





Frontier®
Laboratory Fume Hood

Perfectly tailored solutions
for your fume containment needs

www.escolifesciences.com

ESCO LIFESCIENCES

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About Esco

Since Esco was founded in 1978, our company has earned a reputation for innovation in the worldwide laboratory equipment and pharmaceutical equipment industry. Today, Esco continues to emerge as a market leader in containment, clean air, pharmaceutical, and laboratory equipment technologies with active sales in more than 100 countries and direct company offices in the top ten geospecific markets.

From our headquarters in Singapore, Esco directs a highly efficient research, product development, manufacturing and customer service program. We are the only company in our market that is completely configured to export most of what we manufacture. Our many languages and culture, customs and traditions, and modern business management techniques blend into a single effort focusing on customer service, one customer at a time. As you learn more about Esco, you will understand why *World Class. Worldwide.* is more than a phrase. It's part of who we are, where we are from and where we are going.

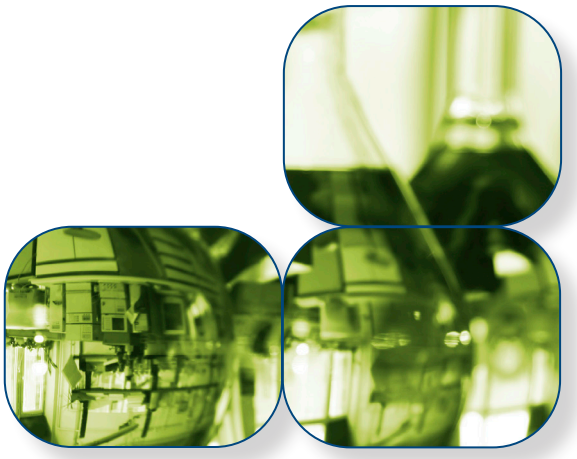
World-Class Test Facility

Esco is proud to be one of the few manufacturers in the world with a test facility capable of testing hoods to both ASHRAE 110-2016 (US) and the EN14175-3 (European) standards. Esco's Fume Hood Test Laboratory was designed with the assistance of Tintschl Engineering AG, a specialist consulting firm from Germany. It has controlled relative humidity, room temperature and pressure for optimum test conditions. Esco is also one of the few companies to routinely sample and subject production fume hoods to a battery of containment and safety tests. All custom fume hoods with modified dimensions are also tested in our laboratory to ensure containment before delivery.

Perfectly Tailored Solutions!

Fume Hoods are the primary method of exposure control in the laboratory. Their importance cannot be undermined in keeping everyone safe from exposure to toxic chemicals.

When it comes to laboratory safety, Esco has the broadest selection of specialized fume hoods in the market. Esco manufactures a wide array of sizes and configuration to guarantee that there is always an Esco fume hood that fits the level of protection that you need.



The Esco Frontier® Fume Hoods are Tested and Certified for Safety

Esco is the world-leader when it comes to offering fume hood equipment that has international compliance to both the American ASHRAE 110-2016 and European Standard EN14175. In addition, the base cabinets are also built and tested according to SEFA-8 recommended practices. This gives you the confidence that all Esco fume hoods are manufactured to provide maximum operator protection and safety.



invent-uk

ASHRAE 110-2016 : SEFA 1-2010 — Flow Containment & Instrumentation

CERTIFICATE OF TYPE TESTING IN ACCORDANCE WITH ASHRAE 110-2016

CERTIFICATE & REPORT NO: INV/ASHRAE110/795
DATE: 25th October 2017

Fume Hood Manufacturer:
Esco Micro Pte Ltd
21 Changi South Street 1
Singapore 486 777

Fume Hood Model/Type:
EFA-4
1.22m (4') wide bench-type
External Dimensions:
Height = 1400mm
Width = 1220mm
Depth = 900mm (max)
Internal Dimensions:
Height = 1230mm (max)
Width = 996mm (max)
Depth = 675mm (max)

Test Opening:
Width: 996mm
Height: 440mm

Fume Hood Flow:
Face velocity: 62lft/min (0.31m/s)
Flow rate: 320cfm (550m3/hr)

Fume Hood Containment:
At all test positions: <0.010ppm
Test opening scans: <0.050ppm
Sash movement effect: <0.010ppm

This is to certify that the fume hood described above has been type-tested in accordance with ASHRAE 110-2016, as required by SEFA 1-2010, and resulted in performance characteristics given in the corresponding test report.

Tested and Certified by: Dr A F Bicen

Invent UK Ltd, 85 Southdown Road, Harpenden, Herts AL5 1PR
T: +44 (0) 1582 461666 F: +44 (0) 1582 460077 E: info@invent-uk.com

American Standard ASHRAE 110-2016

ASHRAE110-2016 (ANSI approved) is one of the most challenging standards in the world that tests the containment efficiency of a fume hood. The efficiency is derived from the fume hood's ability to contain the released challenge gas under normal operation. The ASHRAE110-2016 test facility at Esco is constructed based on recommendation given by Invent-UK, a third party organisation that certifies fume hoods. First published in 1985 and updated in 2016, this standard employs a set of rigorous tests to evaluate hood performance such as: the flow visualization, the face velocity test, and the SF_6 containment test.

Here in Esco, we are capable of conducting the complete ASHRAE110-2016 test in our laboratory.



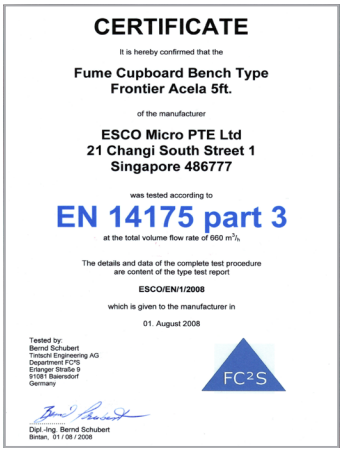
Face Velocity Measurement Test



Tracer Gas (SF_6) Containment Test



Flow Visualization Test



CERTIFICATE

It is hereby confirmed that the

Fume Cupboard Bench Type Frontier Acela 5ft.

of the manufacturer

ESCO Micro PTE Ltd
21 Changi South Street 1
Singapore 486777

was tested according to

EN 14175 part 3

at the total volume flow rate of 660 m³/h

The details and data of the complete test procedure are content of the type test report

ESCO/EN/1/2008

which is given to the manufacturer in

01. August 2008

Tested by:
Bernd Schubert
Tmschi Engineering AG
Department FC²S
Erlanger Straße 9
91081 Baiersdorf
Germany

FC²S

Dipl.-Ing. Bernd Schubert
Bintan, 01 / 08 / 2008

European Standard EN 14175

EN 14175 is a harmonized European standard which supercedes the former national standards of Germany, the UK and France. The EN14175 is comprised of a series of containment tests besides the normal face velocity tests. The containment test includes, ***the Inner Measurement Plane Test, Outer Measurement Plane Test and the Robustness of Containment Test.*** A key element of the standard is the robustness test, which simulates airflow disturbance in front of the hood.

The challenge gas which is released into the fume hood is 10% SF_6 and 90% N_2. A set of sampling probes is positioned at various predetermined locations to monitor SF_6 escaping from the hood.



Inner Grid Test



Outer Grid Test



Robustness Test

SEFA-8 Test on Frontier® Acela™ Base Cabinet (EBA)

No.	Type of Test	Test Result
1	Cabinet load test	PASS
2	Cabinet concentrated load test	PASS
3	Cabinet torsion	PASS
4	Cabinet submersion test	PASS
5	Door hinge test	PASS
6	Door impact test	PASS
7	Door cycle test	PASS
8	Chemical spot test	PASS
9	Hot water test	PASS
10	Impact test	PASS
11	Paint adhesion on steel	PASS
12	Paint hardness on steel	PASS

The Scientific Equipment and Furniture Association (SEFA)

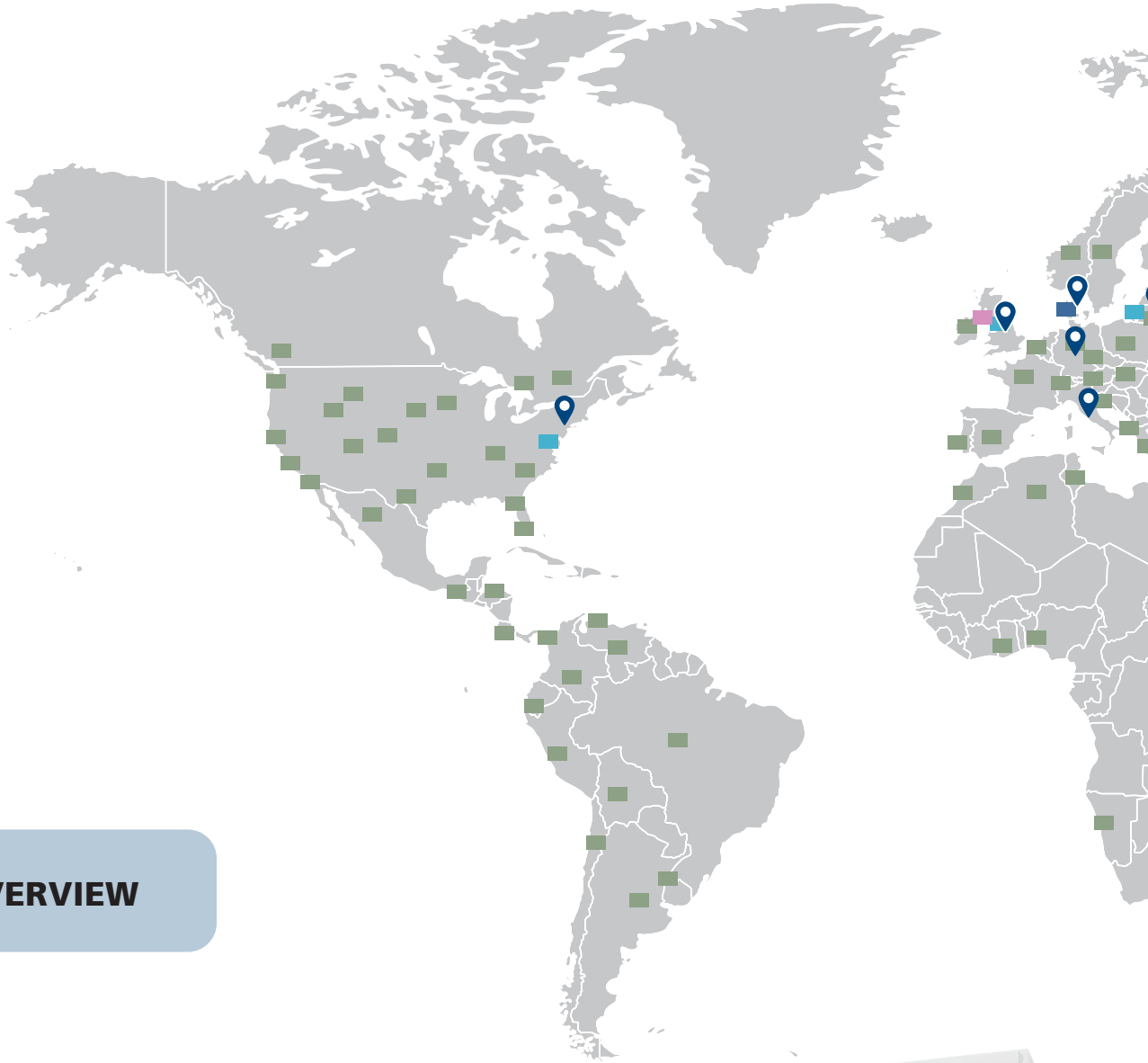
SEFA is a voluntary international trade association representing members of the laboratory furniture, casework, fume hood and related industry. The Association was founded to promote this rapidly expanding industry and to improve the quality, safety and timely completion of laboratory facilities in accordance with customer requirements. The tests recommended by SEFA-8 are shown on the table on the left side.



Actual photo during Cabinet Load Testing



Actual photo during Door Hinge Test



PRODUCT OVERVIEW



Frontier® Mono™

- Single wall design
- Worktop and service fixtures are installed on the base cabinet
- No sash sloping
- Phenolic resin liner and baffle
- Available sizes: 4, 5 and 6 ft



Frontier® Duo™

- Dual wall design
- With black color phenolic resin worktop
- Has service fixtures added: 1 remote-controlled gas fixture and 1 swan-neck faucet
- Ergonomic 8° sloped front sash
- Available sizes: 4, 5, 6 and 8 ft



Frontier® Acela™

- Tri-wall design
- Low energy-consumption, high performance fume hood
- 5° sloped front sash design
- Superior containment at 0.3 m/s face velocity
- Available sizes: 4, 5, 6 and 8 ft



Frontier® Acid Digestion™

- Designed for acid-digestion applications (except perchloric acid)
- Built with u-PVC internal surface and polycarbonate sash to prevent etching from Hydrofluoric Acid
- Available sizes: 4, 5, 6 and 8 ft

Note: *MCB is not included with the fume hoods. Fume hoods require an external blower (sold separately).*





Frontier® Perchloric™

- Ideal when handling hot perchloric acid and nitric acid
- Built with seamless stainless steel interior chamber
- Equipped with a wash down system
- Available sizes: 4, 5, 6 and 8 ft



Frontier® Radioisotope™

- Designed for handling radioactive materials
- Full stainless steel interior for easy cleaning and decontamination
- Available sizes: 4, 5, 6 and 8 ft



Frontier® Acela™ M Series

- Designed specifically for users in the mining industry
- Provides the highest level of containment and protection against highly corrosive chemicals at high temperature
- With European-made ceramic worktop
- Available sizes: 4, 5, 6 and 8 ft



Frontier® Floor Mounted™

- Designed to provide comfortable space when dealing with large apparatus and containers of hazardous materials.
- Can be reconfigured as a distillation hood by adding optional low-height base cabinet and distillation grids
- Available sizes: 4, 5, 6 and 8 ft



Frontier® PPH™

- Designed to provide the highest level of protection and containment against highly corrosive acids
- Full polypropylene interior and exterior makes it metal free and suitable for trace metal analysis
- Rust-free
- Available sizes: 4, 5, 6 and 8 ft

Frontier® MONO™

General Purpose Laboratory Fume Hood

The Frontier® Mono™ fume hood is the most basic of all Esco ducted fume hoods with a single wall construction designed for a fully maximized internal work zone. This hood is generally applicable for common laboratory applications such as boiling, evaporation, drying and other applications that emit noxious fumes and vapors.

