HOW TO SELECT A PASS-THRU: ITS ROLE AS A CLEANROOM COMPONENT AND DESIGN CONSIDERATIONS

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Selecting the right pass-thru airlock means fewer people entering the cleanroom, reducing cleanroom contamination and increasing operating efficiency.

Modular cleanrooms protect manufacturing operations from the constant threat of air particulate contamination. Pass-thru cabinets (also called pass-thru airlocks) are a component of a cleanroom system and play an important role in reducing contamination. Clean manufacturing environments that are free of dust and bacteria are requirements not only in the production of medical devices and pharmaceuticals, but are also an increasingly common requirement of the modern manufacturing industry as a whole: computers and consumer electronics, food processing, vehicles, air and spacecraft, and many new manufacturing processes in biotechnology and nanotechnology.

Preventing product contamination increases productivity and also enables manufacturers to comply with industry quality standards. For example, cleanroom systems, including pass-thrus used in compounding pharmacies, must comply with USP 797 and USP 800, which stipulate cleaning requirements. As manufacturing evolves in sophistication and advanced manufacturing techniques emerge, the demand for cleanroom systems increases. To meet this increasing demand it is important to understand how cleanrooms function, and how to evaluate and choose the right components that make up an effective cleanroom system. In this article we will focus on pass-thrus: what their role is in relation to cleanrooms, how a pass-thru works, and how to select a pass-thru for a specific application.

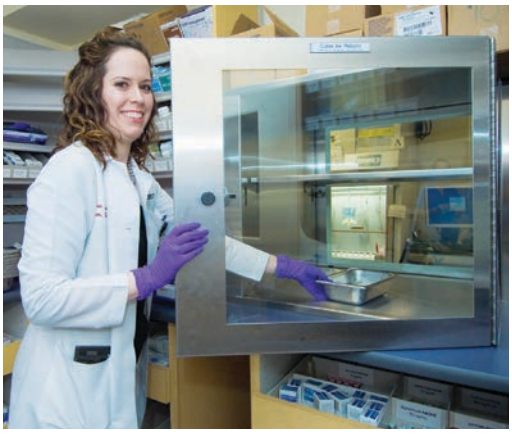

Photo: Dana-Farber Cancer Institute; Sam Ogden

THE ROLE OF A PASS-THRU

To prevent contamination of a cleanroom, people and materials must pass through some kind of vestibule that connects the controlled environment of the cleanroom to less-controlled “dirty air” or surrounding space. People walk through air showers, where high-velocity air nozzles remove particulate from clothing while a person stands in the air-locked space for a minute or so. Materials, products and specimens are transferred into the cleanroom through a pass-thru, which are cabinets mounted on the wall or floor of a cleanroom. Pass-thrus prevent cleanroom air from leaking out and depressurizing the cleanroom and also prevent dirty, untreated air from flowing into the cleanroom. Passing items through the pass-thru’s interlocked doors means fewer people have to enter the cleanroom, which reduces cleanroom contamination and increases operating efficiency. Properly designed and constructed, a pass-thru is easy to clean and maintain, which is crucial for maintaining cleanroom standards.

HOW A PASS-THRU WORKS

Pass-thru doors are designed with interlocks, so that only one side door can be opened at a time, preventing depressurization of the cleanroom. Transferring materials into the cleanroom begins when an operator opens the pass-thru door on the “dirty air” side; the interlock mechanism automatically or manually locks the cleanroom-side door shut.

The operator places materials into the pass-thru on the “dirty air” side and closes and latches the door. The pass-thru’s sturdy, latching doors on both sides tightly compress against urethane or silicone bulb gaskets to prevent air loss from the cleanroom. If the air pressure in the cleanroom drops, untreated dirty air at lower pressure will flow into the cleanroom.

Next, the interlocking mechanism releases, an operator opens the cleanroom-side door and transfers materials into the cleanroom. After transfer is complete, the cleanroom side door is closed. When both doors are closed, the interlock is released and the pass-thru is ready for another use.

HOW TO SELECT FOR YOUR APPLICATION

The function of every pass-thru is to transfer materials with minimal impact on the cleanroom. Well-designed pass-thrus contribute to this requirement; they are made of rugged, durable stainless steel so they withstand constant use and are easy to clean and maintain, especially in sterile environments. Inter-locks are an essential mechanism; models with double-wall construction hide and protect the interlock.

Pass-thrus include features that meet requirements for specific industries and standards. There are basically three levels of pass-thrus: a basic stainless steel design that fits most every need; a design with a fully welded body for aseptic manufacturing; and a bio-design for terminal sterilization processing. Here are basic features of each:

1. Stainless steel construction

Pass-thrus with a smooth, stainless steel interior that is easy to wipe down are suited for most manufacturing and laboratory process, including pharmacies and semiconductor manufacturing. The smooth stainless steel interior, usually made from type 304 #4 stainless, doors included, is created with formed- and stitch-welded seams. The cabinet floor is completely flush; there is no lip at the front to clean around. Hard-edge door gaskets made from smooth, durable, heavy-gauge polyethylene eliminate interior crevices that could harbor contamination. A built-in mechanical interlock with T-handle turn latch is highly recommended, and models with double-wall construction hide and protect the interlock. The maintenance panels should be easy to remove. Pass-thrus that are flush-mounted and tightly sealed to a cleanroom wall or floor-level opening will eliminate any shelf-like surfaces, further reducing areas where particulates and contamination can collect.

