KURSUS
PENGENALAN KEPADA PERKHIDMATAN MEKANIKAL DALAM BANGUNAN

Pengenalan kepada Peralatan Makmal dan Bilik Bersih (Clean Room)

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LABORATORY EQUIPMENT

FUME CUPBOARD

BIOHAZARD SAFETY CABINET

LAMINAR AIR FLOW CABINET

FUME CUPBOARD

DEFINITION

Define as "A partially enclosed work space that limits the spread of fume to operators and other personnel. It is ventilated by an induced flow of air through an adjustable working aperture that dilutes the fume and by means of an extract system, provides for the release of fume remotely and safely:

BS 7258: Part 1: 1990

STANDARDS

BS 7258

AS 2243

SAMA (Scientific Apparatus Manufacturers Assoc., USA

CLASSIFICATION/TYPE

I) General Purpose FC
- Class A
- Class B
- Class C

II) Special Purpose FC
- Perchloric Acid FC
- Radioisotope FC

GENERAL PURPOSE FUME CUPBOARD

CLASS A

- Used for materials of extreme toxicity or hazard.
- 125- 150 ft/min face velocity across sash (min. 100-125 ft/min)
- Treshold Limit Value (TLV) < 10 ppm

GENERAL PURPOSE FUME CUPBOARD

CLASS B

- Used for most materials and operations in the laboratory
- 100 ft/min face velocity across sash (min. 80 ft/min)
- TLV 10-550 ppm

GENERAL PURPOSE FUME CUPBOARD

CLASS C

- Used for materials or operations where the hazard is not high.
- 75-80 ft/min face velocity across sash (min 50-60 ft/min)
- TLV > 550 ppm

SPECIAL PURPOSE FUME CUPBOARD

PERCHLORIC ACID FC

- Used only for Perchloric Acid compound application due to the potential explosion hazard of perchloric acid when combined with organic material.

- 125-150 ft/min face velocity across sash

SPECIAL PURPOSE FUME CUPBOARD

RADIOISOTOPE FUME CUPBOARD

- Used for radioactive applications.
- 125-150 ft/min face velocity across sash

TYPES OF FUME CUPBOARD (AIR FLOW)

CONVENTIONAL

- Allows only fixed sash opening

AUTOMATIC AIR-BYPASS

- Allows the sash to be operated in various position and maintaining the required face velocity

ADD/AUXILLIARY AIR

- Addition of tempered outside air to provide the required face velocity and at the same time reduce the exhaust air-conditioning air

BIOHAZARD SAFETY CABINET

BIOHAZARD SAFETY CABINET

Definition

BS 5726-31

Define as "cabinet intended to offer some protection to the user and environment from the hazards of handling infected material, and other dangerous biological material, but excluding radioactive, toxic and corrosive substances"

STANDARDS

- DIN 12950
- NSF. Std. 49
- BS 5726
- AS 2252 Pt. I (Class I)
- AS 2252 Pt. II (Class II)
- AS 2567 – Cytotoxic Drug Safety Cabinet
- US Fed. Std. 209c, Class 10

TYPE

Class I – Designed specifically to provide operator/ personnel protection but do not protect product (material being handled within the cabinet)

Class II - Provides high level personnel,environment and product protection

Class III - Operator is segregated from the work by physical barrier (gloves mechanically attached to the cabinet. Provides high level personnel, environment and product protection.

