

**ESCO®**

**LABORATORY FUME HOODS**



**Certified to the ANSI / ASHRAE 110-1995 Standard**

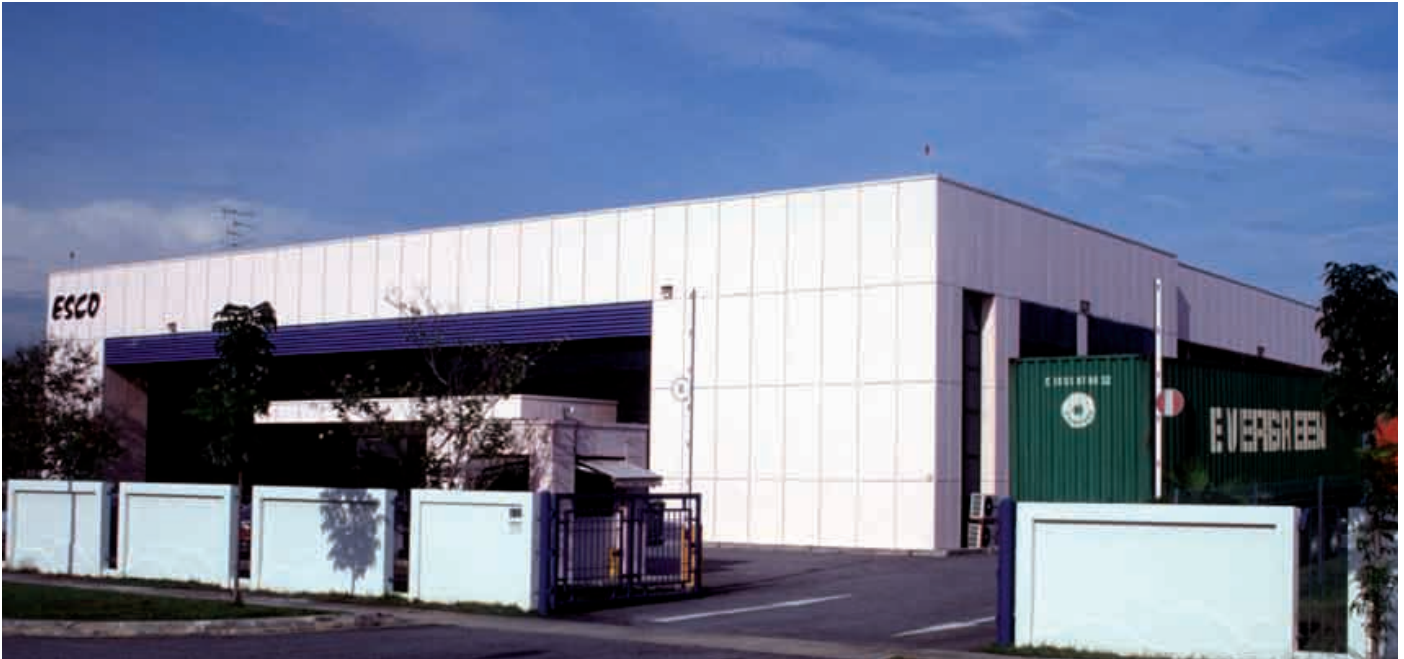
**Optimum Operator Protection and Performance**

**Wide Range of Construction Options**

**Available with Optional Microprocessor Control**

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Over 200 distributors worldwide

International presence in Asia, Europe and US

5 core business divisions

Laboratory Fume Hood Division  
 Biotechnology Equipment Division  
 Fume Filtration Division  
 Cleanroom Construction  
 Components Division

International certifications



The inception of Esco began in 1978 when the founder, upon observing the emerging high-tech industrial and life sciences industries, forayed into the clean air solutions industry to fulfil the needs of this community for quality clean air solutions.

Pioneering the development of clean air technology in South East Asia, Esco designed and constructed the region's FIRST cleanroom - an environment in which airborne particulates are minimized by constant filtration in order to prevent product contamination.

The Esco brand name has since been associated with the forefront of airflow technology for both containment and protection. It is our unique perspective on the convergence of industry and science and our understanding of the industry and scientific community that have enabled us to build our expertise in containment technology leading to developments of FIRST-CLASS ESCO laboratory furniture.

Today, the company has built a strong international presence with representative offices worldwide and an overall resource strength of more than 300 employees to support the growing international customer base. A third of Esco's employees represent Esco's core team of dedicated R&D personnels who have been crucial in making many "Esco Milestones" from the development of "secondary isolated negative pressure filter seals" to Esco's first of many international certifications.

**LABORATORY FUME HOOD DIVISION**

Laboratory Fume Hood Division specializes in ASHRAE 110-1995, BS7258, EN14175-3 certified laboratory fumehoods for use in laboratories to protect operators and laboratory personnel during their operations and activities.

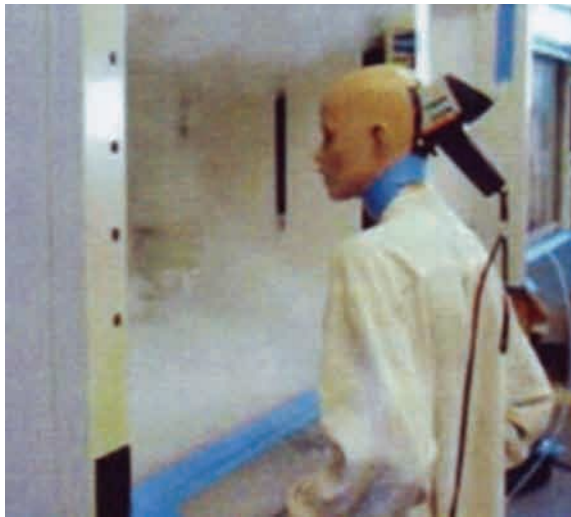
**CERTIFICATION**

Esco Fume Hoods have been independently certified by Invent -UK, Ltd. as fully compliant to the latest safety and performance requirements of the US Standard ANSI/ASHRAE Standard 110-1995, British Standard BS 7258: 1994 and containment test requirements of European Standard EN 14175-3:2003.

**IN-HOUSE TESTING**

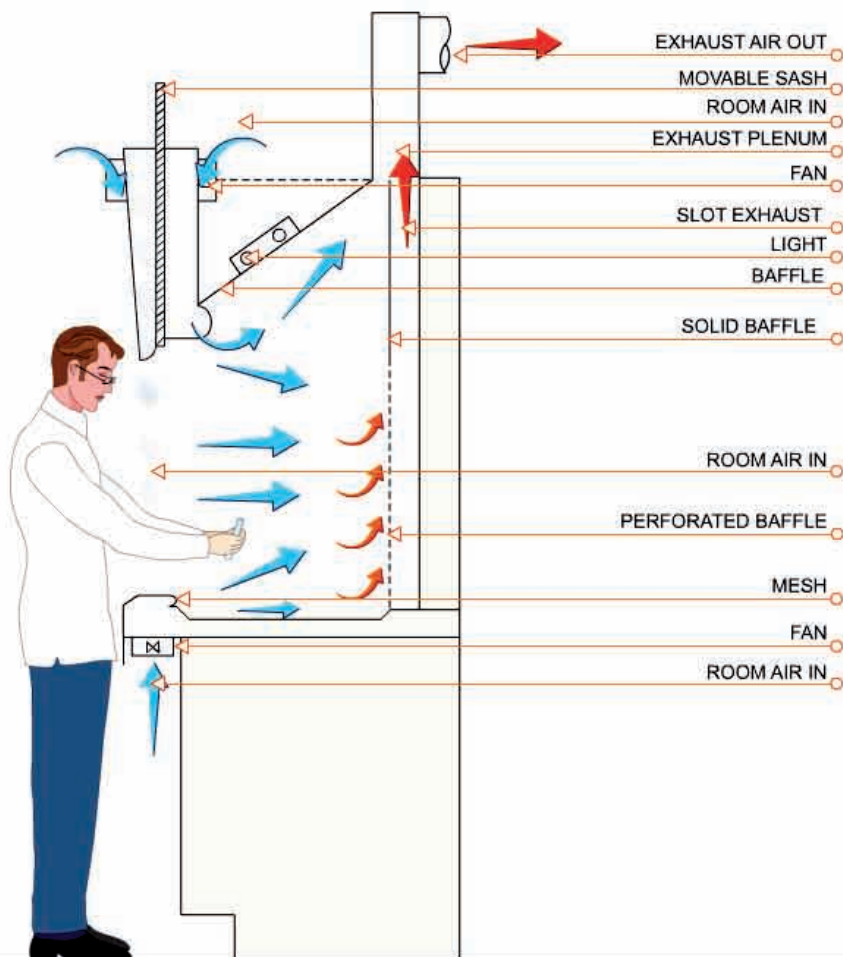
Esco's in-house ASHRAE testing laboratory at our Research and Development facilities is fully equipped to conduct performance test on fume hoods according to the ASHRAE Standard requirements.

Esco has raised the stakes in the laboratory fume hood manufacturing industry with its acquisition of the Berkeley Fume Hood technology developed at the **Lawrence Berkeley National Laboratory in California, USA**. This is the much talked about technological concept set to revolutionize the way fume hoods are constructed. The Esco's newest class fume hood, Frontier™ Guard (available in Q4, 2006) which incorporates this acquired technology, is a high-performance equipment with easier, less expensive installation, enhanced safety and a constant air volume operation that is not dependent on the operator.