Aesthetics and Ergonomic Design

- Complementary neutral white with blue accent blends the hood with any casework, metal or wood.

Designed for Safety and Optimum Performance

- Has a vertical-rising sash constructed of tempered glass with fail-safe counterbalanced mechanism.
- More savings with its energy-efficient hood lighting.
- Certified according to ANSI/ ASHRAE 110-2016 standard, assuring you of a safe and reliable laboratory fume hood.

Aerodynamic Foil Entry

- Grade 304 SS airfoil safely ventilates fumes generated towards the back of the hood for superior operator protection.
- Helps reduce turbulence and eliminate airflow.



CERTIFICATE OF TYPE TESTING IN ACCORDANCE WITH ASHRAE 110-2016

CERTIFICATE & REPORT NO: INV/ASHRAE110/799

DATE: 30th October 2017

Fume Hood Manufacturer:
Esco Micro Pte Ltd
21 Changi South Street 1
Singapore 486 777

Fume Hood Model/Type:
EFH-4
1.2m (4') wide bench-type

Test Opening:
Width: 1120mm
Height: 440mm

Fume Hood Flow:
Face velocity: 99ft/min
Flow rate: 590cfm

Fume Hood Containment:
At all test positions: <0.010ppm
Test opening scans: <0.050ppm
Sash movement effect: <0.010ppm

This is to certify that the fume hood described above has been type-tested in accordance with ASHRAE 110-2016, as required by SEFA 1-2010, and resulted in performance characteristics given in the corresponding test report.

Tested and Certified by: Dr A F Bicen

Invent UK Ltd, 85 Southdown Road, Harpenden, Herts AL5 1PR
T: +44 (0) 1582 461666 F: +44 (0) 1582 460077 E: info@invent-uk.com

EFH is ASHRAE 110-2016 certified



Single Wall Construction with Isocide™

- Constructed of EG steel and aluminum with Isocide™ powder coating for maximum corrosion resistance.
- Single wall design provides a fully maximized internal work zone.

Superstructure Design

- Internal liner and baffle system is made of phenolic resin laminates for durability and corrosion resistance.
- Removable baffles for easy servicing.

Base Cabinet

- Has built-in dished black phenolic resin laminate tabletop, four electrical socket outlets and polypropylene drip cup.

Optional Accessories:



Service Fixture

Guide to Models, Frontier® Mono™ Fume Hoods

EFH- ___ A ___

External Width	Code	Internal Depth	Code	Electrical Code	Code
1220 mm (48.0")	**4**	682 mm (26.9")	**A**	220-240 VAC, 50/60 Hz, 1Ø	**8**
1500 mm (59.0")	**5**			110-120 VAC, 50/60 Hz, 1Ø	**9**
1800 mm (70.9")	**6**				

General Specifications, Frontier® Mono™ Fume Hoods

Model	220-240 VAC, 50/60 Hz, 1Ø	EFH-4A8 2090135	EFH-5A8 2090142	EFH-6A8 2090148
	110-120 VAC, 50/60 Hz, 1Ø	EFH-4A9 2090314	EFH-5A9 2090315	EFH-6A9 2090147
Nominal size		1.2 meter (4')	1.5 meter (5')	1.8 meter (6')
External Dimensions (W 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 Work Area, Dimensions (W x D x H)		1120 x 682 x 1435 mm (44.1" x 26.9" x 56.5")	1420 x 682 x 1435 mm (55.9" x 26.9" x 56.5")	1720 x 682 x 1435 mm (67.7" x 26.9" x 56.5")
Exhaust Volume / Static Pressure Required Face Velocity of 0.5 m/s (100 fpm) at Full Open Sash		1109 cmh at 68 Pa (653 cfm at 0.27" WG)	1406 cmh at 80 Pa (827 cfm at 0.32" WG)	1703 cmh at 88 Pa (1002 cfm at 0.34" WG)
Exhaust Outlet Diameter and Material		250 mm (10.0"), PVC	250 mm (10.0"), PVC	305 mm (12.0"), PVC
LED Light Intensity		791 lux (73.5 foot-candles)	1011 lux (94 foot-candles)	1231 lux (114 foot-candles)
Construction	Main Body	EG steel with aluminum and oven-baked Epoxy-polyester hybrid Isocide™ powder coating		
	Internal Liner	Esco Resinate™ 4 mm Phenolic Resin Laminates		
	Interior Baffle System	Esco Resinate™ 6 mm Phenolic Resin Laminates		
	Airfoil	Stainless Steel grade 304		
	Worktop	No built-in worktop for the fume hood unit. The phenolic dished work top is included with the base cabinet		
Sash Specification	Sash material	Frameless tempered safety glass		
	Sash configuration	Vertical		
	Sloping	No sloping		
	Maximum Sash Opening	550 mm (21.7")		
Power Consumption		25 W (LED Lighting Only)		
Electrical*	Cabinet Full Loads Amps (FLA)	7 A		
	Optional Outlets (FLA)	6 A		
	Cabinet Nominal Power	60 W	100 W	
	Cabinet BTU/Hr	205	341	
Controller		Rocker Switches		
Net Weight**		120 Kg (264 lbs)	155 Kg (342 lbs)	180 Kg (397 lbs)
Shipping Weight**		199.0 Kg (439 lbs)	210.0 Kg (463 lbs)	226.3 Kg (499 lbs)
Shipping Dimensions, Maximum (W x D x H)**		1300 x 950 x 1940 mm (51.2" x 37.4" x 76.4")	1650 x 950 x 1940 mm (65.0" x 37.4" x 76.4")	1950 x 950 x 1940 mm (76.8" x 37.4" x 76.4")

**The maximum rating of all the electrical outlets combined is 5 Amperes. Please contact Esco if you need electrical outlets with higher capacity.*
Note: EFB only shipped unassembled, minimum order quantity is 2 units per size, units can be double / triple stacked on a pallet.
*** Cabinet BTU = Cabinet nominal power x 3.41214*
****Fume hood unit only. Excludes base cabinet/ optional stand.*

Frontier® DUO™

General Purpose Laboratory Fume Hood

The Esco Frontier® Duo™ Fume Hood is an upgraded version of its predecessors representing design and engineering innovations that are at the forefront of fume hood technology. It has a rugged dual wall construction offering a much robust design that allows service fixtures and electrical outlets to be mounted on both sides of the wall.

Elegant Aesthetics

- Complementary color scheme (neutral white with blue accents) blends the hood with any casework, metal or wood. Enhanced visibility with minimal glare and reflections.
- Color temperature is tuned to provide a gentle and comfortable work environment for the user.

Sentinel™ Silver Microprocessor (Optional)

- Supervises hood functions such as hood airflow.
- Provides audible and visual alarms for low airflow and/ or unsafe sash positions.



CERTIFICATE OF TYPE TESTING IN ACCORDANCE WITH ASHRAE 110-2016

CERTIFICATE & REPORT NO: INV/ASHRAE110/792
DATE: 20th October 2017

Fume Hood Manufacturer:
Esco Micro Pte Ltd
21 Changi South Street 1
Singapore 486 777

This is to certify that the fume hood described above has been type-tested in accordance with ASHRAE 110-2016, as required by SEFA 1-2010, and resulted in performance characteristics given in the corresponding test report.

Tested and Certified by: Dr A F Bicen

Invent UK Ltd, 85 Southdown Road, Harpenden, Herts AL5 1PR

EFD is ASHRAE 110-2016 certified



Dual Wall Construction Coated with Isocide™

- Made of EG steel with hybrid Isocide™ powder coating for long term chemical abrasion and weathering resistance.

Perfect Pitch Profile

- 8° sloping of the front sash allows users to work further into the hood without strain.
- Enhanced visibility with minimal glare and reflections.

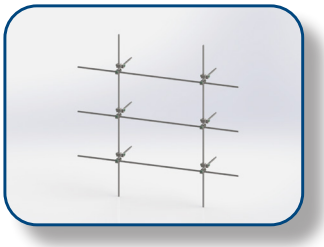
Built-in Worktop

- Dished worktop provides spill retention and is made of phenolic resin, a highly corrosion-resistant material.

Optional Accessories:



Base Cabinet (EBD)



Distillation Grid



Service fixtures



Sentinel™ Silver Microprocessor

Esco Sentinel™ Silver Microprocessor Control System



Menu Button
- Provides access to Settings, Admin Pin, and Calibration

Exhaust Blower Button
-Turns the blower on/ off.

Lamp button
-Turns the lamp on and off

Socket Button
- Turns electrical socket on and off

UV function not applicable

LCD Display
- Graphical Interface indicates hood performance.

Up and Down Button
-Adjusts value inside menu options
-Moves the sash window upward and downward (for motorized sash only)

Guide to Models, Frontier® Duo™ Fume Hoods

EFD - 4 - A - 8

External Width	Code	Controller	Code	Electrical	Code
1200 mm (47.2")	4	Rocker Switches	A	220-240 VAC, 50/60 Hz, 1Ø	8
1500 mm (59.0")	5	Sentinel™ Silver Microprocessor Control System	B	110-120 VAC, 50/60 Hz, 1Ø	9
1800 mm (70.9")	6				
2400 mm (94.5")	8				

General Specifications, Frontier® Duo™ Fume Hoods

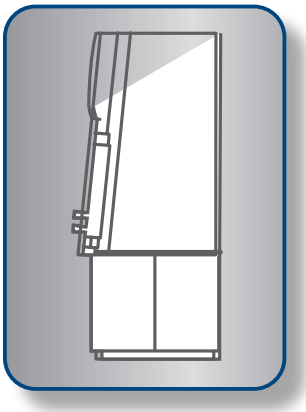
Model	220-240 VAC, 50/60 Hz, 1Ø	EFD-4A8 2090098	EFD-4B8 2090105	EFD-5A8 2090311	EFD-5B8 2090114	EFD-6A8 2090120	EFD-6B8 2090312	EFD-8A8 2090128	EFD-8B8 2090132
	110-120 VAC, 50/60 Hz, 1Ø	EFD-4A9 2090097	EFD-4B9 2090103	EFD-5A9 2090109	EFD-5B9 2090113	EFD-6A9 2090119	EFD-6B9 2090124	EFD-8A9 2090524	EFD-8B9 2090523
Nominal size		1.2 meter (4')		1.5 meter (5')		1.8 meter (6')		2.4 meters (8')	
External Dimensions (W x D x H)		1200 x 790 x 1500 mm (47.2" x 31.1" x 59.0")		1500 x 790 x 1500 mm (59.0" x 31.1" x 59.0")		1800 x 790 x 1500 mm (70.9" x 31.1" x 59.0")		2400 x 790 x 1500 mm (94.5" x 31.1" x 59.0")	
Internal Work Area, Dimensions (W x D x H)		1000 x 592 x 1259 mm (39.4" x 23.3" x 49.6")		1300 x 592 x 1259 mm (51.2" x 23.3" x 49.6")		1600 x 592 x 1259 mm (63" x 23.3" x 49.6")		2200 x 592 x 1259 mm (86.6" x 23.3" x 49.6")	
Exhaust Volume/ Static Pressure Required Face Velocity of 0.5 m/s (100 fpm) at Full Open Sash		1074 cmh at 41 Pa 632 cfm at 0.16" WG		1461 cmh at 52 Pa 860 cfm at 0.21" WG		1798 cmh at 71 Pa 1058 cfm at 0.29" WG		2483 cmh at 95 Pa 1462 cfm at 0.38" WG	
Exhaust Outlet Diameter and Material		305 mm (12"), EG Powdercoat							
Number of Exhaust Collars		1		1		1		2	
LED Light Intensity		800 lux (74.3 foot-candles)							
Construction	Main Body	EG steel with oven-baked Epoxy-polyester hybrid Isocide™ powder coating							
	Internal Liner	Esco Resinate™ 4 mm Phenolic Resin Laminates							
	Internal Baffle system	Esco Resinate™ 6 mm Phenolic Resin Laminates							
	Worktop	Phenolic Resin							
Sash Specification	Sash Material	Frameless 6 mm tempered safety glass							
	Sash Configuration	Vertical							
	Sloping	8° slope							
	Maximum Sash Opening	550 mm (21.7")							
Power Consumption		25 W (LED Lighting Only) / 60 W (LED Lighting and Microprocessor Control System)							
Electrical*	Cabinet Full Load Amps (FLA)	7 A	6 A	7 A	6 A	7 A	6 A	7 A	6 A
	Cabinet BTU/Hr**	205	341	341	341	341	341	410	341
Net Weight* **		157 Kg (346 lbs)		181 Kg (399 lbs)		205 Kg (452 lbs)		283 Kg (624 lbs)	
Shipping Weight* **		212 Kg (467 lbs)		243 Kg (536 lbs)		287 Kg (633 lbs)		294 Kg (648 lbs)	
Shipping Dimensions, Maximum* (W x D x H)**		1300 x 950 x 1940 mm (51.2" x 37.4" x 76.4")		1600 x 950 x 1940 mm (63.0" x 37.4" x 76.4")		1950 x 950 x 1940 mm (76.8" x 37.4" x 76.4")		2500 x 950 x 1940 mm (98.4" x 37.4" x 76.4")	

**The maximum rating of all the electrical outlets combined is 5 Amp. Please contact Esco if you need electrical outlets with higher capacity.*
***Cabinet BTU = Cabinet nominal power x 3.41214*
****Fume hood unit only. Excludes base cabinet/ optional stand.*

Frontier® ACELA™

High Performance Fume Hood

The Esco Frontier® Acela™ Fume Hood is a high performance, low flow fume hood engineered for safety, performance and energy efficiency, all combined in one multi-featured product. Its ability to operate at a reduced face velocity of 0.3 m/s allows for an exhaust volume reductions of up to 58% as compared to a conventional fume hood. This directly translates to more savings for your company.



Perfect Pitch Profile

- 5° Face Pitch ergonomically allows users to work further into the hood without strain.
- Ergonomic design is anthropometrically proven.



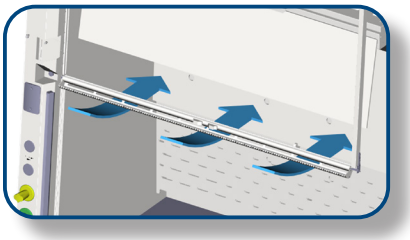
High Sight Line

- High sight line of 846 mm (33.3") for enhanced visibility.



