be used and your ability to maintain them over that time period, 4) the type and number of classes that will take place in the lab, and the need to change room configurations to suit all users' needs, and 5) budgetary constraints.

If you decide to install downdraft tables, there are a number of possible designs, so you will need to assess options carefully and in consultation with your EH&S department, architects, and engineers. Consider installing a system that has adjustable settings (for example, a low setting to be used when the lab is unoccupied versus a higher setting for times when the tables are in use; or having the ability to increase ventilation early in the course, when the cadavers are heavily saturated, or when dissecting regions with higher exposure levels (e.g., chest and abdominal cavities)). Once you have selected a downdraft table design, your EH&S department should conduct a smoke test on a sample table to test its ability to efficiently draw fumes away from the breathing zone. In addition, a qualified EH&S representative should collect air samples from the breathing zone of someone dissecting at the table, to ensure the table is controlling exposure levels. It is best to conduct air testing during a dissection that has the highest potential for exposure (e.g., body cavities). You may have to redesign the table and/or ventilation system based on these test results.

Doors and security:

You will need to consider the expected flow of traffic in and out of the lab to best position doorways. In addition, ensure that the doors are wide enough to allow for the passage of all of the equipment that will be used in the lab (e.g., gurneys for cadaver delivery, dissection tables, cadaver lifts). If a main hallway is located outside the lab, do not incorporate glass panels in the doors (or in the areas adjacent to the lab doors). If glass panels are already present, install frosted glass. Install key-card readers at each lab door to secure the space and to regulate who has access and when. Using a key-card access system can also allow you to extract data about class attendance and after hours lab usage. Positioning security cameras outside the doors to the lab is also strongly recommended.

Windows and window treatments:

Natural light is a great asset in a gross lab. Waist-high to ceiling windows can maximize options, as windowsills can be utilized for storage or display of anatomical models. If adjacent buildings are in the field of view, select window treatments that will allow light to filter in but will prevent people from viewing the lab's interior. Take care as some window treatments may be effective during daylight hours, but they may not be effective at night, when the lights are on in the lab.

Lighting fixtures:

Overhead lighting is a key component in any gross lab. General overhead lighting will probably not be sufficient for all dissections, particularly dissections of body cavities. An ideal configuration is to have ceiling-mounted surgical lights at each table, in addition to the general overhead lighting. Take care to determine the best placement for the boom arm to ensure the light can reach all areas of the table with minimal shadows. Keep in mind that other items may be competing for space above the table, such as ventilation panels, computers, and cameras.

Flooring:

You should install a non-slip, uniform floor. Avoid floors with individual tiles, as the joints between the tiles will be difficult to keep clean. In addition, avoid a floor with too much or too little texture, as the former may be difficult to clean while the latter may facilitate accidents. A floor drain is also a very helpful addition, as this will facilitate the ability to hose down the lab for deep cleaning. If a floor drain is installed, the floor will need to be graded to guide water towards the drain.

Room Partitions:

If you are designing a large lab, consider installing room partitions to create smaller working areas. Partitions may help with noise control and they can also help build a sense of community.

Electrical Outlets:

Take care in planning the location and number of electrical outlets in the lab. If power tools such as autopsy saws will be utilized at each table, outlets need to be located in close proximity. Take care to note the length of the electrical cords associated with each tool and ensure that you will be able to reach all parts of the table when these tools are plugged into the outlets.

Temperature Control:

It is ideal to have local control over the temperature in an anatomy lab, as this space is typically kept at a lower temperature than most rooms on campus.

Eyewash/Chemical Shower:

All labs should have an eyewash and chemical shower located either in or in close proximity to the gross lab.

Sink areas:

You cannot have too many sinks in a gross lab. When determining how many sinks to include in your lab design, consider how many people will be utilizing the lab at any given time, and keep in mind what the optimal traffic flow would be for your lab (e.g., situating sink bays at opposite ends of the room may be optimal).