ASHRAE Test conducted on Frontier Guard in progress

- ▶ **“Push-pull” method of containing and exhausting fumes**, uses small supply fans built-in at the top and bottom of the sash to produce low-velocity airflow that gently push air into the fume hood
- ▶ **Efficient air divider** that separates the fume hood's interior from the exterior, assuring the user of continuous supply of clean air towards the breathing zone
- ▶ Easy outflow of contaminated air with the **main baffle aligned at the middle of exhaust plenum**
- ▶ **Advanced baffle system with perforations** at the lower half of the fume hood in front of the sash opening, flushes air out at the first instance, eliminating the need to contain contaminated air longer than necessary
- ▶ No retention or recycling of the fumes and air happens because of the **diagonal cross baffle**
- ▶ Supply airflow patterns reduce currents and vortexes, improving containment and exhaust performance.
- ▶ **Fluorescent lighting mounted out of air stream** for better airflow uniformity, angled in a fashion that it shines down on the work surface and not on the operator. Improved lighting quality and reliability hence reducing maintenance.
- ▶ **Less volume of air to exhaust**, the prototype has undergone the ASHRAE110-1995 test protocol and achieved containment with 70% flow reduction at 0.2m/s airflow velocity.
- ▶ **A highly-efficient energy-saving equipment**, cutting energy costs by about USD2100 per year per fume hood.



**Esco Fume Hood's unique progressive bypass airflow system** is a result of years of research and development by Esco's team of dedicated R&D specialists in perfecting its fume hood technology. Central to the fume hood's high quality performance is its unique airflow system that offers superior containment over a broad range of face velocities.

Inherent in the development of this system is an understanding of fluid dynamics and the tendency for air turbulence to occur within the workzone. When air enters through the sash, a vortex is created. Activities such as opening the sash and working in the hood can disturb the vortex resulting in air turbulence. The stability of a vortex is dependent on an efficient airflow system that is able to contain and draw out the vapours.

**Traditional fume hood design** shows the incapability of the airflow system to control the intake air causing turbulent rolls and eddy currents within the workzone and ultimately resulting in concentrations of noxious fumes and possible backdrafts. The solution to keeping the face velocity constant is to increase extract air volume.

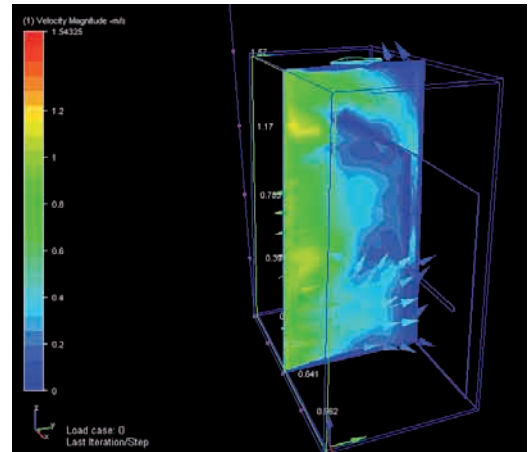
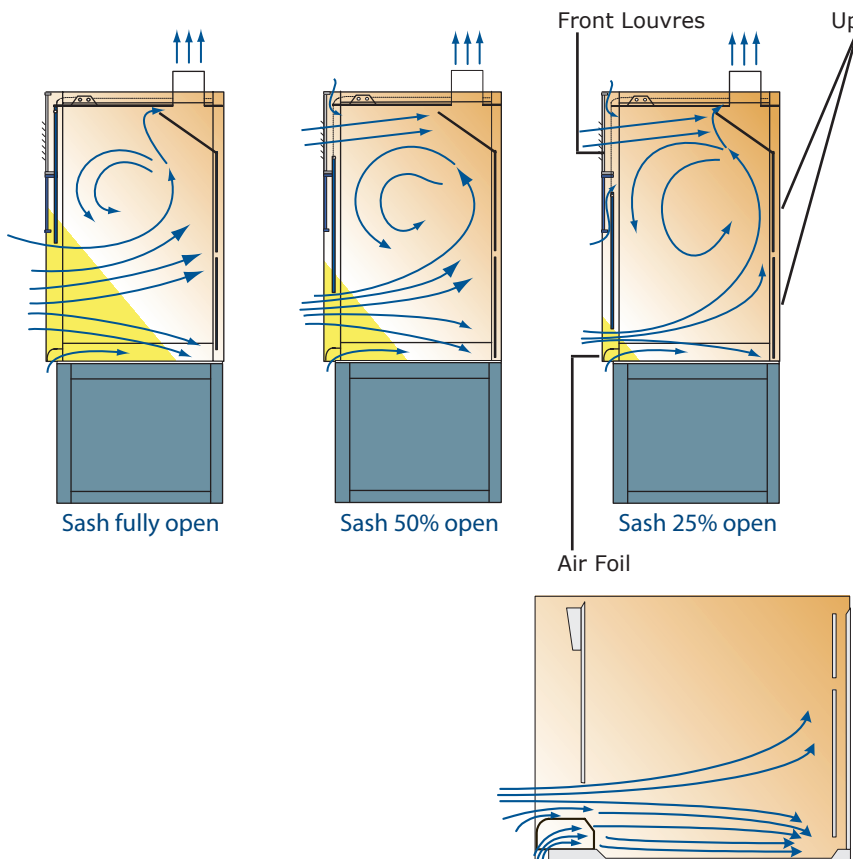
**Esco's high performance fume hood incorporates a progressive bypass airflow system that maintains superior containment at low face velocity.**

It is based on the principle of redistribution of intake air hence stabilizing the vortex. Its containment property is further enhanced with a combination of aerodynamic components - upper and lower baffle system, front louvres and steel airfoil. In combination, the system addresses high volume intake without having to increase extract volume.

**Esco's high performance fumehood offers a solution to operations that are conscious in many levels - environmental, energy conserving and economic focused.**

## PROGRESSIVE BYPASS AIRFLOW SYSTEM

The bypass system redistributes intake air when the sash is closed to prevent high velocity air streams which can cause turbulence and compromise chemical fume containment.



## COMPUTATIONAL FLUID DYNAMICS (CFD)

Leading-edge computational fluid dynamics software is used to visualize and analyse the airflow pattern in the fume hood, leading to an optimum product with an effective airflow bypass system design.

1. When sash is **fully open**, air flows in through front opening and via air foil.
2. When sash is lowered down to **50% front opening**, air flows in through front opening, gap at ceiling and front louvres.
3. When sash is lowered down to **25% front opening**, air flows through all of the above and via gap between sash and front panel.

**Air Foil** minimises undesirable air turbulence entering the hood by its aerodynamic design. Smoothens the flow of air entering through air foil across the work surface and deflects it to the lower baffle opening.

Air foil also provides room for air flow when sash is completely closed.

Esco Fume Hoods have been independently certified by Invent-UK Ltd (Hertfordshire, UK) to meet and exceed the latest safety and performance requirements of the ANSI/ASHRAE Standard 110-1995. Esco's in-house ASHRAE testing laboratory at our Research and Development facilities is fully equipped to conduct performance tests on fume hoods according to the ASHRAE standard requirements.

The ASHRAE 110-1995 Standard is one of the latest and most comprehensive methods for testing the operator safety level of fume hoods, by determining quantitatively and repeatably how well fume hoods contain the gases and vapours released in the workzone. First published in 1985 and extensively revised in 1995, the method employs the following tests to evaluate fume hood performance.

## 1. Flow Visualization

Flow visualization qualitatively tests a fume hood's ability to contain vapors. Smoke is released inside the fume hood to visually determine if a fume hood or associated ductwork leaks. The following tests are conducted:

### ► Local Smoke Visualization



Local Smoke Visualization

A stream of smoke is discharged from the stick along the left and right walls, along the joints between the walls and the work surface, behind the airfoil, above the work surface of the fume hood in a line parallel to the hood face, 6 inch/150 mm behind the face of the fume hood, along the top of the face opening, above the work surface forming an 8inch/200-mm diameter circle.

### ► Gross Smoke Visualization



Gross Smoke Visualization

Evaluates the overall cabinet airflow pattern by releasing large volume of smoke inside the fume hood using smoke candle or smoke generator.

## 2. Face Velocity Measurements

Face velocity measurements determine the average velocity of air moving perpendicular to the hood face at 25%, 50%, and 100% sash opening settings. The open face of the fume hood is divided into equal square grids with the size of no greater than 300x300mm and the velocity measurement is taken as one reading per 0.2 sec and averaged over 300 sample readings.



Face Velocity Measurement

## 3. Tracer Gas Containment

This test evaluates the containment efficiency of a fume hood by releasing SF6 (Sulphur Hexafluoride) tracer gas inside the workzone near the sash window opening at a rate of 4 liters/min. The following tests are conducted:

### ► Static Sash Tests

A mannequin, with the detector probe attached to its nose, is positioned in front, at the center of the sash opening. The SF6 ejector is positioned at the center of the work top. The gas is released and the detector is monitored for 5 minutes for traces of SF6 leakage. The test is repeated with the mannequin and

ejector positioned towards the right and left side of the fume hood. The whole procedure is then repeated for 100%, 50% and 25% sash opening.

### ► Probe Traversing Tests as Static Sash Openings

The detector probe is slowly run across the surface perimeter of the fume hood face and external joints to scan for SF6 leakage.

### ► Sash Movement Effect Tests

The sash is moved up and down with the detector in the mannequin to detect potential SF6 leakage when the sash is opened and closed rapidly.

Note: Tracer gas containment is the most stringent test method in testing the containment capability of a fume hood. Many other manufacturers rely on face velocity measurements to check for personnel protection provided by fume hoods.

