

News to Use

Design Requirements Manual

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Please address questions or comments to: shawm@mail.nih.gov

Sound Control for Open Offices

Open office environments are increasingly being used to accommodate more people in less space. If designed properly, open offices can promote collaboration, teamwork and communication. If not designed properly, however, open offices can have disruptive levels of noise, which can lead to distractions and stress. The collaborative discussion that the open office encourages could be distracting to coworkers working on tasks requiring focus and concentration.

Speech

Noise in the form of speech is a reality in all offices, and is generally not a distraction unless it is intelligible. Speech which is unintelligible because of low volume or sound masking is perceived as background noise. Intelligible speech is much harder to ignore and is distracting.

Speech intelligibility must be considered for confidentiality and privacy. The conversations of workers dealing with contracts, finances, personnel and other sensitive topics should not be intelligibly overheard. In some cases, as with healthcare facilities, privacy is a requirement mandated by HIPAA (Health Insurance Portability and Accountability), The Joint Commission and other regulations.

Noise

Determining when the level of noise becomes disruptive is difficult, because a moderate amount of background noise is beneficial to any environment. Too much noise, or noise in the wrong frequencies, can be distracting and lead to a reduced efficiency and increased stress.

Noise can be produced by office machines and HVAC distribution inside of the office space, as well as mechanical equipment, traffic and other sources outside of the space. Maximum sound control measures should be taken at the perimeter and inside of the space since sound absorption and reduction alternatives within an open office are limited.

Open Office Design

Many of the features of traditional office environments (tall partitions, hard-walled offices, carpet, acoustical tile ceilings) have the effect of controlling noise through absorption and isolation. Open office design eliminates a number of these features and their associated acoustical benefits. Common elements of open office design which have negative acoustical impact include:

- Use of hard materials. Hard materials, including exposed concrete floors and ceilings, glass walls, metals and laminates are reflective and propagate sound throughout a space.
- Reduction of partitions. Sound efficiently travels through spaces along uninterrupted paths.

- Reduction of workstation sizes. When workstation size is reduced and density is increased, informal meetings, private conversations and conference calls in workstations become infeasible without disrupting neighbors.

Noise Remediation Design

A properly designed open office environment will address noise issues and resolve them in ways to better promote the collaborative and teaming benefits while providing a good working environment. A number of proven strategies include:

- Use of noisy and quiet rooms. Provide an adequate number of rooms outside of the open environment for noisy activities (informal meetings, conference calls, breaks) so that these activities do not occur in the open office. Provide rooms for quiet activities that require concentration and for conversations requiring privacy.
- Use of high Noise Reduction Coefficient (NRC) rated materials. NRC measures the ability of a material to convert sound into mechanical energy. Floors, ceilings, partitions and other surfaces with high NRC-rated material control sound by absorption. NRC rating of 0.95 indicates that 95% of sound is absorbed.
- Strategically locate high Sound Transmission Class (STC) rated partitions. STC is a measure of the ability of a material to stop the passage of sound. Partitions or other barriers with high STC ratings located in a space can effectively isolate sound and prevent it from passing to another part of a space.
- Design to reduce background noise. Design HVAC systems, building enclosure and other systems to reduce unwanted background noise.
- Sound masking. Sound masking systems add an unobtrusive background sound to the space. A well designed system will reduce the intelligibility of speech, reduce acoustic distractions and provide increased privacy.

Summary

Open offices can be beneficial if designed appropriately and in conjunction with the acoustical performance of the space. The open office space should be properly designed with interior finishes and materials selected accordingly. Adequate noisy and quiet rooms outside of the open office should be provided to isolate and control sound.

Reference:

ASTM E 1374-02, Standard Guide for Open Office Acoustics and Applicable ASTM Standards

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<http://orf.od.nih.gov/PoliciesAndGuidelines/BiomedicalandAnimalResearchFacilitiesDesignPoliciesandGuidelines/Pages/DesignRequirementsManualPDF.aspx>

DRM Chapter 4, Section 4-3 Interior Architectural Finishes

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Managing the Commissioning Process (Part II)

Part 1 of this article looked at important commissioning milestones to be tracked in the master project schedule including the Pre-Functional Checklists (PFCs), the first testing document prepared by the Commissioning Agent (CxA). The second document, the Functional Performance Tests (FPTs), is critically connected to the completion of the controls submittal. The controls submittal is a complex document and a reflection of the contractor's understanding of the owner's intent. Delays in the completion and approval of the controls submission can result in late development of the FPTs, which can result in delays at the end of the project and unsatisfactory environmental and operational conditions. A strategy that many project managers are finding successful is having design charrettes when the control contractor is starting the development of their submittals. As a combined effort of the contractor, the designer and the CxA this can be an excellent method of making sure the original design intent is carried through construction.

The next important commissioning milestones are the completion of the actual functional tests. The dates for the tests must be imbedded in the contractor's schedule, so the contractor is required to consider commissioning as a process through the length of the project and not just a two week testing event at the end of the project. This also provides a method to tie payments for monthly requisitions to commissioning task completion, so that owners do not overpay early in the project and helps ensure that there is money left in the pay requisition to leverage the contractor into taking necessary action to make corrections. Having the complete commissioning process captured in the master project schedule will help ensure that issues are found and addressed early so issues will not drag past testing and into project turnover. It also provides the project manager and owner the financial leverage necessary to take action to resolve issues while there is still enough financial assets in the project to provide them the necessary control.

Enforcement of the Statement of Preparedness.

