

DESIGN GUIDE FOR CLEANROOMS

Cleanroom Design¹

CLEANLINESS CLASSIFICATION²	AIRFLOW PATTERN³	AVERAGE AIR VELOCITY	AIR CHANGES PER HOUR
ISO CLASS 8 (100,000)	Nonunidirectional / Mixed	1 – 8 fpm	5 – 30
ISO CLASS 7 (10,000)	Nonunidirectional / Mixed	10 – 15 fpm	30 – 60
ISO CLASS 6 (1,000)	Nonunidirectional / Mixed	25 – 40 fpm	125 - 240
ISO CLASS 5 (100)	Unidirectional	40 – 80 fpm	240 - 480
ISO CLASS 4 (10)	Unidirectional	50 – 90 fpm	300 – 540
ISO CLASS 3 (1)	Unidirectional	60 – 90 fpm	360 – 540
ISO CLASS 2	Unidirectional	60 – 100 fpm	360 - 600

NOTES:

- This table relates cleanliness class to both the average air velocity in the cleanroom and rate of air changes per hour. The range of values listed is a consensus of existing practice and is not intended to indicate design. It is up to the designer and end user to arrive at a value either inside or outside the range that is consistent with project needs. Generally the approach is to the higher values in cleanrooms housing a relatively dirty process or where the cleanroom garment program or discipline is relaxed. The lower end of the range is more appropriate for cleaner processes and a more disciplined cleanroom gowning procedure.
- Cleanliness classifications in parenthesis refer to the former FED STD 209E Classifications.
- Airflow pattern listed represents the more common airflow characteristics for cleanrooms of that class.

FILTER EFFICIENCIES

Cleanliness Class	Filter Efficiency
Class 2	99.99999% @ 0.12µm
Class 3	99.9995% @ 0.12µm
Class 4	99.999% @ 0.12µm
Class 5	99.99% @ 0.30µm
Class 6	99.99% @ 0.30µm
Class 7	99.99% @ 0.30µm
Class 8	99.99% @ 0.30µm

AIR RETURNS

Cleanliness Class	Air Return Design
Class 2	Raised Floor
Class 3	Raised Floor
Class 4	Raised Floor
Class 5	Low Wall Long Axis
Class 6	Low Wall
Class 7	Low Wall or Ceiling
Class 8	Low Wall or Ceiling

CEILING DESIGN

Cleanliness Class	Ceiling Grid Type
Class 2	Gel Grid
Class 3	Gel Grid
Class 4	Gel Grid
Class 5	1-1/2" T Bar Gasket
Class 6	1-1/2" T Bar Gasket
Class 7	1-1/2" T Bar Gasket
Class 8	Side Access HEPA Hsg.

FILTERED CEILING COVERAGE

Cleanliness Class	Amount of Filters
Class 2	100% Ceiling Coverage
Class 3	100% Ceiling Coverage
Class 4	100% Ceiling Coverage
Class 5	100% Ceiling Coverage
Class 6	20-60% Ceiling Coverage
Class 7	5-40% Ceiling Coverage
Class 8	5% Remote Filter Bank