Please refer to opposite page for ASHRAE test results carried out by Invent-UK on our EFH Frontier Mono fume hood



Tracer Gas Containment Test



## DESCRIPTION OF TEST ROOM FACILITIES

The tests were carried out in Invent UK's test room. The test room differential pressure, temperature relative humidity, and velocity during tests were:

- Room differential pressure: - 2Pa
- Room air temperature: 19°C -20°C
- Room air relative humidity: 39%
- Room air velocity: less than 0.1 m/s

## CONTAINMENT TESTS

Static Sash Test

Acceptance: Leakage rate shall not exceed 1ppm

At 25% sash opening	Right	< 0.005 ppm
	Center	< 0.005 ppm
	Left	< 0.005 ppm
At 50% sash opening	Right	< 0.005 ppm
	Center	< 0.005 ppm
	Left	< 0.005 ppm
At 100% sash opening	Right	0.005 ppm
	Center	0.006 ppm
	Left	< 0.005 ppm
Result		<b>Pass</b>

Probe Traversing Tests At Static Sash Openings

Acceptance: Leakage rate shall not exceed 1ppm

At 100% Sash Opening	0.698 ppm
At 50% Sash Opening	0.278 ppm
At 25% Sash Opening	0.0039 ppm
Result	<b>Pass</b>

Sash Movement Effect Tests

Acceptance: Leakage rate shall not exceed 1ppm

Mannequin on the left	Effect of Sash Opening	0.015ppm
	Effect of Sash Closing	0.012ppm
Mannequin on the center	Effect of Sash Opening	0.020ppm
	Effect of Sash Closing	0.018ppm
Mannequin on the right	Effect of Sash Opening	0.025ppm
	Effect of Sash Closing	0.016ppm
Result		<b>Pass</b>

## VELOCITY TESTS

Acceptance: Face Velocity should be within 0.4 – 0.6 m/s (80 to 120 fpm) at all points on the face of the fume hood under various sash positions.

At 100% sash opening	0.50 m/s
At 50% sash opening	0.79 m/s
At 25% sash opening	1.31 m/s
Result	<b>Pass</b>

## FLOW VISUALISATION TESTS

Local Visualisation (Low Volume Smoke) Tests

- Along the sash edge = GOOD
- Top LHS corner = GOOD
- Top RHS corner = GOOD
- Bottom LHS corner = FAIR
- Bottom RHS corner = FAIR

Large Volume Smoke Test

The entry flow to the fume cupboard is good. The internal smoke clears within less than 5 sec when the sash is open (100%) and within approx 10 sec when the sash is closed (25% open)

## PHENOLIC RESIN LAMINATES USED IN ESCO FUME HOODS

Chemical & Stain Resistance Independent Test Report Results

Reference Standard: **BS EN 438: Part 2: 1991**

A. Chemical Resistance Test

(Solutions removed after 24hours)

### Test Solutions

1. Ammonium Chloride, 10%
2. Potassium Carbonate, 10%
3. Potassium Chloride, 10%
4. Potassium Iodide, 10%
5. Sodium Carbonate, 5%
6. Chloroform
7. Carbon tetrachloride
8. Sodium Bicarbonate, 5%
9. Sodium Chloride, 5%
10. Potassium Ferricyanide, 5%
11. Trisodium Phosphate, 1%
12. Ammonium Hydroxide, 10%
13. Ethanoic Acid, 5%
14. Barium Chloride Dihydrate, 10%

### Results

- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change

B. Chemical Resistance Test

(Solutions removed after 10 minutes)

### Test Solutions

1. Silver Nitrate, 5%
2. Hydrochloric Acid, 10%
3. Sulfuric Acid, 10%
4. Nitric Acid, 10%
5. Hydrogen Peroxide, 3%
6. Saturated Calcium Hydroxide
7. Phosphoric Acid, 85%
8. Caustic soda, 10%

### Results

- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change
- No visible change

C. Chemical Resistance Test

(Solutions removed immediately after application)

### Test Solutions

1. Sulfuric Acid, 96%
2. Nitric Acid, 65%
3. Hydrochloric acid, 37%

### Results

- No visible change
- No visible change
- No visible change

The **ESCO FRONTIER DUO** high performance fumehood offers a solution to operations that are conscious in many levels - **environmental, energy conserving and economic focused**. Representing **DESIGN** and **ENGINEERING INNOVATIONS** that are at the forefront of fume hood technology providing superior containment of noxious chemical fumes at broad range of face velocity and offering much needed workzone ergonomic benefits.



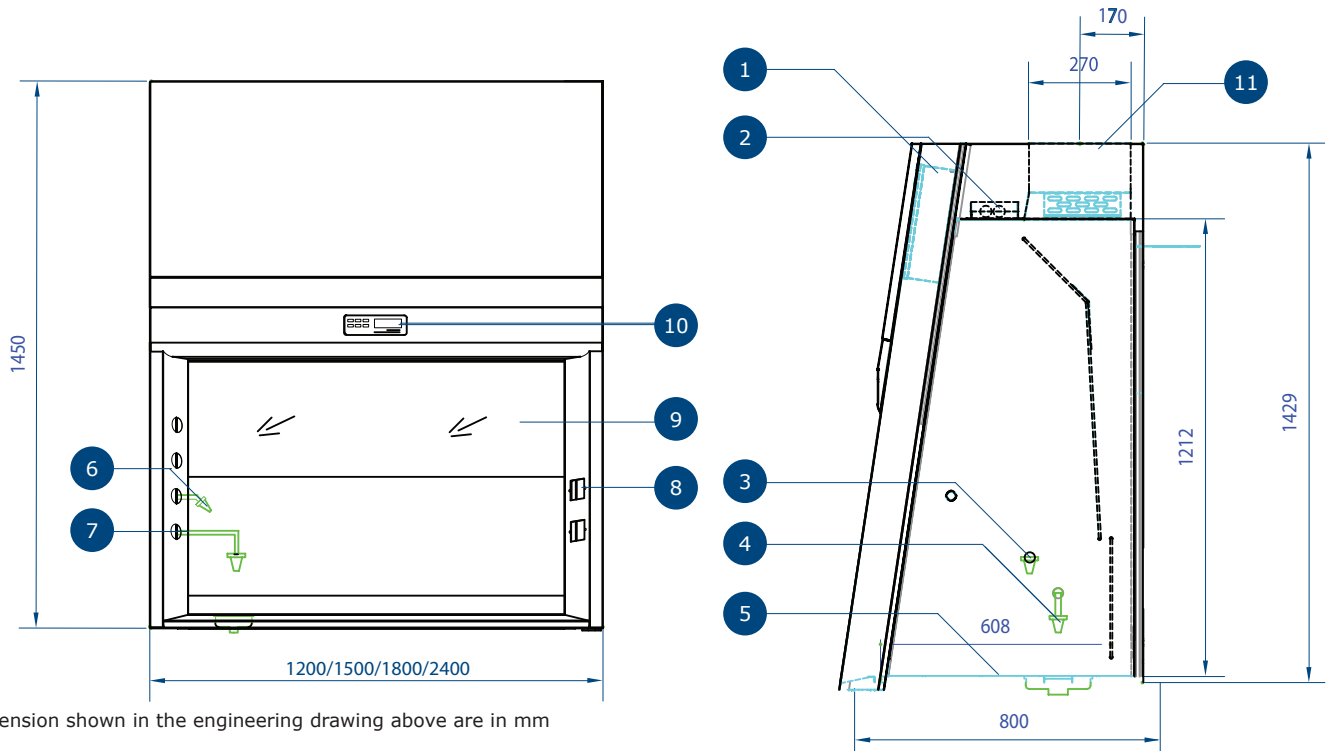
- Progressive bypass airflow system characteristic in a **high performance** fume hood provides superior containment within the workzone even at low air velocity. **Upper and lower baffle system, front louvres and aerodynamic air foil enhance redistribution system.**
- **8-degree sloped front** supports a high degree of visibility and operator comfort; angled front extends operator reach and maximizes workzone.
- **(Optional) Esco Sentinel™ Microprocessor control** is fully configurable to user requirement. Acting as an interface for the **airflow sensor**, the control provides a continuous display of inflow velocity. The microprocessor alarm system will be triggered should the inflow velocity within the workzone fall to a low level that compromises operator safety.
- **Double wall component allows service fixture remote controls and electrical outlets to be placed on opposite panels** to maximize operator safety.
- **State of the art baffle system** constructed of phenolic resin laminates delivers maximum containment by ensuring airflow uniformity throughout the main chamber of hood.
- **Corrosion-resistant epoxy powder coated electro-galvanised steel airfoil** provides a spill retention and safely ventilates fumes generated towards the front of the hood for superior operator protection.
- Integral fluorescent lighting is mounted out of the air stream for better airflow uniformity; the aerodynamic design of the enclosure ensures maximum containment possible.
- **Standard vertical rising fail safe counterbalanced sash constructed of laminated safety glass** maximizes operator safety. The safety mechanism causes sash to tilt and lock if a cable snaps.
- **Worktop is constructed of phenolic resin**, a highly corrosion-resistant material, enhancing durability by minimizing spill damage.
- Standard service fixtures include 1 water outlet, 1 gas outlet and 2 electrical outlets.
- Flat workzone with no exposed screws/metal for easy cleaning and avoid corrosion hassle.

