Issue 42
July 2015
Division of Technical Resources
Office of Research Facilities
National Institutes of Health
Technical News BULLETIN

Seamless Sheet Flooring in Laboratories

Overview

Seamless floors are used in applications where joints in the flooring are not acceptable. Seamless floors are typically used in biocontainment laboratories, vivariums, clean rooms, clinical use rooms and other spaces requiring cleanliness and/or aseptic conditions, or where high moisture or similar conditions are a concern. Seamless flooring is typically turned vertically up adjacent vertical surfaces, creating integral coved bases at walls, casework and equipment.

There are two categories of seamless flooring: sheet (the focus of this article) and resinous. Resinous flooring are liquid-applied systems (epoxy resin and other polymer based materials) used in vivariums, warehouses, mechanical rooms and other areas subject to extreme wear, wash-down and disinfection. Resinous flooring are installed in a multi-step process over an entire floor area, resulting in a monolithic flooring surface. Resinous floors are hard and durable, but are also expensive, time consuming to install, and difficult to repair.

Sheet Flooring

Sheet flooring is an economical alternative to resinous flooring for many applications. It is manufactured in rolled sheets and adhered directly to the substrate, resulting in a quick, one-step application. Flooring joints are chemically bonded or heat welded, creating a monolithic flooring surface. There are three primary types of sheet flooring, each with distinct advantages and limitations:

Vinyl: Vinyl flooring consists of a PVC or urethane wear layer laminated to a vinyl backing layer. A laboratory grade vinyl floor should have a 20 mil wear layer that is slip and UV resistant and a backing layer that provides a level of resiliency. Vinyl flooring is impervious to water and chemical resistant.

Rubber: Rubber flooring is made from natural or synthetic rubber and may have recycled content. In most forms, it is naturally slip resistant, resilient and antibacterial. Rubber is generally durable and comfortable.

Linoleum: Linoleum is traditional system manufactured from natural materials such as linseed oil, limestone and jute. Linoleum is water resistant (though not impervious), durable and chemical resistant.

Physical Properties

In most laboratory applications the performance of flooring is very important. Each flooring type is available in a range of quality and performance levels, so they should be carefully assessed for suitability for the specific application. During the specification and selection process, the following properties should be considered:

Chemical Resistance: All flooring subject to chemical use shall meet ASTM F925[1] standards, which require testing of materials for resistance to common laboratory chemicals. Additional resistance requirements may be required for unusual applications.

Static Load Limit: All flooring subject to high equipment or other static loading shall be tested to meet ASTM F970[1] standards. This test provides a PSI value for the maximum static floor load that doesn't cause any visual indentation, or create an indentation more than .005". Values of 500 PSI or higher should be considered for high floor-loading areas.

Hardness: All flooring subject to scratching and abrasive wear should have a surface which has been tested to be high on the Mohs hardness scale[2], which ranges from 1 (softest) to 10 (hardest). Vinyl, for example, is available with a wear layer as high as 9.

Underfoot Comfort: A floor's resiliency contributes to the comfort of occupants who may be required to stand for long periods of time. Comfort is not necessarily mutually exclusive with hardness and durability – some sheet vinyl products have a very hard wear layer as well as resilient backing layer.

Water Resistance: All seamless flooring is water resistant, but not all systems are impervious. Excessive water can penetrate and damage linoleum, particularly if it is not resealed periodically.
Additional properties which may be important to the performance of flooring include static dissipation, sound absorption and resistance to high as well as low temperature (thermal shock).

Other Considerations

Other considerations which are important, but which should not outweigh physical properties and performance, include aesthetics, recycled content/recyclability, low VOC of the system (including adhesive), maintenance and cost

For large or complex flooring installations, a mock-up is recommended. The mock-up should include, at a minimum, a welded seam, a section of base, inside and outside corner, and other typical conditions. The mock-up should include adjacent materials to ensure compatibility and to allow review of transition detailing.

In addition to proper selection of flooring materials, the success of any flooring installation will depend on installation. The condition of the substrate, including moisture content and pH, should be reviewed to ensure that they are within manufacturer's recommendations. Cracks, voids and other imperfections in floor substrate should be repaired or mitigated. Manufacturer's requirements for environmental conditions, temperature acclimation of materials, curing times and protection should be followed.

Reference:

[1]ASTM Resilient Floor Covering Standards,
http://www.astm.org/Standards/resilient-floor-covering-standards.html

[2] Mohs Hardness Scale,
http://geology.com/minerals/mohs-hardness-scale.shtml