Acela™ Shaping Vanes

- Improves containment by increasing airflow "sweep" at the critical area.



Ergonomic Sash Handle

- Gently directs air into the hood without sacrificing visibility.



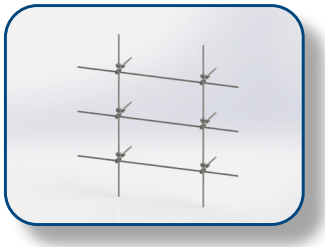
Optional Accessories:



Base Cabinet (EBA)



Circuit board protection



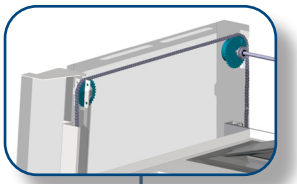
Distillation grid



Service fixtures

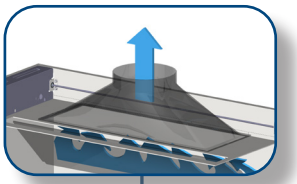
Standards Compliance	Chemical Fume Containment	Electrical Safety
	ANSI/ASHRAE 110-2016, USA EN 14175, Europe	CAN/CSA-22.2, No.61010-1 EN-61010-1, Europe IEC-61010-1, Worldwide





Chain and Sprocket Sash Support System

- The unique design provides a robust stream of bypass air into the hood cavity.



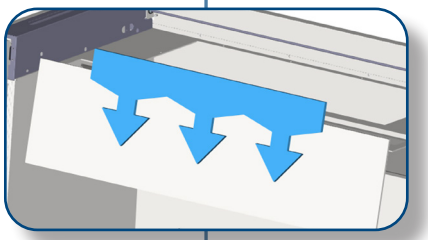
Tempered Fiber Glass Exhaust Collar

- Enhances airflow uniformity.



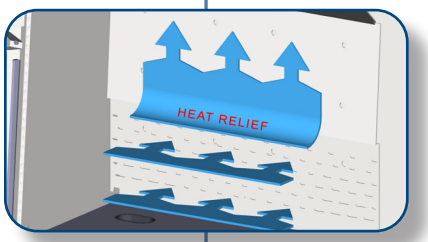
Functionally Robust Bypass

- The unique design provides a robust stream of bypass air into the hood cavity.



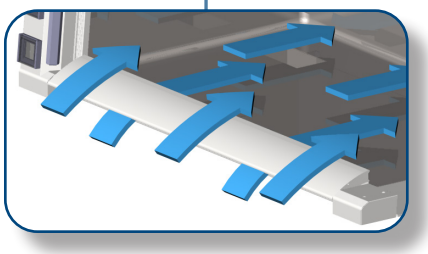
Hot Zone Baffles

- The unique Hot Zone Baffle design draws most contaminants back in single pass displacement of the air. Thermal heat relief is quickly achieved.



Aerodynamic Foil Entry

- Provides maximum airflow "sweep" on the critical boundary layer.
- Helps reduce turbulence and eliminate backflow.



Tri-wall Construction Coated with Isocide™

- Built for maximum robustness and for long term chemical abrasion and weathering resistance.



Scrubber



Worktop



Sentinel™ XL Airflow Alarm



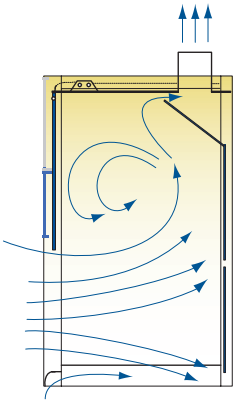
Support Stand (ASL)

Computational Fluid Dynamics

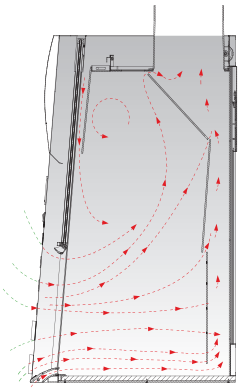
Computational Fluid Dynamics (CFD) modelling is employed in the development of Esco clean air and containment devices. Laminar Topography™ on Frontier® Acela™ Fume Hoods was developed with computational fluid dynamics modelling in the Esco Research and Development Center. The main thrusts of the project were improved airflow uniformity, enhanced safety, reduction in noise levels, and energy consumption.

First, engineering teams conceptualized possible designs, and, instead of building physical models, utilized CFD to simulate airflow patterns, pressurizations and visualize possible areas of turbulence. This allowed a large number of iterations of the airfoil, sash handle, baffle, bypass and exhaust collar to be evaluated. Finally, physical prototypes were constructed, tested, and the best design combination selected for production.

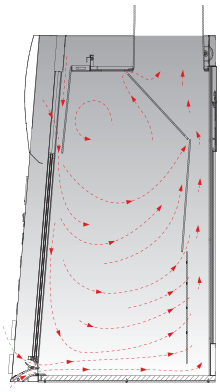
CFD has allowed us to effectively reduce the vortex in conventional fume hood designs to the minimum, resulting in a safe yet energy-saving fume hood design.



Conventional Fume Hood



Frontier® Acela™ *High Performance Low Flow Fume Hood (Design Opening)*



Frontier® Acela™ High Performance Low Flow Fume Hood (Full Close)

Conventional Fume Hoods are Energy Spenders

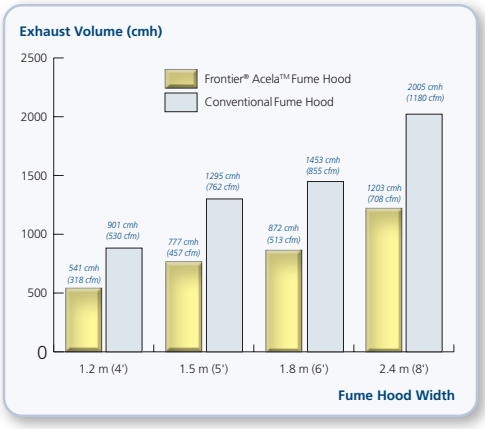
The cost of running a full blown fume food in a laboratory is certainly not a joke. More so if you maintain more than two of this equipment in the lab. Fume hoods, which are essential in keeping the safety of every personnel inside the laboratory, are highly energy-intensive with each one consuming more energy than three homes in an average U.S. environment. Depending on climate and system design, estimated energy costs for fume hoods range up to US$9000 annually, based on face velocities of 0.5 m/s (100 fpm) at full sash open position for a 1.8 m (72") hood. Variable Air Volume (VAV) is one of the various approaches presently employed to reduce hood energy consumption. The table below compares conventional hoods, VAV hoods, and the Esco Frontier® Acela™ High Performance Low Flow Hood.

	Conventional Fume Hood	Variable Air Volume (VAV) Fume Hood	High Performance Low Flow Fume Hood
Working Principle	0.5 m/s (100 fpm) at full open sash position	0.5 m/s (100 fpm) at all sash positions with sophisticated control system	0.3 m/s (60 fpm) at 457 mm (18") sash opening using advanced aerodynamic designs
Initial Cost	Low	High	Medium
Running Cost	Very High	Medium (VAV Maintenance)	Low
Ease of Installation, Commissioning and Maintenance	Easy	Difficult	Easy

Energy use and savings potential for laboratory fume hoods, Evan Mills, Dale Sartor; Energy, 2003

Green Product

Compared with conventional hoods, Esco Frontier® Acela™ operates safely at 0.3 m/s (60 fpm) at 457 mm (18.0") or full open sash position while maintaining excellent ASHRAE and EN containment. Exhaust volume reductions of up to 58% may be achieved without compromising safety. **This translates into an annual operating cost savings of up to US$5600**. Unlike VAV systems the Esco Frontier® Acela™ is easy and inexpensive to install, commission and maintain.



Fume Hood Width	Exhaust Volume		% Reduction in Exhaust Volume
	Frontier® Acela™ 0.3 m/s (60 fpm) at 457 mm (18")	Conventional Fume Hood 0.5 m/s (100 fpm) at 457 mm (18")	
1.2 m (4')	541 cmh (318 cfm)	901 cmh (530 cfm)	60%
1.5 m (5')	777 cmh (457 cfm)	1295 cmh (762 cfm)	60%
1.8 m (6')	872 cmh (513 cfm)	1453 cmh (855 cfm)	60%
2.4 m (8')	1203 cmh (708 cfm)	2005 cmh (1180 cfm)	60%

Guide to Models, Frontier® Acela™ Fume Hood

EFA- __ D __ __ W- __

External Width	Code	External Depth	Code	Internal Liner	Code	Sash Type	Code	Color	Code	Electrical	Code
1220 mm (48.0")	4U	900 mm (35.4")	D	Esco Resinate™	R	Vertical	V	Esco White	W	220-2240 VAC, 50/60 Hz	8
1525 mm (60.0")	5U			Esco Resinate Plus™	U	Combination*	C			110-120 VAC, 50/60 Hz	9
1830 mm (72.0")	6U										
2440 mm (96.0")	8U										

*Combination Sash is not available for 8 feet models.

General Specifications, Frontier® Acela™ Fume Hood

Model	220-240 VAC, 50/60 Hz, 1ø		EFA-4UDRVW-8 2090004	EFA-5UDRVW-8 2090014	EFA-6UDRVW-8 2090023	EFA-8UDRVW-8 2090223
			EFA-4UDRCW-8 2090005	EFA-5UDRCW-8 2090015	EFA-6UDRCW-8 2090024	
			EFA-4UDUCW-8 2090623	EFA-5UDUCW-8 2090624	EFA-6UDUCW-8 2090625	EFA-8UDUVW-8 2090287
			EFA-4UDUVW-8 2090369	EFA-5UDUVW-8 2090300	EFA-6UDUVW-8 2090663	
	110-120 VAC, 50/60 Hz, 1ø		EFA-4UDRVW-9 2090193	EFA-5UDRVW-9 2090207	EFA-6UDRVW-9 2090208	EFA-8UDRVW-9 2090501
			EFA-4UDRCW-9 2090346	EFA-5UDRCW-9 2090063	EFA-6UDRCW-9 2090263	
			EFA-4UDUVW-9 2090199	EFA-5UDUVW-9 2090256	EFA-6UDUVW-9 2090257	EFA-8UDUVW-9 2090258
			EFA-4UDUCW-9 2090224	EFA-5UDUCW-9 2090253	EFA-6UDUCW-9 2090254	
Nominal Size			1.2 meter (4')	1.5 meter (5')	1.8 meter (6')	2.4 meters (8')
External Dimensions (W x D x H)	Fume Hood unit only		1220 x 900 x 1406 mm (48.0" x 35.4"x 55.4")	1525 x 900 x 1406 mm (60.0" x 35.4"x 55.4")	1830 x 900 x 1406 mm (72.0" x 35.4"x 55.4")	2440 x 900 x 1406 mm (96.1" x 35.4"x 55.4")
	With Exhaust Collar		1220 x 900 x 1521 mm (48.0" x 35.4"x 59.9")	1525 x 900 x 1521 mm (60.0" x 35.4"x 59.9")	1830 x 900 x 1521 mm (72.0" x 35.4"x 59.9")	2440 x 900 x 1521 mm (96.1" x 35.4"x 59.9")
	With Fully-opened Sash		1220 x 900 x 1609 mm (48.0" x 35.4"x 63.3")	1525 x 900 x 1609 mm (60.0" x 35.4"x 63.3")	1830 x 900 x 1609 mm (72.0" x 35.4"x 63.3")	2440 x 900 x 1609 mm (96.1" x 35.4"x 63.3")
Internal Dimensions (W x D x H)			996 x 675 x 1230 mm (39.2" x 26.6"x 48.4")	1300 x 675 x 1230 mm (51.2" x 26.6"x 48.4")	1605 x 675 x 1230 mm (63.2" x 26.6"x 48.4")	2210 x 675 x 1230 mm (87.0" x 26.6"x 48.4")
Exhaust Volume/ Static Pressure Required	**Face Velocity**	**Sash Opening**				
	0.3 m/s (60 fpm)	457 mm (18.0")	541 cmh at 14 Pa (316 cfm at 0.06" WG)	777 cmh at 15 Pa (457 cfm at 0.06" WG)	872 cmh at 20 Pa (510 cfm at 0.08" WG)	1203 cmh at 14 Pa (706 cfm at 0.06" WG)
	0.4 m/s (80 fpm)	457 mm (18.0")	721cmh at 20 Pa (424 cfm at 0.08" WG)	942 cmh at 24 Pa (554 cfm at 0.10" WG)	1163 cmh at 29 Pa (684 cfm at 0.12" WG)	1604 cmh at 26 Pa (944 cfm at 0.10" WG)
	0.5 m/s (100 fpm)	457 mm (18.0")	901 cmh at 32 Pa (530 cfm at 0.13" WG)	1177 cmh at 35 Pa (693 cfm at 0.14" WG)	1453 cmh at 42 Pa (855 cfm at 0.17" WG)	2005 cmh at 34.3 Pa (1180 cfm at 0.13" WG)
	0.3 m/s (60 fpm)	Full	899 cmh at 22 Pa (526 cfm at 0.09" WG)	1175 cmh at 29 Pa (691 cfm at 0.12" WG)	1450 cmh at 36 Pa (848 cfm at 0.14" WG)	1819 cmh at 27.3 Pa (1070 cfm at 0.11" WG)
	0.4 m/s (80 fpm)	Full	1199 cmh at 37 Pa (701 cfm at 0.15" WG)	1556 cmh at 49 Pa (922 cfm at 0.20" WG)	1933 cmh at 61 Pa (1138 cfm at 0.24" WG)	2668 cmh at 48.3 Pa (1570 cfm at 0.19" WG)
	0.5 m/s (100 fpm)	Full	1499 cmh at 67 Pa (877 cfm at 0.27" WG)	1958 cmh at 77 Pa (1152 cfm at 0.31" WG)	2197 cmh at 95 Pa (1285 cfm at 0.38" WG)	3335 cmh at 74.3 Pa (1962 cfm at 0.30" WG)
Exhaust Outlet Diameter and Material			305 mm (12.0"), Fiberglass			
Number of Exhaust Collar			1			2
LED Lighting System	Description		Pre-wired hood lighting with electronic ballast for energy efficiency and instant start			
	Lamp Intensity		930 lux (86.3 foot-candles)	915 lux (85 foot-candles)	886 lux (82.3 foot-candles)	931 lux (86.5 foot-candles)
Controller			Rocker Switches (default). Option to upgrade to Sentinel™ XL Microprocessor Controller			
Construction	Main Body		Electrogalvanized steel with Epoxy-polyester hybrid Isocide™ powder coating			
	Internal Liner		Esco Resinate™ 4 mm Phenolic Resin Laminates			
	Internal Baffle system		Esco Resinate™ 6 mm Phenolic Resin Laminates			
	Worktop (default)		Phenolic Resin			
Sash Specifications	Sash Material		6 mm Laminated-Tempered and Framed Safety Glass			
	Sash Configuration		Vertical or Combination			Vertical
	Sloping		5^0 Sloped			
	Maximum Sash Opening		670 mm (26.4")			
Electrical	Cabinet Full Load Amps (FLA)		32 A			
	Cabinet Nominal Power		100 W (lighting only)			
Shipping Weight*			260 Kg (573 lbs)	310 Kg (683 lbs)	360 Kg (794 lbs)	470 Kg (1036 lbs)
Shipping Dimension, Maximum (W x D x H)*			1300 x 950 x 1900 mm (51.2" x 37.4"x 74.8")	1650 x 950 x 1900 mm (65.0" x 37.4"x 74.8")	1950 x 950 x 1900 mm (76.8" x 37.4"x 74.8")	2500 x 950 x 1900 mm (98.4" x 37.4"x 74.8")

*Fume hood unit only. Excludes base cabinet / optional stand.

