Stratos®

High Sensitivity Aspirating Smoke Detectors

APPLICATION NOTE

Clean Room Smoke Detection

Shanghai SMIC

Clean Rooms provide an unusual challenge to the fire detection designer, in that their physical configuration and the direction and volume of air flowing through them usually mean that the probability of detecting a fire at an early stage if using 'conventional' type smoke detectors is unlikely. Experience has proven that only highly sensitive detectors of the aspirating type are likely to provide adequate protection.

Clean Rooms are built to a varying degree of cleanliness, and are atmospherically controlled to house sophisticated manufacturing and ancillary equipment. Clean rooms range from Class 1 areas down to Classes 10, 100, 1000 etc.).

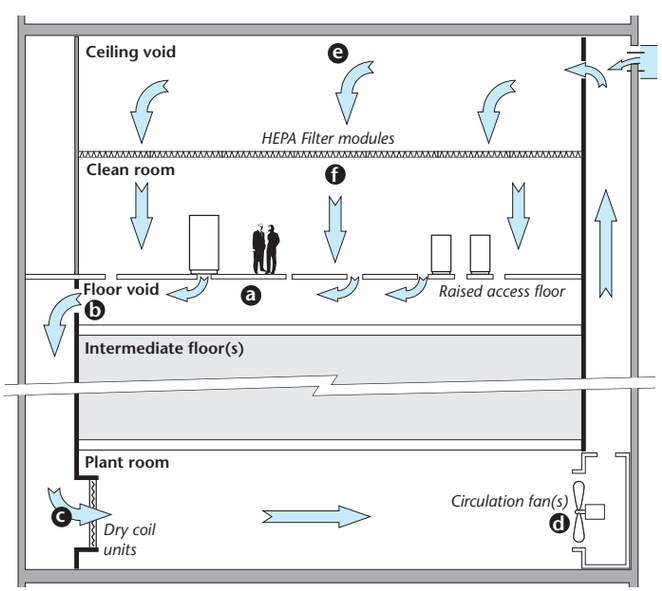
The byproducts of combustion are particularly damaging to many of the manufacturing processes undertaken in a Clean Room environment. The consequential cost of having an undetected fire develop within a microelectronics clean room far outweigh the cost of providing an efficient early warning smoke detection system.

Characteristics:

Clean Room facilities often occupy several floors or levels within the complex. Refer to Fig 1. The airflow through the facility is as follows. - Air is forced into the duct(s) and into the ceiling plenum above the Clean Room. A proportion of fresh air may be added at this point. In the plenum, the air dissipates and passes down through a filter bed fitted with high efficiency filter modules, generally referred to as HEPA (High Efficiency Particle Arrestor) or ULPA type, where any particulate matter in the air is removed. The air passes through the Clean Room and leaves through strategically placed vents or grilles in the raised floor. The air passes through the floor void and into ducts leading down the building. At the base of the duct the air passes over dry coil units, into the plant room plenum, then back into the air handling unit.

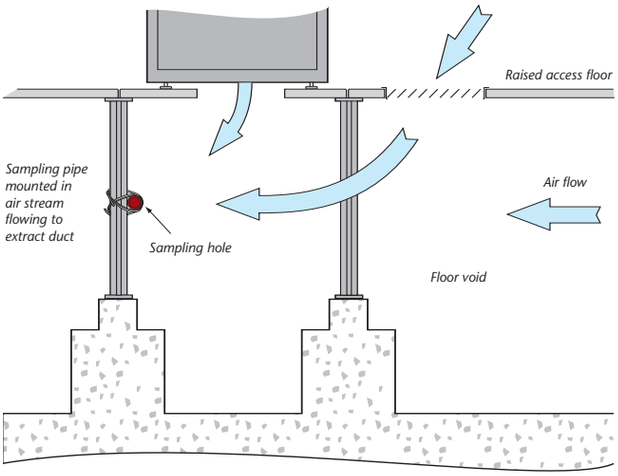
The ventilation system would be designed to give a certain number of complete air changes within the room in a defined time. Within the room itself the air would enter from virtually the whole surface area of the ceiling to provide a gentle laminar (non turbulent) flow. It should ne noted that the airflow through slots, vents and ducts will be at a much higher velocity and will be turbulent in nature.