The Statement of Preparedness is a document signed by the contractor and verified by the CxA that all preparatory work necessary to perform the FPTs is complete. The effective implementation and execution of the Statement of Preparedness during the construction phase can significantly increase efficiency during functional performance testing. Included in the Statement is the completion TAB work, point to point checks completed by the control contractor, completion of the PFCs and the contractor's first run through of the FPTs. The Statement should be included in the specifications as part of the contract to provide the project manager the tool to confirm work is being done on time and as

required. Having this as component of the master schedule requires the general contractor to track all the sub-tasks necessary to maintain the commissioning process. This will ultimately require the contractor to implement their own QA/QC plan, rather than deferring back to the owner's CxA to perform this function at the end of the project, costing time, money and quality.

Maintenance and Facilities Involvement in the Commissioning Process.

It is imperative that facility personnel be involved in decision making from the very beginning of the project. When developing the Owner's Project Requirements (OPR) they should be included as part of the commissioning team and in writing the Basis of Design (BOD). They need to be keenly aware of the types of systems being proposed and confirm they have the people and knowledge base to maintain those systems. If necessary, their early involvement will confirm that this is the time to obtain the training necessary; hire people with the knowledge base to maintain the facility; or contract this work out in the future. Many owners and project managers work under the misconception that all necessary training to maintain the facility will be provided at the end of the project by the contractors. This is not the case; the training at the end of the project is to build on the maintenance personnel's knowledge base with specific information particular to this specific project. There have been many projects where owners have not provided their facility personnel the hours and days necessary to be involved throughout the design, construction and turnover phases of the project in a misguided approach to saving money, this is a false economy. Turning over expensive and complicated equipment to personnel who are not properly trained in its maintenance and operation can be very costly in loss of equipment lifespan and higher energy costs due to inefficient operation. Every project manager should insist maintenance personnel be involved from the onset of the project

Conclusion

A properly managed and integrated commissioning process will greatly increase the odds of the success of a project. A well-managed and implemented process requires everyone involved in the project, from design through construction and turn over to recognize commissioning is integral, not supplemental to the process. It will provide measurable milestones and consistent documentation to confirm that the project is healthy with respect to commissioning and achieving successful completion. Most important it will have the entire team looking at commissioning as it is defined by ASHRAE as a process that runs throughout the project and not a two week quality control event at the end of the project.

Reference: www.ashrae.org

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DRM Chapter 1 Section 7 Commissioning

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Managing the Commissioning Process (Part I)

It is not uncommon to see a project schedule with a two week block of time labeled "commissioning". As the schedule moves toward completion the block of time gets absorbed by the activities around it with no change to the end date, and commissioning becomes a coincident activity with TAB, installation of electrical devices, final controls check out, and final finishes. This results in an occupied space with an incomplete commissioning issues log, unhappy occupants, and an owner having to decide to write off issues that should have been resolved months earlier. This can be the result of "commissioning lite", the base minimum that needs to be done to check off whatever box is necessary to say the project requirements have been met.

The purpose of this series of articles is to present commissioning not as a box to be checked, but as an integral part of an integrated approach to overall project management, which maximizes value to a project.

Commissioning Definition.

ASHRAE's guideline 0 defines commissioning as "A quality-focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the owner's project requirements"¹. By this definition commissioning is not a two week EVENT tacked on to the end of a project, but a project delivery PROCESS. The commissioning process can be used as a valuable tool to evaluate the performance of the project's designers, contractors, consultants and facility personnel throughout the entire project, for design conception to facility turnover.

Project management and Commissioning Agent (CxA) should work hand in hand throughout the project, from design conception through construction turnover. Unfortunately many project managers' view commissioning as a quality control program. When working together project management and commissioning are mutually compatible, delivering a complete and satisfactory project:

Key commission process components include:

The Owner's Project Requirements (OPR) and the Basis of Design (BOD).

The OPR provides the narrative for the original intent of the project, including the expectations of how the facility is to be used and the overall goals for the project. The BOD is a record of the design team's technical response to the OPR; including, but not limited to, a narrative of the facilities systems; calculations of load analysis for environmental systems; equipment and product selections intended for use in the facility. These documents need to be the foundation from which the entire commissioning process is built. Unfortunately these documents are often prepared long after design has started or even after construction has begun. The OPR and BOD are living documents and should be maintained and updated throughout the life of the project. As decisions are made and changes considered they should always be measured against and documented in the OPR and BOD. Updates to

these documents should be issued to and reviewed by the project and commissioning team, including user groups and facility maintenance personnel. This will help to maintain project expectations by keeping the team informed.

Transfer of Commissioning Knowledge.

It is critical that the knowledge developed in creating the OPR and BOD is transferred from design into construction. Transfer of these documents and the decision making process contained therein will help the contractors understand the original intent of the project. The project manager, working with the CxA, should develop a plan to incorporate this information into the bidding and construction documents. Whether they are specifically in the bidding documents or as sections within the commissioning specifications and project special conditions, their inclusion will provide important historical knowledge to the contractor and give the project manager another layer of enforceable contractor documents to drive the commissioning process. One of the most important reasons for providing this information is to give the contractor the background knowledge to understand how their work fits into the entire commissioning process, this allows them to take that knowledge and project it into their master project schedule.

Commissioning in the Master Schedule.

There are five major commissioning milestones that need to be captured in the contractor's master schedule.

1. Development and approval of Pre-Functional Checklists (PFCs)
2. Development and approval of Functional Performance Tests (FPTs)
3. Field completion of PFCs
4. Submission of Statement of Preparedness
5. Field completion of FPTs

The health of a project's schedule can be clearly gauged by the status of the CxA's creation and approval of their two major test documents: the PFCs and FPTs. Development and approval of the PFCs indicates that the submittal process is complete and equipment is ordered and on its way. If development and approval of the PFCs is not a milestone in the schedule, this important trigger can be missed. If the PFCs development is not complete it is usually because there are issues with the submittals being issued and approved, or the CxA is behind schedule. Either way this situation needs to be addressed and corrected. Without a milestone in the schedule the trigger date will pass without the project manager taking action.

