

# News to Use

## Design Requirements Manual

The formulae  $\frac{\partial \rho}{\partial x} + \frac{\partial (\rho v)}{\partial x} = \frac{\partial \rho}{\partial x} + \frac{\partial (\rho v)}{\partial x} + \rho \frac{\partial v}{\partial x}$  for building  $\frac{\partial (\rho v)}{\partial x} = \frac{\partial \rho}{\partial x} + \frac{\partial (\rho v)}{\partial x} + \rho \frac{\partial v}{\partial x}$  state of the art  $\frac{\partial (\rho v)}{\partial x} = \frac{\partial \rho}{\partial x} + \frac{\partial (\rho v)}{\partial x} + \rho \frac{\partial v}{\partial x}$  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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## Plumbing Requirements for Biosafety Level 3 Laboratories

**B**iosafety Level 3 (BSL-3) laboratories present unique challenges and requirements for plumbing design. This article is not intended to be all-inclusive of these challenges, but will highlight a number of important considerations and unique aspects for plumbing systems serving BSL-3 containment areas.

### Water Systems

All water supplies must be isolated from other functions with an approved backflow preventer installed outside of the containment area. N + 1 redundancy may be utilized to serve multiple suites.

Purified water systems shall be completely independent of any systems requiring sterile or pharmaceutical grade water supplies.

Point-of-use purified water production units, fed directly from the BSL-3 lab water, is the preferred method of providing high purity water within BSL-3 spaces.

### Vacuum Systems

The use of disinfectant traps and hydrophobic filters are required at each point-of-use, including biosafety cabinets. *Filters utilized shall be at least HEPA efficiency and permanent type pipe-line filters should be sterilizing grade for repeated use.*

Isolation valves and decontamination ports shall be provided to allow independent isolation and decontamination of the pump without decontaminating the entire building-collection system.

Exhaust shall be separately piped above the roof at locations approved in consideration of the facility risk assessment and to prevent re-entrainment into facilities.

### Compressed Gas Systems

No special provisions are necessary for isolating pressurized gases into BSL-3 containment labs serving typical turrets located within the open lab. Such systems may be common with other BSL-2 compressed gas systems, provided BSL-3 areas are zoned for independent service isolation.

### Plumbing Fixtures

**Sinks and Faucets:** Hand-wash sinks located at the exit are a requirement for all containment areas.

All sinks/lavatories must have fully cleanable, non-porous, finished sanitary surfaces and deep seal traps.

Faucets within containment shall have gooseneck-type spouts and be fitted with an integral vacuum breaker and laminar flow, non-aerating, non-splash outlet. The use of separate outlet taps for hot and cold water is not acceptable. Faucets shall be fully hands-free.

**Emergency Fixtures:** Emergency fixtures (eye washes and emergency showers) shall be configured as an isolated potable supply, with backflow protection provided for services prior to entering containment.

**Showers:** Showers shall provide a minimum flow rate of 10 L/min (2.5 gal/min). Hand-held showers shall not be utilized, except where specifically required for barrier-free compliance and shall include a vacuum breaker.

**Water Closets:** Water closets located inside a containment area, shall have a deep-seal, vented, self-cleaning trap arrangement directly below the fixture, and a wall-mount 13.5 liter-per-flush (3.5 gal/flush) blow-out flushing action closet shall be required to prevent stoppages and clear traps.

**Floor Drains and Floor Sinks:** Floor drains and floor sinks should be avoided in containment unless specifically required by the program and in accordance with the risk assessment and approved by the DOHS.

### Piping Routing and Insulation

Exposed piping shall be avoided in a containment area, and if necessary shall be installed with adequate clearance to allow for cleanability. Where exposed piping with insulation is necessary, the insulation shall be nonporous and impact-resistant with sealed joints.

### Piping Identification

Piping systems shall be accurately identified and services specific to containment spaces shall clearly designate the specific function. Vacuum and biowaste piping shall include the universal biohazard sign at piping and at equipment, and pipe tag color code shall be in accordance with ANSI/ASME standards.

### Biosecurity

Systems and equipment shall be located only in secured areas compliant with facility biosecurity requirements and the risk assessment. Piping systems and equipment not serving BSL-3 facilities shall not be located within containment areas. *In as much as possible, piping and service openings for systems serving other building areas should not require entrance into BSL-3 spaces.*

### Decontamination

All plumbing system equipment, piping, seals, and components shall be compatible with the anticipated fumigation method and liquid disinfectant trap fluids as determined appropriate by the risk assessment.

### Penetrations

Penetrations through the containment barrier shall be gas-tight, nonporous and visible for routine inspection and maintenance. *Penetrations shall be designed and constructed to that only controlled leakage occurs. The control of leakage through the containment barrier is especially important in fumigation activities.* Penetrating components shall be sufficiently rigid in construction or adequately braced to maintain the long-term integrity of the penetration.