Frontier® ACID DIGESTION™

Acid Digestion Fume Hood

Green Product

Esco Frontier® Acid Digestion™ Fume Hood is a high performance low flow fume hood designed to handle concentrated acids at high temperatures. This specialized fume hood can be built with unplasticized polyvinylchloride (u-PVC) or polypropylene (PP) internal surfaces which are known for their superior chemical resistance. Sash is made up of polycarbonate material to prevent etching caused by Hydrofluoric Acid.

Ergonomic Polycarbonate Sash

- Excellent choice for applications involving the use of acids such as hydrofluoric acid to prevent fogging or etching.
- With sash stop feature that regulates movement beyond 457 mm (18") to maintain a safe working condition for the user.
- Sash key lock feature allows laboratory managers to restrict access in the fume hood.

U-PVC or PP Internal Chamber

- Designed to withstand reaction from strong and corrosive acids.



Sentinel™ XL Airflow Alarm (Optional)

- An airflow monitoring device designed to monitor face velocity in real time.
- Generates an alarm if the face velocity is not within safe limits ensuring safety to all operators.

Tri-Wall Construction Coated with Isocide™

- Built for maximum robustness, long term chemical abrasion and weathering resistance.

Specialized High Performance Fume Hood

Optional Accessories:


Base Cabinet (EBA)


Circuit board protection


Service fixtures



Sentinel™ XL Airflow Alarm



Scrubber


Worktop


Support Stand (ASL)

Guide to Models, Frontier® Acid Digestion™ Fume Hoods

EFQ- ___ D ___ W- ___

External Width	Code	External Depth	Code	Internal Liner	Code	Sash Type	Code	Color Code	Code	Electrical Code	Code
1220 mm (48.0")	**4U**	900 mm (35.4")	**D**	u-PVC	**C**	Vertical	**V**	Esco White	**W**	230 VAC, 50/60 Hz	**8**
1525 mm (60.0")	**5U**			Polypropylene	**P**	Combination	**C**			110-120 VAC, 50/60 Hz	**9**
1830 mm (72.0")	**6U**										
2440 mm (96.0")	**8U**										

** Combination Sash not available for EFQ-8UDC _W-_ model.*

General Specifications, Frontier® Acid Digestion™ Fume Hoods

Model	**220-240 VAC, 50/60 Hz, 1Ø**	**EFQ-4UDCCW-8 2090239**	**EFQ-5UDCCW-8 2090245**	**EFQ-6UDCCW-8 2090212**	**EFQ-8UDCVW-8 2090710**	
		EFQ-4UDPCW-8 2090030	**EFQ-5UDPCW-8 2090022**	**EFQ-6UDPCW-8 2090031**		
		EFQ-4UDCVW-8 2090066	**EFQ-5UDCVW-8 2090246**	**EFQ-6UDCVW-8 2090264**	**EFQ-8UDPVW-8 2090038**	
		EFQ-4UDPVW-8 2090035	**EFQ-5UDPVW-8 2090036**	**EFQ-6UDPVW-8 2090037**		
	110-120 VAC, 50/60 Hz, 1Ø	**EFQ-4UDCCW-9 2090201**	**EFQ-5UDCCW-9 2090534**	**EFQ-6UDCCW-9 2090535**	**EFQ-8UDCVW-9 2090327**	
		EFQ-4UDPCW-9 2090538	**EFQ-5UDPCW-9 2090539**	**EFQ-6UDPCW-9 2090540**		
		EFQ-4UDCVW-9 2090050	**EFQ-5UDCVW-9 2090536**	**EFQ-6UDCVW-9 2090537**	**EFQ-8UDPVW-9 2090542**	
		EFQ-4UDPVW-9 2090328	**EFQ-5UDPVW-9 2090541**	**EFQ-6UDPVW-9 2090270**		
Nominal Size		1.2 meter (4')	1.5 meter (5')	1.8 meter (6')	2.4 meters (8')	
External Dimensions (W x D x H)	Fume Hood unit only	1220 x 900 x 1406 mm (48.0" x 35.4"x 55.4")	1525 x 900 x 1406 mm (60.0" x 35.4"x 55.4")	1830 x 900 x 1406 mm (72.0" x 35.4"x 55.4")	2440 x 900 x 1406 mm (96.1" x 35.4"x 55.4")	
	With Exhaust Collar	1220 x 900 x 1460 mm (48.0" x 35.4"x 57.5")	1525 x 900 x 1460 mm (60.0" x 35.4"x 57.5")	1830 x 900 x 1460 mm (72.0" x 35.4"x 57.5")	2440 x 900 x 1460 mm (96.1" x 35.4"x 57.5")	
	With Fully-opened Sash	1220 x 900 x 1609 mm (48.0" x 35.4"x 63.3")	1525 x 900 x 1609 mm (60.0" x 35.4"x 63.3")	1830 x 900 x 1609 mm (72.0" x 35.4"x 63.3")	2440 x 900 x 1609 mm (96.1" x 35.4"x 63.3")	
Internal Dimensions (W x D x H)		996 x 689 x 1230 mm (39.2" x 27.1"x 48.4")	1300 x 689 x 1230 mm (51.2" x 27.1"x 48.4")	1605 x 689 x 1230 mm (63.2" x 27.1"x 48.4")	2210 x 689 x 1230 mm (87.0" x 27.1"x 48.4")	
Exhaust Volume/ Static Pressure Required	**Face Velocity**	**Sash Opening**				
	0.3 m/s (60 fpm)	Design opening: 457 mm (18.0")	541 cmh at 14 Pa (318 cfm at 0.06" WG)	777 cmh at 15 Pa (457 cfm at 0.06" WG)	872 cmh at 20 Pa (513 cfm at 0.08" WG)	1203 cmh at 14.20 Pa (708 cfm at 0.06" WG)
	0.4 m/s (80 fpm)		721 cmh at 20 Pa (424 cfm at 0.08" WG)	942 cmh at 24 Pa (554 cfm at 0.10" WG)	1163 cmh at 29 Pa (685 cfm at 0.12" WG)	1604 cmh at 26.44 Pa (944 cfm at 0.11" WG)
	0.5 m/s (100 fpm)		901 cmh at 32 Pa (530 cfm at 0.13" WG)	1177 cmh at 35 Pa (693 cfm at 0.14" WG)	1453 cmh at 42 Pa (855 cfm at 0.17" WG)	2005 cmh at 34.26 Pa (1180 cfm at 0.14" WG)
	0.3 m/s (60 fpm)	Full open: 670 mm (26.4")	899 cmh at 22 Pa (529 cfm at 0.09" WG)	1175 cmh at 29 Pa (692 cfm at 0.12" WG)	1450 cmh at 36 Pa (853 cfm at 0.14" WG)	1819 cmh at 27.28 Pa (1071 cfm at 0.11" WG)
	0.4 m/s (80 fpm)		1199 cmh at 37 Pa (706 cfm at 0.15" WG)	1556 cmh at 49 Pa (916 cfm at 0.20" WG)	1933 cmh at 61 Pa (1138 cfm at 0.24" WG)	2668 cmh at 48.34 Pa (1570 cfm at 0.19" WG)
	0.5 m/s (100 fpm)		1499 cmh at 67 Pa (882 cfm at 0.27" WG)	1958 cmh at 77 Pa (1152 cfm at 0.31" WG)	2197 cmh at 95 Pa (1293 cfm at 0.38" WG)	3335 cmh at 74.25 Pa (1963 cfm at 0.30" WG)
Exhaust Outlet Diameter and Material		254 mm (10"), PVC Pipe				
Number of Exhaust Collars		1			2	
LED Lamp Intensity		930 lux (86.3 foot-candles)	915 lux (85 foot-candles)	886 lux (82.3 foot-candles)	931 lux (86.5 foot-candles)	
Construction	Main Body	Electrogalvanized steel with Epoxy-polyester hybrid Isocide™ powder coating				
	Internal Liner	u-PVC or Polypropylene				
	Worktop					
Sash Specification	Sash Material	5 mm Polycarbonate				
	Sash Configuration	Vertical or Combination				
	Sloping	5°				
	Maximum Sash Opening	670 mm (26.4")				
Electrical	Cabinet Full Load Amps (FLA)	32 A				
	Cabinet Nominal Power	100 W (lighting only)				
Shipping Weight*		263 Kg (580 lbs)	314 Kg (692 lbs)	363 Kg (800 lbs)	472 Kg (1041 lbs)	
Shipping Dimension, maximum (W x D x H)*		1300 x 950 x 1940 mm (51.2" x 37.4" x 76.4")	1650 x 950 x 1940 mm (65.0" x 37.4" x 76.4")	1950 x 950 x 1940 mm (76.8" x 37.4" x 76.4")	2500 x 950 x 1940 mm (98.4" x 37.4" x 76.4")	

**Fume hood unit only. Exclude base cabinet/optional stand.*

Frontier® PERCHLORIC ACID™

Perchloric Acid Fume Hood

Green Product

Esco Frontier® Perchloric Acid™ Fume Hood is designed to be used for routine handling of hot perchloric acid and hot nitric acid. However, it is not advisable for applications involving sulphuric acid, acetic acid, organic solvents or any combustible materials.

When heated, perchloric acid vaporizes and condenses to form metallic perchlorates on hood, duct and fan components. In addition to being highly corrosive, condensed vapors can react with hood gaskets, greaser and collected materials to form explosive perchlorate salts. EFP has a built-in wash down system that removes salts that may have accumulated in the hood's corners and baffle system through a series of water sprays. For added safety, Esco Fume scrubber is a required accessory used to prevent the formation of perchlorate salts in the hood's exhaust system.

Dedicated Wash down System

- Wash down system behind baffles washes away any perchlorate salt deposits on the baffles.
- Water pump system ensures water pressure is constant during the wash down process.

Stainless Steel Internal Chamber

- Constructed from stainless steel with coved corners and seamless design for easy cleaning of surface from perchlorate salts.



Sentinel™ XL (Optional)

- Provides additional safety by alerting user if the fume hood operates outside the recommended face velocity. Lower face velocity may compromise user safety.

Tri-Wall Construction Coated with Isocide™

- Built for maximum robustness, long term chemical abrasion and weathering resistance.



Esco Fume Scrubber (EFS) is a compulsory accessory for EFP units

Optional Accessories:



Base Cabinet (EBA)



Circuit board protection



Service fixtures



Sentinel™ XL Airflow Alarm



Worktop

Guide to Models, Frontier® Perchloric Acid™ Fume Hoods

EFP- ___ D ___ W- ___

External Width	Code	External Depth	Code	Internal Liner	Code	Sash Type	Code	Color Code	Code	Electrical Code	Code
1220 mm (48.0")	4U	900 mm (35.4")	D	SS 304	4	Vertical	V	Esco White	W	230 VAC, 50/60 Hz	8
1525 mm (60.0")	5U			SS 316 (optional)	6	Combination*	C			110-120 VAC, 50/60 Hz	9
1830 mm (72.0")	6U										
2440 mm (96.0")	8U										

*Combination Sash not available for EFP-8UD_ _W-_ model.