Part 2 of this article will include other important commissioning milestones that need to be included in the master project schedule. Also included will be the importance of the owner's facility and maintenance personnel participation in the commissioning process.

Reference: ¹www.ashrae.org

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DRM Chapter 1 Section 7 Interior Commissioning

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Slip Resistance

Slippery floor finishes should always be avoided, and all floors should have some level of slip resistance. Slip resistance as safety measure is especially important in wet locations and on sloped floors where otherwise normally acceptable flooring systems can become hazardous. In addition to obvious places like showers and building entrances, slip resistant flooring may be required in stairs, autoclave rooms, cage washes, aquatics, mechanical rooms, kitchens and any other room where standing water can expect to be encountered.

Appropriately designed slip resistant floor surfaces help prevent slip and fall accidents. The Occupational Safety and Health Administration (OSHA) estimates slip and fall accidents constitute the majority of general industry accidents and cause 15% of all accidental deaths.¹



The United States Access Board requires accessible surfaces to be slip resistant to minimize hazards to people with disabilities, especially for those using canes and other walking aids.² The Board does not specify a minimum level of slip resistance, however, because there is no consensus on a method of rating slip resistance in flooring products.

Measuring Slip Resistance

There are many methods of measuring slip resistance, and the appropriate amount of slip resistance should be assessed based on the parameters of each specific project including the use of the facility and the intended users and occupants. It must be recognized that greater slip resistance is not always better; excessive slip resistance can be hazardous, and exceedingly rough surfaces can trap contaminants. In clean environments the need for smooth surfaces must be weighed against slip resistance, since rough slip resistant surfaces can be harder to clean.

A traditional measurement of slip resistance is the coefficient of friction (COF). The COF represents the resistance to movement between two objects, higher COF indicates greater friction and slip resistance. There are a number of testing methods for COF, none of which are universally recognized. One standard in use for many years, ASTM C1028-07 standard, *Static Coefficient of Friction Testing*, did not adequately assess wet floor friction and is no longer in use. A COF of greater than 0.60 indicates dry slip resistance, but is not a reliable measure for a wet floor.

ASTM E303.93 standard *Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester* is a widely used test for ceramic tiles and other materials. A Surface Frictional value of 36 or above indicates a slip resistance floor.

ANSI A137.1 standard, *Tile Slip Test* is a test of dynamic coefficient of friction (DCOF). A DCOF of greater than 0.42 indicates a slip resistant wet floor.

There are a number of ways of providing slip resistance to flooring material:

Integral slip resistant surface. Most premanufactured flooring products, including ceramic and porcelain tile, vinyl, rubber and other tiles and sheet goods are available with integral slip resistant surfaces. Field applied flooring, including resinous flooring, can be installed with the application of granular materials in the topcoat to increase COF. Concrete floors can be finished with a slip-resistant surface texture.

Abrasive coatings. Durable rough grits, including silicon carbide and aluminum oxide, can be embedded in epoxy, urethane or similar coating to give slip resistance to an existing flooring which has a low COF.

Chemical or mechanical etching. New or existing stone, concrete, ceramic tile and other flooring can be roughened or etched mechanically or through the application of acid.

Mats and carpeting. Mats and carpeting can be laid on floors to provide areas of slip resistance. It is important that these items are waterproof, durable and removable for cleaning. It is also important that these items have a slip resistant base surface so that they stay in place and have non-trip edges so that they do not present a tripping hazard.

Waxes, sealants and polishes. Non-slip waxes, sealants and polishes can be applied on many flooring systems to increase COF. These must be re-applied regularly to provide long-term effectiveness.

Other Considerations

Although hazardous conditions should be corrected wherever possible, efforts should be taken to ameliorate existing conditions:

Lighting. Adequate lighting can help reduce slip-and-fall accidents, especially at ramps, steps and floor transitions.

Handrails. Handrails can be visual indicators of a hazardous area and provide support to regaining balance.

Signage. Signage can be used to warn of hazardous conditions.

Cleaning. Cleaning, including occasional deep cleaning, can maintain the intended level of slip resistance.

Maintenance. Removing damaged or worn surfaces, removal of standing water.

References

1. <http://osha.gov/SLTC/walkingworkingsurfaces>
2. <http://access-board.gov/guidelines-and-standards>

Further details on this month's topic are available on the DRM website

<http://orf.od.nih.gov/PoliciesAndGuidelines/BiomedicalandAnimalResearchFacilitiesDesignPoliciesandGuidelines/Pages/DesignRequirementsManualPDF.aspx>
DRM Chapter 4 Section 4 Interior Finishes

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Interior Gypsum Board

Gypsum board is one of the most frequently used construction materials and makes up most of the interior wall surfaces and many of the ceiling surfaces in laboratories and other common building types. There is a wide variety of gypsum board available, and these products must be specified and detailed appropriately to perform as required.

Primary advantages of gypsum board are the low cost and ease of installation. Gypsum board arrives in large sheets, up to 14' (4.2M) long and is cut, installed and finished using common tools. Typical gypsum board is 5/8" (16mm) thick, but is available in thicknesses from 1/4" (6mm) to 1" (25mm). Gypsum board consists of gypsum plaster (calcium sulfate dihydrate) pressed between two layers of paper or fiberglass mat.

Applications: Gypsum board is available from a number of manufacturers which have proprietary brand names with unique characteristics and specifications. In addition to standard gypsum board, most manufacturers provide products for specialty applications to address specific performance requirements in buildings.

Fire Resistance: Type X gypsum board can provide fire ratings of up to 4 hours when installed as part of an Underwriters Laboratories (UL) rated wall assembly. To meet fire ratings, all components, including gypsum board type and thickness, framing assembly components, fasteners and fastener spacing, must be in strict conformance with the UL design specification.

