

News to Use

Design Requirements Manual

The formulae $\frac{\partial \mu_i}{\partial \alpha} + \frac{\partial}{\partial \alpha} (\mu_i \mu_j) = -\frac{\partial \mu_j}{\partial \alpha} + \frac{\partial}{\partial \alpha} (\mu_j \mu_i) + s_i(\rho - \rho_i)$ for building $\frac{\partial}{\partial \alpha} (\rho \bar{U} \bar{U}) = -\frac{\partial \rho}{\partial \alpha} + \frac{\partial}{\partial \alpha} (\mu \frac{\partial U}{\partial \alpha} - \rho \mu \bar{U}) + s_i(\rho - \rho_i)$ state of the art $\frac{\partial}{\partial \alpha} (\mu \bar{U} \bar{U}) = \frac{\partial}{\partial \alpha} (\mu \frac{\partial U}{\partial \alpha} - \rho \mu \bar{U})$ 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

Fume Hood Requirements and Testing

Fume Hoods provide local exhaust ventilation to control airborne hazards e.g. chemical fumes, flammable vapors and potentially dangerous dusts. Fume Hoods may be variable air volume (VAV) or constant air volume (CV) type. Although the use of VAV Fume Hoods is highly recommended, the decision shall be based on a comprehensive lifecycle cost analysis that accounts for all system features required by NIH.

All Fume Hoods shall be manufactured under the ANSI/ASHRAE STD 110 and shall meet minimum performance ratings as described in DRM Chapter 6, Section 6-1-00 D.7.d. These performance criteria define the parameters for accurately validating the proper operation of the Fume Hoods. Fume Hoods to be used in NIH facilities shall meet specific criteria as detailed in the latest NIH Design Requirements Manual (DRM). The criteria are defined in NIH Specification Section 11810, NIH Specification Section 11820, NIH Specification Section 11830.

All Fume Hoods installed in NIH facilities shall comply with the following NIH testing requirements:

- NIH Specification Section 15991-On Site Testing-CV Fume Hoods
- NIH Specification Section.15992-On Site Testing-VAV Fume Hoods
- Appendix E.3 "Fume Hoods Testing and Alarm System."

The NIH testing protocol, unlike ANSI/ASHRAE STD 110, has clear pass and fail criteria whose target values must meet prescribed acceptance levels for dynamic and static tests. It assesses turbulent intensity (TI) which is more representative of containment effectiveness than the parameters measured in the Standard ANSI/ASHRAE 110 protocol. Contaminant leakage is observed from different positions within the hood, with a variety of sash opening settings, at different face velocities and with movement across the face of the hood with and without an operator. It is important to perform a risk assessment, or in other words, to evaluate the Fume Hoods placement and working conditions when establishing the face velocity. On-site testing and off site mock up to perform the NIH protocol is conducted independently of both the fume hood manufacturer and the fume hood control system manufacturer. Testing shall be conducted for at least 50% of the hoods provided in the project.

All ARRA funded projects must comply with the NIH Fume Hood manufacturing, testing and performance requirements per the specifications listed in the DRM.

VAV Fume Hoods in non-containment type labs shall have no air-cleaning (HEPA or charcoal), except for radiological hoods.

The laboratory in which a VAV Fume Hood is installed shall remain under negative pressure with respect to the corridor or adjoining rooms even when the Fume Hood operates at the minimum exhaust air rate. When the exhaust air quantity is reduced, supply air quantity shall be reduced by the same volume. Laboratory minimum ventilation requirement of six (6) air changes per hour (ACH) shall be met even when the Fume Hood operates in the minimum exhaust air rate position. Airflow monitoring/alarm devices shall be installed at each Fume Hood to provide the user with operating information. These devices shall monitor the face velocity at the sash opening.

Low flow Fume Hoods may be used at NIH as long as they meet ALL the requirements as outlined in the NIH / ASHRAE 110 Modified Fume Hood Testing Protocol. The face velocity of low flow hoods should **NEVER be below 0.41 m/s (80 fpm)**.

Auxiliary air-type Fume Hoods shall NOT be used in any NIH facilities. In the event of a retrofit application, the A/E shall investigate the capacities of the existing system exclusive of the auxiliary air, laboratory supply and exhaust system characteristics. Once it has been established that the system can support the addition or replacement of an existing Fume Hood, this information shall be forwarded to the project officer for approval before the design is allowed to proceed.

For further information, refer to the DRM Chapter 6 Section 6-1-00 D.7.d Fume Hoods; Chapter 6 Section 6-1-00 D.7.e Variable Volume Fume Hoods; Chapter 6 Section 6-1-00 D.7.f Low Flow and Auxiliary Air Fume Hoods; Appendix E, Section E.3: Fume Hood Testing and Alarm Systems; Biosafety in Microbiological and Biomedical 5th ed. 2007, CDC/NIH; *Methodology for Optimization of Laboratory Hood Containment*; Farhad Memarzadeh, National Institutes of Health, 1996; ACGIH, Industrial Ventilation, a manual of recommended practices. Chapter VIII-HVAC.