General Specifications, Frontier® Perchloric Acid™ Fume Hoods

Model	220-240 VAC, 50/60 Hz, 1Ø	**EFP-4UD4VW-8 2090198**	**EFP-5UD4VW-8 2090265**	**EFP-6UD4VW-8 2090214**	**EFP-8UD4VW-8 2090316**	
		EFP-4UD4CW-8 2090073	**EFP-5UD4CW-8 2090074**	**EFP-6UD4CW-8 2090039**		
		EFP-4UD6VW-8 2090525	**EFP-5UD6VW-8 2090072**	**EFP-6UD6VW-8 2090077**	**EFP-8UD6VW-8 2090079**	
		EFP-4UD6CW-8 2090076	**EFP-5UD6CW-8 2090075**	**EFP-6UD6CW-8 2090041**		
	110-120 VAC, 50/60 Hz, 1Ø	**EFP-4UD4VW-9 2090526**	**EFP-5UD4VW-9 2090527**	**EFP-6UD4VW-9 2090528**	**EFP-8UD4VW-9 2090529**	
		EFP-4UD4CW-9 2090303	**EFP-5UD4CW-9 2090627**	**EFP-6UD4CW-9 2090629**		
		EFP-4UD6VW-9 2090530	**EFP-5UD6VW-9 2090531**	**EFP-6UD6VW-9 2090532**	**EFP-8UD6VW-9 2090533**	
		EFP-4UD6CW-9 2090626	**EFP-5UD6CW-9 2090628**	**EFP-6UD6CW-9 2090630**		
Nominal Size		1.2 meter (4')	1.5 meter (5')	1.8 meter (6')	2.4 meters (8')	
External Dimensions (W x D x H)	Fume Hood unit only	1220 x 900 x 1442 mm (48.0" x 35.4"x 56.7")	1525 x 900 x 1442 mm (60.0" x 35.4"x 56.7")	1830 x 900 x 1442 mm (72.0" x 35.4"x 56.7")	2440 x 900 x 1442 mm (96.1" x 35.4"x 56.7")	
	Fume hood unit and Top Scrubber	1220 x 900 x 2220 mm (48.0" x 35.4"x 87.4")	1525 x 900 x 2220 mm (60.0" x 35.4"x 87.4")	1830 x 900 x 2220 mm (72.0" x 35.4"x 87.4")	2440 x 900 x 2220 mm (96.1" x 35.4"x 87.4")	
	With Fully-opened Sash	1220 x 900 x 1646 mm (48.0" x 35.4"x 64.8")	1525 x 900 x 1646 mm (60.0" x 35.4"x 64.8")	1830 x 900 x 1646 mm (72.0" x 35.4"x 64.8")	2440 x 900 x 1646 mm (96.1" x 35.4"x 64.8")	
Internal Dimensions (W x D x H)		996 x 690 x 1258 mm (39.2" x 27.2"x 49.5")	1301 x 690 x 1258 mm (51.2" x 27.2"x 49.5")	1606 x 690 x 1258 mm (63.2" x 27.2"x 49.5")	2216 x 690 x 1258 mm (87.2" x 27.2"x 49.5")	
Exhaust Volume/ Static Pressure Required	**Face Velocity**	**Sash Opening**				
	0.3 m/s (60 fpm)	Design Opening: 457 mm (18.0")	542 cmh at 7 Pa (319 cfm at 0.03" WG)	705 cmh at 9 Pa (415 cfm at 0.04" WG)	867 cmh at 12 Pa (510 cfm at 0.05" WG)	1192 cmh at 8 Pa (702 cfm at 0.03" WG)
	0.4 m/s (80 fpm)		723 cmh at 13 Pa (425 cfm at 0.05" WG)	939 cmh at 17 Pa (553 cfm at 0.07" WG)	1156 cmh at 20 Pa (680 cfm at 0.09" WG)	1590 cmh at 14 Pa (936 cfm at 0.06" WG)
	0.5 m/s (100 fpm)		903 cmh at 20 Pa (531 cfm at 0.08" WG)	1174 cmh at 26 Pa (691 cfm at 0.11" WG)	1445 cmh at 28 Pa (850 cfm at 0.12" WG)	1987 cmh at 22 Pa (1170 cfm at 0.09" WG)
	0.3 m/s (60 fpm)	Full Open	642 cmh at 13 Pa (378 cfm at 0.06" WG)	834 cmh at 17 Pa (491 cfm at 0.07" WG)	1027 cmh at 22 Pa (604 cfm at 0.09" WG)	1412 cmh at 14 Pa (831 cfm at 0.06" WG)
	0.4 m/s (80 fpm)		856 cmh at 23 Pa (504 cfm at 0.10" WG)	1113 cmh at 30 Pa (655 cfm at 0.13" WG)	1369 cmh at 39 Pa (806 cfm at 0.17" WG)	1883 cmh at 25 Pa (1108 cfm at 0.11" WG)
	0.5 m/s (100 fpm)		1070 cmh at 36 Pa (630 cfm at 0.15" WG)	1391 cmh at 47 Pa (819 cfm at 0.20" WG)	1712 cmh at 61 Pa (1008 cfm at 0.26" WG)	2354 cmh at 40 Pa (1386 cfm at 0.17" WG)
Exhaust Outlet Diameter and Material			305 mm (12.0"), Stainless Steel			
Number of Exhaust Collars			1			2
LED Lamp Intensity			930 lux (86 foot-candles)	915 lux (85 foot-candles)	886 lux (82.3 foot-candles)	931 lux (86 foot-candles)
Construction	Main Body		Electrogalvanized steel with Epoxy-polyester hybrid Isocide™ powder coating			
	Internal Liner		Stainless steel 304 1.5 mm (option to upgrade to SS 316)			
	Worktop					
Sash Specification	Sash Material		Laminated-Tempered and Framed Safety Glass			
	Sash Configuration		Vertical or Combination			Vertical
	Sloping		5° sloped			
Electrical	Cabinet Full Load Amps (FLA)		34.4 A			36.8 A
	Cabinet Nominal Power		470 W			840 W
Net Weight*			230 Kg (506 lbs)	270 Kg (594 lbs)	332 Kg (731 lbs)	378 Kg (832 lbs)
Shipping Weight*			260 Kg (573 lbs)	295 Kg (650 lbs)	360 Kg (794 lbs)	410 Kg (904 lbs)
Shipping Dimension, maximum (W x D x H)*			1300 x 950 x 1940 mm (51.18" x 37.4" x 76.38")	1650 x 950 x 1940 mm (65" x 37.4" x 76.38")	1950 x 950 x 1940 mm (76.77" x 37.4" x 76.38")	2500 x 950 x 1940 mm (98.43" x 37.4" x 76.38")

*Fume hood unit only. Exclude base cabinet/optional stand.

Frontier® RADIOISOTOPE HOOD™

Radioisotope Fume Hood

Green Product

Esco Frontier® Radioisotope™ is designed to be used when handling radioactive materials. This specialized fume hood is built with stainless steel internal and work surfaces with coved, seamless welded corners for easy cleaning and decontamination.

Frontier® Radioisotope™ fume hoods are engineered to provide maximum safety when handling radiopharmaceuticals and other radioactive materials. In addition, these hoods provide containment performance similar to that of a high performance low flow fume hood.

Tri-Wall Construction Coated with ISOCIDE™

- Built for maximum robustness, long term chemical abrasion and weathering resistance.

Perfect Pitch Profile

- 5° Face Pitch ergonomically allows users to work further into the hood without strain.
- Ergonomic design is anthropometrically proven.

Reinforced work surface

- Strong enough to hold the weight of heavy lead bricks.
- Capable of holding up to 15 kN/m² (2.175 lb/in²).

Equipment Integration

- Capable of customization to allow integration of radiopharmacy equipment such as generator and dose calibrator.



Full Stainless Steel Internal Chamber

- Coved corners to minimize contamination build-up.
- Seamless stainless steel liner and worktop for easy cleaning.
- Provides maximum operator safety since stainless steel is impermeable to radioactive materials.

Lead-lining Options

- Capable of adding a horizontal sliding chest shield, an L-block, or lead-lined walls.

Acela Shaping Vanes

- Improves containment by increasing airflow "sweep" at the critical area.

Optional Accessories:



Base Cabinet (EBA)



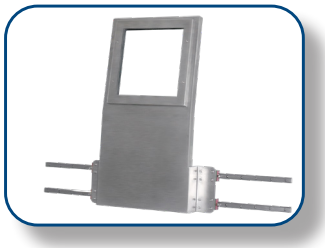
Circuit board protection



Service fixtures



Sentinel™ XL Airflow Alarm



Horizontal Sliding Chest Shield



Support Stand (ASL)

Guide to Models, Frontier® Radioisotope™ Fume Hoods

EFI- _ D _ W- _

External Width	Code	External Depth	Code	Internal Liner	Code	Sash Type	Code	Color Code	Code	Electrical Code	Code
1220 mm (48.0")	**4U**	900 mm (35.4")	**D**	SS 304	**4**	Vertical	**V**	Esco White	**W**	230 VAC, 50/60 Hz	**8**
1525 mm (60.0")	**5U**			SS 316 (optional)	**6**	Combination*	**C**			110-120 VAC, 50/60 Hz	**9**
1830 mm (72.0")	**6U**										
2440 mm (96.0")	**8U**										

**Combination Sash not available for EFI-8UD_ _W-_ model.*

General Specifications, Frontier® Radioisotope™ Fume Hoods

Model	**220-240 VAC, 50/60 Hz, 1ø**	**EFI-4UD4CW-8 2090081**	**EFI-5UD4CW-8 2090171**	**EFI-6UD4CW-8 2090172**	**EFI-8UD4VW-8 2090180**
		EFI-4UD6CW-8 2090082	**EFI-5UD6CW-8 2090174**	**EFI-6UD6CW-8 2090175**	
		EFI-4UD4VW-8 2090177	**EFI-5UD4VW-8 2090178**	**EFI-6UD4VW-8 2090179**	**EFI-8UD6VW-8 2090184**
		EFI-4UD6VW-8 2090181	**EFI-5UD6VW-8 2090182**	**FI-6UD6VW-8 2090183**	
	110-120 VAC, 50/60 Hz, 1ø	**EFI-4UD4CW-9 2090543**	**EFI-5UD4CW-9 2090544**	**EFI-6UD4CW-9 2090545**	**EFI-8UD4VW-9 2090552**
		EFI-4UD6CW-9 2090546	**EFI-5UD6CW-9 2090547**	**EFI-6UD6CW-9 2090548**	
		EFI-4UD4VW-9 2090549	**EFI-5UD4VW-9 2090550**	**EFI-6UD4VW-9 2090551**	**EFI-8UD6VW-9 2090556**
		EFI-4UD6VW-9 2090553	**EFI-5UD6VW-9 2090554**	**EFI-6UD6VW-9 2090555**	
Nominal Size		1.2 meter (4')	1.5 meter (5')	1.8 meter (6')	2.4 meters (8')
External Dimensions (W x D x H)	Fume Hood unit only	1220 x 900 x 1442 mm (48.0" x 35.4"x 55.1")	1525 x 900 x 1442 mm (60.0" x 35.4"x 55.1")	1830 x 900 x 1442 mm (72.0" x 35.4"x 55.1")	2440 x 900 x 1442 mm (96.1" x 35.4"x 67.9")
	With Exhaust Collar	1220 x 900 x 1521 mm (48.0" x 35.4"x 59.9")	1525 x 900 x 1521 mm (60.0" x 35.4"x 59.9")	1830 x 900 x 1521 mm (72.0" x 35.4"x 59.9")	2440 x 900 x 1521 mm (96.1" x 35.4"x 59.9")
	With Fully-opened Sash	1220 x 900 x 1643 mm (48.0" x 35.4"x 64.7")	1525 x 900 x 1643 mm (60.0" x 35.4"x 64.7")	1830 x 900 x 1643 mm (72.0" x 35.4"x 64.7")	2440 x 900 x 1643 mm (96.1" x 35.4"x 64.7")
Internal Dimensions (W x D x H)		996 x 753 x 1246 mm (39.2" x 29.6""x 49.1")	1301 x 753 x 1246 mm (60.2" x 29.6""x 49.1")	1606 x 753 x 1246 mm (63.2" x 29.6""x 49.1")	2216 x 753 x 1246 mm (87.2" x 29.6""x 49.1")
Exhaust Volume/ Static Pressure Required	**Face Velocity** / **Sash Opening**				
	0.3 m/s (60 fpm) / Design opening: 457 mm (18.0")	542 cmh at 7 Pa (319 cfm at 0.03" WG)	705 cmh at 9 Pa (415 cfm at 0.04" WG)	867 cmh at 12 Pa (510 cfm at 0.05" WG)	867 cmh at 12 Pa (510 cfm at 0.05" WG)
	0.4 m/s (80 fpm) / Design opening: 457 mm (18.0")	723 cmh at 13 Pa (425 cfm at 0.05" WG)	867 cmh at 12 Pa (510 cfm at 0.05" WG)	867 cmh at 12 Pa (510 cfm at 0.05" WG)	867 cmh at 12 Pa (510 cfm at 0.05" WG)
	0.5 m/s (100 fpm) / Design opening: 457 mm (18.0")	903 cmh at 20 Pa (532 cfm at 0.09" WG)	1174 cmh at 26 Pa (691 cfm at 0.11" WG	1445 cmh at 28 Pa (851 cfm at 0.12" WG)	1987 cmh at 22 Pa (1170 cfm at 0.09" WG)
	0.3 m/s (60 fpm) / Full open	642 cmh at 13 Pa (378 cfm at 0.06" WG)	834 cmh at 17 Pa (491 cfm at 0.07" WG	1027 cmh at 22 Pa (605 cfm at 0.09" WG)	1412 cmh at 14 Pa (831 cfm at 0.06" WG)
	0.4 m/s (80 fpm) / Full open	856 cmh at 23 Pa (504 cfm at 0.10" WG)	1113 cmh at 30 Pa (655 cfm at 0.13" WG)	1369 cmh at 39 Pa (806 cfm at 0.17" WG)	1883 cmh at 25 Pa (1108 cfm at 0.11" WG)
	0.5 m/s (100 fpm) / Full open	1070 cmh at 36 Pa (630 cfm at 0.15" WG)	1391 cmh at 47 Pa (819 cfm at 0.20" WG)	1712 cmh at 61 Pa (1008 cfm at 0.26" WG)	2354 cmh at 40 Pa (1385 cfmat 0.17" WG)
Exhaust Outlet Diameter and Material		305 mm (12.0"), Stainless Steel			
Number of Exhaust Collars		1			2
LED Lamp Intensity		930 lux (86.4 foot-candles)	915 lux (85.0 foot-candles)	886 lux (82.3 foot-candles)	931 lux (86.5 foot-candles)
Construction	Main Body	Electrogalvanized steel with Epoxy-polyester hybrid Isocide™ powder coating			
	Internal Liner (default)	Stainless steel 304 1.5 mm (Optional upgrade to SS 316)			
	Worktop (default)	Stainless steel 304 1.5 mm (Optional upgrade to SS 316)			
Sash Specifications	Sash Material	Laminated-Tempered and Framed Safety Glass			
	Sash Configuration	Vertical or Combination			Vertical
	Sloping	5°			
Electrical	Cabinet Full Load Amps (FLA)	32 A			
	Cabinet Nominal Power	100 W (lighting only)			
Net Weight*		218 Kg (481 lbs)	249 Kg (549 lbs)	313 Kg (690 lbs)	361 Kg (796 lbs)
Shipping Weight*		240 Kg (529 lbs)	275 Kg (606 lbs)	340 Kg (749 lbs)	390 Kg (860 lbs)
Shipping Dimension, maximum (W x D x H)*		1300 x 950 x 1940 mm (51.2" x 37.4" x 76.4")	1650 x 950 x 1940 mm (65.0" x 37.4" x 76.4")	1950 x 950 x 1940 mm (76.8" x 37.4" x 76.4")	2500 x 950 x 1940 mm (98.4" x 37.4" x 76.4")

