



Directflow

EBD SERIES

**DIRECT
GAS-FIRED
MAKE-UP AIR
SYSTEMS**



**SIX HORIZONTAL
MODELS AVAILABLE**

**TWO STANDARD
CABINET SIZES**

**AIR DELIVERIES:
3,200 - 40,000 SCFM.**

**UP TO 3" TOTAL
STATIC PRESSURE
STANDARD**

**HEAT INPUT FROM
117 TO 5,635 MBH**

**STANDARD
CONTROL FEATURES**

**LOCATION:
OUTDOOR
OR
INDOOR**

**100% OUTSIDE AIR
APPLICATIONS**

Industrial & Commercial Make-Up Air

Indoor Air Quality Control is necessary for personnel comfort and safety. In many workplace environments high levels of ventilation are required to accomplish this task.

The removal of large quantities of indoor air can cause negative building pressure, creating secondary problems such as:

- Flue Back-drafts in Combustion Equipment
- Pilot Failures in Heating & Cooling Equipment
- Infiltration of Dirt and Contaminants
- Performance Reducton of Exhaust Ventilation Fans
- Difficulty Opening Doors and Windows
- Uncomfortable Working Conditions
- Odor Control Problems in Commercial Kitchens

To prevent these effects, provisions for adequate supplies of replacement air are essential.

The EBD Series

The EBD Series of Direct Gas-Fired Make-Up Air Systems furnishes fresh, clean and tempered air by the most fuel-efficient and cost effective means currently in existence.

EBD Systems utilize "Line" burner technology to heat incoming air. Combustion efficiency is 100%. Thermal efficiency is 92%, with 8% of released energy absorbed by the formation of water vapor during combustion.

Combustion products are limited to a 5 ppm (parts per million) of carbon monoxide and 0.5 ppm of NOX. These are the levels accepted by ANSI standards for Direct-Fired Heating Equipment.

EBD Units are constructed with Premium Energy Efficiency Motors and Forward-Curved Centrifugal Fans, Accurate Temperature and Air Control Systems, and **Optional Filtration to provide a complete system to fit each application.**

Typical Applications For EBD Series Units

- Exhaust Hoods for Commercial Kitchens
- Welding Fume Exhaust Equipment
- Foundry and Plating Area Ventilation
- Chemical Fume Exhaust Hoods
- Paint / Spray Booth Applications
- Grinding and Buffing Area Ventilation
- Wood, Metal and Plastic Working Areas
- Commercial Garage Ventilation
- General Factory Heating and Ventilation

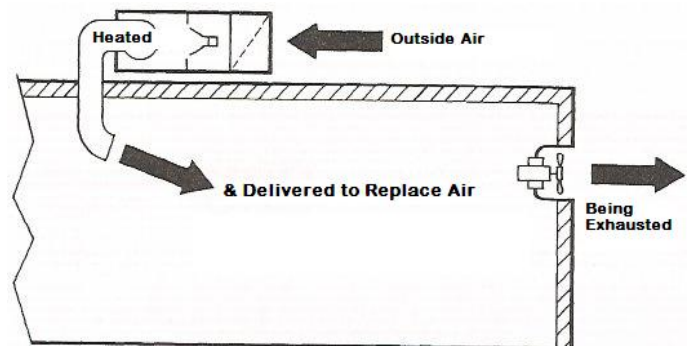


Figure 1: Typical Application – For Every Cubic Foot of Exhaust Air – a Cubic Foot of Make-UP Air is Required.

