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

Below-Grade Waterproofing and Dampproofing

Moisture intrusion is a leading cause of structural deterioration, indoor air quality problems, and premature failure of building materials. Moisture-related failures can disrupt research operations and compromise mission-critical spaces. Two common below-grade moisture protection strategies—dampproofing and waterproofing—are often misunderstood or incorrectly interchanged. Although related, these systems serve different purposes and are not equivalent.

Definitions

On dampproofing, IBC states that "Where hydrostatic pressure will not occur, floors and walls for other than wood foundation systems must be dampproofed."[1] Typical characteristics of dampproofing are that it is not intended to resist hydrostatic pressure and that it commonly involves asphaltic/bituminous coatings or thin membranes (depending on the system).

Regarding waterproofing, IBC states that "Where required ground-water investigation indicates that a hydrostatic pressure condition exists, and the design does not include a ground-water control system, walls and floors must be waterproofed."[1] Typical characteristics of waterproofing are that it resists liquid water under pressure and is designed for long-term, high-risk moisture environments.

Applications

Dampproofing is only acceptable in low-risk conditions where geotechnical assessment indicates that liquid water intrusion is unlikely and hydrostatic pressure is not anticipated. Appropriate applications include foundation walls constructed in free-draining soils, areas located above the seasonal high-water table, structures equipped with effective and maintainable perimeter drainage systems and which are not occupied and do not contain functions or material which can be impacted or degraded by high humidity or water intrusion.

Waterproofing systems are required where exposure to liquid water or hydrostatic pressure may occur. This includes below-grade walls and slabs, foundations located at or below the seasonal high-water table, tunnels, vaults, and utility corridors. As a best practice, waterproofing should be implemented in all below-grade spaces that house sensitive assets, including but not limited to specialized equipment, laboratories, and data infrastructure.

NIH Design Considerations

The NIH campus frequently presents conditions where hydrostatic pressure conditions exist and therefor meets the requirement for walls and floors to be waterproofed.[1] Due to these campus-wide geotechnical concerns and the value and criticality of many below-grade facilities, a comprehensive combined waterproofing and sub-soil drainage system is required for most structures.[1] Given the critical nature of biomedical occupancies, it is essential that facilities be protected by an effective waterproofing and drainage system. A comprehensive design approach involves balancing site-specific conditions—such as soil, groundwater, and drainage—with key facility factors, like the criticality of the space and accessibility for future repairs.

A successful below-grade system involves a holistic evaluation that balances site-specific geotechnical conditions with facility criticality, repair access, and occupant safety. When waterproofing is specified for high-value protection rather than for hydrostatic resistance, the design documentation should clearly state this intent.[2] This proactive approach ensures biomedical occupancies remain resilient against moisture infiltration and helps streamline the code compliance process. For detailed guidance, the NIH *Design Requirements Manual* (*DRM*) should be consulted.

Conclusion

The distinction between dampproofing and waterproofing is fundamental to protecting NIH assets. While building codes define the minimum requirement based on the presence of hydrostatic pressure, the high-value and mission-critical nature of biomedical facilities demands a more stringent, risk-based approach. For NIH projects, designers must prioritize long-term performance, occupant safety and health over initial savings. This mandates the use of comprehensive waterproofing and drainage solutions for all critical occupancies. Proper

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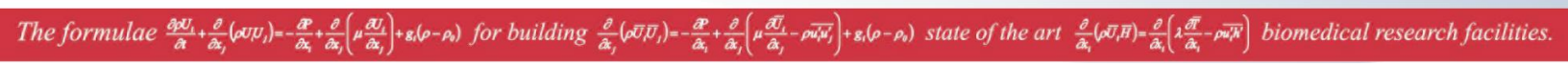

system selection is not merely a code compliance issue but a critical investment in safeguarding research operations, animal safety, and NIH missions.

Attribute Matrix – Key Differences

ATTRIBUTES	DAMPPROOFING	WATERPROOFING
Protection Level	Low	High
Hydrostatic Pressure Resistance	No	Yes
Durability	Limited	Long term
Repairability/ Accessibility	Extremely difficult and costly	Difficult, but more options available
Cost	Low first cost	High first cost; lower life cycle risk
Crack-bridging capability	Limited	Yes
Detailing	Moderate	High

References

1. International Code Council. (2024). 2024 *International Building Code*, Section 1805.2 "Dampproofing" and Section 1805.3, 1805.4 "Waterproofing." https://codes.iccsafe.org/content/IBC2024V2.0
2. National Institutes of Health. (2024). *Design Requirements Manual* (Revision 2.1). Section 1.4 Applicability, 2.4 Reliability & Redundancy. https://orf.od.nih.gov/TechnicalResources/Pages/DesignRequirementsManual.aspx