

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 $\frac{\partial}{\partial x_i}(\rho U_i) = -\frac{\partial p}{\partial x_i} + \frac{\partial}{\partial x_i}(\mu \frac{\partial U_i}{\partial x_i} - \rho U_i^2) + s_i(\rho - \rho_0)$ state of the art $\frac{\partial}{\partial x_i}(\rho U_i) = \frac{\partial}{\partial x_i}(\lambda \frac{\partial}{\partial x_i} - \rho U_i^2)$ 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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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