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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.*

Ice Machines

Section 4.5.1.13 of the DRM requires an ice machine on each floor of a lab building. This addresses the fact that ice is commonly used by laboratories to keep samples and reagents cold during procedures, which means obtaining ice should not require traveling long distances or between floors.

Laboratories are unique, so the requirements of laboratory users should be assessed early in the Programming Phase of a project. A large building may need more than one ice machine on a floor, and ice machines may not be required on a largely dry or analytical lab floor (in which case a Request for Variance must be submitted and approved).

Design Considerations

Ice machines are available in a wide range of types and sizes, and the requirements for a project should be documented in the Basis of Design and on the Room Data Sheets and Equipment Schedules (see DRM Appendices F and G). Important factors to consider when selecting a unit include the type of ice produced (cubes, nuggets, or flakes), daily capacity, and bin size.

Ice machines are common resources and therefore should be centrally and conveniently located along the main corridor. Due to the potential for spilled ice and water, they should not be located in the corridor itself, but in an adjacent room or alcove. This area should have a waterproof floor (epoxy or sheet material) sloped to a drain, with an integral base detailed for flood resistance, per DRM 4.3.1C.

Dry ice may also be required depending on facility needs, and a dry ice machine can be co-located with a traditional ice machine. Dry ice machines use liquid carbon dioxide piped from central bulk storage tanks. Dry ice is produced in blocks, pellets, or flakes in a variety of capacities. It is a hazardous material because it is extremely cold, so a dry ice machine should be in a locked room unless it is in a controlled-access corridor. Due to sublimation, dry ice machines should be located in well-ventilated spaces with oxygen monitors and alarms.

Engineering Considerations

Water serving an ice machine may be sourced from the domestic (potable) or laboratory (non-potable and isolated) water service depending on the function. Machines that produce ice for human consumption must be from a domestic water system per DRM Section 8.3 and the International Plumbing Code (IPC). When an ice machine serves a dedicated laboratory function, both the ice machine and the water service to the machine must be clearly marked as non-potable and not for human consumption.

Ice machines making ice for human consumption must be provided with some form of backflow protection. Backflow preventers are required by the American Society of Inspectors of Plumbing and Sanitary Engineers (ASSE); in most cases, modern ice making equipment uses integral backflow prevention. Integral backflow preventers are preferred because they eliminate the need for an external backflow preventer, which would require routine maintenance and yearly certification. Ice machines for dedicated laboratory ice production do not require backflow protection, per DRM Table 8.3.6.

Filtration of water service to an ice machine should be installed per the manufacturer's recommendation to prevent scaling and buildup of particulates and sediments. Analysis of the incoming water quality may be necessary to determine the required filtration in order to maximize the quality of the ice output and reduce cleaning requirements.

Whether serving potable or non-potable applications, ice machines should be drained to sanitary waste due to machine flushing and cleaning agents, following the latest edition of the Federal Food Code for ice machines. A laboratory ice machine may drain to the sink tail piece in situations where it is local to a laboratory sink. All other applications should be drained to a funnel floor drain with an approved air gap. See DRM Section 8.4.10 for specific drain configuration requirements.

Air-cooled ice machines can release large amounts of heat into the environment, so a mechanical engineer needs to review the HVAC system capacity to confirm it is sufficient to handle the heat load of the ice machine. If the ice maker is being added as part of a renovation project, the heat load will need to be identified in the Room Data Sheet (DRM Appendix F) and should be included in the facility heat load calculations in the Basis of Design. Water-cooled ice machines may be connected to building chilled water or condenser water systems. Per DRM Section 6.3.6.2, water-cooled ice machines may not draw their cooling water from a domestic or laboratory water source, nor may cooling water be sent to a drain in a one pass cooling configuration.

'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

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https://www.orf.od.nih.gov/TechnicalResources/Pages/DesignRequirementsManual2016.aspx