

News to Use

Design Requirements Manual

The formulae $\frac{\partial Q}{\partial t} + \frac{\partial}{\partial x}(\rho U) = -\frac{\partial}{\partial x} + \frac{\partial}{\partial x}(\mu \frac{\partial U}{\partial x}) + s(\rho - \rho_0)$ for building $\frac{\partial}{\partial x}(\rho U) = -\frac{\partial}{\partial x} + \frac{\partial}{\partial x}(\mu \frac{\partial U}{\partial x} - \rho \bar{u}^2) + s(\rho - \rho_0)$ state of the art $\frac{\partial}{\partial x}(\rho U) = \frac{\partial}{\partial x}(\mu \frac{\partial U}{\partial x} - \rho \bar{u}^2)$ 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

HVAC - Air Distribution Systems

Heating, ventilation, and air conditioning (HVAC) air distribution systems for Research Laboratories and Animal Facilities shall deliver heated or cooled air to all spaces to maintain the allowable range of space temperatures.

Supply, exhaust, and outside air shall be **ducted** for all spaces, i.e., not taken through ceiling plenums, shafts, mechanical equipment rooms, corridors, or furred spaces. Plenums and air shafts for distribution of supply or exhaust air is prohibited in NIH laboratories. Common outdoor air ductwork may be permitted for outdoor air intakes to multiple air-handling units due to space constraints and building configuration.

The circulation of air directly between areas is not permitted except in the following situations. Air circulation is permitted between toilet rooms, locker rooms, janitors' closets, between adjacent corridors into negative pressure areas and out of positive pressure areas.

Supply air to each individual room shall be balanced for the actual airflow requirements (the highest cooling load or makeup air/ventilation airflow requirement). The central supply and exhaust air systems shall be balanced for the total of the individual airflow requirements in each room plus the allowable duct leak based on the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) duct construction manual. Air temperature and air amount to each space shall automatically adjust as appropriate to accommodate variations in the space heating and cooling loads.

Supply air distribution system shall be designed to minimize turbulence and to avoid having an impact on the performance of primary containment equipment such as chemical fume hoods and Biosafety Cabinets (BSC).

- Air outlets shall not discharge into the face of fume hoods or BSCs.
- Exhaust grilles and registers shall be located away from supply air diffusers in a manner that creates uniform, low velocity airflow across the room.

The duct system design for NIH buildings shall consider space configuration, space air diffusion, noise levels, duct leakage, duct heat gains and losses, balancing methods, fire and smoke control, initial investment cost, and system operating cost.

The ductwork systems shall be designed, fabricated and installed in accordance with American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) and SMACNA standards. Refer to Exhibit X6-2-A for a list of acceptable air velocities to be used in the design and sizing of different HVAC components.

Ductwork may be single-wall or double-wall construction. It may also be round, flat oval, or rectangular shape. Duct fittings, joint methods, supports, and construction details shall be in accordance with SMACNA standards. All fittings shall have documented pressure loss coefficients by either SMACNA or ASHRAE. Irregular or makeshift fittings are not acceptable. Factory-fabricated fittings by independent manufacturers may be utilized provided they have catalogued performance criteria.

Specification for ductwork construction material, sealing and leakage class, and pressure classification construction shall be as per SMACNA standards.

Refer to exhibit X6-2-B for minimum ductwork construction to be used in NIH facilities. The sheet metal contractor is required to conduct pressure tests of the installed ductwork per SMACNA to quantify the leakage rate of the installed systems.