**OPTIONS & ACCESSORIES**

- Base cabinetry is available for additional storage area in the laboratory.
- **Polypropylene drip-cup sink & epoxy-coated faucet** manufactured according to BS 2874, DIN 12898, DIN 12919 and DIN 3537. **NB: These items must be pre-fitted at the factory.**
- Motion Sensor with fixable timing for energy conservation and operator protection; when no movement is detected, sash will close for safety and light will switch off to conserve energy.
- Motorized sash window for improved operators convenience.
- Further customization is available upon request.



Electrical panel is located at the front to allow easy servicing.



\*Dimension shown in the engineering drawing above are in mm

### Engineering Details

1. Electric Box 2. Fluorescent Light 3. Service Fixture Outlet 4. Water Fixture Outlet 5. Phenolic Worktop  
6. Water Fixture Remote Control 7. Service Fixture Remote Control 8. Electrical Outlet 9. Sash Window 10. Operating Microprocessor Switch (Optional) 11. Exhaust Collar

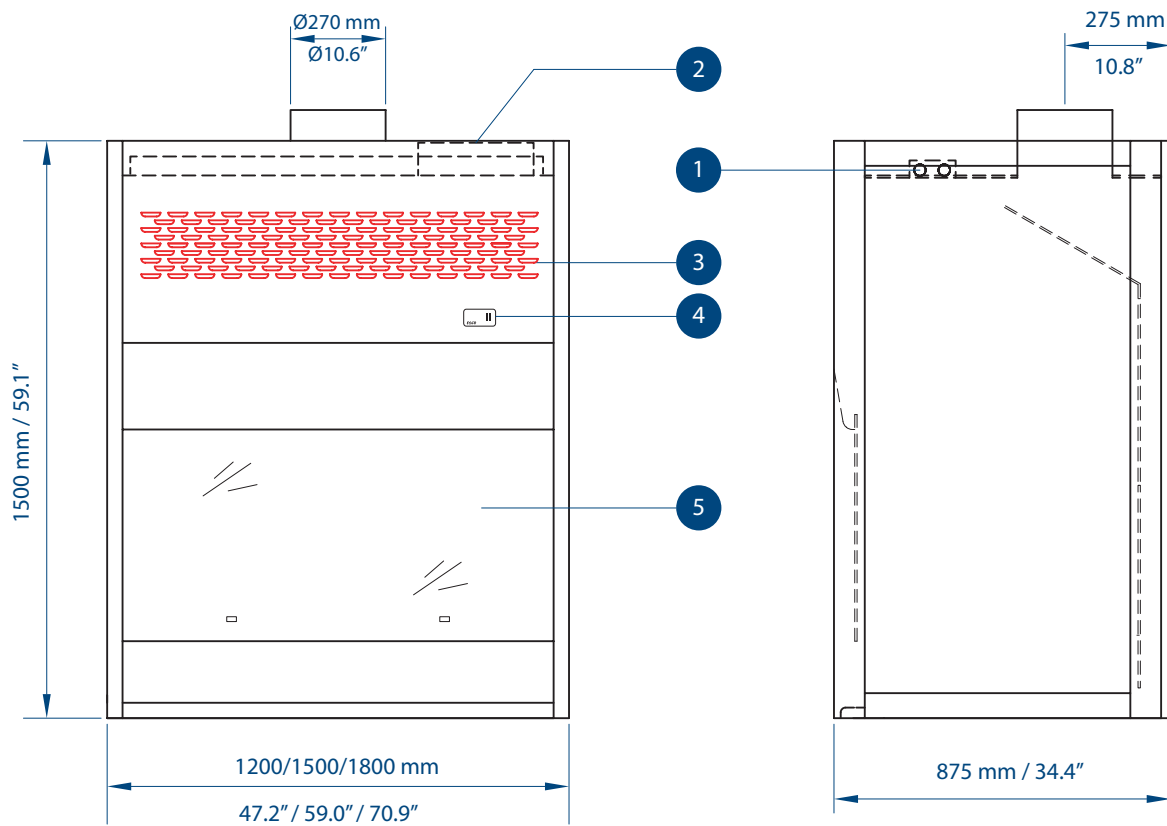
General Specifications	EFD-4XX	EFD-5XX	EFD-6XX	EFD-8XX
External Dimensions (L x D x H)	1200 x 789.2 x 1516 mm 47.2" x 31" x 59.1"	1500 x 789.2 x 1516 mm 59.0" x 31" x 59.1"	1800 x 789.2 x 1516 mm 70.9" x 31" x 59.1"	2400 x 789.2 x 1516 mm 94.5" x 31" x 59.1"
Internal Workzone Dimensions (L x D x H)	1031 x 597 x 1369 mm 40.6" x 23.5" x 53.9"	1331 x 597 x 1369 mm 52.4" x 23.5" x 53.9"	1631 x 597 x 1369 mm 64.2" x 23.5" x 53.9"	2231 x 597 x 1369 mm 87.8" x 23.5" x 53.9"
Maximum Sash Opening	630 mm / 24.8"			
Recommended Maximum and Minimum Exhaust Air Volume for minimum face velocity of 0.5m/s or 100fpm at half-open hood sash position	Max: 990 cmh / 583 cfm Min: 495 cmh / 290 cfm	Max: 1238 cmh / 729 cfm Min: 619 cmh / 365 cfm	Max: 1485 cmh / 875 cfm Min: 740 cmh / 440 cfm	Max: 1980 cmh / 1166 cfm Min: 990 cmh / 583 cfm
Exhaust Outlet Diameter	Inner: 260 mm / 10.2" • Outlet: 270 mm / 10.6"			
Light Intensity at Work Surface	780 Lux / 72 foot candelas			
Construction	Main body: Phenolic resin laminates Support frame: Aluminium extrusions with an oven-baked epoxy powder-coated finish Interior baffle system: Phenolic resin laminates			
Power Consumption	25W (Flourescent Lighting Only) / 60W (Flourescent Lighting and Microprocessor Control System)			
Power Supply	<b>Choose from the following power supply configuration codes when ordering (e.g. EFD-4A3, for 220-240VAC 60HZ)</b> 1: 220-240VAC 50HZ 2: 110-130VAC 60HZ 3: 220-240VAC 60HZ 4: 110-130VAC 50HZ 5: 100-110VAC 50HZ/60HZ			
Controller	<b>Choose from the following controller configuration codes when ordering (e.g. EFD-4A3, for simple switch)</b> A: Switch Control B: Sentinel™ Microprocessor control			
Crating Size	1230 x 840 x 1600 mm 48.4" x 33.1" x 63"	1530 x 840 x 1600 mm 60.2" x 33.1" x 63"	1830 x 840 x 1600 mm 72" x 33.1" x 63"	2430 x 840 x 1600 mm 95.7" x 33.1" x 63"
Net Weight	156 kg	195 kg	230 kg	300kg

Laboratory fume hoods are one of the most important components used to protect laboratory personnel from exposure to hazardous chemicals and agents used in the laboratory. They can provide an effective backup safety device for the containment and exhaust of toxic, offensive, or flammable materials when the containment of an experiment or procedure fails and vapours or dusts escape from the apparatus being used.



Generously-sized work room due to improved positioning of the service fixtures.

- ▶ **Industrial-grade support structure constructed of electro-galvanised steel and aluminium with a corrosion and abrasion resistant oven-baked powder-coated finish.**
- ▶ **Internal liner is constructed of phenolic resin laminates;** more corrosion-resistant and durable than other common internal liner materials (refer to page 7 of this catalogue for the chemical resistance report / test results for the phenolic resin laminate material). **Single wall design** ensures the internal workzone width is maximized.
- ▶ **Instant-start electronically ballasted 5000k lighting system** is flicker-free and the warm glow of the lighting system is comfortable to the operator's eyes during extended hours of usage. Integral fluorescent lighting is isolated from the air stream in order to increase airflow uniformity.
- ▶ **Standard vertical rising fail-safe counterbalanced sash.** The sash will tilt and lock if a cable snaps; Optionally, horizontal sliding sashes or combination horizontal / vertical sashes are available; all sashes are constructed of tempered glass for maximum operator safety.
- ▶ **State of the art baffle system** constructed of phenolic resin laminates delivers maximum containment by ensuring airflow uniformity throughout the main chamber of hood.
- ▶ **Aerodynamic design eliminates air turbulence** within the hood which can otherwise compromise containment; noise levels and static pressure losses are also minimized. Aerodynamic **curved side profile improves containment.**
- ▶ **Corrosion-resistant stainless steel airfoil** provides spill retention and safely ventilates fumes generated towards the front of the hood for superior operator protection; the curved front edge also facilitates an ergonomic working position.
- ▶ Black colour work surface resists staining. Work surface is included with *optional* base cabinet.
- ▶ Electrical system is designed to meet the latest international regulations and standards for safety.
- ▶ **Independently certified to the latest safety and performance requirements of the ANSI/ASHRAE Standard 110-1995;** when ordered with a modified control system, these units will also comply with the British / Australian / New Zealand standards BS 7258, AS 2243.8 and NZS 7203.
- ▶ Standard systems are shipped fully-assembled; however, units can also be shipped unassembled to lower freight handling costs; our industry-exclusive aluminium extrusion modular system makes re-assembly quick and efficient.