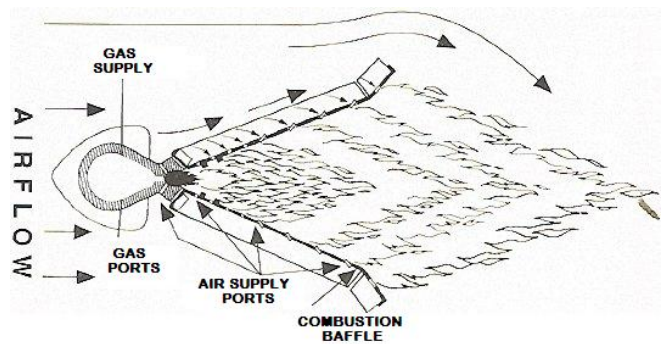
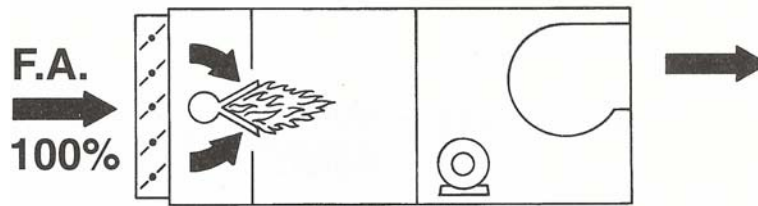


Figure 2: Burner Combustion Pattern

EBD – 100% FRESH AIR APPLICATIONS



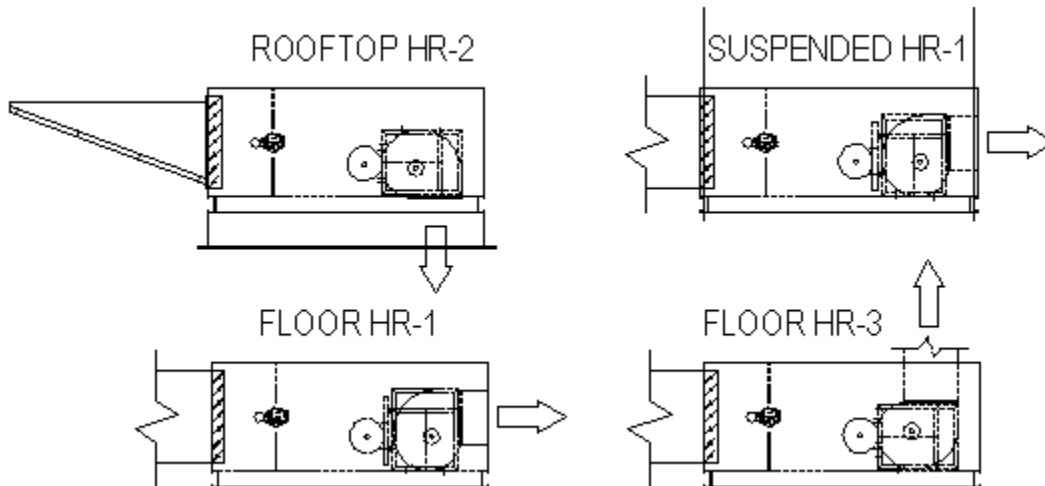
The basic EBD system is designed to introduce 100% outside air into a building to replace exhaust air and help reduce infiltration of cold air and contaminants.

During EBD operation, airflow is continuous. A modulating gas flame control regulates the burner. This control system provides operation at any point on its turndown range to provide a constant discharge air temperature.

Normally an exhaust system is interlocked with the EBD make-up air system. An auxiliary starter contact is supplied with the EBD for this function.

The EBD system's primary application is to serve as a make-up air heater. In many industrial and commercial applications, this is both practical and economically sound.

EBD – TYPICAL INSTALLATION CONFIGURATIONS



The EBD system is designed for easy installation in multiple locations. This makes it flexible and adaptable if project design changes occur.

The HR-3, Vertical Up Discharge configuration is a fixed option.

Standard Equipment

General Features:

Two standard blower discharge arrangements are available:

HR-1: Horizontal and HR-2: Discharge Rigid Base Frame for mounting on roof curb or steel, suspended by vertical hangers or on a flat surface.

Cabinet:

18 Gauge Galvanized Steel Cabinet with 22 Gauge Liner.

Doublewall insulated panels provide easy access to motors, controls, piping, and filters.

Durable Blowers & Motors:

Forward curved, DWDI, Class 2 fan with solid turned ground shaft & 100,000 hour bearings.