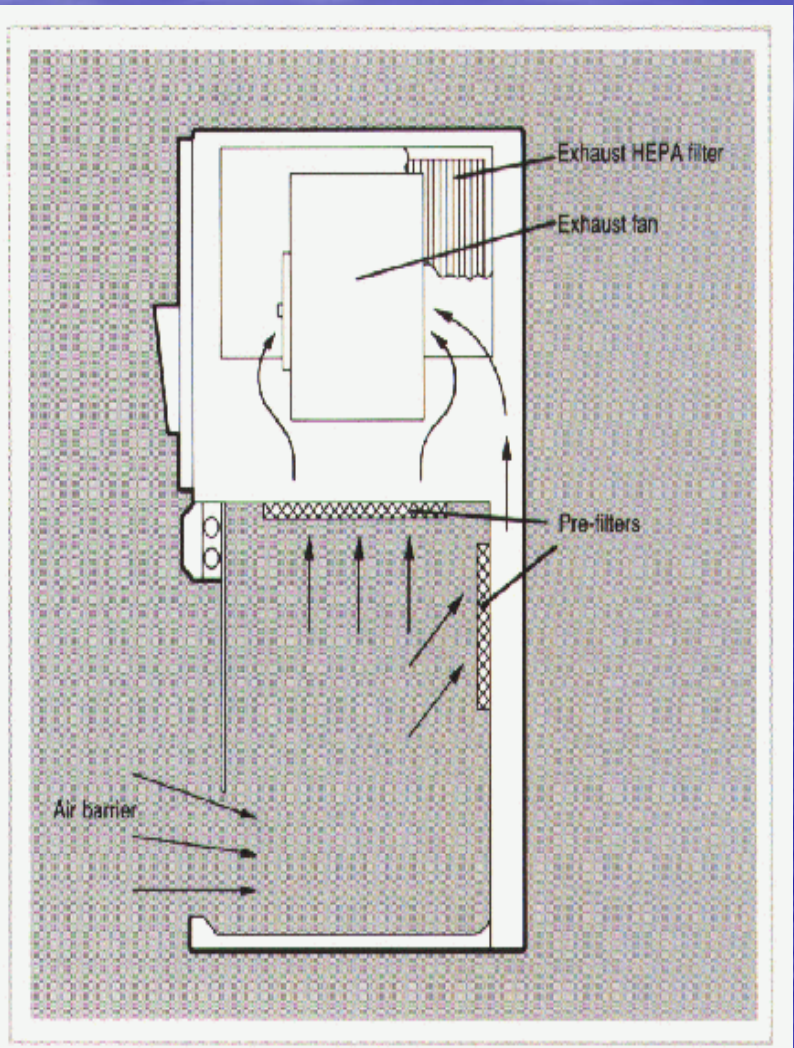
Cytotoxic Cabinet - For both containment and asceptic manipulation. Provides protection for maintenance personnel as well.

CLASS I

- 100% exhaust cabinets with HEPA filtration
- Inward air velocity at the work opening 0.5-0.8 m/s
- Room air passes through the work zone and can contaminate product
- Air exhausted to the room