Durability: Standard gypsum board has sufficient durability for offices and other moderate-duty use. It can be damaged by impact and abrasion, so impact-resistant or abuse-resistant gypsum panels must be used in areas subject to impact, wheeled traffic and excessive wear. When abuse resistant gypsum board is used, wall protection should be considered in high traffic areas like corridors, vivariums and loading docks. Both abuse and impact resistant gypsum board are tested per ASTM C1629.

Water and Moisture Resistance: When exposed to water or high humidity standard gypsum board will absorb water, degrade and become a growth medium for mold. Water resistant gypsum board is resistant to water, but is not waterproof and not appropriate for locations subject to repeated or prolonged water exposure. Mold-resistant gypsum board surface consists of fiberglass instead of paper, preventing the growth of mold on the surface. Mold-resistant gypsum board is appropriate for humid conditions but not for direct water exposure. Because of these inherent limitations, alternatives materials such as concrete masonry units (CMU) or fiberglass reinforced plastic (FRP) should be used in wet locations. Cement board, though not a gypsum board, is a related product that is appropriate for use as a backer for tile in showers, or as a

backer for integral wall bases with monolithic floors and other wet locations.

Sag Resistance: Gypsum board is rigid but will sag if not adequately supported, especially in horizontal applications. Sag resistant gypsum board should be used in humid conditions and on ceilings and other horizontal surfaces where support spacing exceeds 16" (410mm), where gypsum board thickness is less than 5/8" (16mm).

Sound Isolation: Gypsum board assemblies typically do not have good acoustical properties because gypsum board is a light weight material installed on a lightweight framing system. Assemblies can be designed for acoustic performance if detailed appropriately. Acoustic gypsum board, along with double-row of framing, resilient channels, sound insulation, acoustical sealants and other wall assembly details, can be used to obtain a high sound transmission coefficient (STC). STC ratings are tested per ASTM standard E90 and rated per ASTM standard E413.

Other Considerations

Jobsite conditions: Gypsum board can be damaged by impact, bending or exposure to water. Therefore, gypsum board must be handled and stored properly on the jobsite. Manufacturer's recommendations, including support and environmental conditions, should be followed.

Expansion: Gypsum board assemblies expand like other construction materials, so expansion must be accommodated with expansion joints.

Holding Capacity: Gypsum board has negligible holding capacity for screws and other fasteners, so strapping must be installed where shelving, cabinets, wall protection rails and other wall-mounted equipment will be installed. Strapping requirements, as specified in DRM Section 4-3.B Interior Partitions, shall be followed in all laboratory applications.

Resources:

The Gypsum Association (www.gypsum.org) is the governing industry association for the Gypsum Board industry. The Gypsum Association publishes a number of design and technical manuals which are valuable resources for detailing and specifications.

ASTM C1396 Standard Specification for Gypsum Board covers most common gypsum board installation, physical properties specifications, water resistance, absorption, strength, deflection and other important characteristics.

ASTM C840 Standard Specification for Application and Finishing of Gypsum Board covers requirements for the methods of application and finishing of gypsum board.

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DRM Chapter 4 Section 3 Interior Architectural Elements

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Electrical System Neutral and Ground

One of the least understood and, often, misunderstood aspect of the electrical system is electrical system grounding. One of the reason confusion arises is due to use of interchangeable terms of Neutral and Ground. A Neutral represents a reference point within an electrical distribution system. Neutral conductors connected to the reference point should, normally, be noncurrent carrying conductors, sized to handle momentary faults (short circuits) occurring in electrical equipment. A Ground, on the hand, represents an electrical path, normally designed to carry fault current when an insulation breakdown occurs within electrical equipment. This means that Neutral can be grounded, but Ground is not neutral. In a 3 phase low voltage distribution system, the preferred installation consists of five wires i.e. 3 phase conductors, a neutral conductor and a separate ground conductor.

Introduction of non-linear loads, such as computers, electronic lighting, TVs, VCRs and other switch-mode power conversion equipment, created 3rd harmonics overloading of the neutral conductor, prompting the need for proper grounding of the equipment as well as proper sizing of the neutral conductor.

As the characteristics of electrical equipment changes from linear to non-linear, the nature of grounding expands from the task of insuring the safety of personnel to insuring that one type of electrical equipment does not interfere with other types of electrical equipment. Lowering electrical system impedance is critical for proper functioning of electrical equipment. To lower system impedance, the NIH Design Requirements Manual (DRM) requires that when a large percentage (50% or more) of the load is non-linear, provide the following:

- (1) Branch circuit panelboards with 200% neutrals.
- (2) Full-size individual neutrals for each branch circuits.
- (3) Oversized neutrals for shared circuit homeruns for modular furniture.

Nonlinear equipment causes rapid changes in voltage and current while transferring energy from the distribution system to the equipment load, creating a phenomena similar to a small radio transmitter. As a result, we need to address Radio Frequency Interference types of electrical noise to other equipment. Usually other equipment, in metallic enclosures is not affected by these small radio-type signals; however, some equipment circuitry may be affected.

The typical solution is to add RFI filters in the incoming power lines to the offending equipment. Proper functioning of these RFI filters requires proper grounding. The normal grounding practice is to connect the RFI filters to same ground point used by the equipment causing the condition when a high frequency, low impedance path to ground exists. Otherwise, it may be necessary to install a separate conductor back to the Neutral reference point in the electrical system.

Unfortunately, too many variables exist within any grounding system. Proper sizing of conductors, use of RFI filters, and installation of low impedance grounding path are critical to suppress electrical noise. The general practice should include discussions with equipment suppliers to determine if and what types of electrical interference affect their products.

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Lactation Room Requirements

For many years lactation rooms have been recognized as a building amenity with advantages for both employer and employee. Benefits include increased workplace diversity, improved children's health, reduced absenteeism and increased productivity.