Fans elastically mounted to unit rigid base frames to minimize vibration and provide for quiet operation.

Motor and drive mounted within unit protects motor and eliminates personnel safety hazards due to external drives.

Standard Adjustable V-Belt Drive – sized for 135% of motor HP.

Premium Efficient (E+), T-Frame, open drip-proof, 1800 RPM motors for all standard voltages.

Variable Pitch Motor Sheaves standard on 10 HP and below.

Dependable Gas and Safety Systems:

Gas and safety controls with:

- Fireeye Flame Safeguard
- Flame Rod Sensor
- Gas Pilot Ignition
- High Temperature Limit Switch
- Electronic Discharge Air Temperature Controller
- Control System and Ignition Transformer
- Electrical Fuse Circuit Protection
- Main Gas Shut-off Valve
- High and Low Velocity Airflow Proving Switches
- Motor Starter and Overloads
- Auxiliary Starter Contact
- Compliance with ANSI Codes

Burners:

Direct Gas-Fired Line Burner for Natural Gas from 6 oz to 1 PSIG with up to 22:1 turndown ratio.

Basic Control Package / DC-1:

Maxitrol Series 14 Basic Modulating Discharge Air Sensor and Remote Temperature Selector Dial (Field Installed).

All Interfacing Selector Switches, Indicating Lights and Mild Weather Burner Cut-Out Control and Low Outlet Temperature Shut-off Control provided by others.

Options and Accessories

General:

HR-3 – Vertical Up-Blast Arrangement.

Roof Curb:

Shipped Knock-Down for Field Installation.

Motors & Drives:

Variable Pitch Motor Sheaves 15 HP and above.
Total Enclosed Motors.
Two Speed 1800/1200 RPM Motors.
Extended Grease lines for blower shaft bearings located on cabinet exterior.

Burners:

Propane Firing in lieu of Natural Gas – Contact Factory.

Electric & Gas Controls:

High Gas Pressure Regulator.
Regulators Shipped Loose for Field Installed.
Low Pressure Gas Manifold – 7” to 10” w.c.
Insurance Approvals for Gas Controls:
GE-GAPS – Formerly IRI, Factory Mutual, or combined GE-GAPS/FM.
High and Low Gas Pressure switches.
Pre-Purge Timer prior to trial for ignition.
Disconnect Switch or Circuit Breaker – Field mounted and wired.
UV Scanner.

Dampers:

Motorized Intake Damper – Supplied with two position motor with internal damper proving end switch.
Recommended for indoor installations to isolate unit from outside air when not in operation.
Motorized Discharge Damper – Supplied with two position motor with internal damper proving end switch.
Recommended for outdoor installations to isolate unit from indoor air when not in operation, preventing heat loss and condensation within unit.

Weather Hoods:

Stormproof Weatherhood and Birdscreen.
Stormproof Weatherhood with Birdscreen with 2” Cleanable Filters.

Other:

V-Bank Filter Sections:

Filter Section – “V”-bank section for 2” deep filters.
Filters – Extended Surface or Cleanable Filters available.

External Vibration Isolation – Spring or Rubber-in-Shear Isolators. Shipped Loose.

Expanded Basic Control Package / DC-2

Maxitrol Series 14 Basic Modulating Discharge Air Sensor, Mild Weather Burner Cut-Off Sensor, and Low Outlet Temperature Shut-off Control.
Remote Control Panel with Summer-Off-Winter Switch, Blower On-Off Switch, Indicating Lights for Blower On, Heat On, Flame Failure Alarm On, Blocked Intake Filter Alarm On (if filters are ordered) and Discharge Air Temperature Selector Dial.

Basic System – HV-1 includes a solid state amplifier, high and low temperature discharge sensor, remote temperature selector dial/sensor and modulator/regulator gas valve. Temperature selector dial/sensor field mounted and wired.