2. Fully welded body

Processes including aseptic manufacturing, compounding pharmacies, chemo drug pharmacies and manufacturing require sterile yet easy cleaning. To meet this need, cabinets with fully welded stainless

steel interiors have smooth, formed-radius corners to prevent particulate from collecting in corners and edges. Spills are easily wiped up. These cabinets have the same "lipless" interior floor, silicone bulb gasket, and stainless steel T-handle door latch.

3. Bio-design

Specialized bio-contaminant or "germ-free" processes such as terminal sterilization processing, nanotechnology and production facilities with strict isolation procedures require aseptic cleaning of cleanroom equipment surfaces. For these processes, bio-design pass-thrus feature the same solid, fully welded body with coved radius corners, and a seamless interior, but now with knife-edge hatch openings. This design is less likely to harbor particles and is easier to keep clean. Additional features for easy cleaning include a one-piece door gasket and doors with lift-off hinges that are easy to remove for special cleaning and autoclaving.

4. Additional considerations

Other factors to consider in selecting a pass-thru include how the pass-thru will be mounted to the cleanroom. Check the size of wall spaces and clearances, and note obstructions that will affect door swings or access to service panels. Pass-thrus with 90-degree turns, vertical sliding doors and interior or exterior service panels provide flexible solutions that maximize space and operations efficiency of the cleanroom.

Consider the type of materials that will be transferred through the pass-thru, and how they will be transferred: whether materials are transferred in small quantities by hand, or in continuous batches on a roller bed or conveyor, will affect

Clean Air PRODUCTS

CAP18W WALL MOUNTED, SINGLE DOOR, PASS THRU CABINET COMPARISON CHART

Pass thru cabinets from Clean Air Products feature durable stainless steel construction, are easy to clean and maintain, and comply with USP 800 cleaning requirements


Standard Wall Mounted Pass Thru
CAP18W


Wall Mounted Recirculating HEPA Filtered Pass Thru
CAP18WHF


Wall Mounted Fully Welded Pass Thru
CAP18WFB


Wall Mounted Fully Welded HEPA Filtered Pass Thru
CAP18WFBHF


Wall Mounted Bio-Design Pass Thru
CAP18WBD

	*Optional But Highly Recommended	CAP18W	CAP18WHF	CAP18WFB	CAP18WFBHF	CAP18WBD
Recommended Applications	*Pharmacies*	X	X	X	X	X
	Semiconductor Manufacturing	X	X	X	X	X
	Compounding Pharmacies			X	X	X
	Chemo Drug Pharmacies & Manufacturing			X	X	X
	Aseptic Manufacturing			X	X	X
	Terminal Sterilization Processing					X
	Nanotechnology					X
	Facilities With Strict Isolation Procedures					X
Cabinet Features	*304, #4 Finish Stainless Steel Double Wall Construction*	X	X	X	X	X
	Removable Inner Liners	X	X			
	Seamless Fully Welded Design			X	X	X
	Smooth Formed Radius Corners			X	X	X
	Lipless Interior Floor	X	X	X	X	X
	Knife-Edge Hatch Opening					X
	**Mechanical Interlock With 90° Stainless Steel T-Handles*	X	X	X	X	
	One Step, Pin Style Mechanical Interlock					X
	Stainless Steel Pan Head Hardware	X	X			
	Stainless Steel Hex Head Hardware			X	X	X
	**2 Piece Stainless Steel Flush Mount Mounting Frame Set*					X
	**8 Piece Stainless Steel Universal Mounting Frame Set*	X	X	X	X	
	HEPA Filtration		X		X	
Door Features	*Stainless Steel Flush Mount Continuous Hinge*	X	X	X	X	
	Stainless Steel Lift Off Hinges					X
	Silicone Bulb Gasket	X	X	X	X	
	Poured Seamless Polyurethane Gasket					X
	Over Center Compression Latches	X	X	X	X	X
	Clear Tempered Safety Glass Windows	X	X	X	X	X
	Electrical Requirements	None	120V, 60Hz, 0.3-1.2A	None	120V, 60Hz, 0.3-1.2A	None

the type of pass-thru selected. Some pass-thrus have manual or automatically operated doors and interlocks at the top.

Also consider how the pass-thru integrates with cleanroom operations and how it will be used by personnel. Some cleanrooms benefit from pass-thrus with their own HEPA air filters or external ventilation coupling to connect to the cleanroom air handling system. Interior shelves may be preferred by personnel to separate materials and keep them above floor surfaces of the pass-thru. Viewing windows, interior lights and easy access to internal parts for maintenance are other features important to cleanroom personnel.

To meet specialized requirements, pass-thrus can be designed with fire-rated doors, lead-lined doors or pneumatic vertical sliding doors.

CONCLUSION

In conclusion, the pass-thru is a critical component of cleanroom operations, important in maintaining the cleanroom environment. Pass-thrus simplify material transfer, efficiently reduce the amount of traffic, and preserve the air pressure and cleanliness of the cleanroom. Pass-thrus can be selected with a wide variety of options that maximize value, ease of use and efficiency of any cleanroom. Our pass-thrus are well designed, convenient to install, and easy to use and maintain. Durable, double-wall, all stainless-steel construction improves the functionality, and appearance, of the cleanroom.

About Clean Air Products

Clean Air Products designs and manufactures high quality cleanroom systems, components, equipment and supplies for a broad range of applications. Since 1969, Clean Air Products has served the medical, pharmaceutical, food and beverage processing, aerospace/military and semiconductor industries, among others.

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