

2.0 FUME HOODS

2.1 Standard Fume Hood Performance Requirements • Fume hoods shall be of complete KD (Knock down) construction with airfoil design to insure maximum operating efficiency. Foil sections at the front facials of the hood shall minimize eddying of air currents at the hood face and the rear baffle system shall minimize turbulence in the upper portion of the hood interior.

✓ Test Method – The hood shall be tested by a third party as per the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 110-1995 and EN-14175.

2.2 Quality Assurance

• The laboratory fume hood manufacturer shall provide fume hood work tops and casework all manufactured & shipped with proper packing & should take the full responsibility of the entire scope of works as specified in the tender

• Each fume hood should come Pre Wired along with PDI (Pre Dispatch Inspection Report)

2.3 Specifications

• Superstructure Frame – A free-standing rigid panel structure of steel (G.I.)

• Interior Walls- Double wall ends, not more than 6" wide, shall be provided to maximize interior working area. The area between the double wall ends shall be closed to house the remote control valves. Cutouts to be provided inside the fume hood for service line accessibility. The same to have a cover with a fastener free design. The vertical facias shall contain the required service controls, electrical switches and receptacles.

• Airfoil – A streamlined airfoil shall be integral at the bottom of the hood opening on bench and distillation hoods. This foil shall provide a nominal 20mm open space between the foil and the top front edge of the work surface to direct an air stream across the work surface to prevent back flow of air. The sash to be provided with a separate handle which also provides for air flow when in completely closed position. The foil shall be 1.2mm steel to resist denting and flexing.

• Baffle- A stable, non-adjustable baffle with a single slot on the back baffle to aid in distributing the flow of air into and through the hood. The baffle shall be space out from the back liner and shall be removable for cleaning.

• Duct Collar- A 8"-10" diameter polyethylene funnel shaped rectangular duct collar shall be located in the top of the hood plenum chamber.

• Lighting- Two fluorescent light fixture (inclusive of CFL tubes) of 20 volts each to be provided in the fume hood. The lighting fixture to be completely outside the fume hood area.

• Sash- A sash provided should be move in a vertical rising steel frame without any noise. The bottom of the sash frame shall have a full length metal handle. The ash track has minimum protrusion to avoid any kind of turbulence. The sash shall be counterbalanced with a weights to prevent tilting and binding during operation. The glass panels shall be 5mm toughened glass mounted in an leveled channel with roller for smooth operation.

• Plumbing Services – Utility services like Nitrogen, Vacuum, Compressed Air & Potable water shall consist of remote control valves as selected located within the end panels, controlled by in and out facility with flexible hose passing through the side panels of the hood, with color coded plastic handles. Interior fitting for water shall be with powder coated brass. All gas valves for regular lab gases to have standard needle valve and push and turn type arrangement for all burning gases to be supplied. All supplied valves to clear the following pressures test conditions: Gas Fittings- 7 bar, Water fittings-10 bar.

• Electrical Services – The hood superstructure shall be fully wired and should have a control box with MCB blower starter all safety devices like trip etc. Inlet to be of 3 phase power supply and the whole electrical to be of plug and play type. It also has 4 nos. electrical sockets and switches of Northwest make (230 V, 5/16 A, 50 Hz)

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- **Liner-** Interior liner panels shall be 6 mm thick Phenol resin base industrial laminate.
- **Digital Panel-** Fume hoods shall be provided with an alarm system to detect low and high hood face velocities. The alarm system shall indicate the actual face velocity of sash position. The system have an air velocity sensor mounted on the interior side liner of the hood where it is easily accessible for cleaning. The velocity monitor shall have a digital display of the air velocity through the hood face in feet per minute. The alarm signals shall activate any time the face velocity falls below the low velocity alarm set point or rises above the high velocity alarm set point. There shall be both visual and audible alarm signals. The audible alarm shall have a mute. Low and high alarm contacts shall be provided for remote monitoring.
- **Lattice Rod Assembles** – 12mm diameter solid SS rods shall be completed with the PP clamps to form a lattice arrangement to hold the test samples and rotors within the fume hood.
- **Centrifugal Blower-** Silent high efficiency remote blower consisting of continuous rating motor and chemical resistant impellar. The blower is designed to give a face velocity at safe working height as per the international safe velocity norms. (ANSI/AIHA Z9.5). The blower body is polypropylene UV treated, high density and chemical (corrosion) resistant and is mounted on a metallic stand.
- **Ducting** – Rigid Ducting of PP (Polypropylene) + FRP (Fibre Reinforced Polyester) and flexible ducting with flanges, bends, damper transitions, clamps etc. Flexible joint is provided in the ducting in order to avoid transmitting the blower vibrations to the hood. A weather proof rain cowl is provided at the outlet of blower.