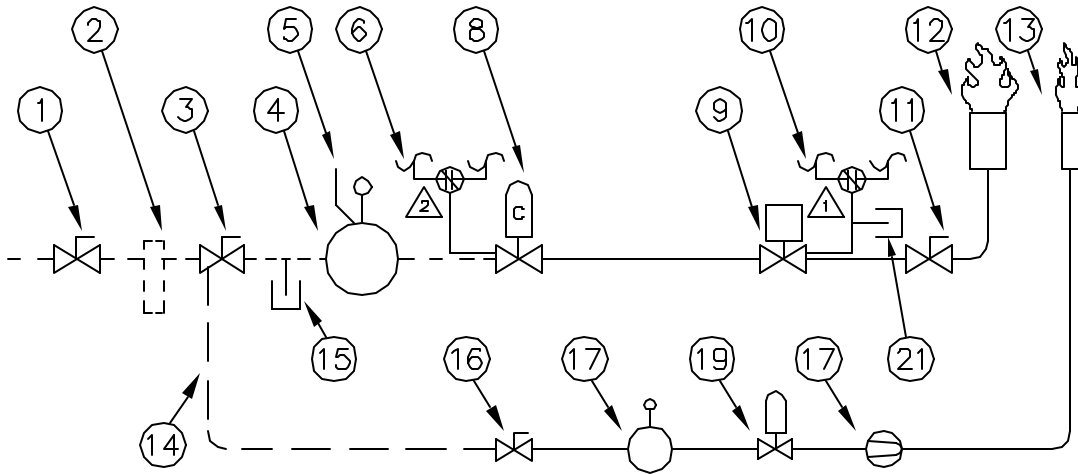
Expanded Basic System – HV-2 includes solid state amplifier, high and low temperature discharge sensor, modulating regulator gas valve, remote control station with indicator lights for blower on heat on, flame failure alarm on, blocked intake alarm on (if ordered), summer-off-winter switch, blower on-off switch, mild weather burner cut-out, low outlet shut-off and temperature selector dial/sensor (mounted on front of remote panel lid).

Basic System – BMS-1 includes signal conditioner to modulate electronic modulating gas valve based on a 4-20 MA or 0-10 VDC signal from building management system with a fixed maximum discharge air temperature of 90 degrees F. regardless of customer’s “BMS” signal input. Building management system will monitor blower, on heat on, flame failure alarm on, blocked intake alarm on (if ordered), heating on function, blower on-off function and mild weather burner cut-out control function and low outlet temperature shut-off function.

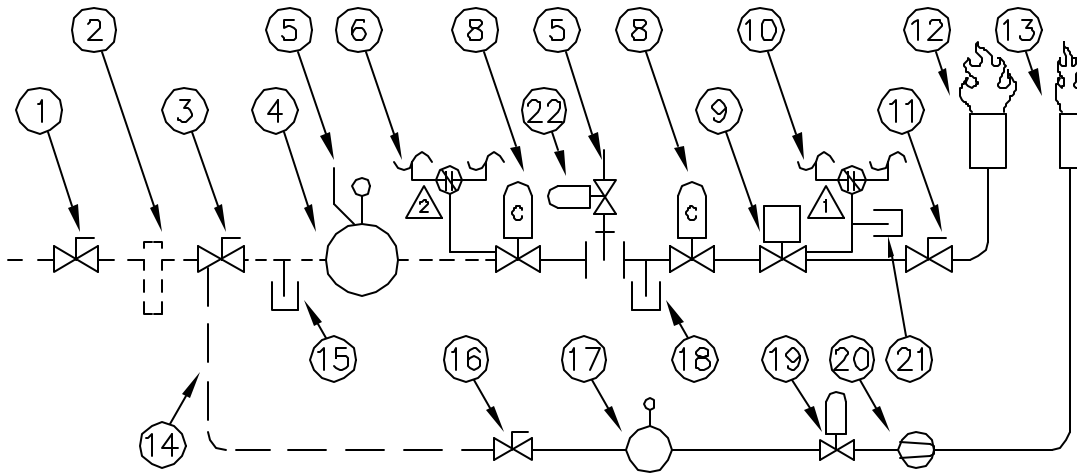
Expanded Basic System – BMS-2 includes signal conditioner to modulate electronic modulating gas valve based on a 4-20 MA or 0-10 VDC signal from building management system with a fixed maximum discharge air temperature of 90 degrees F. regardless of customer’s “BMS” signal input. Remote control station shall be provided with indicator lights for blower on, heat on, flame failure alarm on, blocked intake alarm on (if ordered), summer-off-winter switch, blower on-off-auto switch, mild weather burner cut-out controller and low temperature shut-off controller.