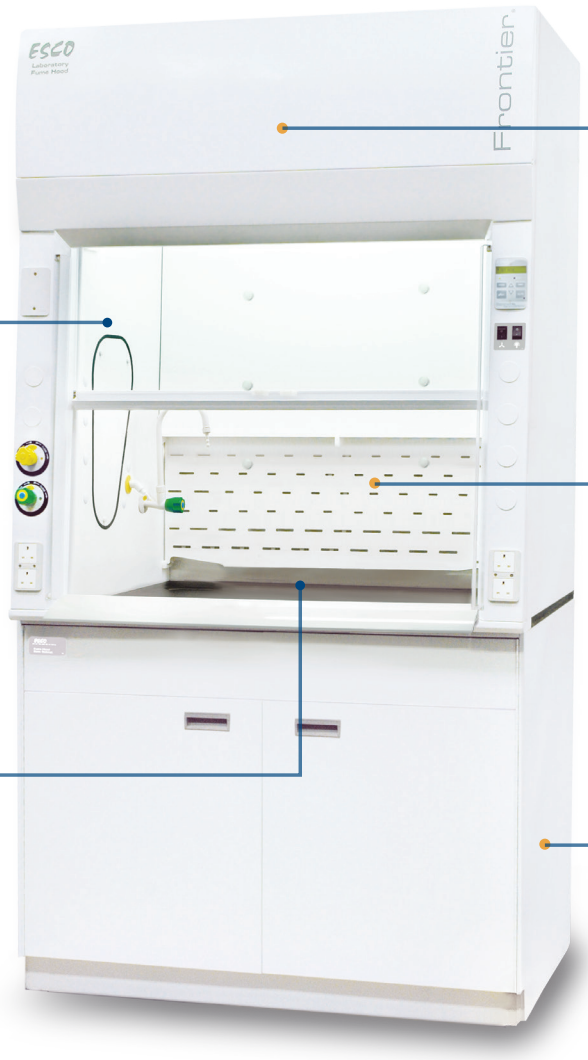
**Fume hood unit only. Exclude base cabinet/optional stand.*

Frontier® ACELA™ M SERIES

Ideal Fume Hood for Mining Industry

Green Product

The Frontier® Acela™ M Series Fume Hood is designed specifically for users in the mining industry. It provides the highest level of protection and containment against highly corrosive chemicals at high temperatures.



Durable Internal Liner

- Made of Esco Resinate Plus™, which is a proprietary composite material made of Fiberglass Reinforced Plastic.
- Offers excellent chemical and physical resistance against harsh chemicals such as highly corrosive acids.

Generous Inner Work Depth

- The inner work depth is 100 mm deeper than conventional hoods.
- The design helps in containing leaks and splashes during chemical analysis.

High Energy Savings

- Operates safely at face velocities as low as 0.3 m/s. This translates to more energy savings for your lab.
- Uses energy-efficient hood lighting through a pre-wired, electronic ballast.

Robust design

- Has tough chain and sprocket sash support system.
- Designed to accommodate heavy equipment such as furnaces.

Tri-Wall Construction Coated with Isocide™

- Built for maximum robustness, long term chemical abrasion and weathering resistance.

Specialized High Performance Fume Hood

Optional Accessories:



Base Cabinet (EBA)



Circuit board protection



Service fixtures



Sentinel™ XL Airflow Alarm



Scrubber



Support Stand (ASL)

Guide to Models, Frontier® Acela™ M Series

EFA- __ MU __ W- __

External Width	Code	External Depth	Code	Internal Liner	Code	Sash Type	Code	Color	Code	Electrical Code	Code
1220 mm (48.0")	4U	1000 mm (39.4")	M	Esco Resinate™ Plus	U	Vertical	V	Esco White	W	230 VAC, 50/60 Hz	8
1525 mm (60.0")	5U					Combination	C			110-120 VAC, 50/60 Hz	9
1830 mm (72.0")	6U										
2440 mm (96.0")	8U										

** Combination sash is not available for 8 feet models*

General Specifications, Frontier® Acela™ M Series

Model			EFA-4UMUVW-8 2090567	EFA-5UMUVW-8 2090362	EFA-6UMUVW-8 2090568	EFA-8UMUVW-8 2090569
		220-240 VAC, 50/60 Hz, 1Ø	EFA-4UMUCW-8 2090640	EFA-5UMUCW-8 2090570	EFA-6UMUCW-8 2090571	
		110-120 VAC, 50/60 Hz, 1Ø	EFA-4UMUVW-9 2090573	EFA-5UMUVW-9 2090574	EFA-6UMUVW-9 2090575	EFA-8UMUVW-9 2090576
			EFA-4UMUCW-9 2090577	EFA-5UMUCW-9 2090578	EFA-6UMUCW-9 2090579	
Nominal Size			1.2 meter (4')	1.5 meter (5')	1.8 meter (6')	2.4 meters (8')
External Dimensions (W x D x H)	Fume Hood unit only		1220 x 1000 x 1406 mm (48.0" x 39.4"x 55.4")	1525 x 1000 x 1406 mm (48.0" x 39.4"x 55.4")	1830 x 1000 x 1406 mm (48.0" x 39.4"x 55.4")	2440 x 1000 x 1406 mm (48.0" x 39.4"x 55.4")
	With Exhaust Collar		1220 x 1000 x 1521 mm (48.0" x 39.4"x 60.0")	1525 x 1000 x 1521 mm (48.0" x 39.4"x 60.0")	1830 x 1000 x 1521 mm (48.0" x 39.4"x 60.0")	2440 x 1000 x 1521 mm (48.0" x 39.4"x 60.0")
	With Fully-opened Sash		1220 x 1000 x 1603 mm (48.0" x 39.4"x 63.1")	1525 x 1000 x 1603 mm (48.0" x 39.4"x 63.1")	1830 x 1000 x 1603 mm (48.0" x 39.4"x 63.1")	2440 x 1000 x 1603 mm (48.0" x 39.4"x 63.1")
Internal Dimensions (W x D x H)			996 x 775 x 1230 mm (39.2" x 30.5" x 48.4")	1301 x 775 x 1230 mm (51.2" x 30.5" x 48.4")	1606 x 775 x 1230 mm (63.2" x 30.5" x 48.4")	2216 x 775 x 1230 mm (87" x 30.5" x 48.4")
Exhaust Volume/ Static Pressure Required	**Face Velocity**	**Sash Opening**				
	0.3 m/s (60 fpm)	Design opening: 457 mm (18.0")	541 cmh at 14.3 Pa (318 cfm at 0.06" WG)	776 cmh at 14.6 Pa (457 cfm at 0.06" WG)	866 cmh at 19.9 Pa (510 cfm at 0.08" WG)	1203 cmh at 14.2 Pa (708 cfm at 0.06" WG)
	0.4 m/s (80 fpm)		720 cmh at 19.7 Pa (424 cfm at 0.08" WG)	941 cmh at 23.7 Pa (554 cfm at 0.10" WG)	1162 cmh at 28.8 Pa (684 cfm at 0.12" WG)	1604 cmh at 26.4 Pa (944 cfm at 0.11" WG)
	0.5 m/s (100 fpm)		900 cmh at 31.8 Pa (530 cfm at 0.13" WG)	1174 cmh at 34.7 Pa (692.8 cfm at 0.14" WG)	1453 cmh at 41.8 Pa (855 cfm at 0.17" WG)	2005 cmh at 32.3 Pa (1180 cfm at 0.13" WG)
	0.3 m/s (60 fpm)	Full open	894 cmh at 22.1Pa (526 cfm at 0.09" WG)	1174 cmh at 28.7 Pa (691 cfm at 0.12" WG)	1440 cmh at 36.1 Pa (848 cfm at 0.15" WG)	1818 cmh at 27.3 Pa (1070 cfm at 0.11" WG)
	0.4 m/s (80 fpm)		1191 cmh at 36.7 Pa (701 cfm at 0.15" WG)	1566 cmh at 49.3 Pa (922 cfm at 0.20" WG)	1933 cmh at 61.4 Pa (1138 cfm at 0.25" WG)	2667 cmh at 48.3 Pa (1570 cfm at 0.19" WG)
	0.5 m/s (100 fpm)		1490 cmh at 66.6 Pa (877 cfm at 0.27" WG)	1957 cmh at 76.6 Pa (1152 cfm at 0.31" WG)	2183 cmh at 94.7 Pa (1285 cfm at 0.38" WG)	3333 cmh at 74.3 Pa (1962 cfm at 0.30" WG)
Exhaust Outlet Diameter and Material			305 mm (12.0"), Fiberglass			
Number of Exhaust Collars			1			2
LED Lamp Intensity			930 lux (86.3 foot-candles)	915 lux (85 foot-candles)	886 lux (82.3 foot-candles)	931 lux (86.5 foot-candles)
Construction	Main Body		Electrogalvanized steel with Epoxy-polyester hybrid Isocide™ powder coating			
	Internal Liner (default)		Esco Resinate Plus™			
	Worktop (default)		Ceramic Worktop			
Sash Specification	Sash Material		Laminated-Tempered and Framed Safety Glass			
	Sash Configuration		Vertical (for units EFA-__MUVW-8 and EFA-__MUVW-9) Combination (for units EFA-__MUCW-8 and EFA-__MUCW-9)			
	Sloping		5° Sloped			
	Maximum Sash Opening		670 mm (26.4")			
Electrical	Cabinet Full Load Amps (FLA)		32 A			
	Cabinet Nominal Power		100 W (lighting only)			
Net Weight*			255 Kg (562 lbs)	305 Kg (672 lbs)	365 Kg (805 lbs)	473 Kg (1043 lbs)
Shipping Weight*			285 Kg (628 lbs)	335 Kg (739 lbs)	395 Kg (871 lbs)	503 Kg (1109 lbs)
Shipping Dimension, maximum (W x D x H)*			1300 x 1050 x 1900 mm (51.2" x 41.3" x 74.8")	1650 x 1050 x 1900 mm (65.0" x 41.3" x 74.8")	1950 x 1050 x 1900 mm (76.8" x 41.3" x 74.8")	2500 x 1050 x 1900 mm (98.4" x 41.3" x 74.8")

** Fume Hood unit only. Excludes base cabinet/optional stand.*

Frontier® FLOOR-MOUNTED™

The Floor Mounted Fume Hood

The Esco Frontier® Floor Mounted™ is designed to provide comfortable space when users have to deal with tall apparatus and large hazardous containers that require increased height area.

This fume hood is built with a vertical sliding sash for ease of access when transporting apparatus into the hood. The user must not enter the hood while an activity generating hazardous fumes exists or when suspected concentration of fumes exists inside the chamber.



Tri-Wall Construction Coated with Isocide™

- Built for maximum robustness, long term chemical abrasion and weathering resistance.

High Energy Savings

- Operates safely at face velocities as low as 0.3 m/s. This translates to more energy savings for your lab.
- Uses energy-efficient hood lighting through a pre-wired, electronic ballast.

High Sash Opening

- Has a double-hung full-framed sash which can be raised vertically up to a maximum opening height of 1600 mm (63") for rolling in of large equipment of portable work stations.

Design Flexibility

- Its design is floor-mounted by default but can be reconfigured as a distillation hood by adding an optional removable low-height base cabinet (see accessories page).

Optional Accessories:



Low Height Base Cabinet (EBF)



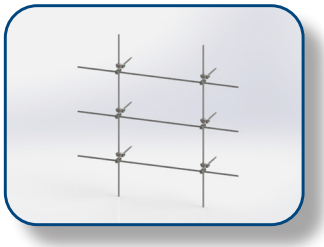
Circuit board protection



Service fixtures



Sentinel™ XL Airflow Alarm



Distillation grid

Guide to Models, Frontier® Floor Mounted™ Fume Hoods

EFF-__B__W-_

External Width	Code	External Depth	Code	Internal Liner	Code	Sash Type	Code	Color	Code	Electrical Code	Code
1220 mm (48.0")	**4U**	965 mm (38.0")	**B**	Esco Resinate™	**R**	Vertical	**V**	Esco White	**W**	230 VAC, 50/60 Hz	**8**
1525 mm (60.0")	**5U**			Esco Resinate Plus™	**U**					110-120 VAC, 50/60 Hz	**9**
1830 mm (72.0")	**6U**										
2440 mm (96.0")	**8U**										