Federal Requirements

With the passage of The Patient Protection and Affordable Care Act (Affordable Care Act) in 2010 the provision of lactation rooms in workplaces and reasonable break time for employees to express breast milk has become a federal requirement. Section 4201 of the Affordable Care Act requires provision of 'a place, other than a bathroom, that is shielded from view and free from intrusion from coworkers and the public, which may be used by an employee to express milk.' These requirements became effective in March 2010, and apply to all employers with more than 50 employees. Smaller employers can apply for an exception if they can prove undue hardship.

Also in 2010 The US Office of Personnel Management issued a memorandum regarding Nursing Mothers in Federal Employment. The memorandum provided guidance regarding reasonable amount of break time used to express milk and advised Federal agencies to take action in providing accommodations in the workplace for working mothers to express milk.

The Office of Research Services, Division of Occupational Health and Safety (DOHS) manages the Nursing Mothers Program¹ (NMP) at NIH. The DOHS continually strives to provide guidance and enhance the present NMP by identifying changes, if any, that should be made in the physical environment to provide clean, private, comfortable spaces for NIH staff and visiting nursing mothers to express milk. Additional guidance is provided by the Office of Personnel Management² (OPM) and the Department of Labor³ (DOL).

Room Requirements

Lactation rooms should not be in or accessed through bathrooms, locker rooms or similar facilities, but should be distinct rooms designed for their intended purpose. Lactation rooms may be located near lobbies or main corridors, in proximity to breakrooms, bathrooms and other core building functions. In larger facilities it may be beneficial to consider distributed rooms for convenience and to reduce travel time. All lactation rooms are required to be private space that is free from intrusion and shielded from view but accessible. Facilities may have large lactation rooms with two or

more stations, but the stations must be separated by a privacy curtain or other screening device. Lactation rooms should be easy to find and identified as part of the facility's signage and wayfinding system.

Each room shall be equipped with a lockable door (accessible by emergency personnel), table(s) or counter, comfortable ergonomic chair(s) with adjustable armrest, trash can, paper towels, cleansers, adequate lighting, two duplex electrical outlets and a medical grade breast pump. A sink with hot and cold water is required near, but is highly preferred to be within the actual lactation room.

Suggested additional features include:

- A wall phone inside the suite, near the door.
- Bulletin board, posted parental and educational information.
- Comfortable, non-glaring light, such as overhead lights, wall sconces or table lamps.
- A palette of soft colors, patterns and textures conducive to relaxation. Wall coverings and fabrics which are stain-resistant but easily cleaned.

Lactation rooms are required to be available for use during working hours. Room sign-up or scheduling can assist with availability.

The DOHS periodically conducts Lactation Room Needs Assessments by reviewing the number of lactation rooms at NIH; determining their adequacy relative to buildings and population centers; and identifying inadequacies which should be addressed in future addition and renovation projects. Questions regarding the most current Lactation Room Needs Assessment for NIH or the NMP in general, should be directed to the DOHS Nursing Mothers Program Manager at 301-496-2960.

References

1. ¹Nursing Mothers Program, NIH
www.ors.od.nih.gov/sr/dohs/Resources/nursing/pages/lactation.aspx
2. ²Guide for Establishing a Federal Nursing Mother's Program, OPM,
www.opm.gov/policy-data-oversight/worklife/reference-materials/nursing-mother-guide.pdf
3. ³Memorandum for Heads of Exertive Departments and Agencies,
www.dol.gov/whd/nursingmothers/NMothersFederalEmplmnt.pdf

Further Reading

1. Business Case for Breastfeeding, Office on Women's Health, HHS,
www.womenshealth.gov/breastfeeding/business-case-for-breastfeeding.html

Further details on this month's topic are available on the DRM website

<http://orf.od.nih.gov/PoliciesAndGuidelines/BiomedicalandAnimalResearchFacilitiesDesignPoliciesandGuidelines/Pages/DesignRequirementsManualPDF.aspx>

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ANSI/ASSE Z9.11-2016 "Laboratory Decommissioning" Update and Revision

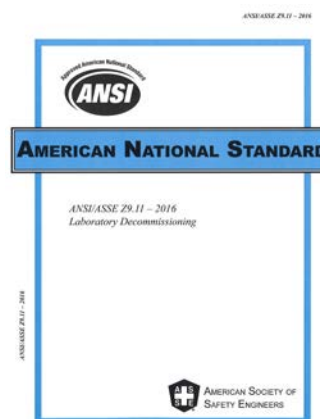
The American Society of Safety Engineers (ASSE), the secretariat for the American National Standards Institute (ANSI), published the revised laboratory decommissioning standard ANSI/ASSE Z9.11 in February 2016. ANSI/ASSE Z9.11-2016 supersedes ANSI/ASSE Z9.11 - 2008. ANSI requires that standards be maintained by review or affirmation of the entire document at least five years from the date of approval as an American National Standard.

Farhad Memarzadeh, Ph.D., P.E., National Institutes of Health (NIH), chaired the ANSI/ASSE Z9.11 revision subcommittee and Lou DiBerardinis CIH, CSP, Massachusetts Institute of Technology (MIT) was Vice Chair. A twelve-member subcommittee representing federal agencies (NIH, National Regulatory Commission [NRC]); Universities (MIT, University of Wisconsin, University of Michigan); Pharmaceutical Companies (Millennium, Inc., Emergent BioSolutions) and private consultants with experience in laboratory decommissioning (Alliance BioScience, Life Support Services, McCarthy Holdings, Inc., and SCB Compose) revised the standard.