• **Scrubbers Specifications:**

General details			
	For 1 no. LCV fume hoods of 6 feet width	For 2 nos. LCV fume hoods of 6 feet width each	For 3 nos. LCV fume hoods of 6 feet width each
Capacity	1000 CFM for two 6 feet width LCV fume hoods	2000 CFM for two 6 feet width LCV fume hoods	3000 CFM for three 6 feet width LCV fume hoods
Working temp.	Ambient	Ambient	Ambient
Design temp.	60 degree celcius	60 degree celcius	60 degree celcius
Type	Vertical Packed Bed scrubber with circulation tank and recirculation pipes and fittings.	Vertical Packed Bed scrubber with circulation tank and recirculation pipes and fittings.	Vertical Packed Bed scrubber with circulation tank and recirculation pipes and fittings.
Motor(MAKE-KIRLOSKAR/AMBICA/	0.5 HP, 2900 RPM, Capacity 50 ltr/min, Head 5 mtrs	1 HP, 2980 RPM, Capacity 50 ltr/min, Head 5 mtrs	1.5 HP, 2980 RPM, Capacity 50 ltr/min, Head 5 mtrs

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	Material for Construction		
Bottom/room/ shell	PP + FRP	PP + FRP	PP + FRP
Manway necks/Reinf. Pads	PP + FRP	PP + FRP	PP + FRP
Manway flanges	PP + FRP	PP + FRP	PP + FRP
Nozzle necks	PP + FRP	PP + FRP	PP + FRP
Nozzle flanges	PP + FRP	PP + FRP	PP + FRP
Gasket	Natural resin – 3mm	Natural resin – 3mm	Natural resin – 3mm
Bolts and nuts	GI	GI	GI
	Thickness		
Tank	3 mm PP + 5 mm FRP	3 mm PP + 5 mm FRP	3 mm PP + 5 mm FRP
Scrubber	3 mm PP + 3 mm FRP	3 mm PP + 3 mm FRP	3 mm PP + 3 mm FRP
	Painting		
Outside of tank	Smoke grey	Smoke grey	Smoke grey
Inside of tank	NIL	NIL	NIL

***Other**

Accessories like overflow provision and water level indicator.

Less space occupation, maximum efficiency and maximum recollection. All nozzles shall be provided with FRP gussets.

Water fill shall be done to take care of leakage. Floor space requirement of 2 m X 2m.

Water fill test shall be done to take care of leakage

- **Base Cabinets** – Fume hoods are designed to rest on a bench (high base stand, pedestal or a cabinet) which is a complete rigid steel structure. Gauge of steel used in its construction shall be 0.8 mm GI.
- **Transition-** Used to connect fume hood with ducting should be designed to reduce the static pressure and is made up of PP-FRP.
- **Work Surface** – Hood work surface shall be 20mm thick jet black granite made in the form of a watertight pan, not less than 7 mm deep to contain spillage. Worktop will have oval 100mm x 200mm 'PP' Cup-Sink for drainage. The work surface and cup drain shall be available in black colour.

3. PERFORMANCE REQUIREMENTS

3.1 **Steel Casework Construction Performance**

- Base cabinets shall be constructed to support at least a uniformly distributed load of 250 kgs.
- Each leg should have a load capacity of 450 kg
- Each adjustable and fixed shelf support an evenly distributed load of 40 Kg.
- All drawers shall operate smoothly, a minimum of 1,00,000 cycles with an evenly distributed load of 25 kg.
- Swinging doors on floor-mounted casework shall support 45+45 Kg. suspended at a point 1 feet from hinged side, with doors swung through an arc of 90 degrees. Weight load test shall allow only a temporary deflection, without permanent distortion or twist. Door shall operate freely after test and assume a flat plan in a closed position.