EBD SCHEMATIC PIPING DIAGRAMS

- UNLISTED UNIT
- GE GAP UNDER 1 MBH
- GE GAP & FM UNDER 1 MBH
- FM UNDER 12.5 MBH



- GE GAP ABOVE 1 MBH
- FM & GE GAP ABOVE 1 MBH



ITEM	DESCRIPTION	
1	MAIN GAS HAND SHUT-OFF VALVE (IF RECOMMENDED BY FM)	X
2	DRIP LEG	X
3	MAIN GAS HAND SHUT-OFF VALVE NPT	X
4	MAIN GAS PRESSURE REGULATOR	X
5	VENT LINE THRU ROOF TO OUTSIDE ATMOSPHERE	X
6	LOW GAS PRESSURE SWITCH	X
7		
8	SAFETY SHUT-OFF VALVE WITH PROOF OF CLOSURE	X
9	SELECTRA VALVE	X
10	HIGH GAS PRESSURE SWITCH	X
11	MANUAL LEAK TEST HAND VALVE	X
12	MAIN GAS BURNER	X
13	PILLOT GAS BURNER	X
14	PILLOT GAS SUPPLY LINE	X
15	TEST CONNECTION UPSTREAM OF ITEM 4	X
16	PILLOT GAS HAND VALVE	X
17	PILLOT PRESSURE REGULATOR	X
18	TEST CONNECTION BETWEEN SSOV'S	X
19	PILLOT SOLENOID VALVE	X
20	PILLOT NEEDLE VALVE (IF REQUIRED)	X
21	TEST CONNECTION DOWNSTREAM OF ITEM 10	X
22	VENT VALVE (NORMALLY OPEN)	X

△ 1 HIGH GAS PRESSURE SWITCH REQUIRED FOR:
 -FM GREATER THAN 2.5MBH
 -FM ANY SIZE W/ GAS PRESSURE OVER 14" W.C.
 -GE GAP OR GE GAP & FM OVER 150,000