Decommissioning is addressed in the 2008 National Institutes of Health (NIH) Design Requirements Manual (DRM) for biomedical laboratories and animal research facilities. Decommissioning, as defined in ANSI Z9.11-2016 is a process to ensure that a facility and its associated infrastructure meet environmental health and safety requirements for its next use. For biomedical research laboratories, the ANSI Z9.11 standard provides a risk-based approach for dealing with common contaminants and waste management and provides details for managing the presence of extremely hazardous materials or exceptional circumstances. ANSI/ASSE Z9.11-2016 asserts a strategy to perform a risk assessment of a laboratory space to ensure the safety and readiness for the demolition worker to begin work and/or for the next occupant. This standard applies to research laboratories that will undergo a change of use or occupancy as a result of deconstruction for renovation or demolition. While other laboratories, such as teaching or quality control laboratories, are not specifically covered by this standard, the techniques recommended here can be used. This standard does not apply to decommissioning activities in non-laboratory space, such as office buildings and chemical plants. General concepts expressed here may be appropriate to other types of facilities only after careful evaluation.

The intent of ANSI/ASSE Z9.11-2016 is to provide an overarching roadmap for the research laboratory decommissioning process that

can assist an institution in developing its own decommissioning plan. The standard identifies the minimum acceptable criteria for completing the decommissioning process, and documenting the necessary information for regulatory and historical purposes. Those involved in the development of a decommissioning plan for a research laboratory of any size will benefit by this guidance document. References, tables, and other resources for assessing the risk level of the project have been updated.



ANSI/ASSE Z9.11-2016 was carefully reviewed to ensure that the updated standard reflects acceptable procedures and techniques. The subcommittee added new definitions, acronyms and additional applicable reference regulations; a new section on the risk assessment and characterization of radiological hazards in relation to NRC regulations; a new appendix, 'Crisis Management Planning for Decommissioning Project's'; and

revised tables and diagrams that are more user friendly. Numerous edits and a few deletions were made as part of the revision process but the processes to achieve decommissioning described in the original version remain essentially the same.

The scope of this standard has not changed from its earlier version. ANSI/ASSE Z9.11-2016 provides:

1. Guidance for the decommissioning of all or parts of laboratory facilities.
2. Guidance to determine extent of acceptable risk given the future use of the facility.
3. Methodologies to document, monitor, and verify the decommissioning process.
4. Criteria for development of a decommissioning plan for laboratories that address human health and environmental protection and meets the goals of the overall decommissioning process and,
5. Identifies stakeholders, their roles, responsibilities and relationships.

References

1. <http://www.asse.org/ansi/asse-z9-11-2016-laboratory-decommissioning/>

Further details on this month's topic are available in the 2008 DRM website

<http://orf.od.nih.gov/PoliciesAndGuidelines/BiomedicalandAnimalResearchFacilitiesDesignPoliciesandGuidelines/Pages/DesignRequirementsManualPDF.aspx>
DRM Chapter 1 Section 9 Environmental Management/Radiation Safety

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Wall Protection

Many areas of laboratory buildings are subject to heavy traffic, including loading docks, service corridors and vivariums. Other areas have less intensive traffic but are still subject to damage. All areas should be designed with appropriate wall protection.

Before wall protection is selected the wall itself should be designed to withstand day-to-day wear typical for the area. Concrete block walls should be considered in areas subject to heavy wheeled traffic and impact, including shipping and receiving, loading docks, service corridors and vivariums. High-impact, fiberglass-reinforced gypsum board should be used in frame walls. Gypsum board selection must also address moisture, ratings and other concerns. Walls can be finished with impact-resistant fiber-reinforced high-performance paint as an additional level of protection.

Wall protection is especially important in vivariums, containment labs, clean rooms and other specialty areas where the integrity of the finish is crucial. Wall protections should be designed as part of an overall materials and finish protection strategy, including kick plates, guards and jamb protection on doors. Wall construction, including steel stud gauge strapping and bracing, shall be designed for both the installation of wall protection and potential impact loading.

Wall protection should be seen as an opportunity to enhance the aesthetics of a space, and materials, colors and detailing should be carefully selected. Material must be appropriately durable for the anticipated level of wear. Wall protection in containment areas and vivariums must be completely sealed. Wood and porous materials are not appropriate in most laboratory or clinical areas.

Corner Guards

Corner guards protect outside corners, which are the most vulnerable part of the wall. Corner guards are usually installed immediately above the base, and can be partial or full wall height.

Surface-applied Guards are metal or vinyl 'L' profile guards adhered or fastened directly to the gypsum board. Stainless steel is an appropriate material for most clinical and containment spaces.

Two-part guards are decorative plastic guards on a retainer assemblies which are mechanically fastened to the gypsum board. Two-part guards are less durable but more decorative than surface-applied guards.

Flush guards are two-part guards with a retainer assembly installed in the plane of the gypsum board layer, so that the finished guard surface is flush with the finished wall surface. This is a relatively high-cost installation appropriate for highly visible public areas.

Sheet Wall Protection

Sheet wall protection is a layer of vinyl, fiber reinforced plastic (FRP) or similar durable material adhered to the wall surface. Sheet protection can be installed in conjunction with corner guards and wall protection rails or by itself. Sheets can be installed as a partial height wainscot or full height. Sheets are available in a range of thicknesses and colors and can be smooth or textured.

Wall Protection Rails

Crash Rails are stainless steel or aluminum rails which standoff of the walls with intermittent standoff brackets. Crash rails provide high-levels of protection from heavy wheeled traffic and are usually used in



Figure 1: Crash Rails

shipping and receiving areas, vivariums and service corridors. Because they stand off the walls corridor they effectively narrow the corridor, so corridor widths must increase accordingly. Crash rails are often installed at multiple heights to protect from carts, pallet jacks, wheeled equipment and other items.

Wall Guards are a decorative plastic guard cover installed on a mounting base which is screwed to the wall. Wall guards are available in a number of sizes, profiles and colors. Although wall guards protect the walls from impact, they can themselves be damaged, and should only be used in low and medium traffic areas. A guard assembly installed at the appropriate height and with the appropriate rounded gripping surface can also function as a handrail in corridors and ramps. An appropriately designed guard can function as a chair rail in a conference room.