Fig. 1

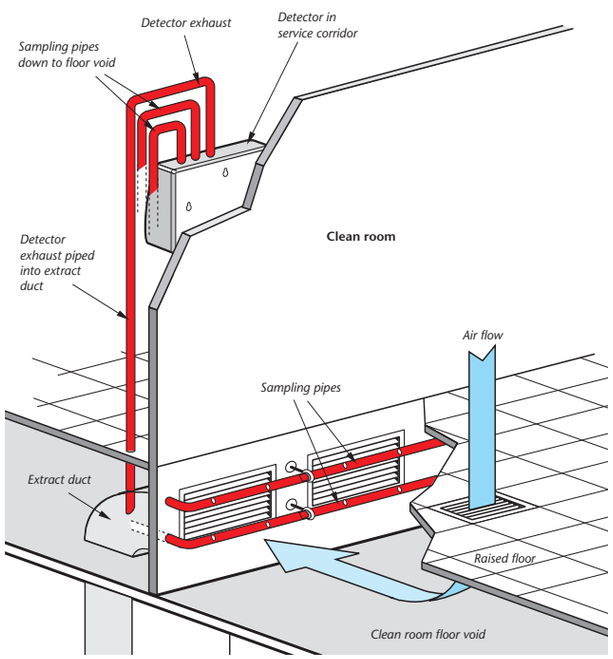


In Figure 1 overleaf, there are six possible recommended positions for aspirating smoke detection, three of them illustrated below.

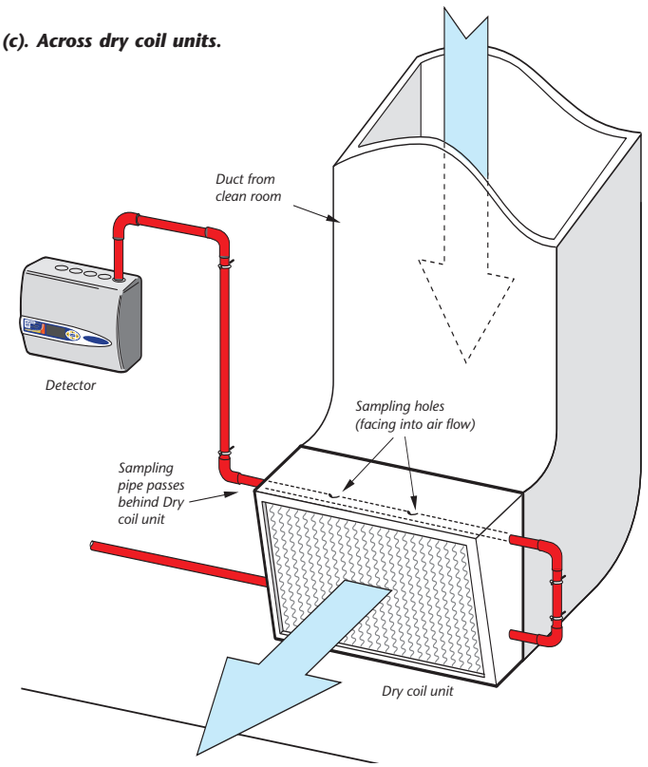
(a). Beneath the raised access floor.



(b). Across the entry to extract ducts.



(c). Across dry coil units.



Efficient detection within the Clean Room:

- To place the sampling pipework as close as practical to the actual risk.
- To keep the length of sampling pipe networks as short as possible.
- It is necessary to restrict the area/volume covered because of the volume of air flowing through that area at any moment in time.

Performance testing:

It is unusual for performance testing to be permitted because there is great potential for contamination of the area. This is particularly the case if the room is in operation. If possible, the installed systems should be performance tested to verify the systems respond as required to very small amounts of pre-combustion particles. A test is described in BS 6266: 1992 (Fire Detection in Electronic Data Processing Environments) in Appendix A.3 where a length of PVC wire is electrically overloaded in a controlled test such that very small quantities of particles are generated. The surface temperature reached by the wire during this test is intended to be relatively low and it is unlikely hydrogen chloride vapours would be released if the 2 metre version of the test is undertaken.

For further detailed information on Clean Room protection go to:
www.airsensetechnology.com/documents/guides/clean_rooms.pdf

Some Successful Worldwide installations for Clean Room protection:

- ***Guangdong Shenzhen IBM, China***
- ***Shanghai SMIC, China***
- ***C.E.A - LETI, France***
- ***GEC - Marconi, Bristol, UK***
- ***BTU, Cottbus, Netherlands***
- ***Motorola, Whiteoak VA, USA***
- ***NSC - Electron, Kulim, Malaysia***
- ***Akzo Fibres, Arnhem, Netherlands***
- ***Samsung Electronics Corp. Korea***
- ***Samsung Display Corp. Korea***
- ***LG Philips, Soowon, Korea***
- ***XIntel, China***

AirSense Technology USA Limited
297 Kingsbury Grade • Suite D • P.O. Box 4470 • Lake Tahoe • Nevada • 89449 • USA
Tel: 775 832 5327 Fax: 503 641 1253
e-mail: sales@airsense.us • www.airsense.us

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