## Engineering Details

1. Fluorescent Light 2. Electrical Panel 3. Air Bypass System  
4. Simple Switches 5. Sash Window

General Specifications	EFH-4XX	EFH-5XX	EFH-6XX
External Dimensions (L x D x H)	1200 x 875 x 1500 mm 47.2" x 34.4" x 59.1"	1500 x 875 x 1500 mm 59.0" x 34.4" x 59.1"	1800 x 875 x 1500 mm 70.9" x 34.4" x 59.1"
Internal Workzone Dimensions (L x D x H)	1120 x 680 x 1200 mm 44.1" x 26.8" x 47.2"	1420 x 680 x 1200 mm 55.9" x 26.8" x 47.2"	1720 x 680 x 1200 mm 67.7" x 26.8" x 47.2"
Maximum Sash Opening	580 mm / 22.8" (standard vertical rising sash)		
Recommended Maximum and Minimum Exhaust Air Volume for minimum face velocity of 0.5m/s or 100fpm at half-open hood sash position	Max: 1170 cmh / 690 cfm Min: 585 cmh / 344 cfm	Max: 1480 cmh / 870 cfm Min: 740 cmh / 436 cfm	Max: 1795 cmh / 1055 cfm Min: 900 cmh / 530 cfm
Exhaust Outlet Diameter	Inner: 260 mm / 10.2" • Outlet: 270 mm / 10.6"		
Light Intensity at Work Surface	780 Lux / 72 foot candelas		
Construction	Main body: Phenolic resin laminates Support frame: Aluminium extrusions with an oven-baked epoxy powder-coated finish Interior baffle system: Phenolic resin laminates Airfoil: Stainless steel grade 304		
Power Consumption	25W (Fluorescent Lighting Only) / 60W (Fluorescent Lighting & Microprocessor Control System)		
Net Weight	140 kg / 310 lbs	170 kg / 370 lbs	210 kg / 460 lbs
Crating Size (unassembled hood)	1550 x 1100 x 500 mm 61.0" x 43.3" x 19.7"	1850 x 1100 x 500 mm 72.8" x 43.3" x 19.7"	2150 x 1100 x 500 mm 84.6" x 43.3" x 19.7"
Crating Size (assembled hood)	1300 x 950 x 1800 mm 51.2" x 37.4" x 70.9"	1650 x 950 x 1800 mm 64.9" x 37.4" x 70.9"	1950 x 950 x 1800 mm 76.8" x 37.4" x 70.9"
Controller	Only available in simple switch control (e.g. EFH-4A3, for simple switch)		



Specifically designed for use with Esco Fume Hoods.

Built-in black phenolic resin laminate tabletop; highly resistant to a wide variety of common laboratory acids, solvents and chemicals; phenolic resin is easy-to-clean, will not discolour, and will not corrode.

2 universal electrical socket outlets with splash-proof plastic covers are provided standard with the base cabinet. (For alternative electrical outlet options contact Esco).

1 swan-neck remote control water faucet, 1 additional multi-purpose remote control fitting for air/gas/vacuum/

water/nitrogen. Fittings are BS 2874 / DIN Standard 12920 / DIN12898 compliant.

High-quality fittings ensure long service life and increased safety; for example, our gas fittings are fitted with a safety catch that provides a visual indication of valve position; designed in accordance with recognized international standards.

High-quality built-in PP drip cup is more durable and easy-to-clean than conventional plastic cupsinks.

An opening with a cover is provided at the backwall of the cabinet for convenient plumbing installation.

Designed for ergonomics and operator comfort: the cabinet depth is 100mm less than the fume hood, providing the operator with more leg-room.

Cabinet assembly maximizes storage space in the laboratory; convenient for solvents, acids and other laboratory chemicals. Each cabinet includes an adjustable white powder-coated steel shelf for storage purposes. Cabinet door is lockable.

Industrial-grade support structure constructed of electro-galvanised steel and aluminium with a corrosion and abrasion resistant oven-baked powder-coated finish.

Internal cabinet liner is constructed of epoxy powder-coated electro-galvanised steel; more corrosion resistant and durable than other common internal liner materials.

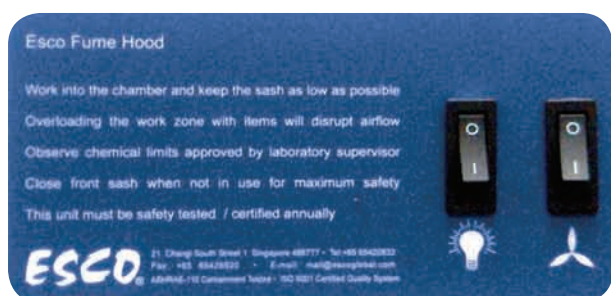
*Additional / customised service fixtures and other accessories are also available on request. Please contact Esco or your local distributor for details.*

General Specifications	EBC-4AX	EBC-5AX	EBC-6AX
External Dimensions (L x H x D)	1200 x 850 x 800 mm 47.2" x 33.5" x 31.5"	1500 x 850 x 800 mm 59.1" x 33.5" x 31.5"	1800 x 850 x 800 mm 70.9" x 33.5" x 31.5"
Construction	Electro-galvanised steel with an oven-baked white epoxy powder-coated finish		
Power Supply Options (Frontier Mono only)	<b>Choose from the following options and specify option number (e.g. EBC-4A1) when ordering</b> <b>0.</b> Frontier Duo Fume Hood Base Cabinet* <b>1.</b> 220-240VAC 50HZ, 1 phase <b>2.</b> 110-130VAC 60HZ, 1 phase <b>3.</b> 220-240VAC 60HZ, 1 phase <b>4.</b> 110-130VAC 50HZ, 1 phase <b>5.</b> 100-110VAC 50HZ / 60HZ		
Net Weight	120 kg / 260 lbs	150 kg / 330 lbs	190 kg / 420 lbs
Crating Size	1450 x 850 x 1000 mm 57.1" x 33.5" x 39.4"	1750 x 850 x 1000 mm 68.9" x 33.5" x 39.4"	2050 x 850 x 1000 mm 80.7" x 33.5" x 39.4"

\* Base cabinet for Frontier Duo Fume Hood is supplied without worktop, service fixtures and electrical sockets.

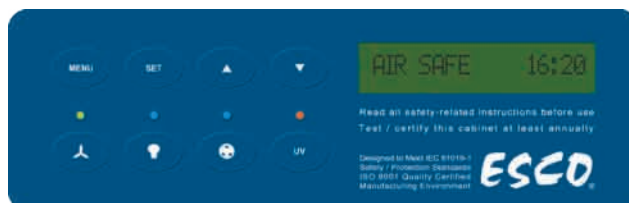
### Controller Options

#### Switch Control



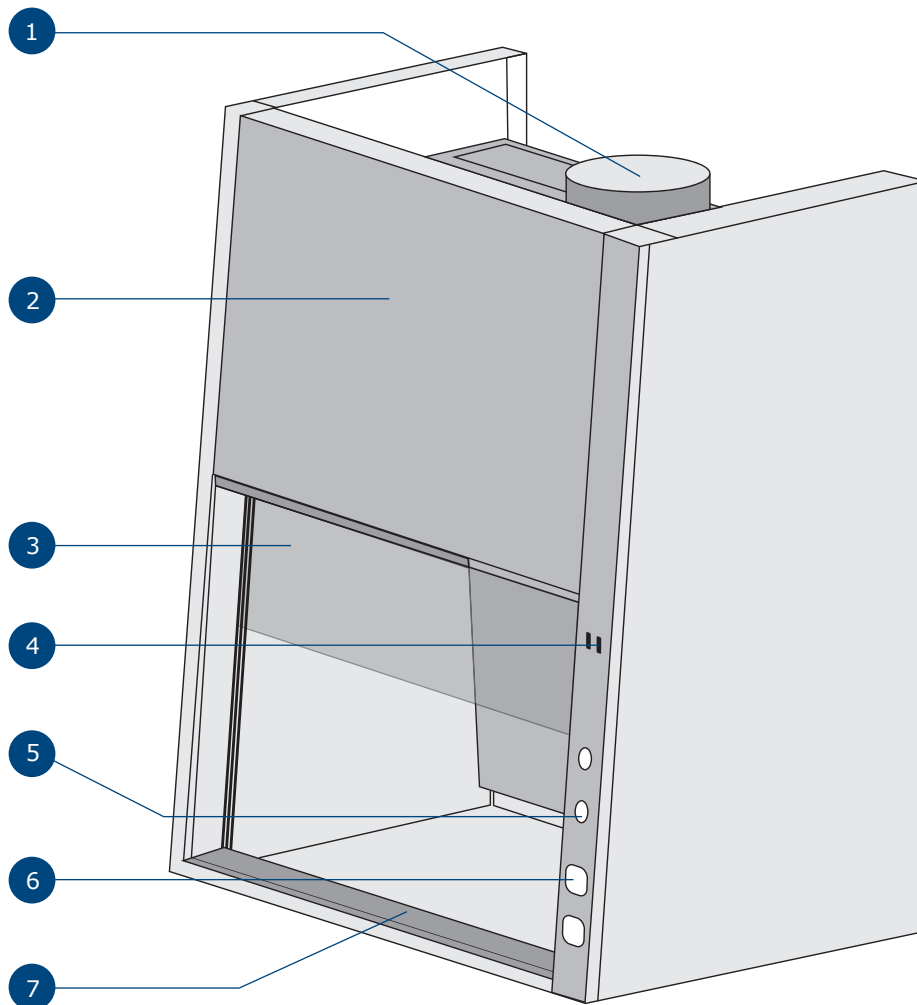
#### Sentinel™ Microprocessor control

**Esco Sentinel™ Microprocessor control** is fully configurable to user requirement. Acting as an interface for the **airflow sensor**, the control provides a continuous display of inflow velocity. The microprocessor alarm system will be triggered should the inflow velocity within the workzone fall to a low level that compromises operator safety.



