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

Backflow Prevention in Water Supply Systems (Part 2)

In NIH laboratories and Animal Research Facilities (ARF), an independent laboratory water distribution system is required to maintain separation between a facility's laboratory water supply and potable water supply. The rationale for this is to minimize the requirements for testable backflow devices within the labs and ARFs (see DRM 8.3.6). This significantly reduces the need for floor drains in lab areas (which can pose additional hazards) as well as flood risks associated with certain required backflow protection devices and ongoing maintenance costs. The dedicated lab water supply system is segregated at the building water service entrance (prior to any building connections) and provided with (N+1) high-hazard type Back Flow Preventer (BFP) devices.

Dedicated Laboratory Water Systems

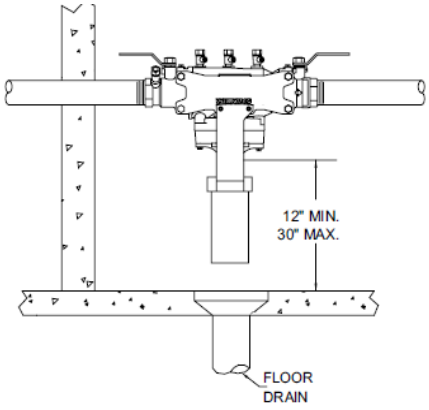
This segregated lab water system approach allows many lab water supply connections to be adequately protected with approved point of use, non-testable BFPs where high hazard devices would otherwise be required if the connections were served from a facility potable supply system. The benefits of this system also include reductions in annual operations and maintenance costs and research disruptions. Although the lab water system is segregated from the potable supply, risks to system water quality must still be controlled and minimized. High hazard BFPs may still be required to address certain higher risk connections. DRM Table 8.3.6 "Backflow Protection" lists connection points/equipment that would be connected to the dedicated laboratory water system and the method of protection required for each application and use point.

Potable Water Laboratory Applications

There are certain laboratory applications that require potable supplies arranged and protected from backflow in accordance with plumbing code and the DRM and which cannot be served by the lab water supply system. Where potable water is required, the BFP application shall be in accordance with the IPC, including Table 608.1. A few examples include supply to animal drinking water systems, high-purity water systems, emergency fixture supply systems, clinical instrument sterilizers, animal feed prep, surgical handwash, and make-up water to aquatics facilities. Proper physical separation from other water supplies (e.g. lab water supply) and plentiful labeling of potable and lab water piping within the lab or ARF are essential to help protect against improper connections during future renovations.

BFP Requirements

The installation of BFPs shall be justified by risk. The designer shall consider annual maintenance and service requirements for testable devices including ancillary devices, such as properly sized drain receptors and trap primers. Where required, BFPs must be located in unconcealed, readily accessible locations with proper service clearances and shall not be located above ceilings or where water discharge would not be fully controlled. Testable BFPs shall be located in proximity to properly sized drain receptors that can accommodate the full flow of the device in the event of discharge. Improperly sized and/or located drain receptors have resulted in significant facility damage from flooding due to uncontrolled draining of BFPs under failure conditions. There are additional requirements and restrictions for BFP installation in specific applications such as High Containment labs (see DRM 8.6.2).



ASSE 1013 Typical Installation

The engineer of record (EOR) must specify post-installation testing of each testable device following ASSE or ABPA procedures by a certified cross connection control device tester. Further, the EOR shall specify the contractor must provide a BFP log at the conclusion of the project to list all device locations, types, model and serial numbers, testing/replacement requirements, and testing reports at project turnover in the Operation and Maintenance documentation. Testing must occur prior to occupancy with results turned over within 60 days of completion. All testable devices require a dated test tag be attached to the BFP to indicate test results.

Resources

1. NIH Design Requirements Manual (DRM) Revision 1.5: 03/26/2020

2. International Plumbing Code (IPC - 2018)

'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@nih.gov

Further details on this month's topic are available on the DRM website Section 8.3 Water Systems
www.orf.od.nih.gov/TechnicalResources/Pages/DesignRequirementsManual2016.aspxPages/DesignRequirementsManual2016