Division of Technical Resources
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News to Use Design Requirements Manual
The formulae $\frac{\partial \rho U_i}{\partial t} + \frac{\partial}{\partial x_j}(\rho U_j U_i) = -\frac{\partial P}{\partial x_i} + \frac{\partial}{\partial x_j}\left(\mu \frac{\partial U_i}{\partial x_j}\right) + g_i(\rho - \rho_0)$ for building $\frac{\partial}{\partial x_j}(\rho \overline{U_i U_j}) = -\frac{\partial \overline{P}}{\partial x_i} + \frac{\partial}{\partial x_j}\left(\mu \frac{\partial U_i}{\partial x_j} - \rho \overline{u_i u_j}\right) + g_i(\rho - \rho_0)$ 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

Introduction to NIH Building Automation Systems

The Building Automation System (BAS) at NIH is configured as a network with control functions at multiple levels and with multiple points of operator control and supervision. The BAS includes central servers, local building engineer's workstations, data transmission systems, field panels and controllers, necessary interfacing controls, sensors and actuators. The controller contains a microprocessor and other supporting electronics, and performs local control functions and executes application programs without requiring communications with the central server or workstations. All new facilities shall use digital controls in accordance with the DRM. The Architect/Engineers (A/E) and Project Officers (PO) shall meet with maintenance staff early in the project to coordinate new digital controls with existing.

BAS design shall provide uniformity of design; combine the best overall economy with suitability of design; and be compatible with all other building systems. Provisions for future expansion shall be made as determined by NIH on a project-by-project basis.

BAS installations shall strive for standardization across institutes and operating organizations to maintain consistency and increase reliability. It is the responsibility of the institute and/or operating organization to define and present those standards to the design and construction community. Appendix D of the DRM provides site-specific standards that apply to the Bethesda Campus while Section 7-3 of Chapter 7 provides physical Input/Output (I/O) requirements, sequences, and system requirements related to how the BAS is applied to the building areas and systems. This section is organized by "element" of the building and systems and includes applications for specialized areas such as high containment.

The functional intent of the BAS is to provide standardization and to ensure access requirements are met. BAS applications as described by the DRM shall control and/or monitor all systems in the building with the exception of vivarium lighting systems; scientific equipment monitoring systems; fire alarm systems; elevators; security; chilled water plants; and hot water or steam plants. The DRM covers building level connections to campus steam, campus hot water generating, and campus chilled water systems.

The BAS shall be an integrated digital control system composed of a tiered Local Area Network (LAN) architecture connecting supervisory servers/interfaces and distributed stand-alone multi-level controllers. Supervisory graphic software system configuration and backup software shall use a client/server architecture to store and serve the graphics, user databases, system configuration databases, site controller programming backup/upload/download, etc.

Throughout the design process, the A/E shall coordinate with the organizations that will support or use the BAS. A/Es shall coordinate, in concert with the PO, the designation of a building system telecommunication hub and required building support hardware to support the BAS. The A/E shall develop clear specifications for the control contractor relative to the LAN and its point of connectivity with the institute provided services and required interface hardware as part of their design. Requirements for Internet Protocol (IP) addresses shall be established and secured through the PO.

A/Es shall coordinate through the PO to determine point naming and equipment numbering conventions; graphic formats and layouts; location of operator interfaces and required number of portable operator workstations; training requirements; required user accounts and levels of access; and the routing of alarms and notifications. A/Es shall coordinate with the users and applicable safety organizations for control parameters and condition tolerances.

The design documents shall include, at a minimum:

- Specifications detailing the BAS requirements.
- Schematic drawings indicating the systems/zones and all control system input and output.
- List of all points with summary counts.
- Detailed written sequences of operation.
- BAS infrastructure schematics.
- Valve schedules.
- Indication of control elements on the applicable discipline design floor plans

Additional detailed drawing and specification requirements are indicated in Section 7-1-30 B. of the DRM.

Further details on this month's topic are available on the DRM website
http://orf.od.nih.gov/PoliciesAndGuidelines/BiomedicalandAnimalResearchFacilitiesDesignPoliciesandGuidelines/DesignRequirementsManualPDF.htm
DRM Chapter 7, Sections 7-1, 7-2, 7-3; Appendix D