

News to Use

Design Requirements Manual

The formulae $\frac{\partial U}{\partial x} + \frac{\partial (pU)}{\partial y} = \frac{\partial p}{\partial x} + \frac{\partial (pU)}{\partial y} + g(p-p_0)$ for building $\frac{\partial (pU)}{\partial x} = \frac{\partial p}{\partial x} + \frac{\partial (pU)}{\partial y} - p\frac{\partial U}{\partial y}$ state of the art $\frac{\partial (pU)}{\partial x} = \frac{\partial p}{\partial x} + \frac{\partial (pU)}{\partial y} - p\frac{\partial U}{\partial y}$ 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'. Please address questions or comments to: shawm@mail.nih.gov

BSL-3/ABSL-3 Electrical Requirements

High containment (BSL-3/ABSL-3) facility electrical design should consider various factors such as reliability, redundancy and decontamination.

Electrical Service, Distribution and Feeders: For new facilities, to ensure reliability of electric service, a minimum of two dedicated utility services, physically separated in different ductbanks and different manholes should be considered. These dedicated services shall be fed by different primary substations or by one double-ended utility substation, which is fed by two dedicated utility service lines. Each required electric service to the facility shall be sized to handle 100% of the design load (i.e., 2N redundancy). The preferred method of installation for the electric utility services is underground; overhead lines may be used only within the secured perimeter of the facility. Locate distribution equipment, such as medium voltage switches and transformers, in a secured location. Downstream electrical distribution from switchgear to critical areas, such as mechanical support rooms with redundant motors in each set, shall comprise pairs of distribution switchboards / panelboards, each fed from a separate side of the switchgear, to supply approximately one-half of each set of motors.

Emergency Generator: Provide a local generator dedicated to the facility to provide emergency/standby power; however, a remote generator farm (with redundant feeders) may also be acceptable.

Consider providing 100% generator backup for facilities where the loads mandated to be connected to a generator comprise the majority of the load of the facility. Consider the loss of redundancy in emergency operation of the facilities with 100% generator backup and update operational procedure during emergency operation. Provide a load bank (including a connection point suitable for use for a portable generator) for periodic testing of the generator.

Electrical Installation in Containment Areas: Avoid installing electrical equipment which requires service within a containment area. Electrical systems and equipment not serving the BSL3/ABSL3 area shall not be located within the containment area.

Containment Barrier Penetrations: Penetrations through the containment barriers shall comply with the following requirements:

- Penetrations through the containment barriers shall be gas tight, nonporous, smooth and cleanable; and readily visible for routine inspection, cleaning, and maintenance. Penetrating components shall be sufficiently rigid in construction and adequately braced to structure to maintain the long term integrity of the penetration. The result shall be free of sharp edges or similar hazards.
- All penetration shall be durable, sealed, and tested to meet the room tightness criteria for BSL3/ABSL3 laboratories.
- Submission and Mock-up: Penetrations into the containment barrier (including mounting of electrical boxes) shall be detailed in the construction documents and shall require mock-ups to be constructed and tested prior to installation.

Sealing Requirements: Provide silicon-based caulk in all areas in accordance with Sealant matrix provided in Exhibit X4-2-A.

Conduits for All Systems: Conduit applications in BSL3/ABSL3 facilities are as follows:

- Conduit Type: Use RGS conduit with threaded fittings in all BSL3 areas.
- Seal-off: Provide seal-off fittings when conduits exit defined BSL3/ABSL3 perimeter.
- SMR: Use of surface metal raceway systems is not allowed in BSL3/ABSL3 areas.

Power Wiring: Insulation shall be compatible with sealing compound (sealing compound non-deleterious to insulation), using THW, THWN, THHN/THWN, or XHHW.

Other System Wiring: Voice/data, fire alarm, control, and security system wiring shall follow the same sealing requirements as that of the power wiring. Cable types shall be determined by NIH Information Technology and manufacturer's recommendations for voice/data wiring and by respective system manufacturers for other systems. The A/E shall coordinate exact requirements for security wiring with the Division of Physical Security Management (DPSM) for projects within NIH, Bethesda campus.

Boxes for All Systems: General requirements of device boxes are as follows:

Type and Depth: All boxes shall be double gang type; the box depth shall be at least the next size larger than the minimum size required per code.

Cast Boxes: Provide cast boxes with external mounting provisions, external hub, and gasketed device cover plates.

Sealing: Provide a 25 mm (1 in.) barrier of silicone caulk around the wire within a device box hub. Provide a continuous bead of caulk between the device box and the adjacent surface. Provide a continuous bead of caulk around the device cover plate and the adjacent surface.

Lighting Fixtures: Lighting fixture installation shall comply with the following requirements:

- Fixtures shall be UL listed for damp location. Lighting fixtures shall allow full decontamination with ease of effort, and permit easy re-lamping and access to ballasts. Lighting fixtures shall be provided with stainless steel housings, glass or heavy duty acrylic prismatic lens, and stainless steel door with tool-less fasteners.
- Use surface mounted, fully sealed, enclosed, and gasketed fluorescent fixtures. Seal surface mounted fixtures with a continuous bead of sealant around its perimeter to seal housing to ceiling. Lighting fixtures may be pendant mounted only in an open ceiling. Pendant-mounted lighting fixtures shall be fully sealed and gasketed with same features as those of surface mounted fixtures.
- Connect 50% of light fixtures in the laboratories to the emergency power source. Provide at least one lighting fixture per room laboratory areas with self-testing emergency battery ballast connected to unswitched local emergency generator circuits.