Only personnel and environment protection
NOT product

BIOHAZARD SAFETY CABINET – CLASS I

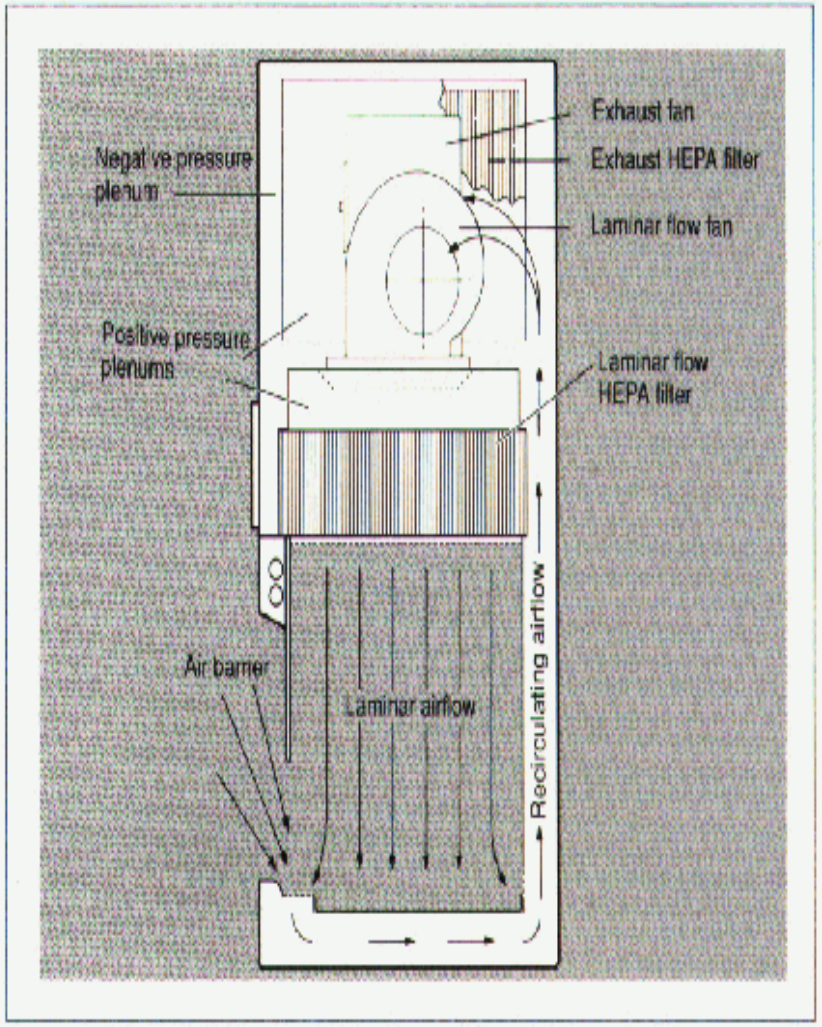


CLASS II

- Part-recirculating LAF cabinets with HEPA filtration of exhaust air
- An air barrier at the work opening
- Separate fan/ HEPA filter systems for exhaust and LAF
- Vertical LAF recirculated in the work zone to protect products
- Air exhausted to the room

Personnel, environment and product protection

BIOHAZARD SAFETY CABINET – CLASS II




Gelman Sciences
BioHazard-Protection
BIOHAZARD


PHILIPS
PHILIPS

CLASS III

- Totally enclosed, 100% exhaust cabinets with HEPA filtration of supply and exhaust air
- All work within the work zone conducted through attached rubber gloves
- Air exhausted out from room
- In Europe, double filtration is common

Personnel, environment and product protection

BIOHAZARD SAFETY CABINET – CLASS III

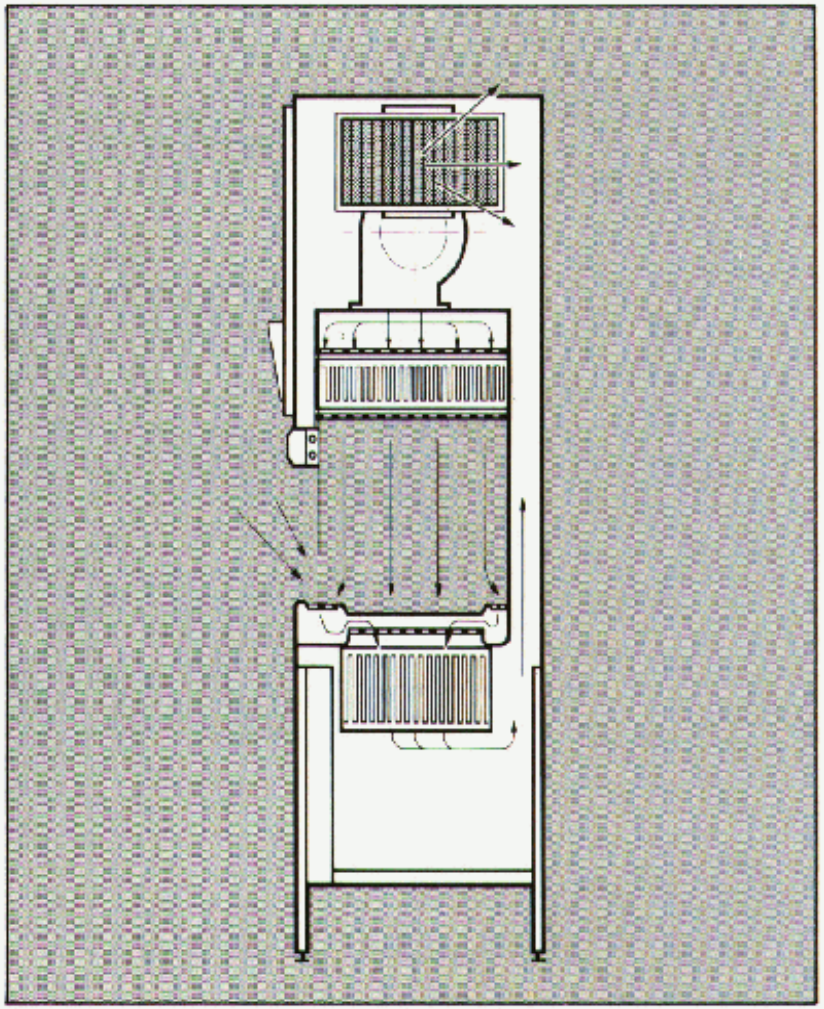

SYSTEM FAILURE ALARM
STOP ALL WORK
LEAVE LAB
CALL MAINTAINENCE
EMERGENCY CHEMICAL SHOWER
ROOM PRESSURE SETPOINT
NEG 50 Pa
SPEED ADJUST