The **Esco Basic Fume Hood** combines innovative features like a revolutionary back baffle design which optimizes airflow and a 8° sloped front which maximizes operator comfort. If your use is looking for a product which enhances ergonomics and operator safety, this is the product to look for.

- Combined single wall / double wall construction allows for easy installation of service fixtures on front panel.
- Revolutionary back baffle design optimises airflow & improves containment within the workzone.
- Sloped work front at 8° for operator comfort in extended operation.
- All-metal construction can be shipped unassembled; requires less storage space and reduces costly freight charges.
- Standard vertical rising fail-safe counterbalanced sash. The sash will tilt and lock if a cable snaps; Optionally, horizontal sliding sashes or combination horizontal / vertical sashes are available; all sashes are constructed of tempered glass for maximum operator safety.
- Standard service fixture includes: 1 water outlet, 1 gas outlet and 2 electrical outlets.
- Simple assembly procedure means quicker utilisation upon delivery.
- Compliant to ASHRAE 110-1995 safety standards.



**Engineering Diagram:**

1. Exhaust Collar 2. Fixture Outlet 3. Sash Window 4. Operating Switch  
 5. Fixture Outlet 6. Electrical Outlet 7. Ergonomic Airfoil

The spacious **ESCO WALK - IN FUME HOOD** is designed for large scale experiments that necessitates maximum work area. It is ideal for operators who require a large area for tall apparatus and set ups such as distillation operations, extraction apparatus or mobile set up units.

Building from the innovation of the double wall fume hood, the walk in fume hood features the same **DOUBLE WALL COMPONENT**, providing operators safety and performance benefits.

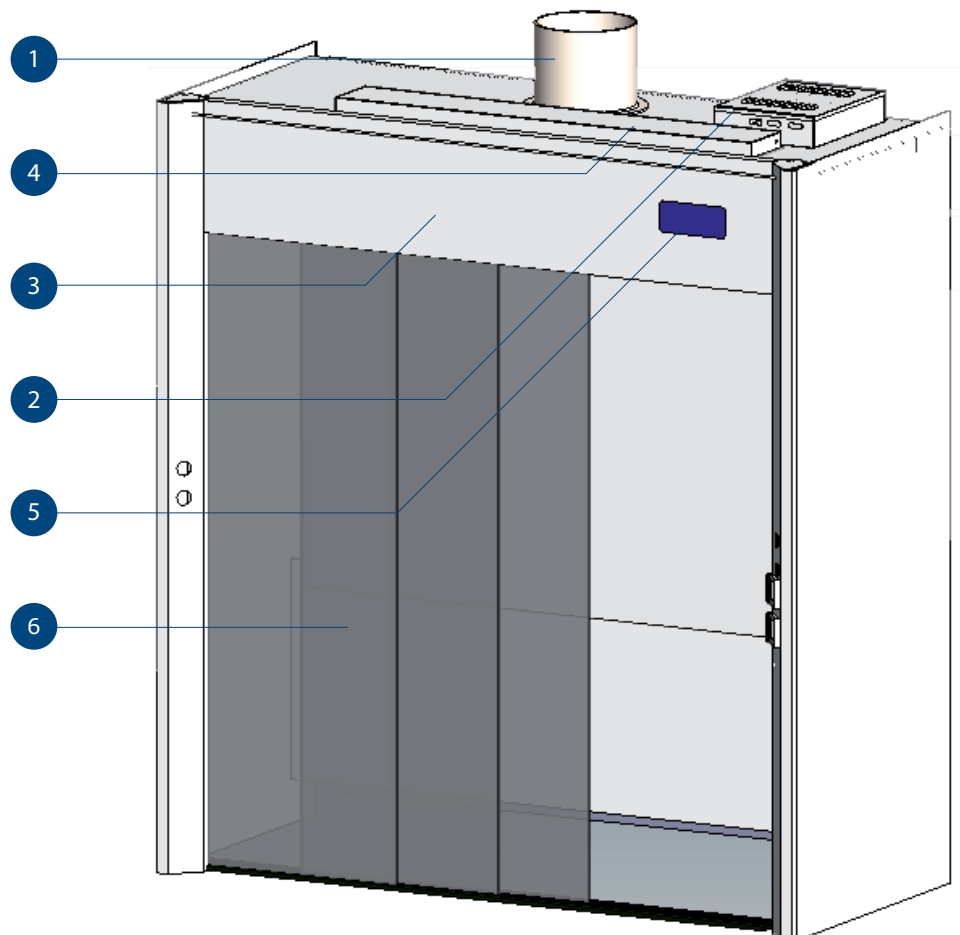
- ▶ It complies with ANSI / ASHRAE 110 - 1995 International Standard
- ▶ **Size enables operators to create a safe workzone for large scale experiments;** A cost effective alternative to constructing a safety room.
- ▶ **Double wall component allows for performance innovations.**
- ▶ **Installation of service fixtures and the routing of interior plumbing and electrical lines in the workzone area** maximizes accessibility in the workzone and minimizes operator movements; It provides a solution to bulky base cabinetry, optimizing workzone.
- ▶ **Double wall component provides a fail safe containment mechanism** preventing fume leaks outside of the workzone should the inner wall be damaged.
- ▶ Interior wall covers metal screws in the workzone construction improving **corrosion resistance** of the body.
- ▶ **Aerodynamic design eliminates air turbulence** within the hood which can otherwise compromise containment; noise levels and static pressure losses are also minimized. **Aerodynamic curved side profile improves containment.**
- ▶ Integral fluorescent lighting is mounted out of the air stream for better airflow uniformity; in addition, the aerodynamic design of the enclosure ensures maximum containment possible.
- ▶ **State of the art baffle system** constructed of phenolic resin laminates delivers maximum containment by ensuring airflow uniformity throughout the main chamber of hood.

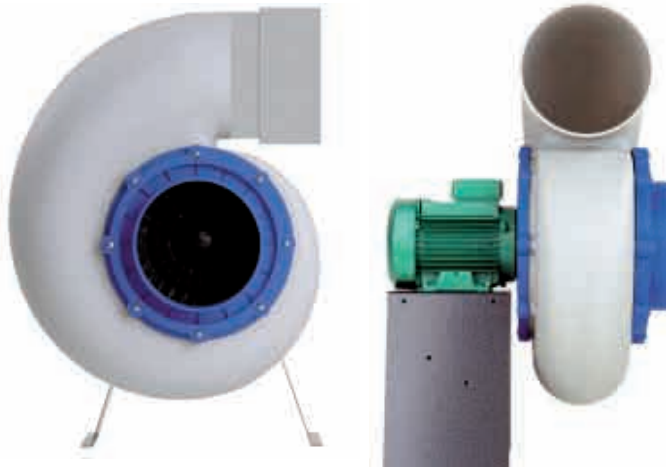
### OPTIONS & ACCESSORIES

- ▶ **Esco Sentinel™ Microprocessor control** is fully configurable to the user requirement. Acting also as a fail safe control system, it resets the system and restores the hood to safety settings in cases of failure.
- ▶ Further customization is available upon request.

### Engineering Details

1. Exhaust Collar
2. Electric Box
3. Filter
4. Fluorescent Light
5. Optional Sentinel™ Microprocessor Control
6. Horizontal Opening
7. Window Sash





- ▶ Plastic impeller and casing is highly resistant to chemicals and corrosion; specifically designed for corrosive fume hood applications.
- ▶ Single block strong high density, UV-treated and recyclable polypropylene (PPH). No welded joints. available in polypropylene (PP) construction suitable for most general fume hoods.
- ▶ Forward-curved centrifugal type impeller made of injection molded PPH. Fan wheel supplied with motor shaft bushing and hub cap constructed of PPH.
- ▶ Performance in accordance with AMCA 210-85 and ISO 5801.

General Specifications	EQR/FC-FAN-PP025	EQR/FC-FAN-PP030
Inlet / Outlet Diameters	200 mm / 7.9" internal measurements;	250 mm / 9.8" internal measurements
Motor / Fan Speeds	1450 rpm (motor)	
Power Consumption	0.37 kW	1.5 kW
Power Supply	220-240V, single phase, 50/60HZ; or 110-130V, single phase, 50/60HZ; or 220-240V/415V, 3 phase, 50/60HZ	

## FUME HOOD FAN SELECTION PROCEDURE

Calculate the air volume required by the hood; take the product of; the sash height at which minimum inflow velocity will be considered, the inflow velocity specified, the length (from side to side) of the hood.

A common inflow velocity specified is 0.5m/s or 100fpm; however, consult with your Laboratory Safety Officer for more information or contact your local Esco representative for advice on appropriate hood inflow velocities; bear in mind that a higher inflow velocity does not necessarily result in a greater factor of containment and safety.