The steel surface to follow the following testing standards

S.No.	Characteristic	Specifications	Method Used
1	DFT (DRY FILM) THICKNESS	35 micron	ELCOMETER OR DFT METER
2	GLOSS AT 60 DEGREE	70+units	GLOSS METER
3	SCRATCH	3Kgs	SCRATCH HARDNESS TESTER
4	IMPACT RESISTANCE	275 Kg.cm	IMPACT TESTER
5	CROSS CUT ADHESION	1X1 mm or GT	
6	FLEXIBILITY	3.25 mm	CYLINDERICAL MANDREL BENDING TESTERS

7	ERICHSEN CUPPING	8 mm	ERICHSEN CUPPING TESTER
8	SLAT SPRAY	1000 hours	SALT SPRAY CHAMBER

Zinc Phosphate deposition rate: 1.1 gm/mt. Square, IS – 3618 (1966) Reaffirmed in 1991 and IS - 6005 (1998).

Mild Steel (CRC): IS-513 (1994) Reaffirmed in 1998.

3.2 Service Fittings and Accessories

- **Laboratory Service Fittings:** Service fittings shall be laboratory grade, and water faucets and valve bodies shall be cast red brass alloy or bronze forgings. All fittings shall be powder plated unless specified otherwise.
- **Service Indexes:** Fittings shall be identified with service indexes in the colour coding as per DIN 12920.
- All water faucets and gas valves should meet the following performance tests and requirements.

3.2.1 **Chemical Resistance:** Finish shall meet the following tests for chemical resistance:

3.2.2 **Fume Test :** Suspended coated sample in a container at least 6 cubic foot capacity, approximately 12" above open beakers, each containing 100 cc of 70% nitric acid, 94% sulfuric acid and 35% hydrochloric acid respectively. After exposure to these fumes for 150 hours, the finish on the samples shall no discoloration, disintegration or other defets

3.2.3 **Direct Application Test:** Subject coated samples to the direct action of the reagents and solvents listed below at a temperature of 25 degree C dropping from a burette at the rate of 60 drops per minute for ten minutes. Finish on the samples shall not rupture, though slight discoloration or temporary softening is permissible.

3.2.4 **Mar and Abrasion Resistance:** Finishes shall a have pencil hardness of 2H-4H with adhesion substantial enough to withstand both direct and reverse impacts of 160 inch pounds. Finish shall have excellent mar resistance and be capable of withstanding scuffing, marring and other ordinary wear.

3.2.5 **Reparability:** Finish shall b capable of surface repair in the event that a fitting is scratched or a surface rupture occurs. The service fitting manufacturer shall have available an air-drying coating, specially formulated to match the existing finish colour, which may be applied in the field to repair coated surfaces.

4.1 Dampers and Flexible Hose

4.1.1 **General –** Volume control damper sets shall be provided where specified according to the specifications in the offer BOQ. Dampers shall be double thickness heavier than the thickness of the large duct & shall be rigid in construction. The volume control dampers shall be of an approved type, lever operated & complete with locking devices which will permit the dampers to be adjusted & locked in any positions. Construct blades of 3 mm thick PP MOC, provide heavy-duty molded self-lubricating nylon bearings, 13mm (1/2") diameter Plastic axles spaced on 225 mm

(9") centers. Construct frame of 300 mm diameter outer with Flange for fitting minimum 6 bolts and nuts. The outer shell body shall be transparent material of Poly propylene. Automatic \$ manual volume opposed blade shall be not over 225mm wide. The dampers for fresh air inlet shall additionally provide with fly mesh screen, on the outside of 0.8 mm thickness with fines mesh.

- 4.1.2 Manually Adjustable Damper Sets – Damper sets shall be arranged in substantial supporting frames and each blade shall be mounted on a shaft, which turns in sintered bronze bearings. All damper blades shall be inter-connected by means of a suitable bar linkage for ganged operation. All dampers shall be arranged with spindle horizontal and shall be sized to handle the air quantities shown on the drawings. Where manually adjustable damper sets are installed in duct work or other accessible locations the operating shafts shall be extended through the duct and a lockable quadrant fitted.
- 4.1.3 Bird Screens – Galvanized woven mesh or weld mesh bird screens in rigid galvanized iron frames shall be installed behind all Bypass exhaust air openings to the outside of the building.
- 4.1.4 Flexible Connections – Provide flexible duct connections wherever duct work connects to vibration isolated equipment and on all exhaust final connections to spot extractor and as indicated on the drawings. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make air-tight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse and tensional movement and also capable of absorbing vibrations of connected equipment. Flexible connections shall be air tight and resistant to water and fire. Flexible connections shall be fitted to isolate fans from equipments and/or duct work. The connections shall be arranged to permit the renewal of the connection without distributing the duct work or the plant. The metal parts of connected equipment shall be separated by not less than six inches and installed with sufficient slack to compensate for free movement of fans or spring vibration isolators.

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