CYTOTOXIC DRUG SAFETY CABINET

- Partially recirculating Biohazard Safety Cabinet Class II with added protection for maintenance personnel

Personnel (Operator), environment, product and maintenance personnel

CYTOTOXIC DRUG CABINET



LAMINAR AIR FLOW CABINET

LAMINAR AIR FLOW CABINET

Definition

Laminar air flow workstation is defined as an ultra-enclosure with a work zone which protect products from ambient contamination but which does not provide personnel and environment protection

They are self-contained enclosures or cabinets incorporating fans and high efficiency HEPA filter

Flow of air from the work space is blown directly into the laboratory either vertically downwards or horizontally towards operator

STANDARDS

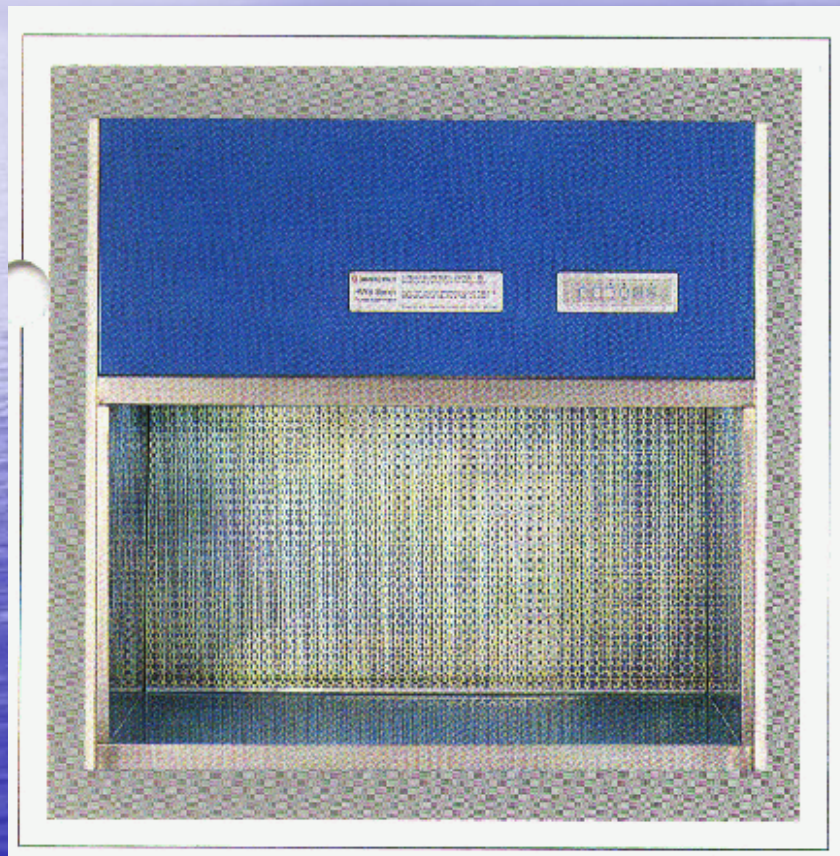
- AS 1386, Pt.5
- US Fed. Std. 209d, Class 100
- BS 5295 Class I