Custom Guards can be made of any durable material attached directly to the wall or on stand-off brackets. Guards can be made of wood, metal, acrylic or other appropriately durable material.

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Equipment Planning

Scientific equipment is a crucial component of any laboratory, and must be planned as carefully as any other aspect of laboratory design. Each set of equipment is specific to the operation and function of the laboratory and must be a primary design consideration.

Equipment must be investigated by the equipment planner early in the project, based on the current use of the lab and anticipated upgrades and future changes. This often starts with an equipment survey, where details of existing equipment is recorded, including make and model, dimensions and required clearances, utility requirements, and photographs. This information is documented in an Existing Equipment Schedule.

The programming of the new facility will determine equipment requirements related to future occupancy and anticipated functional and programmatic changes. Discussions with laboratory user during planning and programming will determine immediate new equipment needs, and future needs to be planned for the facility, to be documented in a New Equipment Schedule.

The design of the new facility has to accommodate the needs of both existing and new equipment in configurations that are efficient and functional. Early documentation and coordination with all members of the design team is essential to develop an integrated solution that addresses all functional requirements.

Key considerations include:

Location

Before equipment can be located within a lab, the basic function, process and flows of the lab must be assessed. Individual items must be located in a rational adjacency with other items with the goal of enhancing the sequential workflow within a lab. A rule of thumb is to locate the most sensitive or potentially hazardous operations as far from the door as possible to limit interference and exposure.

Physical Space

Equipment can be built-in (e.g. environmental rooms, autoclaves), hard-connected (fume hoods, glass washers), loose floor mounted (freezers, centrifuges), under counter (refrigerators), or benchtop mounted (PCRs, mass spectrometers). Regardless of the configuration, equipment must be provided with sufficient space to be set up properly and comfortably with all peripherals, and with sufficient working and maintenance clearances. Equipment which is very sensitive, noisy or potentially hazardous should be located in a remote part of the lab, an alcove or a separate room. The installation and eventual removal of large equipment must be

planned and may include oversized doors and a path (horizontal and vertical) from the lab to a loading dock or other access point.

Utilities

Equipment required connection to a range of utilities including power, data, water, drain, compressed air, vacuum, and a variety of specialty gasses. Power (normal or emergency) may be hard-wired or cord & plug connected, and may include multiple connections, plug configurations, voltages, and other variations. Gasses may be from central systems or local sources, and may need tank restraints, regulators, piping and other devices. Space may be needed for peripherals like uninterrupted power sources, power supplies and chillers.

Heat Load and Turbulence

Equipment may have characteristics which will require coordination with the air distribution system. Equipment generating a large amount of heat may require a dedicated exhaust. Equipment that is sensitive to turbulence may require laminar air diffusers, an enclosure or other device to minimize air movement.

Vibration

Some equipment, including precision imaging, optical and analytical equipment are sensitive to vibration. The performance of the building should be assessed, and these devices strategically located in areas with appropriate vibration performance, which may be slab on grade, shorter structural bays or adjacent to columns. Equipment may also need vibration isolation tables, vibration pads or other devices. Equipment with rotating or reciprocating elements may produce unwanted vibration. These items should be located as far as possible from vibration sensitive equipment, and may need vibration isolators or other control devices.

Other Considerations

Specialty equipment may have weight, shielding, security/access and other requirements which will determine location and other considerations.

Responsibilities

It is important to document which party (generally the contractor or the government) is responsible for providing and installing of each piece of equipment. As a rule of thumb, built-in equipment requires the earliest and most close coordination by the contractor, and is usually provided and installed by the contractor. Hard-connected equipment should be installed by the contractor, but can be provided by either the government or the contractor. Loose equipment is generally provided and installed by the government.

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Wall Shelving

Wall shelving is a common feature in most biomedical laboratories. Shelving can support chemicals, liquids, scientific equipment and other sensitive items, so it must be selected and detailed appropriately.

Materials:

Shelving, like other laboratory materials, must be durable, chemical and moisture resistant. Wood shelving is prohibited. Acceptable material options include:

- Epoxy Resin is durable and chemical resistant, but is heavy and expensive, and exceeds the requirements for shelving in most labs.
- Phenolic Resin is durable and chemical resistant, and lighter and less expensive than epoxy resin. The thickness must be selected to not deflect under loading.
- Chemical Resistant Plastic Laminate may be appropriate for labs that are not subject to high-moisture and harsh chemicals. Shelf core shall be a minimum of 1" (25mm) thick particle board or MDF or 3/4" (19mm) thick solid plywood. Shelving shall be faced on all sides and edge banded, including concealed edges.
- Metal shelving is available in chemical resistant painted steel, stainless steel and wire in a number of materials and finishes.
- Plastic, fiberglass, antimicrobial and other specialized materials as required by research needs.

Loading:

Shelving in laboratories shall be designed for a minimum of 50 pounds (23kg) per linear foot for a 12" (300mm) deep shelf, and proportionally more for deeper shelves. Wall shelving depth can vary by specific requirements, but shall not exceed 14" (355mm) without the system being specifically engineered. For a typical laboratory wall with 4 rows of 12" (300mm) deep shelving on each side, this equates to a potential design load of 400 pounds per linear foot of wall. All laboratory walls shall be a minimum of 18 gauge, but shall be specifically designed for shelving direct and lateral loading. A specific concern is walls which do not extend to structure, which must be adequately stiffened and braced.

All walls to receive shelving shall have wall strapping reinforcement, which is multiple 4" (100mm) wide, 1.33 mm metal gauge sheet metal strips, placed horizontally on both sides of the studs for the full

Further details on this month's topic are available on the DRM website:

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DRM Chapter 4 Section 4 Interior Finishes

length of the partition. It is highly recommended that strapping be installed in all walls where shelving or other wall-mounted items can reasonably be expected to be installed in the future to minimize the cost and disruption of future installation.