△ 2 LOW GAS PRESSURE SWITCH REQUIRED FOR:
 -FM GREATER THAN 2.5 MBH
 -GE GAP OR GE GAP & FM OVER 150,000

MODEL SELECTION TABLE

Model	Air Delivery - SCFM	Outlet Velocity - FPM	Appx. Ship Wt. - LBS.	MBH Input								Motor Horsepower								
				Air Temperature Rise (ΔT)								Total Static Pressure (Refer to Notes Below)								
				50	60	70	80	90	100	110	120	1"	1 1/4"	1 1/2"	1 3/4"	2"	2 1/4"	2 1/2"	2 3/4"	3"
EBD 112	3200	1818	920	188	225	263	301	338	376	413	451	2	2	2	2	2	3	3	3	5
	4000	2273	920	235	282	329	376	423	470	517	563	2	2	2	3	3	3	3	5	5
	5000	2841	920	293	352	411	470	528	587	646	704	3	3	3	3	5	5	5	5	5
	6000	3409	945	352	423	493	563	634	704	775	845	5	5	5	5	5	5	7.5	7.5	7.5
	7000	3977	955	411	493	575	657	740	822	904	986	5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
EBD 116	6000	2166	965	352	423	493	563	634	704	775	845	3	3	3	5	5	5	5	7.5	7.5
	7000	2577	975	411	493	575	657	740	822	904	986	3	5	5	5	7.5	7.5	7.5	7.5	7.5
	8000	2888	975	470	563	657	751	845	939	1033	1126	5	5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
	9000	3249	1195	528	634	740	845	951	1056	1162	1267	7.5	7.5	7.5	7.5	7.5	7.5	7.5	10	10
	10000	3610	1195	587	704	822	939	1056	1173	1291	1408	7.5	7.5	7.5	7.5	10	10	10	10	10
EBD 118	8000	2286	1195	470	563	657	751	845	939	1033	1126	3	5	5	5	5	5	7.5	7.5	7.5
	9000	2571	1215	528	634	740	845	951	1056	1162	1267	5	5	5	5	7.5	7.5	7.5	7.5	7.5
	10000	2857	1215	587	704	822	939	1056	1173	1291	1408	5	5	7.5	7.5	7.5	7.5	7.5	10	10
	12000	3429	1235	704	845	986	1126	1267	1408	1549	1690	7.5	7.5	10	10	10	10	10	15	15
	14000	4000	1235	822	986	1150	1315	1479	1643	1807	1972	10	15	15	15	15	15	15	15	15
EBD 120	12000	2727	1255	704	845	986	1126	1267	1408	1549	1690	7.5	7.5	7.5	7.5	7.5	10	10	10	10
	14000	3182	1280	822	986	1150	1315	1479	1643	1807	1972	7.5	10	10	10	10	15	15	15	15
	16000	3636	1280	939	1126	1315	1502	1690	1878	2066	2254	10	15	15	15	15	15	15	15	20
	18000	4091	1305	1056	1267	1479	1690	1901	2113	2324	2535	15	15	15	20	20	20	20	20	20
EBD 125	16000	2319	1375	939	1126	1315	1502	1690	1878	2066	2254	7.5	7.5	7.5	10	10	15	15	15	15
	18000	2609	1375	1056	1267	1479	1690	1901	2113	2324	2535	7.5	10	10	10	15	15	15	15	15
	20000	2899	1480	1174	1408	1643	1878	2113	2347	2582	2817	10	10	15	15	15	15	20	20	20
	22000	3188	1545	1291	1550	1807	2066	2324	2582	2840	3099	15	15	15	15	15	20	20	20	20
	24000	3478	1600	1408	1690	1972	2254	2535	2817	3099	3380	15	15	20	20	20	20	20	25	25
	26000	3768	1635	1526	1831	2136	2441	2746	3052	3357	3662	20	20	20	20	25	25	25	25	30
	28000	4058	1655	1643	1972	2301	2629	2958	3286	3616	3944	20	25	25	25	30	30	30	30	30
EBD 128	26000	2989	1730	1526	1831	2136	2441	2746	3052	3357	3662	15	15	20	20	20	25	25	25	25
	28000	3218	1760	1643	1972	2301	2629	2958	3286	3616	3944	20	20	20	20	25	25	25	30	30
	30000	3448	1805	1761	2113	2465	2817	3169	3521	3874	4226	20	25	25	25	25	30	30	30	40
	32000	3678	1840	1878	2253	2629	3005	3381	3756	4132	4507	25	25	25	30	30	30	40	40	40
	34000	3908	1905	1995	2394	2793	3193	3592	3991	4390	4789	30	30	30	40	40	40	40	40	40
	36000	4138	1950	2113	2535	2958	3381	3803	4226	4648	5071	40	40	40	40	40	40	40	50	50
	38000	4368	1980	2230	2676	3122	3568	4014	4461	4906	5353	40	40	40	50	50	50	50	50	50
	40000	4597	2175	2348	2817	3289	3756	4226	4695	5165	5635	50	50	50	50	50	50	50	C.H.O.	C.H.O.

NOTES: Use Total Static Pressure column that will overcome total system resistance. Approximate pressure drop for components and necessary items: burner 1/2", filter (dirty) 1/4", intake hood 1/8, birdscreen 1/8", discharge louver 1/8". Damper resistance may be ignored. Weatherproof Intake Hood with Birdscreen and 2" cleanable filters available for: EBD-112 thru 118 up to 12,000 CFM and EBD-120 thru 128 up to 30,000 CFM. Shaded areas require Class 2 fans.