General Specifications, Frontier® Floor Mounted™ Fume Hoods

Model	**220-240 VAC, 50/60 Hz, 1ø**	**EFF-4UBRVW-8 2090025**	**EFF-5UBRVW-8 2090012**	**EFF-6UBRVW-8 2090026**	**EFF-8UBRVW-8 2090027**
		EFF-4UBUVW-8 2090342	**EFF-5UBUVW-8 2090631**	**EFF-6UBUVW-8 2090632**	**EFF-8UBUVW-8 2090633**
	110-120 VAC, 50/60 Hz, 1ø	**EFF-4UBRVW-9 2090272**	**EFF-5UBRVW-9 2090557**	**EFF-6UBRVW-9 2090558**	**EFF-8UBRVW-9 2090559**
		EFF-4UBUVW-9 2090273	**EFF-5UBUVW-9 2090634**	**EFF-6UBUVW-9 2090283**	**EFF-8UBUVW-9 2090635**
Nominal Size		1.2 meter (4')	1.5 meter (5')	1.8 meter (6')	2.4 meter (8')
External Dimensions (W x D x H)	Fume Hood unit only	1220 x 965 x 2360 mm (48.0" x 38.0" x 92.9")	1525 x 965 x 2360 mm (60.0" x 38.0" x 92.9")	1830 x 965 x 2360 mm (72.0" x 38.0" x 92.9")	2440 x 965 x 2360 mm (96.1" x 38.0" x 92.9")
	With Exhaust Collar	1220 x 965 x 2405 mm (48.0" x 38.0"x 94.7")	1525 x 965 x 2405 mm (60.0" x 38.0" x 94.7")	1830 x 965 x 2405 mm (72.0" x 38.0" x 94.7")	2440 x 965 x 2405 mm (96.1" x 38.0" x 94.7")
	With Fully-opened Sash	1220 x 965 x 2688 mm (48.0" x 38.0" x 106.0")	1525 x 965 x 2688 mm (60.0" x 38.0" x 106.0")	1830 x 965 x 2688 mm (72.0" x 38.0" x 106.0")	2440 x 965 x 2688 mm (96.1" x 38.0" x 106.0")
Internal Dimensions (W x D x H)		996 x 662 x 2140 mm (39.2" x 26.1" x 84.3")	1301 x 662 x 2140 mm (51.2" x 26.1" x 84.3")	1606 x 662 x 2140 mm (63.2" x 26.1" x 84.3")	2216 x 662 x 2140 mm (87.2" x 226.1" x 84.3")
Exhaust Volume/ Static Pressure Required	**Face Velocity**	**Sash Opening**				
	0.4 m/s (80 fpm)	Design Opening: 457 mm (18.0")	1160 cmh at 18 Pa (682 cfm at 0.08" WG)	1507 cmh at 23 Pa (887 cfm at 0.10" WG)	1855 cmh at 28 Pa (1092 cfm at 0.12" WG)	2551 cmh at 20 Pa (1501 cfm at 0.09" WG)
	0.5 m/s (100 fpm)		1449 cmh at 28 Pa (853 cfm at 0.12" WG)	1884 cmh at 36 Pa (1109 cfm at 0.15" WG)	2319 cmh at 44 Pa (1365 cfm at 0.19" WG)	3189 cmh at 31 Pa (1877 cfm at 0.13" WG)
	0.4 m/s (80 fpm)	Full Open: 1647 mm (64.8")	1805 cmh at 20 Pa (1062 cfm at 0.09" WG)	2346 cmh at 34 Pa (1381 cfm at 0.15" WG)	2888 cmh at 51 Pa (1700 cfm at 0.22" WG)	3971 cmh at 24 Pa (2337 cfm at 0.10" WG)
	0.5 m/s (100 fpm)		2256 cmh at 31 Pa (1328 cfm at 0.13" WG)	2933 cmh at 52 Pa (1726 cfm at 0.22" WG)	3610 cmh at 80 Pa (2124 cfm at 0.34" WG)	4964 cmh at 38 Pa (2921 cfm at 0.16" WG)
Exhaust Outlet Diameter and Material		305 mm (12.0"), Fiberglass			
Number of Exhaust Collars		1			2
LED Lamp Intensity		975 lux (90 foot-candles)	948 lux (88 foot-candles)	919 lux (85 foot-candles)	971 lux (90 foot-candles)
Controller		Rocker Switches (Option to upgrade to Sentinel™ XL)			
Construction	Main Body	Electrogalvanized steel with Epoxy-polyester hybrid Isocide™ powder coating			
	Internal Liner (default)	Esco Resinate™			
	Worktop (default)	No worktop (Option to purchase low height base cabinet with worktop)			
Sash Specifications	Sash Material	Laminated-Tempered and Framed Safety Glass			
	Sash Configuration	Vertical		Vertical / Horizontal	
	Maximum Sash Opening (two vertical sash up)	1600 mm (63")			
Electrical	Cabinet Full Load Amps (FLA)	32 A			
	Cabinet Nominal Power	100 W (lighting only)			
Net Weight*		342 Kg (754 lbs)	420 Kg (926 lbs)	497 Kg (1096 lbs)	593 Kg (1307 lbs)
Shipping Weight*		370 Kg (816 lbs)	447 Kg (985 lbs)	530 Kg (1168 lbs)	630 Kg (1389 lbs)
Shipping Dimension, maximum (W x D x H)*		2500 X 1250 X 810 mm (98.42" x 49.21" x 31.89")	2500 X 1300 X 1070 mm (98.42" x 51.18" x 42.12")	2500 X 1250 X 1240 mm (98.42" x 49.21" x 48.81")	2500 X 1250 X 1080 mm (98.42" x 49.21" x 42.52")

** Fume hood unit only. Excludes base cabinet/ optional stand.*

Frontier® PPH™

Fully Polypropylene Fume Hood

The Frontier® PPH® Fume Hood provides the highest level of protection and containment against highly corrosive chemicals. Full polypropylene (PP) interior makes the hood metal-free and ideal for sensitive work such as trace metal analysis. PP also has an excellent rating against corrosion and chemical staining.

Tapered Exhaust Collar

- Helps reduce airflow turbulence, static pressure loss and noise level. It also enhances face velocity uniformity.

Polycarbonate Sash

- Ideal for applications that involve the use of Hydrofluoric Acid to prevent fogging or etching.


invent-uk

ASHRAE 110-2016 : SEFA 1-2010

CERTIFICATE OF TYPE TESTING IN ACCORDANCE WITH ASHRAE 110-2016

CERTIFICATE & REPORT NO: INVASHRAE110/899
DATE: 6th June 2019

Fume Hood Manufacturer:
Esco Micro Pte Ltd
21 Changi South Street 1
Singapore 486 777

Fume Hood Model/Type:
PPH-4UDPI W-8
1.2m wide bench-type
External Dimensions:
Height = 1500mm
Width = 1240mm
Depth = 900mm (max)
Internal Dimensions:
Height = 1200mm (max)
Width = 980mm (max)
Depth = 665mm (max)

Test Opening:
Width: 980mm
Height: 440mm

Fume Hood Flow:
Face velocity: 100ft/min (0.5 m/s)
Flow rate: 520cfm (900m³/hr)

Fume Hood Containment:
At all test positions: <0.01ppm
Test opening scans: <0.05ppm
Sash movement effect: <0.01ppm

This is to certify that the fume hood described above has been type-tested in accordance with ASHRAE 110-2016, as required by SEFA 1-2010, and resulted in performance characteristics given in the corresponding test report.

Tested and Certified by: Dr A F Bicen

Invent UK Ltd, 85 Southdown Road, Harpenden, Herts AL5 1PR
T: +44 (0) 1582 461666 F: +44 (0) 1582 460777 E: info@invent-uk.com

PPH is ASHRAE 110-2016 certified



Full PP internal chamber

- Internal liner and worktop is made of ivory-white polypropylene material which is easy to clean. PP also has excellent rating against staining.
- PP is stress-relieved for maximum durability and resistance against bending.

Optional Accessories:


Base Cabinet (EBP)


Circuit board protection


Service fixtures



Sentinel™ XL Airflow Alarm

Guide to Models, Frontier® PPH™ Fume Hoods

PPH- ___ D P ___ W- ___

External Width	Code	External Depth	Code	Internal Liner	Code	Sash Type	Code	Color Code	Code	Electrical Code	Code
1220 mm (48.0")	**4U**	900 mm (35.4")	**D**	Esco PP	**P**	Vertical	**V**	Esco White	**W**	230 VAC, 50/60 Hz	**8**
1525 mm (60.0")	**5U**					Combination	**C**			110-120 VAC, 50/60 Hz	**9**
1800 mm (70.8")	**6U**										
2400 mm (94.5")	**8U**										

General Specifications, Frontier® PPH™ Fume Hoods

Model	**220-240 VAC, 50/60 Hz, 1Ø**	**PPH-4UDPVW-8 2090366**	**PPH-5UDPVW-8 2090367**	**PPH-6UDPVW-8 2090368**	**PPH-8UDPVW-8 2090586**
		PPH-4UDPCW-8 2090505	**PPH-5UDPCW-8 2090507**	**PPH-6UDPCW-9 2090509**	**PPH-8UDPCW-8 2090582**
	110-120 VAC, 50/60 Hz, 1Ø	**PPH-4UDPVW-9 2090502**	**PPH-5UDPVW-9 2090503**	**PPH-6UDPVW-9 2090504**	**PPH-8UDPVW-9 2090585**
		PPH-4UDPCW-9 2090506	**PPH-5UDPCW-9 2090508**	**PPH-6UDPCW-9 2090510**	**PPH-8UDPCW-9 2090583**
Nominal size		1.2 meter (4')	1.5 meter (5')	1.8 meter (6')	2.4 meters (8')
External Dimensions (W x D x H)	Fume Hood unit only	1200 x 900 x 1500 mm (47.2" x 35.4" x 59.1")	1500 x 900 x 1500 mm (59.0" x 35.4" x 59.1")	1800 x 900 x 1500 mm (70.8" x 35.4" x 59.1")	2400 x 900 x 1500 mm (94.5" x 35.4" x 59.1")
	With Exhaust Collar	1200 x 900 x 1681 mm (47.2" x 35.4" x 66.2")	1500 x 900 x 1681 mm (59.0" x 35.4" x 66.2")	1800 x 900 x 1681 mm (70.8" x 35.4" x 66.2")	2400 x 900 x 1681 mm (94.5" x 35.4" x 66.2")
	With Fully-opened sash	1200 x 900 x 1879 mm (47.2" x 35.4" x 74.0")	1500 x 900 x 1879 mm (59.0" x 35.4" x 74.0")	1800 x 900 x 1879 mm (70.8" x 35.4" x 74.0")	2400 x 900 x 1879 mm (94.5" x 35.4" x 74.0")
Internal Work Area, Dimensions (W x D x H)		980 x 665 x 1200 mm (38.6" x 26.1" x 47.2")	1280 x 665 x 1200 mm (50.4" x 26.1" x 47.2")	1580 x 665 x 1200 mm (62.2" x 26.1" x 47.2")	2180 x 665 x 1200 mm (85.8" x 26.1" x 47.2")
Exhaust Volume/ Static Pressure Required at 0.5 m/s (100 fpm) at Full Open Sash		1305 cmh at 73 Pa (768 cfm at 0.29" WG)	1705 cmh at 95 Pa (1004 cfm at 0.38" WG)	2105 cmh at 117 Pa (1239 cfm at 0.47" WG)	2904 cmh at 135 Pa (1709 cfm at 0.54" WG)
Exhaust Outlet External Diameter		300 mm (11.8")			
Number of Exhaust Outlet		1			2
Light Intensity at Work Surface		950 lux (88 foot-candles)	935 lux (87 foot-candles)	900 lux (84 foot-candles)	953 lux (89 foot-candles)
Controller		Rocker Switches (Option to upgrade to Sentinel™ XL)			
Construction	Main Body	Polypropylene			
	Internal Liner				
	Worktop (default)				
Sash Specification	Sash Material	Polycarbonate			
	Sash Configuration	Vertical or Combination			
	Sloping	5^{o} slope			
	Maximum Sash Opening	790 mm (31.1")			
Electrical	Cabinet Full Load Amps (FLA)	32 A			
	Cabinet Nominal Power	25W (lighting only)			
Net Weight*		120 Kg (265 lbs)	140 Kg (309 lbs)	160 Kg (353 lbs)	200 Kg (441 lbs)
Shipping Weight*		150 Kg (331 lbs)	175 Kg (386 lbs)	195 Kg (430 lbs)	230 Kg (507 lbs)
Shipping Dimensions, Maximum* (W x D x H)		1320 x 1000 x 1840 mm (52.0" x 39.4" x 72.4")	1620 x 1000 x 1840 mm (63.4" x 39.4" x 72.4")	1920 x 1000 x 1840 mm (75.6" x 39.4" x 72.4")	2520 x 1000 x 1840 mm (99.2" x 39.4" x 72.4")

**Fume hood unit only. Excludes base cabinet/ optional stand.*

Accessories and Other Options:

Base Cabinets



EBC Base Cabinet for Frontier® Mono

Has built-in dished black phenolic resin laminate tabletop, four electrical socket outlets and polypropylene drip cup.



EBD Base Cabinet for Frontier® Duo

This base cabinet perfectly combines with your Frontier® Duo™ Fume Hood as an added storage area for your chemicals and reagents. It is made of electrogalvanized steel coated with Isocide™ powder for maximum corrosion resistance.



EBF Base Cabinet for Frontier® Floor Mounted Fume Hood

A removable low-height base cabinet with phenolic worktop can be added for a dual function feature. With the added base cabinet, the Frontier® Floor-Mounted™ fume hood can be reconfigured as a distillation fume hood with greater interior height for use of larger apparatus.



EBA-M Base Cabinet for Frontier® Acela™ M Series Fume Hood

Fabricated with electro-galvanized steel with hybrid Isocide™ powder coating for long term chemical, abrasion and weathering resistance. This cabinet is used for fume hoods with 1000 mm internal depth.



EBP Full polypropylene base cabinet for Frontier® PPH™ Fume Hood



Support Stand with levelling feet for Frontier® Acela™, Acid Digestion™, Perchloric Acid™, Radioisotope™ and Acela™ M Series Fume Hood



EBA Base Cabinet for Frontier® Acela™, Acid Digestion™, Perchloric Acid™, and Radioisotope™

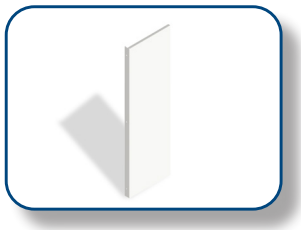
Fabricated with electro-galvanized steel with hybrid Isocide™ powder coating for long term chemical, abrasion and weathering resistance.

Additional accessories for your EBA cabinet:



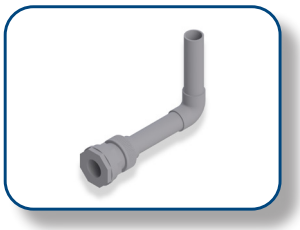
MCB

- Protects laboratory equipment during sudden fluctuation of current. This is only applicable to countries with 230 VAC, 50/60 Hz power requirement. This is factory-installed; specify when ordering.



Filler Panel (FP-EBAD)

- Used to increase the depth of the base cabinet to enclose pipings and utilities.
- One set of filler panels required per continuous row of hoods.



Ventilation Kit (VK-EBA)

- Ventilates base cabinet utilizing the hood exhaust system.
- Field-installed

Worktops

Esco offers seven (7) types of fume hood work surfaces for different applications. Table below compares the difference of each worktop in terms of chemical resistance, temperature resistance and cost.

Type	SS304	SS316	Trespa TopLab Plus Phenolic Resin	Epoxy	u-PVC	PP	Ceramic
Chemical Resistance	Good	Better	Better	Better	Best except for some solvents	Best	Best
Temperature Resistance	Better (300°C)	Better (300°C)	Good (110°C)	Good (165°C)	Good (90°C)	Good (160°C)	Best (1200°C)
Cost	Low Price	Mid Price	Md Price	Mid Price	Mid-Price	Mid-Price	Premium

The table below summarizes the different options for your fume hood's worktop. Please specify choice upon ordering since this is factory-installed.