Shelving material, gauge/thickness and shelf support spacing shall be

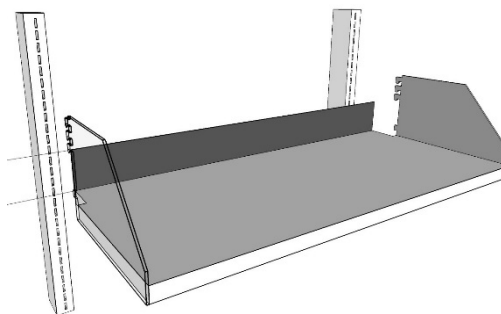


Figure 1: Metal Wall Shelf

Installation:

Wall shelving height shall not exceed 7'-6" (2300mm) for safe reaching height or height limitations as determined by the Division of the Fire Marshal (DFM), whichever is lower. See Chapter 9 Fire Protection Exhibit X9-2-A "Wall Mounted And Peninsula Shelving Height Policy."

Wall shelves must be installed with a maximum open space of 1/4" (6mm) between the back of the shelf and the wall to limit the passage of smoke and heat in the event of a fire. Metal shelves shall be configured to fit around the shelf standards (figure 1), and solid material shelves shall be notched around shelf standards. Shelving and standards in BSL-3 and ABSL-3 facilities shall be sealed to wall and standards, and holes in standards must be sealed.

An edge guard shall be provided for the open ends and backs of all shelves not adjoining a wall. The cantilevered distance between the last support and the end of the shelf shall be no greater than 1'-0" (305mm).

Other Considerations:

Laboratory lighting should be designed to minimize the shadows cast on the benchtop by shelves. One strategy is to locate lighting over and parallel to the bench edge to minimize shadows. Undershelf task lighting can be installed to eliminate shadows and provide task lighting on the benchtop. If undershelf lights are installed, it is recommended that they have a cord and plug into the electrical raceway so that they can be moved with the shelf.

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Resilient Bases

Resilient bases are installed at the base of walls to protect the walls and function as trim at the wall/floor junction. Resilient bases are appropriate in administrative areas, most standard clinical spaces, BSL-2 labs and other light and moderate-duty areas. They are not appropriate in areas subject to high wear, animal facilities, or containment or aseptic or clean environments.

A primary drawback of resilient bases is the joint between the base and the floor, which cannot be cleaned. For areas where unsealed joints are not acceptable a flooring with an integral base must be used.

A resilient base must pliant enough to conform to the profile of the wall and hide imperfections. It must also be flexible enough to form corners and durable enough to withstand the impacts of floor cleaning and traffic.

Resilient Base Materials: Rubber

Thermoset Vulcanized Rubber (TSR) bases are 100% rubber, usually synthetic rubber but may contain a percentage of natural rubber. Rubber is naturally strong, resilient and flexible, and is an ideal material for bases. TSR is homogeneous throughout, so damage will not be highly visible. TSR bases are very durable and long-lasting and are the most expensive base material.

Resilient Base Materials: Vinyl

Thermoplastic Rubber (TPR) bases are made of a mix of polymers, usually mostly plastic with some rubber, and are formulated to have similar characteristics as rubber. TRP is usually has a base layer and a finish layer, so damage is visible. Flexibility, durability and other characteristic can be similar to rubber or similar to vinyl depending on the formulation. TRP is a mid-range price option.

Thermoplastic Vinyl (TV) bases are made almost entirely of Polyvinyl Chloride (PVC). TV bases have a decorative wear layer over a light-colored base layer, so damage is visible. TB is not as flexible as rubber, so it not as easy to install and is more susceptible to damage. TV is a low-cost option.

Resilient Base Styles:

Straight Base: The exposed surface of the base is straight and vertical, and does not have a 'toe' at the floor. Straight bases are appropriate for carpeted floors.

Cove Base: The exposed surface of the base has a curved or angled 'toe' that overlaps and fits snugly against the floor, facilitating maintenance. Cove bases are appropriate for resilient floors.

Sanitary Toe: The exposed surface of the base has a curved or angled 'toe' that extends horizontally and butts flush against the flooring. This type of base is not usual, but can be an option for resilient floors in certain applications.



Types of Resilient Bases: Straight, Cove, Sanitary Toe

Resilient bases are generally available in 2 1/2", 4" and 6" heights. A minimum of 4" is required for NIH facilities to provide adequate wall protection. Bases are generally available in 4' sections or 120' rolls. Rolls are required for NIH facilities to minimize joints. Resilient are available .08" and .125" thickness. .125" thick bases are required for NIH facilities for durability and to conceal irregularities and reduce shrinkage. Inside and outside corners can be field-fabricated or pre-formed corners are available. Field-fabricated corners are acceptable, but must be skillfully done by an experienced installer.

Performance Requirements

ASTM standards should be referenced in the specifications to define minimum performance requirement

ASTM F1861, Standard Specification for Resilient Wall Base, is a general standard for resilient bases, includes materials, general performance and installation.

ASTM F137, Standard Test Method for Flexibility of Resilient Flooring Materials with Cylindrical Mandrel Apparatus, is a standard for flexibility, including bending and crack-resistance.

ASTM F1515, Standard Test Method for Measuring Light Stability of Resilient Flooring by Color Change, is a standard for resistance to light, including fading and aging.

ASTM F925, Standard Test Method for Resistance to Chemicals of Resilient Flooring, is a standard for chemical resistance

Further Reading

ASTM Standards, <http://www.astm.org/>

"Not All Wall Base is Created Equal", Interiors Sources, 7/01/2009

Further details on this month's topic are available on the DRM website:

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DRM Chapter 4 Section 4 Interior Finishes