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The formulae for building state of the art biomedical research facilities.

Locker Room Design Considerations

Research facilities consist of labs and support spaces which follow strict safety requirements, including ones dictating the activities that can be conducted and the items that can be stored within. Eating, drinking, smoking, handling contact lenses, and applying cosmetics are not permitted in any NIH laboratory, per the *Biosafety in Microbiological and Biomedical Laboratories* (*BMBL*). The NIH *Design Requirements Manual* (*DRM*) indicates that wet laboratories require lockable storage for personal items. This necessitates lab personnel having storage lockers outside of the lab to secure their belongings or to change clothes prior to entering labs. The following overview highlights the primary factors to ensure that lab personnel have a safe and convenient place to secure their personal property.

Users and Storage Levels

When designing a locker room, consider who the primary users are, what type of labs or facilities they work in, and their storage requirements. These requirements should be determined through programming, including questionnaires and interviews with laboratory users, principal investigators, and other stakeholders. Afterwards, calculate how frequently the lockers will be used, which helps decide if the users will have assigned personal units (permanent) or day use units (temporary, non-designated).

At the most basic level, storage is required for coats, backpacks, purses, and other personal items. This type of storage is typically associated with BSL-2 labs and other functions where changing clothes is not required. Storage space can be small lockers in a corridor, entry alcove, locker room, or other convenient location. Finishes are non-lab grade and not critical.

When lab requirements include changing into protective clothing (i.e., scrubs, PPE, cleanroom gowns, etc.), a locker room is required with larger lockers, benches and mirrors, and provisions for privacy. These locker rooms may be co-located with restrooms, which require more durable and water-resistant finishes. These requirements are associated with BSL-3 labs, animal facilities, and cleanrooms and are designed as part of lab entry/exit sequence.

The highest performance and hazard labs may also require interlocked doors, water or air showers, one-way traffic, and other control and containment features. The design of these locker rooms and associated spaces must be integral with the facilities they serve, including finishes and systems.

Traffic Flow

The type and use of laboratory will dictate the traffic flow. Clean rooms, aseptic facilities, and other specialized labs may require a dedicated flow to control access and contamination.

All locker rooms built or altered with federal funds shall be compliant with the Architectural Barriers Act Accessibility Standard (ABAAS). This is applicable for new construction, renovations, and leased facilities. The compliance shall include reach constraints, mandatory clearances, and turning radii for locker rooms and adjacent areas.

Locker Materials and Design

The most common materials are metal, plastic, and wood. The material selected can influence the locker's durability, cost, and appearance.

Metal lockers are typically the most affordable. Normal wear and tear may require the finish to be touched up periodically. Due to metal being susceptible to rust and corrosion, they are not ideal for humid conditions unless powder coated or constructed of stainless steel to increase resistance to corrosion. Metal lockers are prone to dents and scratches, but the material is often selected due to its low initial cost.

Plastic lockers are typically more durable, since they do not rust, dent, or delaminate. As a result, they are ideal for damp and humid environments. This includes high-density polyethene (HDPE), etc. but does not include phenolic resin, which is cellulose-based and therefore considered a wood material despite its resin content. Plastic can be customized to the user's needs and requirements and is easy to clean and maintain. The initial cost is higher than other materials, but the overall lifecycle cost is lower due to minimal maintenance needs.

Wood lockers are an option for storage in non-damp environments. This includes solid wood, veneer, MDF, melamine, and phenolic materials. While typically selected for its aesthetic appeal, wood materials are the least durable overall and may require more ongoing maintenance. Wood lockers are porous, chip easily, support microbial bacteria, and are prone to water damage. Since wood lockers are not easy to sanitize, they are not appropriate for supporting facilities which require regular sanitation, such as cleanrooms, ORs, infusion/dialysis bays, etc.

The size and configuration of the lockers will depend on the user's storage needs. Locker sizes can vary in width, depth, and height (e.g., cube, half-height, full height, Z-shaped, multiple tiers high). Due to modular sizing, multiple sizes can be mixed to allow for flexibility and customization. Depending on the level of security required, locks may be as simple as a padlock hasp lock (key or combination), a digital lock, a key card access, or a biometric scanner. Like other components, cost and convenience of the user shall be considered.

To prevent the accumulation of dust, lockers should be designed with sloped tops or to terminate against bulkheads. Cracks, holes, and solid toe kicks should be sealed to prevent pest movement and harborage.

Conclusion

When planning a new lab, the users typically emphasize functional requirements. During the predesign phase, it is incumbent on the designer to remind them that providing remote storage is an integral and essential element in lab design to mitigate the risk of contamination and stay compliant with the *BMBL* and *DRM*. Each design component shall be evaluated to allow for sufficient storage. Additional prerequisites for lockers and locker rooms are included in the *DRM* in multiple chapters, exhibits (design questionnaires), and appendices.

'Design Requirements Manual (DRM) News to Use' is a monthly ORF publication featuring salient technical information that should be applied to the design of NIH biomedical research laboratories and animal facilities. NIH Project Officers, A/Es and other consultants to the NIH, who develop intramural, extramural and American Recovery and Reinvestment Act (ARRA) projects will benefit from 'News to Use'. **Please address questions or comments to:** megan.teague@nih.gov