Fume Hood	Trespa Toplab Plus Phenolic Resin	u-PVC	PP	Epoxy	Ceramic	SS304	SS316
Mono™	Default (for base cabinet)						
Duo™	Default			✓			
Acela™	Default			✓	✓	✓	✓
Acid Digestion™		Default	Default				
Perchloric™						Default	✓
Radioisotope™						Default	✓
Acela™ M Series					Default		
Floor Mounted™	Default (for base cabinet)						
PPH™			Default				

Default – built-in, factory-specified worktop

✓ *- option for upgrade; must be specified upon ordering.*

Esco Resinate™

Esco Resinate™ is a proprietary composite material specifically designed for use as internal liner in laboratory fume hoods.

- Excellent chemical resistance (refer to table below)
- Excellent physical properties provide structural reinforcement for the hood
- Smooth, attractive, easy-to-clean finish

Chemical Resistance* of Esco Resinate™ Internal Liner

	Chemicals	Result
Acids	85% Sulfuric Acid	No Effect
	98% Sulfuric Acid	1st Grade
	50% Nitric Acid	1st Grade
	65% Nitric Acid	2nd Grade
	36% Hydrochloric Acid	No Effect
	85% Phosphoric Acid	No Effect
	40% Hydrofluoric Acid	No Effect
	60% Chromic Trioxide	No Effect
	99% Glacial Acetic Acid	No Effect
	Aqua Regia	No Effect

	Chemicals	Result
Alkalis	40% Sodium Hydroxide	No Effect
	65% KOH	No Effect
	10% Iron Chloride	No Effect
	10% Copper Sulfate	No Effect
	15% Sodium Sulfate	No Effect
	Ammonium Hydroxide	No Effect

	Chemicals	Result
Solvents	37% Formaldehyde	No Effect
	N-Hexane	No Effect
	Ethyl Acetate	No Effect
	Ethyl Ether	No Effect
	Ethyl Alcohol	No Effect
	Isopropyl Alcohol	No Effect
	Carbon Tetrachloride	No Effect
	Naphthalene	No Effect
	Chloroform	No Effect
	Methanol	No Effect
	Toluene	No Effect
	Xylene	No Effect
	Acetone	No Effect
	Styrene	No Effect
	Phenol	No Effect

	Chemicals	Result
General Reagents	50% Magnesium Sulfate	No Effect
	34% Hydrogen Peroxide	No Effect
	Urea	No Effect
	Copper Sulfate	No Effect
	Karl Fisher Reagent	No Effect
	Iodine	No Effect

	Chemicals	Result
Stains and Indicators	1% Gentian Violet	No Effect
	Methylene Blue	No Effect
	Crystal Violet	No Effect
	Methyl Red	No Effect
	Methyl Orange	No Effect

Note: Esco Resinate™ may not be suitable for fume hoods for increased acidic and heat loads. Contact your local sales representative for details.

** Test Method: One drop of test chemical placed on material surface and covered with watch glass for 16 hours before result is observed.*

- *1st Grade: Slight effect on color and gloss. No change to physical properties.*
- *2nd Grade: Clear effect on color and gloss. No change to physical properties.*

Esco Resinate Plus™

Esco Resinate Plus™ liner is offer excellent chemical and physical resistance against harsh environments particularly against highly corrosive acids.

- Fiberglass Reinforced Plastic
- UL1805 Compliant
- Smooth, attractive, easy-to-clean finish

Accessories and Other Options:

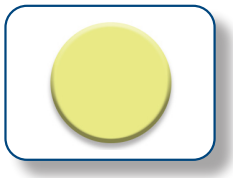
Enhanz™ Service Fixtures

Service fixtures provide a convenient supply of Gas, Vacuum, Air and Water within the working area of compatible Esco products, with American connection and European standard petcocks and fittings. European style fixtures are manufactured according to DIN 12898, DIN 12919 and DIN 3537. European style fixtures have a chemically resistant powder coated finish while American fixtures have an attractive chrome plated finish.

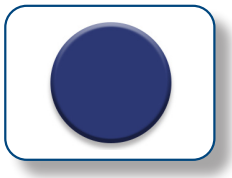
Service Fixtures are not installed at the factory unless otherwise specified, as such plumbing must be done according to local codes. By default, each fume hood comes with one (1) remote-controlled service fixture for water and another for gas. You can choose to add more depending on the fume hood you have. See table below for summary:

Models	Mono™	Junior™	Acela™	Acid Digestion™	Perchloric™	Radioisotope™	Acela™ M Series	Floor Mounted™	PPH™
No. of fixtures that can be added	2	0	6	6	6	6	6	6	6


Processed Water Cold


Gas

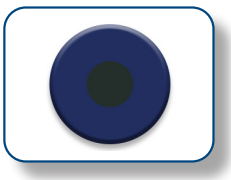

Nitrogen


Oxygen

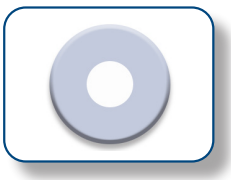

Compressed Air


Argon


Processed Water Hot


Carbon Dioxide


Deionised Water


Vacuum

Circuit Board Protection (MCB)



Provides additional protection to your fume hood unit during sudden fluctuation of current. This is only applicable to 230 VAC, 50/60 Hz hoods. This is factory-installed so it must be specified when ordering.

Compatible with the following Esco Frontier® Fume Hoods:
Acela™ • Acid Digestion™ • Perchloric Acid™ • Radioisotope™ • Acela™ M Series • Floor-Mounted™

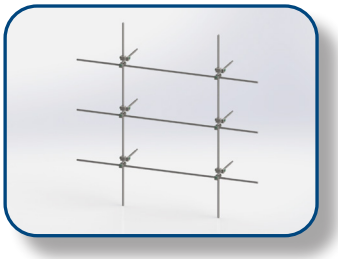
Exhaust Blower



The Esco exhaust blower is specifically designed for corrosive fume hood applications. Its forward-curved centrifugal type impeller is made of injection molded PPH making it highly resistant to chemicals and corrosion. It's performance is in accordance with AMCA 210-85 and ISO 5801.

Note:
1. When ordering exhaust fans, please specify the desired fan rotation, inlet/ outlet diameters and the power supply.
2. Explosion-proof blowers are also available.

Distillation Grids



Distillation grids are scaffoldings made of stainless steel 304 that are used to support clamps for distillation apparatus.

Drip Cups



Drip cups are factory-installed. Must be specified upon ordering.

Note:
Can be upgraded into several sizes

Scrubber



Esco's Fume Scrubber provides excellent air pollution control for fumes emitted from the chemicals during analysis before it leaves the exhaust system towards the atmosphere.

Features:

- Excellent removal efficiencies: 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.

Compatible with the following Esco Frontier® Fume Hoods:

Acela™ • Acid Digestion™ • Perchloric Acid™ • Radioisotope™ • Acela™ M Series • Floor-Mounted™



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.

Sentinel™ XL Airflow Alarm

Power-up your fume hood with Sentinel™ XL, an Esco fume hood airflow monitoring device designed to monitor face velocity in real time. The device will generate an alarm if the face velocity is not within safe limits ensuring safety to all operators.

Compatible with the following Esco Frontier® Fume Hoods:

Acela™ • Perchloric Acid™ • Acid Digestion™ • Radioisotope™ • Floor-Mounted™

Key features:

Enhanced Safety

- Provides audible (mutable) and visual alarm if face velocity is not within safe limits.
- Facilitates hood compliance with industry standards such as OSHA, NFPA, ANSI Z9.5 and EN14175.

Easy Installation

- Plug and play.
- Simple to calibrate and maintain.

User-Friendly Tool

- Hassle-free, self-test procedure.
- It has state-of-the-art, easy-to-use digital interface which clearly displays face velocity at one glance.



LCD Display
- Graphical Interface indicates hood performance.

Menu Button
- Provides access to settings, Admin Pin, and calibration.

Test Button
- Checks the buzzer alarm, temperature sensor and airflow sensor.

Set Button
- Displays menu or sub-menu options on LCD screen.

Mute Button
- Enables/disables sash alarm sound

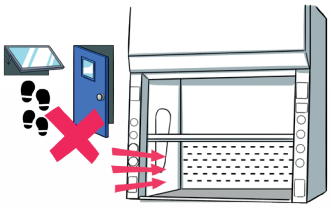
Up and Down Button
- Adjusts value inside menu options
- Moves the sash window upward and downward (for motorized sash only)



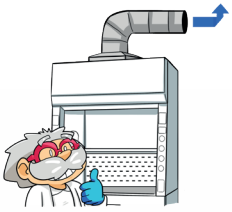
IN THE LOOP

Working Safely with Laboratory Fume Hoods

ESCO LIFESCIENCES



Install the fume hood away from any external disturbances such as: foot traffic, door opening, and aircons or fans.



Ensure that the exhaust has been turned on before commencing work.



Use appropriate personal protective equipment such as gloves, goggles, and laboratory gown.



Keep your face outside and practice working at least 6 inches back from the face of the hood.



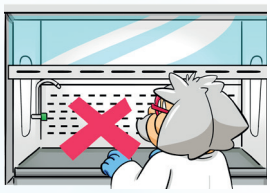
Move cautiously and avoid deliberate movements.



If a potential for explosion or eruption exists, a blast shield should be utilized.



If a combination sash is installed, do not open the vertical and horizontal sashes simultaneously.



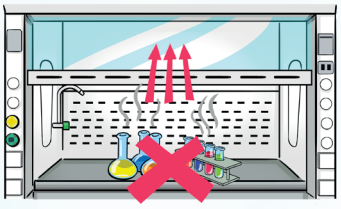
Do not remove the airfoil or baffles as they aid the hood's airflow.



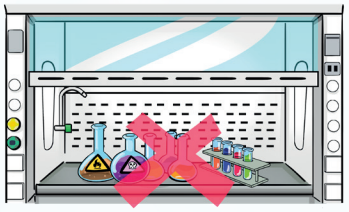
Do not use the fume hood as a storage area for chemicals and reagents as it will interfere with the airflow and containment.



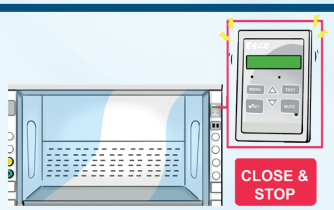
Do not use the hood's sink for waste disposal.



Do not let chemicals evaporate in the hood as a means of disposal.



Do not leave uncapped bottles of chemicals or waste in the hood.



If performance failure is suspected, immediately terminate usage. Close the sash completely and cease work.



Do not use Perchloric acid in a conventional fume hood because explosive perchlorate salts could accumulate in the exhaust system.



Perform routine maintenance and certification.

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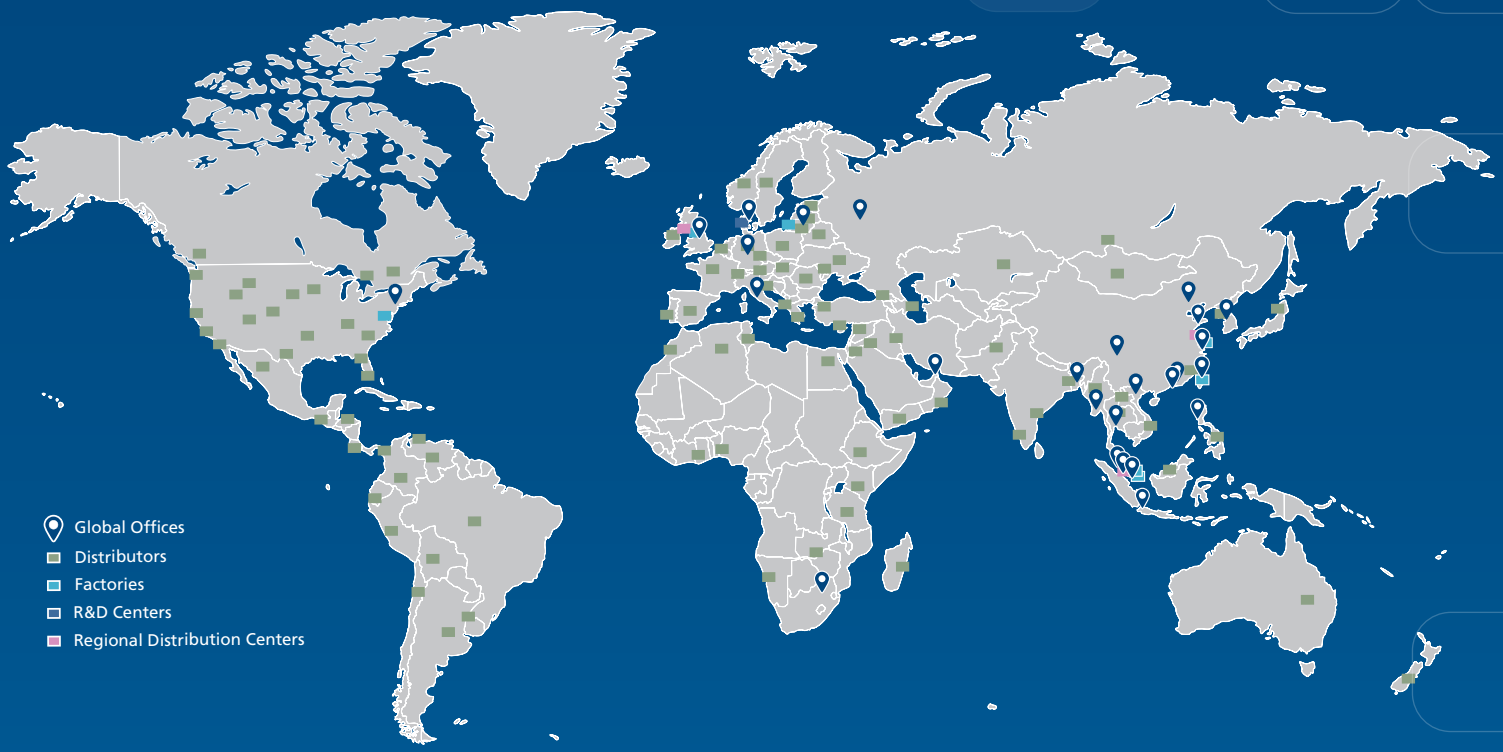
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