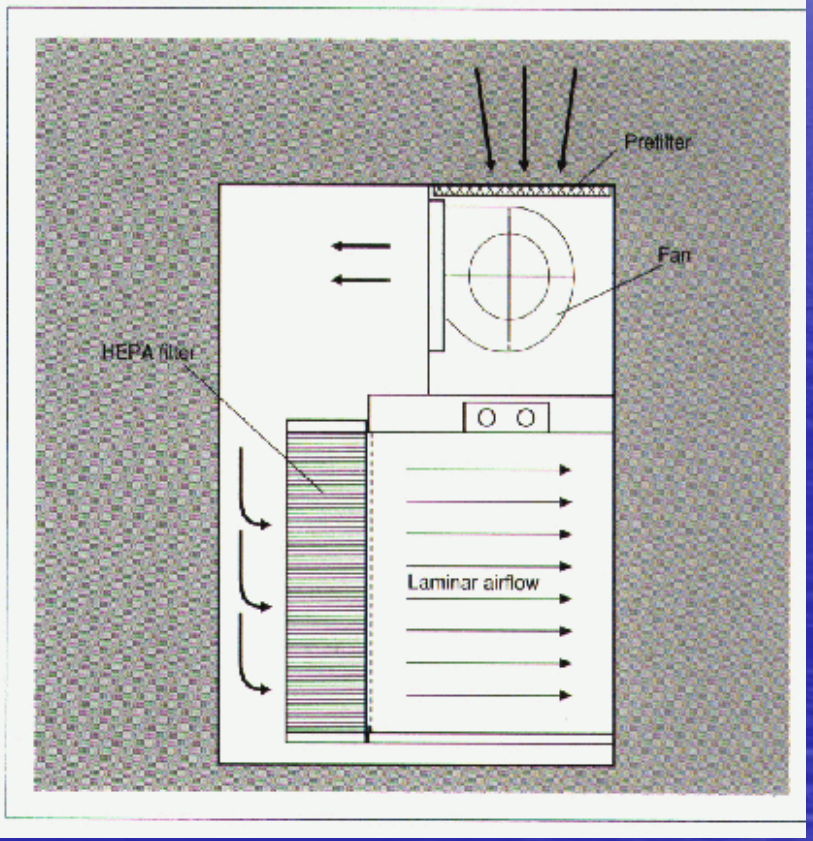
TYPES

1) Horizontal Laminar Flow Cabinet
   - Laminar flow directed towards operator
   - Ambient air from room, filtered into the work zone
   - Velocity 0.45 – 0.5 m/s, +/- 20% of their average

2) Vertical Laminar Flow Cabinet
   - Laminar Flow directed vertically downwards towards product

HORIZONTAL LAMINAR AIR FLOW CABINET





CLEAN ROOM

DEFINITION

US FED. STD 209B

A clean room is an enclosed area employing control over the particulate matter in air with temperature, humidity, and pressure control, as required. Clean room must not exceed particulate count as specified in the air cleanliness class.

DEFINITION

ASHRAE Chapter 15

A specially constructed enclosed area environmentally controlled with respect to airborne particulate, temperature, humidity, air motion, vibration, noise, viable organisms and lighting.

CLASSIFICATION OF CLEAN ROOM

Class 1	Particles count < 1 particle/cu.ft (35 particles/cu.m) of a size 0.5 um
Class 10	Particles count <10/cu.ft of a size 0.5 um and larger not exceeding 5.0 mm
Class 100	Particles count <100/cu.ft of a size 0.5 um and larger

CLASSIFICATION OF CLEAN ROOM

Class 1,000 (1K)

Particle <1,000/cu.ft of a size 0.5 micron and larger

Class 10,000 (10K)

Particle < 10,000/cu.ft of a size 0.5 micron and larger or 65 particle/cu.ft of a size 5.0 microns and larger

Class 100,000 (100K)

Particle <100,000/cu.ft of a size 0.5 micron and larger, or 700 particle/cu.ft of a size 5.0 microns and larger

TYPES OF CLEAN ROOM

A) Conventional or Non-Laminar Clean Room (Turbulent Flow)

B) Laminar Clean Room (Laminar Flow)
   - Vertical Flow
   - Horizontal Flow

PENUTUP

Peralatan Makmal dan Bilik Bersih hanyalah sebahagian kecil daripada Perkhidmatan Mekanikal yang terdapat di dalam sebuah bangunan khas (spt. Hospital, Makmal, Sekolah dll)

Namun seperti juga perkhidmatan mekanikal yang lain, ianya merupakan nadi/penggerak bagi memastikan bangunan dapat berfungsi/hidup.

Sebuah bangunan tanpa mekanikal adalah ibarat badan yang cantik tetapi tidak bernyawa (body without soul). Cantik dari segi zahir tetapi tidak berfungsi.

Perkhidmatan mekanikal-lah yang menghidupkan sesebuah bangunan itu.

Terima Kasih