Division of Technical Resources
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News to Use
Design Requirements Manual
The formulae $\frac{\partial \rho U_j}{\partial t}+\frac{\partial}{\partial x_j}(\rho U_j U_i)=-\frac{\partial P}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu\frac{\partial U_i}{\partial x_j}\right)+g_i(\rho-\rho_0)$ for building $\frac{\partial}{\partial x_j}(\rho\overline{U_i U_j})=-\frac{\partial P}{\partial x_i}+\frac{\partial}{\partial x_j}\left(\mu\frac{\partial U_i}{\partial x_j}-\rho\overline{u_i u_j}\right)+g_i(\rho-\rho_0)$ state of the art $\frac{\partial}{\partial x_i}(\rho U_i H)=\frac{\partial}{\partial x_i}\left(\lambda\frac{\partial T}{\partial x_i}-\rho\overline{u_i h}\right)$ 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: ms252u@nih.gov

Backflow Prevention Devices

Back Flow Prevention/protection (BFP) devices in NIH facilities shall be installed in compliance with all applicable plumbing codes and the device listing requirements in order to protect water supply from contamination or pollution.

A minimum two-step BFP approach shall be utilized to protect the potable water supply and maintain fluid quality in each system.

1. "Isolation" – Providing a proper air gap at the water supply outlet is preferred. It may also consist of approved BFPs that are appropriately matched to the hazard level and specific application. Special attention shall be provided to devices and use application points with a high potential as a backflow hazard.
2. "Containment" – The A/E shall assume that a complete individual system could be potentially contaminated when BFP are applied at this level. Select a protection device that will protect the upstream water supply. This consists of reduced-pressure principal backflow preventers applied to the incoming water service and at the start of sub-systems such as laboratory water supply, fire protection, etc.

Additional NIH BFP requirements include:

- Use of appropriate equipment and materials.
- Proper design of supply systems for sufficient pressure and operation.
- Assessment of potential hazard at each use point.
- Proper identification and labeling of specific piping system contents and areas served.
- Ensuring the appropriate water supply system is extended and readily available to serve all areas.
- Consider location of piping distribution systems relative to program function and connection from the appropriate system to each use point.
- Unconcealed and readily accessible location of BFP devices.

The Architect/Engineer shall consider the annual maintenance and service requirements for testable devices, and ancillary requirements such as drains, trap primers, etc. Project specifications shall include testing and certification of each testable device after installation by a registered cross connection control device tester, prior to acceptance by NIH. Final test reports and a list of device locations, type and service shall be included in project Operations & Maintenance manuals.

NIH lab facilities shall utilize a segregated laboratory water distribution system, independent of potable water to minimize the need for point of use backflow preventers, drains, and significant costs and disruption associated with these devices. This includes the use of reduced-pressure principal devices or vacuum breakers at equipment outlets of particularly high hazard or probability of cross connection, but does not mean that a BFP or reduced-pressure device shall be provided at every outlet or to the degree required of a potable, unprotected system.

Backflow preventers shall be provided with proper service clearances and adequate drainage.

- Provide an automatic shutoff and alarm signal to BAS based on drain system capacity and location of a reduced-pressure principal device.
- Automatic shutoffs shall function independently for each device, shutting off only the single affected BFP in the event of malfunction.
- Where Reduced Pressure Zone (RPZ) devices 50 mm (2 in.) and larger are used, the A/E shall demonstrate that the drainage system can pass the maximum possible flow rate through the device relief valve of the device, or shall provide independent automatic shut-off and alarm annunciation. The flow sensor shall be designed to preclude nuisance tripping during low flows.
- Even where automatic shut-off devices or other provisions are provided, the device shall be arranged to route normal low-flow drainage to an adjacent floor drain.

Low-point drains equipped with hose pattern threads and serving a potable water system shall be provided with ASSE 1011 hose bib vacuum breakers and a hose cap. Where a hose bib is provided near any sewage pump, laboratory waste treatment system, or liquid waste decontamination system, the hose bib shall be provided with a RPZ-BFP. Bypass arrangements shall not be permitted around the BFP.

Water supplies to BSL-3 and ABSL-3 spaces shall be isolated from other functions with an approved BFP installed outside the containment barrier. A single device may be provided for each individual penetration, or parallel devices to provide N+1 redundancy may be utilized to serve multiple suites.

BFPs are also required for connections to mechanical make-up water, high hazard equipment, and must be appropriate for the application and hazard, outside the containment barrier.

Further details on this month's topic are available on the DRM website
http://orf.od.nih.gov/PoliciesAndGuidelines/BiomedicalandAnimalResearchFacilitiesDesignPoliciesandGuidelines/DesignRequirementsManualPDF.htm
DRM Chapter 8, Section 8-3-00 A. Water Service; Exhibit X-8-3-D Backflow Prevention Device Application Guidance; Chapter 8, Section 8-11-00 BSL-3 & ABSL-3 Biocontainment - Water Systems Serving BSL-3 & ABSL-3