



Mini-environment Design Guidelines And Specifications

Definition:

A mini-environment is a means of providing contamination control through the isolation of equipment and processes. It uses an enclosure to separate personnel from equipment and to maintain locally controlled process environment. The mini-environment should provide access to the equipment for loading, maintenance and other purposes.

Design considerations and Guidelines:

1. The mini-environment is designed using Computational Fluid Dynamics for airflow optimization.
2. Light source will be installed inside the mini-environment where illumination is below acceptable levels.
3. Laminar flow inside the mini-environment is adjustable for ambient variation and mini-environment balancing
4. The mini-environment FFU should have a light indicator to show it is functioning
5. The mini-environment is equipped with a dynamic differential pressure controller to adjust airflow velocity to keep a constant pressure condition inside the mini-environment The controller is capable of a 4-20 mA output signal.
6. FFU is to run at about 70% capacity during normal operation
7. The mini-environment is designed to permit access to the tool for maintenance and servicing of equipment without dismantling the mini-environment (doors and removable panels)
8. The mini-environment exhaust locations and size are selected to allow 100% working surface airflow coverage
9. The mini-environment is to be fastened to the tool or to the floor to prevent it from moving
10. The mini-environment design is to limit the transmission of vibration to sensitive process tools
11. The mini-environment is to be designed to operate effectively and to the specifications in class 1 to 100,000 clean rooms
12. The mini-environment is to be designed to operate effectively and to the specifications in Bay & Chase as well as Ballroom clean rooms.

13. The mini-environment is to be designed to operate effectively and to the specifications in clean rooms with or without raised floor.
14. The effect of the suction pressure caused by the pressure differential between the sub-fab and the main fab floors is considered when determining the fan capacity
15. Whenever possible, the mini-environment is designed to integrate directly into the process tool without requiring any additional foot print.
16. The mini-environment is designed with minimum footprint.
17. The mini-environment is designed with airflow behavior such that it will remove particles generated by the process through exhaust opening and away from wafer path. Particle trajectory is assumed to be pure convection by airflow.
18. The mini-environment is designed to eliminate the possible induction of outside air through cracks and opening due to the Venturi effect.
19. Interlock switches are used in the case of personnel and product safety.
20. Door latches are designed and manufactured to be non-particulating.
21. The materials used in the manufacturing of the mini-environment are:
 - Clear anodized Aluminum or stainless steel Extrusion
 - HDPE or equivalent glazing to flush mount with extrusions and panels.
 - Polycarbonate or stainless steel Doors and Panels.
 - Aluminum or stainless steel hardware

Mini-environment Performance Specifications

The following specifications are applicable to most mini-environments. In some cases, these specifications are not applicable and the specifications will be determined on case by case bases:

FFU face velocity	0-110 FPM
Filter face airflow uniformity	±10%
Air-born particle counts 4" above working surface	≤ 1 particle/ft ³ at 0.1 μ
Differential pressure	> 0.005 " of H ₂ O
Transmitted Vibration	< 100 μ-ins/sec
Noise	< NC 55
Airflow Pattern	Laminar & Unidirectional
Working surface airflow coverage	> 90%
Filter pleat depth	70 mm – 100 mm
Filter efficiency	99.9995 % - 99.999995 %
Filter life time	> 7 years
Recovery time	< 5 minutes