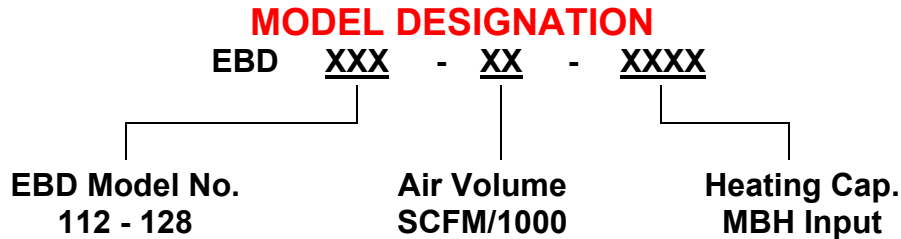
MOTOR FRAME SIZE REFERENCE TABLE

Motor HP	MOTOR TYPE		
	1800 RPM Dripproof or TEFC	1800/1200 RPM Two Winding	
		Dripproof	TEFC
1	143T	145T	145T
1.5	145T	145T	145T
2	145T	182T	182T
3	182T	184T	184T
5	184T	215T	215T
7.5	213T	254T	254T
10	215T	256T	256T
15	254T	–	–
20	256T	–	–
25	284T	–	–
30	286T	–	–
40	324T	–	–
50	326T	–	–
60	364T	–	–

GAS MANIFOLD SIZE		
Based on Standard 10" Inlet gas pressure (Above 6900 MBH – C.H.O.)		
Manifold Size NPT	Maximum MBH – Natural Gas	
	Electronic Modulation & FM	Electronic Modulation with GE – GAPS or FM
1"	1000	1000
1 ¼"	1410	1255
1 ½"	2170	1860
2"	3420	3060
2 ½"	5200	4470
3"	6900	5840

Notes:

1. All motors 3 phase.
2. 15 HP and above will require variable speed drive for two speed applications.



SELECTION PROCEDURE:

1. Choose the EBD system for 100% outside air.
2. Determine unit model from ED Series Selection Table using SCFM of air and MBH input or air temperature rise in °F.
3. For model selected, determine required motor HP for total static pressure resistance. See Notes on page 6 below model selection table regarding statics.

Selection Example:

For a unit to heat 18,000 SCFM of 100% O.A. with an Air Temperature Rise of 100°F and External Static of 0.50": Determine – Roof mounted with Down Discharge, furnished with cleanable filters and intake hood. Fuel is natural gas at 1 PSIG inlet pressure, electric service is 460V/60Hz/3ph.

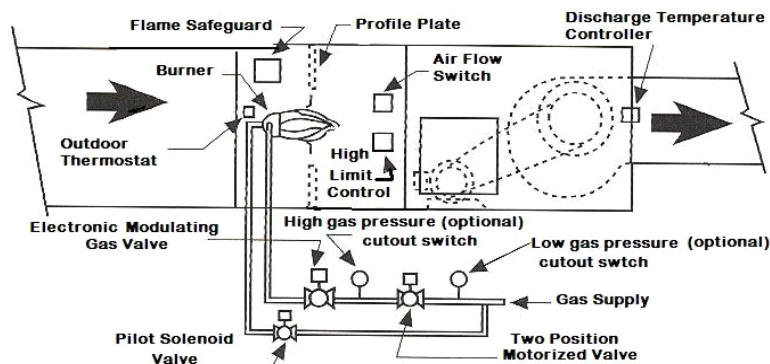
1. EBD system is chosen for 100% outside air.
2. At 18,000 SCFM and 100°F ΔT, select model ED125. MBH Input is 2,113.
3. Total Static is 0.50" + Hood, Birdscreen, Filters, Burner, and Discharge = 1.63".
4. For TSP = 1.63", selection table indicates that a 15 HP motor is required.

