The National Institutes of Health | Division of Technical Resources | Office of Research Facilities

Design Requirements Manual **News to Use**

November 2021

Vol. 02, No. 57

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

Vestibule Types: Airlocks, Anterooms, and Other Functions

The terms vestibule, anteroom, and airlock are applied somewhat indiscriminately and interchangeably. However, in many cases the distinction between these terms has real engineering, safety, and procedural implications; in other instances, there is a regulatory requirement that must be met. Unfortunately, the building science, code, standard, and guideline usage of these terms also tends to be inconsistent. This article aims to clarify appropriate usage of terminology.

Definitions and Usage

A vestibule is an architectural space which serves as a transitional room between exterior and interior or between rooms of differing uses, quality, or classification. Similar definitions could be given for airlocks and anterooms, but with additional requirements pertaining to airflow control, so it is more appropriate for these terms to serve as functional classifiers of vestibule types rather than as stand-alone terms.

The term airlock is particularly problematic in conversational usage, as it is often used to describe any space with doors which must be simultaneously closed during transit through the space, whether by administrative control (e.g., Standard Operating Procedure) or engineering control (interlocking door hardware). The airlock function, however, specifically describes an airtight assembly, inclusive of interlocking airtight doors, which is quite unusual even in biomedical construction. The BMBL was clearer on this point in the fourth edition, but the current sixth edition has lost some of this clarity.[1]

The term "anteroom" is less problematic in conversational usage, as it suggests allowing air passage to maintain differential pressure, directional airflow, etc., with or without interlocking door hardware and/or additional administrative controls.

Vestibule Terminology

Vestibule with Airlock Function: Designed to prevent undesirable airflow from one area to another using hard-interlocked airtight door assemblies (typically only found in BSL3/4, fumigation chambers, and other hazardous specialty laboratories). Maintaining this level of control is meant to prevent fumes, particulate matter, and/or microbial contamination from egressing one space and contaminating other connected spaces (mitigation of contamination, cross contamination, or safety risk). Airlocks should be designed to accommodate donning and doffing PPE and gowning as well as the transit of cleaning and sanitizing materials through the airlock.[2]

Vestibule with Anteroom Function: Utilized to complement the HVAC system in mitigating airflow between areas and to improve the effectiveness of the pressurization systems via hard - or soft - interlocked door assemblies (i.e., engineering and/or administrative controls). As in the airlock function, maintaining air pressure control in an anteroom function is intended to prevent migration of particulate matter and microbial contamination between connected spaces. What differentiates an airlock from an anteroom function is how airflow (and differential pressure) is managed: in an airlock, airflow is prevented, but anteroom function vestibules allow managed airflow, either as a bubble (where the anteroom is positive to adjoining spaces), sink (where the anteroom is negative to adjoining spaces), or cascade (higher pressure exists on one side of the anteroom, which transitions to lower pressure in another adjacent space). Anterooms should be designed to accommodate donning and doffing PPE and gowning as well as the transit of cleaning and sanitizing materials through the anteroom.[2]

Vestibule with Exterior Access Control Function: Utilized to control access to the facility, manage the impacts of the exterior environment on the interior of the building (which can impact energy usage and occupant comfort), and minimize dirt and moisture being tracked into the building. These are required at building entrances.[3]

Vestibule with Interior Access Control Function: Utilized to control access to spaces by unauthorized persons and to manage the directional flow of personnel, materials, equipment, or wastes (i.e., access limited by time, room recovery, etc.). Interior access control functions may be combined with airlock or anteroom functions.

Conclusion

While codes and standards generally maintain internal consistency of usage, the lack of consistency between documents remains problematic. In certain cases, such as BSL-3/ABSL-3 laboratories and elevator lobbies, project language must utilize the language of the applicable regulations. In other instances, representing the majority of uses in the DRM, the language should be examined and revised as necessary to conform with a single, standard taxonomy, as provided here.

References

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