Stainless steel sinks are best for durability and ease of cleaning and sinks with foot pedals are very useful in the gross lab. The sink drains are likely to clog easily, so make sure you have an appropriate drain cover and disposal at each sink. You may want to install automated soap and towel dispensers.

Liquid and solid waste storage:

First, you should estimate how many liquid and solid waste containers will be needed in the lab, based on the number of cadavers. Next, consider the ideal placement for these containers. You may wish to place containers at each sink station, at opposite ends of the lab, and/or near exits. However, when planning areas for liquid waste containment, keep in mind that a ventilated area may be required to prevent exposure to hazardous fumes. You could design a ventilation hood that surrounds a large drum or smaller waste buckets. In addition, you should install a floor drain, curb and/or containment matt around the liquid waste storage container to prevent spills from spreading to other regions of the lab.

Sharps containers:

Estimate how many sharps containers will be needed in the lab. It is important to provide a sufficient number of containers, so students do not need to travel great distances to dispose of sharps, as this increases the likelihood of accidents in transit. Sharps containers should be easily accessible; wall mounted units are very convenient as un-mounted units may tip over or fall off shelves or cabinetry.

Glove boxes:

You may want to consider wall mounted glove dispensers, as these are easily accessible for restocking. You might want to place these near dissection tables or near entrances to the lab.

Lab stools:

The presence of lab stools may impede the custodial staff's ability to clean the floor in the lab. However, students usually appreciate lab stools. Some students may need to sit while dissecting for long hours. In addition, if lectures or presentations commonly take place in the lab, you will probably want to provide seating. Select lab stools that will be easy to clean (e.g., with vinyl seat cushions) and move (e.g., with castors). Make sure that the height of the stool is compatible with the height of your dissection tables, so that students can still

view the donor clearly while seated. Finally, if you are going to have lab stools, make sure to allow extra space between the dissection tables for easy traffic flow.

Storage:

You can never have too much storage space in a gross lab. Keep in mind that you may continue to purchase equipment or supplies in the future that will need to be stored, so allow for some future growth. Open shelving or windowsills are useful for the display of anatomical models and skeletal material. However, you may want to consider closed cabinetry for some of your storage needs. Stainless steel is recommended for all components, as it is durable and easy to clean. When determining where to place storage areas (e.g. in the lab or in an adjacent hallway), first ask who will need access to the items in that storage area and when? You may want to keep valuable equipment and anatomical models in locked cabinets or in separate rooms for long-term storage while disposable supplies may be placed in open storage areas in the lab for easy access.

Computers:

Some gross labs have computer stations at each lab table, however these systems may be cost prohibitive. In order to determine if computers should be part of your lab design, analyze your curriculum and how lab computers would facilitate learning. Ceiling mounted computers will minimize the need for adjacent countertop space; however, as noted above, lighting fixtures, ventilation panels, and cameras may also be competing for space above each table. A useful solution may be to utilize a common boom arm to support multiple components, such as a computer and surgical light.

Cameras:

Some gross labs have cameras placed above each table, or above a prosection station. Similar to the computers, perform a cost/benefit analysis to determine if cameras are critical to your lab design. If cost is an issue, consider installing a single camera station or a mobile unit that can be moved from table to table.

Dry erase boards:

Chalkboards can be difficult to maintain in a gross lab, and computer stations may be cost prohibitive. However, dry erase boards are an excellent addition to any gross lab. Students and faculty will appreciate having access to a number of boards throughout the lab to facilitate self-study and group discussions.

Adjacent spaces:

In most cases, anatomy class activities are not confined to the gross lab only. If your anatomy curriculum involves other small group activities (e.g., radiology or surface anatomy modules), try to be involved in designing the spaces that will accommodate these activities. Other spaces that are closely linked to the gross lab include locker rooms, a morgue or cold room, and a tank/table washroom. If you have the space, it is very useful to have a tank/table washroom with a floor

drain that is located adjacent to the main gross lab. This washroom will provide a valuable area for deep cleaning equipment between classes.

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