For example, when working in metric units:

Minimum inflow velocity at sash height of 0.65 metres  
Minimum hood inflow velocity to be 0.5 m/s  
4ft hood size; internal dimensions 1.12m across

Required hood exhaust volume  
= 0.65m x 0.5ms<sup>-1</sup> x 1.12m  
= 0.364 cubic metres per second  
= 1310 cubic metres per hour

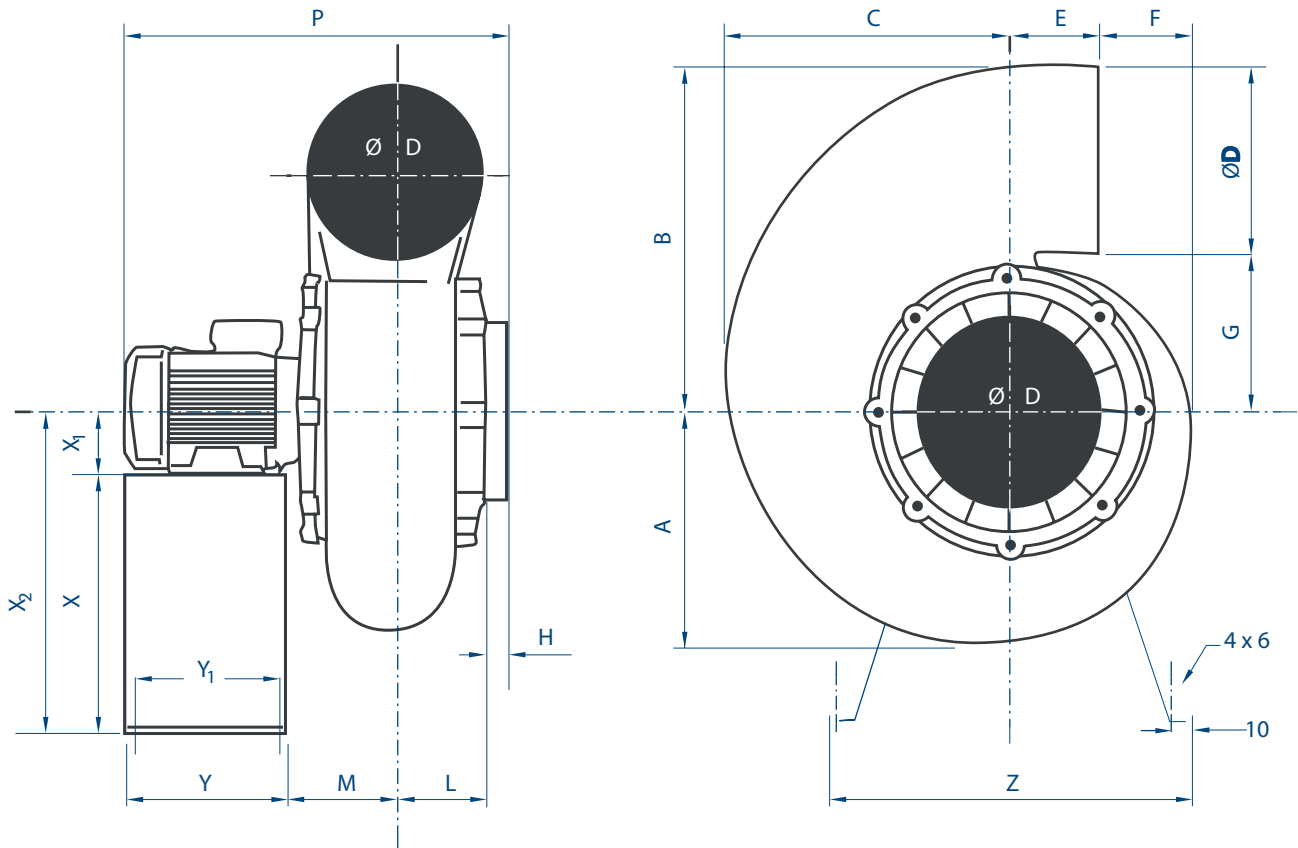
Based on the requirements of the local installation site (length of ductwork, number of elbows etc.); calculate the total system pressure loss of the ductwork run at the specified air volume.

Correlating total system pressure loss with air volume, select an appropriate fan using the performance curves; as long as fan is able to deliver required air volume at system pressure loss equal or more than the calculated value, it can be used; we recommend, however, that a 20% contingency factor be included on the theoretical system pressure loss calculation.

## AVAILABLE FAN ROTATIONS (VIEW FROM MOTOR END)

RD180 	RD 270 
RD 0 	RD 90 
LG 180 	LG 270 
LG 0 	LG 90 

**Explosion-Proof Motor Option:** Available on request; contact Esco or your local distributor for more information.



General Specifications	EQR/FC-FAN-PP025	EQR/FC-FAN-PP030
Dimensions A	248 mm / 9.8"	300 mm / 11.8"
Dimensions B	365 mm / 14.3"	450 mm / 17.7"
Dimensions C	310 mm / 12.2"	373 mm / 14.7"
Dimensions D	200 mm / 7.9"	250 mm / 9.8"
Dimensions E	103 mm / 4.1"	117 mm / 4.6"
Dimensions F	92 mm / 3.6"	112 mm / 4.4"
Dimensions G	165 mm / 6.5"	198 mm / 7.8"
Dimensions H	35 mm / 1.4"	35 mm / 1.4"
Dimensions L	95 mm / 3.7"	110 mm / 4.3"
Dimensions M	105 mm / 4.1"	120 mm / 4.7"
Dimensions Y	180 mm / 7.1"	240 mm / 9.4"
Dimensions Y <sub>1</sub>	160 mm / 6.3"	220 mm / 8.7"
Dimensions Z	420 mm / 16.5"	460 mm / 18.1"
Dimensions X	300 mm / 11.8"	370 mm / 14.6"
Dimensions X <sub>1</sub>	71 mm / 2.8"	90 mm / 3.5"
Dimensions X <sub>2</sub>	371 mm / 14.6"	460 / 18.1"
Dimensions P	430 mm / 16.9"	540 mm / 21.3"
Motor Speeds	1450 rpm	1450 rpm
Power Consumption	0.37 kW	1.5 kW
Power Supply	220-240V, single phase, 50/60HZ; or 110-130V, single phase, 50/60HZ; or 220-240V/415V, 3 phase, 50/60HZ	

**When ordering exhaust fans, please specify: desired fan rotation (see page1 of this brochure for the rotation diagrams), inlet / outlet diameters (should be the same as that of fume hood with which fan will be used), and the power supply.**

**NOTE:** Esco 4ft and 5ft Fume Hood models are equipped with a 10" diameter exhaust collar, which should use a 10" diameter ductwork to maintain low pressure loss. (12" for Esco 6ft Fume Hood models). For fans with inlet diameters smaller than the exhaust collar diameter (see Dimension D above), i.e. PP025 with 7.9" for a EFH-4AX with 10" exhaust collar, a reducer is necessary for connection. However, to maintain low pressure loss, do not install reducer with the exhaust collar. Use 10" ductwork, and install reducer at the connection of the ductwork to the exhaust fan.

**IMPORTANT: Contactor and overload are required to connect the blower to the Fume Hood. These are not provided by Esco. Please contact your local contractor for more information.**

In recent years, there has been increased emphasis on laboratory operator safety and also environmental concerns like environmental health and protection. Governments respond by setting stricter rules to control the emission and quality of exhaust fumes from industries and laboratories. Therefore more and more laboratory designers and facility operators are considering the use of scrubbers for their fume hoods.

Esco fume scrubbers are optimally designed to save space as well as provide effective air pollution control and operator safety protection for fume hoods. This is especially important for perchloric acid fume hoods, so as to prevent a build-up of potentially explosive perchlorate salts on the exhaust fan as well as on the exhaust ducting system. Specially designed to be compatible with Esco's Frontier Mono and Frontier Duo Fume Hoods.



Image 1: Top section of scrubber placed on top of the fume hood. There is an acrylic viewing panel, a packed bed, a liquid spray section as well as a demister in this unit.



Image 2: Bottom section of scrubber placed inside the base cabinet. Consists of a reservoir for scrubbing liquor and a pump which recirculates the liquor back into the system.



- 1. Filter 2. Viewing Panel 3. Filter 4. Scrubber 5. Pump
- 6. Drainage 7. Reservoir

## FEATURES

**Excellent removal efficiency:** Efficient counter-current gas/liquid contact results in 95-98% efficiency for most water-soluble acid and base laden airstreams.

