

News to Use

Design Requirements Manual

The formulae $\frac{\partial U_i}{\partial x_i} + \frac{\partial}{\partial x_i}(\rho U_i) = -\frac{\partial p}{\partial x_i} + \frac{\partial}{\partial x_i}(\mu \frac{\partial U_i}{\partial x_i}) + s_i(\rho - \rho_0)$ for building $\frac{\partial}{\partial x_j}(\rho U_j V_j) = -\frac{\partial p}{\partial x_j} + \frac{\partial}{\partial x_j}(\mu \frac{\partial U_j}{\partial x_j} - \rho U_j^2) + s_j(\rho - \rho_0)$ state of the art $\frac{\partial}{\partial x_i}(\rho U_i) = \frac{\partial}{\partial x_i}(\lambda \frac{\partial T}{\partial x_i} - \rho U_i^2)$ biomedical research facilities.

'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/E's and other consultants to the NIH, who develop intramural, extramural and American Recovery and Reinvestment Act (ARRA) projects will benefit from 'News to Use'.

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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

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 4-3 Interior Architectural Finishes