

Redundant Containment Filtration:

N+1 Redundancy BIBO System versus 2N (100% Redundant) BIBO Filtration

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Here are two arrangements of nominal 6000cfm capacity BIBO Filter systems, with 2Hx2W aspect ratio (Qty (4) 24x24 filters) one done in a 2N Fully (100%) Redundant arrangement and the other in an N+1 Redundant arrangement:

2N or 100% REDUNDANT BIBO:



Side-by-side 2Hx2W BIBO Filter Systems:

(picture at left)

Each BIBO system is complete with (4) filters, inlet and outlet transition sections and opposed bubble-tight dampers. The duct splits inside the mechanical room into two identical branches. Downstream of the two identical filter systems are two identical fans, one fan for each filter box. Each filter and fan set meets 100% of the airflow capacity. Only ONE filter/fan is online at any time while the other filter/fan set is on stand-by.



Stacked 2Hx2W BIBO Filter Systems:

(picture bottom left)

Once again, each BIBO system is complete with (4) filters, inlet and outlet transition sections and opposed bubble-tight dampers, which are clearly visible. This time the filter systems are stacked to reduce footprint.

Once again, the duct splits inside the mechanical room into two identical branches. Downstream of the two identical filter systems are two identical fans, one fan for each filter box. Each filter and fan set meets 100% of the airflow capacity. Only ONE filter/fan is online at any time while the other filter/fan set is on stand-by. (Outlet duct can feed direct to a fan or an outlet manifold can be done to feed to either of the dedicated fans).

N+1 REDUNDANT ARRANGEMENT BIBO:



(Inlet view of 3x3 BIBO Filter System)

3H X 3W BIBO Filter with (6) Oval-blade Bubble-Tight Dampers:

(picture left)

This 3x3 system (Qty (9) 24x24 filters) can be operated with all six dampers open at all times, or it can be operated with only two rows (six filters) online at any one time, which is referred to as N+1 Redundant operation.

In our example (at left), in N+1 Redundant operation, system sizing is done by assuming that one damper set (Inlet & Outlet Damper) is closed at all times, so for our example we would size based on operation of six filters (two rows) being online at all times, or a nominal capacity of 6000cfm at 250fpm face velocity. Opposed damper sets are only closed for filter service, but with oversizing of the system, that permits operation “at capacity” even with one damper set being closed.

Advantages of the N+1 Arrangement:

The obvious advantage of the N+1 Redundancy BIBO Filter arrangement is that you can meet the CSA requirement for redundancy operation of the Isolation Room exhaust HEPA filter system while using only ONE filter system instead of the usual TWO (fully redundant) filter systems.

However, savings are not always evident because the N+1 Redundant system requires multiple sets of bubble-tight dampers to isolate portions of the BIBO filter system. These bubble-tight dampers are constructed of heavier-gage metal than the filter housings and transitional sections, so the cost per damper can actually make these systems more expensive than fabrication of fully-redundant systems of the same capacity.

It is best to contact the manufacturer (or their representative) to get costing on both options to see which is more beneficial.