The National Institutes of Health | Division of Technical Resources | Office of Research Facilities

Design Requirements Manual **News to Use**

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The formulae $\frac{\partial \rho U_i}{\partial t}+\frac{\partial}{\partial x_j}(\rho U U_j)=-\frac{\partial P}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu\frac{\partial U_i}{\partial x_j}\right)+g_i(\rho-\rho_0)$ for building $\frac{\partial}{\partial x_j}(\rho\overline{U}\overline{U_j})=-\frac{\partial\overline{P}}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu\frac{\partial\overline{U_i}}{\partial x_j}-\rho\overline{u_i'u_j'}\right)+g_i(\rho-\rho_0)$ state of the art $\frac{\partial}{\partial x_i}(\rho\overline{U}\overline{H})=\frac{\partial}{\partial x_i}\left(\lambda\frac{\partial\overline{T}}{\partial x_i}-\rho\overline{u_i'h'}\right)$ biomedical research facilities.

Finishes for Aseptic Facilities

In aseptic facilities (BSL-3, ABSL-3, cGMP, compounding pharmacies and other similar), finishes are a vital component in the facility's ability to function properly. The users and operators of these facilities require durable, easily cleanable, smooth, and non-shedding surfaces. Both designers and installers must be qualified and able to provide appropriate, well detailed, and well installed walls, ceilings, and floors. Section 4.4.5 of the 2016 Design Requirements Manual provides finish requirements for these facility types.

A/E's should consult facility users and stakeholders to determine the anticipated agents and methods used for cleaning, disinfection, or sterilization and protocols to be used by the program and select finishes which are compatible and will resist damage and degradation, including softening or discoloration. Materials selected should have a proven, tested record of performance with the chemical agents identified by the program. Testing shall be performed for agents individually and in combination. If a record of performance with agents is not available, a mock-up test should be conducted, documented, and passed prior to selection. It is recommended that at a minimum the finishes selected should be able to withstand regular cleaning, disinfecting and sterilizing by regular timed exposures the following chemical agents:

- Chlorine Dioxide
- 70% Isopropyl Alcohol (IPA)
- Vaporized Hydrogen Peroxide (VHP)
- Hydrogen Peroxide
- Phenolics (Vesphene IIse®, LPH®)
- Peracetic Acid and Hydrogen Peroxide (Peridox RTU®)
- IPA and Phenolics (Spor-Klenz®)

These are aggressive agents, which can rapidly degrade even quality finish materials. Coordination is required between the facilities group, the facility operators and/or cleaning vendors to ensure that these chemicals are properly applied, dwell on the surface for a sufficient time (which may vary, based on temperature and humidity) to ensure adequate kill of any agents of concern inhabiting that surface. Some agents may then need to be followed by an additional chemicals to inert, passivate, or remove the previous chemical from the surface to avoid degradation (especially perascetic acid). Chemicals field prepared from concentrate should be diluted with sterile water to avoid inadvertent surface contamination during the cleaning process.

As renovation of these facilities are complicated and costly, surface finishes should not be selected on first-cost, but on life-cycle cost basis. Systems should be impact resistant and have a minimal number of joints. All joints should be smooth, tight and sealed. Details should address eased outside corners and coved inside corners, particularly at the transition between ceiling to wall and wall to floor. All windows, doors, and mounted components should be detailed to promote cleaning and avoid horizontal ledges and difficult to clean seams and joints. All materials should resist damage due to exposure to heat and humidity as anticipated to be encountered in the life cycle of the project without degradation. All finish material selections should exhibit mold and mildew resistant properties. Wall systems should be impact-resistant and all finishes should be installed over cellulose-free (inorganic-faced) substrates.

Panelized Composite Systems:

Panelized composite wall and ceiling systems are often preferred due to their controlled-environment manufacturing, design versatility, chemical resistance, pressure/airflow resistance, and pre-engineered details. When using a panelized composite system, the A/E should ensure that:

- Installation is accomplished by manufacturer-approved installers.
- Substrate material and detailing is inspected and certified as acceptable by the manufacturer.
- A mock-up of critical details (transitions, penetrations, joints, etc.) is provided and acceptable for their intended purpose.
- Adhesives, sealants, and other components are chemical resistant and able to withstand cleaning as system panels.
- Panel systems have a Class "A" Fire Rating, both as a composite assembly and for the surface alone.

High Performance Reinforced Multi-coat Resinous Finishes:

High performance, reinforced, multi-coat, resinous paint finish on impact, water, and mold-resistant substrate can be considered for assembly finishes if there are functional advantages over panelized systems. If using a multi-coat resinous paint finish, the A/E should ensure:

- Applicators are certified as a Coating Application Specialist (CAS Level II) by the Society for Protective Coatings (SSPC) and trained and approved by the paint system manufacturer for the application of the specific products and techniques required for the application.
- Paint manufacturers inspect and certify acceptable site conditions, including environmental conditions and the condition of the substrate prior to application.
- Daily logs of the application are maintained, including wet film thickness measurements, mixture, cure, and coverage rates room-by-room, or surface-by-surface within larger rooms.
- Cure times, pot life, temperature and humidity, consistency of application, protection and other manufacturer requirements are strictly maintained.
- All applications are inspected by an independent, third party, certified coating inspector (CIP Level 3).
- The finished application is Class "A" Fire Rated.
- Components of the application are from the same manufacturer, to the greatest extent possible.

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

Further details on this month's topic are available on the DRM website
https://www.orf.od.nih.gov/PoliciesAndGuidelines/BiomedicalandAnimalResearchFacilitiesDesignPoliciesandGuidelines/Pages/DesignRequirementsManual2016
DRM Chapter 4, Section 4.4 & 4.5.5