**Durable:** Entire body of scrubber system made of chemical and corrosion resistant Polypropylene.

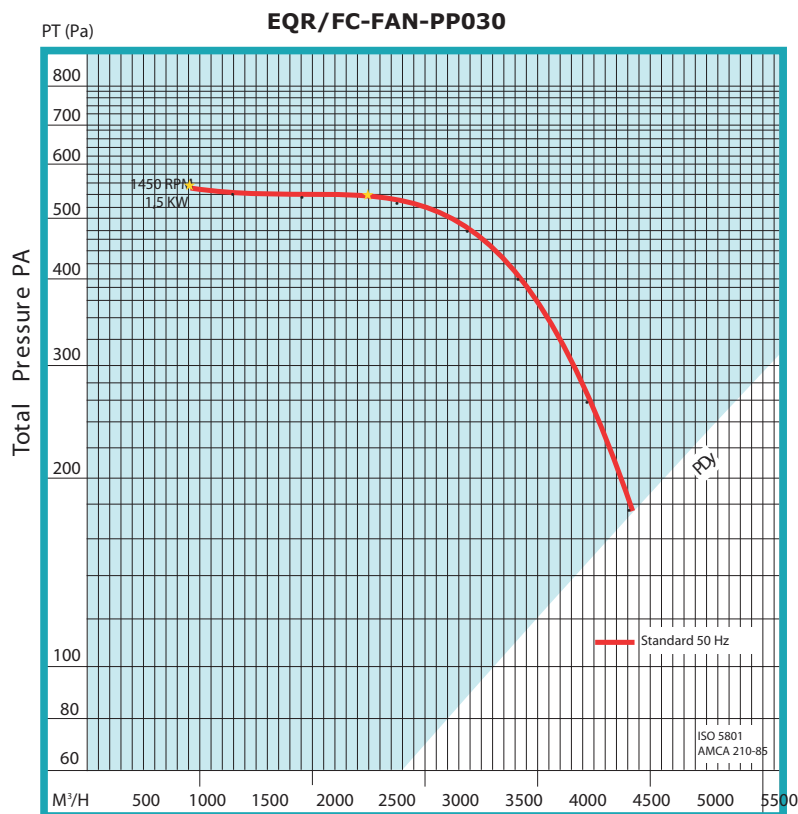
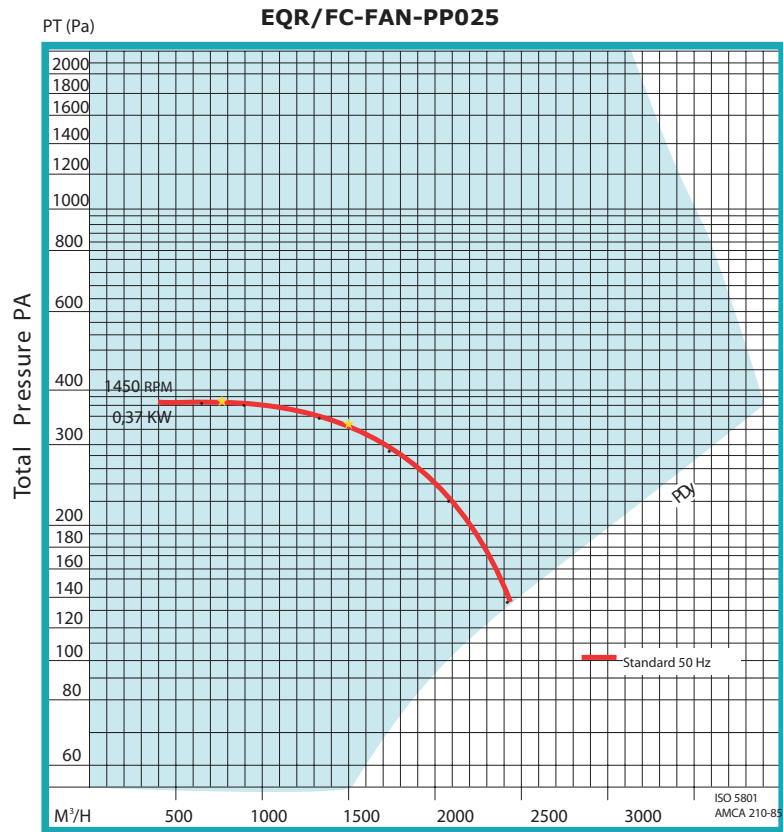
**Compact:** The packing, spray manifold and mist eliminator counted on top of fume hood, pump and reservoir in the base cabinet. This arrangement ensures that minimal extra space is required for the scrubber system.

## SCRUBBING PROCESS

Contaminated exhaust fumes from the fume hood enters the unit, passes through the packed bed (bottom filter), then through the liquid spray section, a mist eliminator (top filter) then into the exhaust system for release to the building exterior. The scrubbing liquor is collected in the reservoir in the bottom section and is recirculated by the pump back to be used in the liquid spray section.

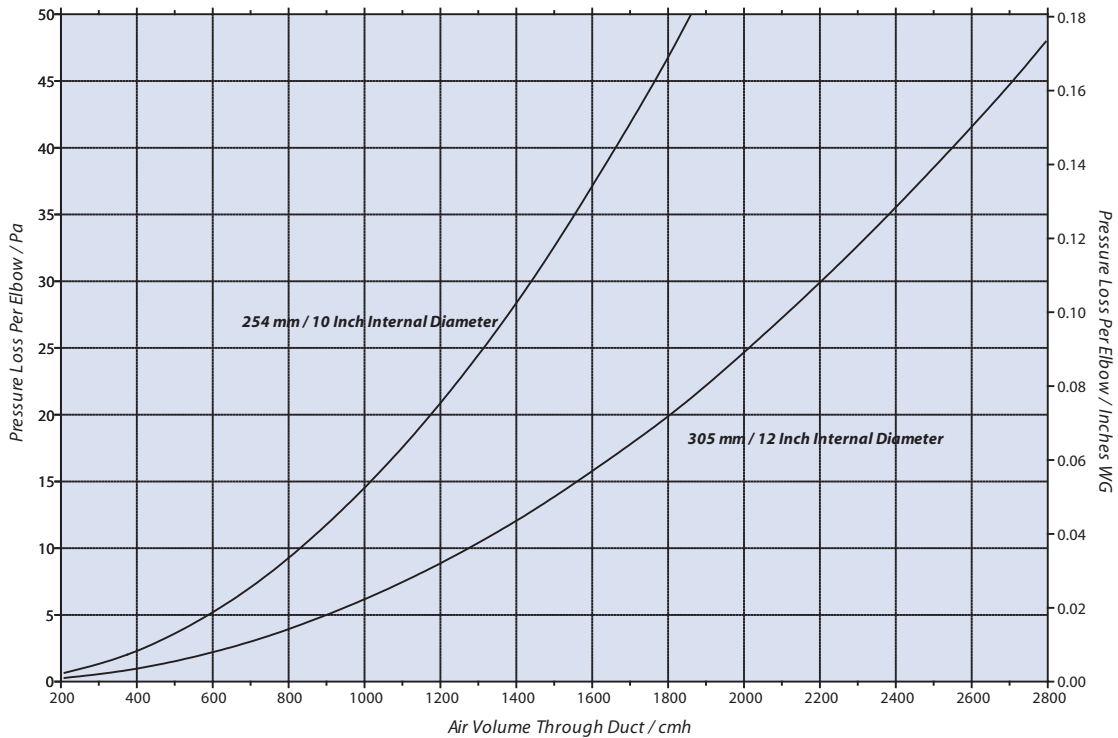
The exhaust fumes and the scrubbing liquor pass in a counter current fashion, resulting in efficient gas/liquid contact.

**Esco Fume Hood Fan Performance Curves**

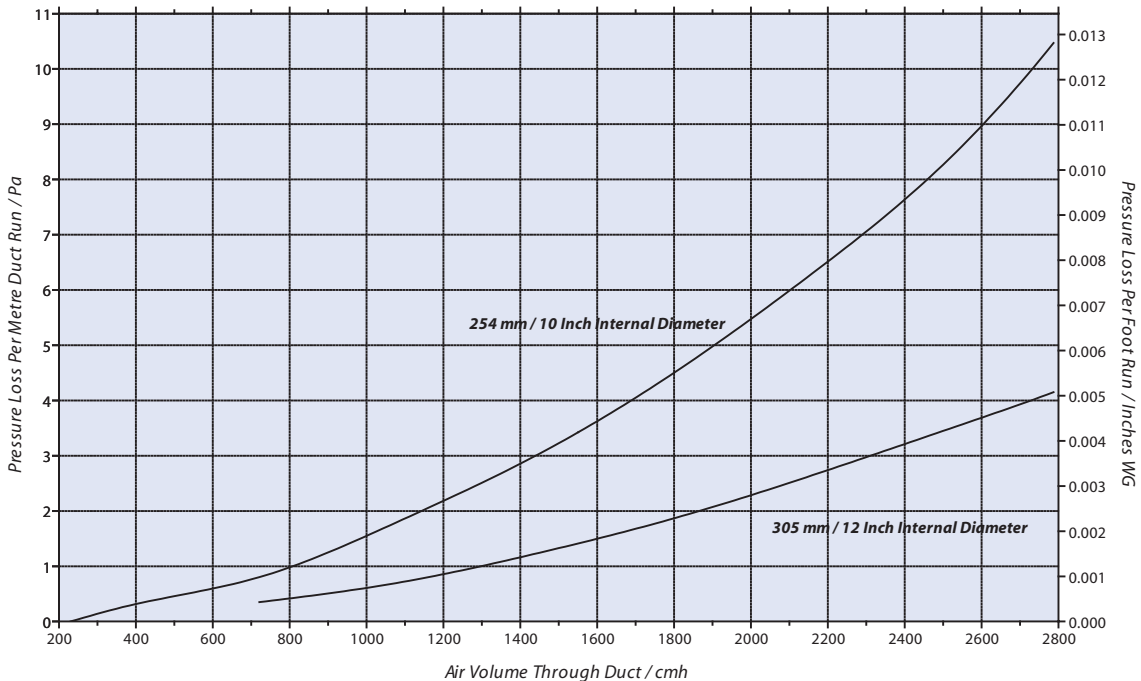


To convert cubic metres per hour (CMH) to cubic feet per minute (CFM) divide value in CMH by 1.7

**STATIC PRESSURE LOSS CHART FOR 10INCH DIAMETER 90° ELBOW BENDS**



**STATIC PRESSURE LOSS CHART FOR CIRCULAR DUCTWORK**



To convert cubic feet minute (CFM) to cubic metres per hour (CMH) multiply value in CFM by 1.7  
 Note: Charts reflect values for standard air density at sea level; approx 14° C  
 When the exhaust system is designed to operate above 610m altitude, below 0° C or above 49° C  
 The duct pressure loss obtained must be corrected for air density.  
 Ductwork in use is assumed to be typical uPVC or uncoated / galvanised steel.  
 The use of different duct materials will affect real-life static losses



Worldwide Headquarters



Esco Technologies, Inc. USA



6,038 sq.m / 65,000 sq.ft production facility



ISO 9001  
REGISTERED FIRM



ISO 14001  
REGISTERED FIRM

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