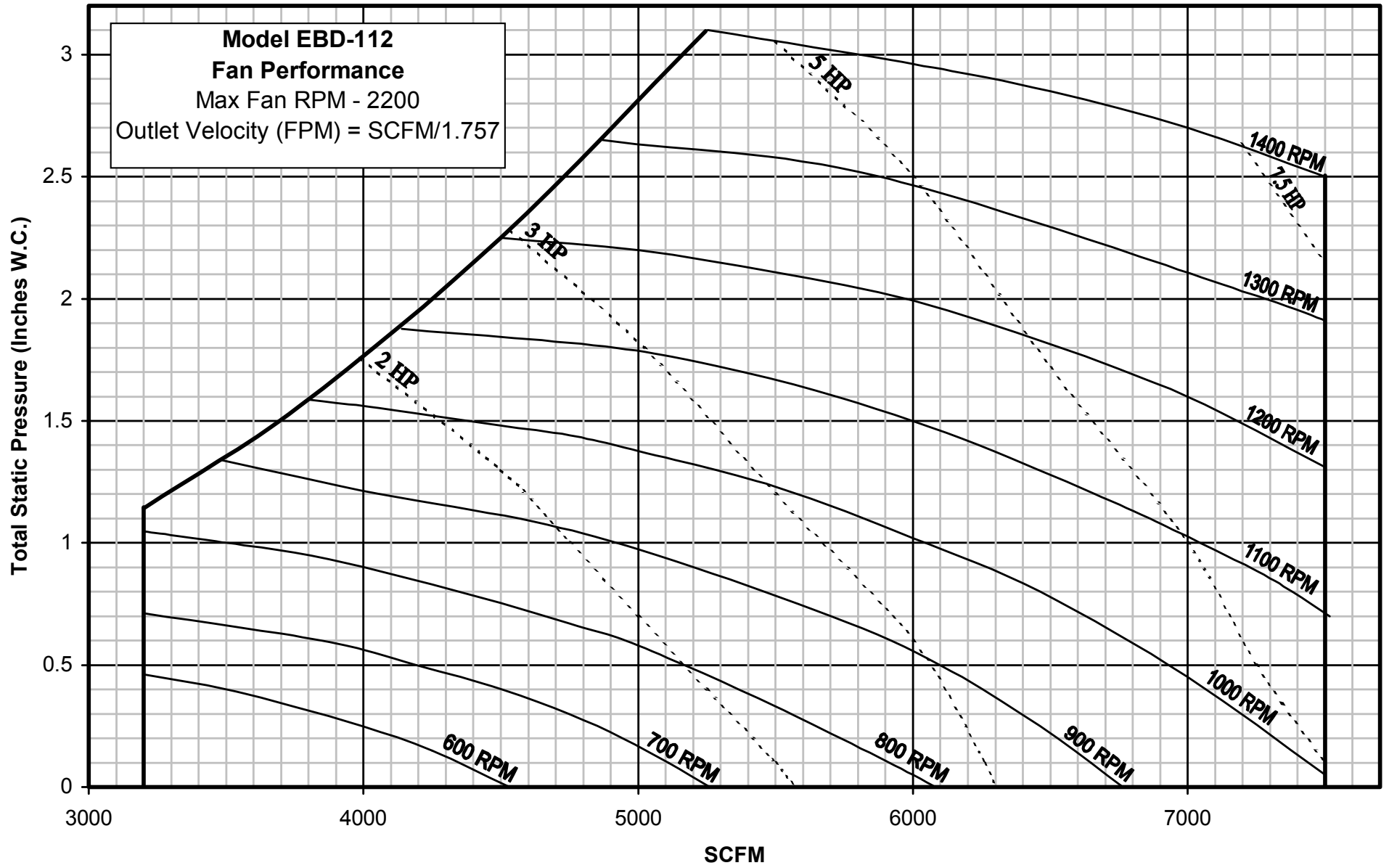
Selection is complete: Model EBD-125-18-2113 with 15 HP motor - Natural gas fired with 1 PSIG Gas Pressure, Rooftop Mounted, Weatherproof, 460/60/3 Power, HR-2 Arrangement, 2" Cleanable Filters, and Intake Hood.

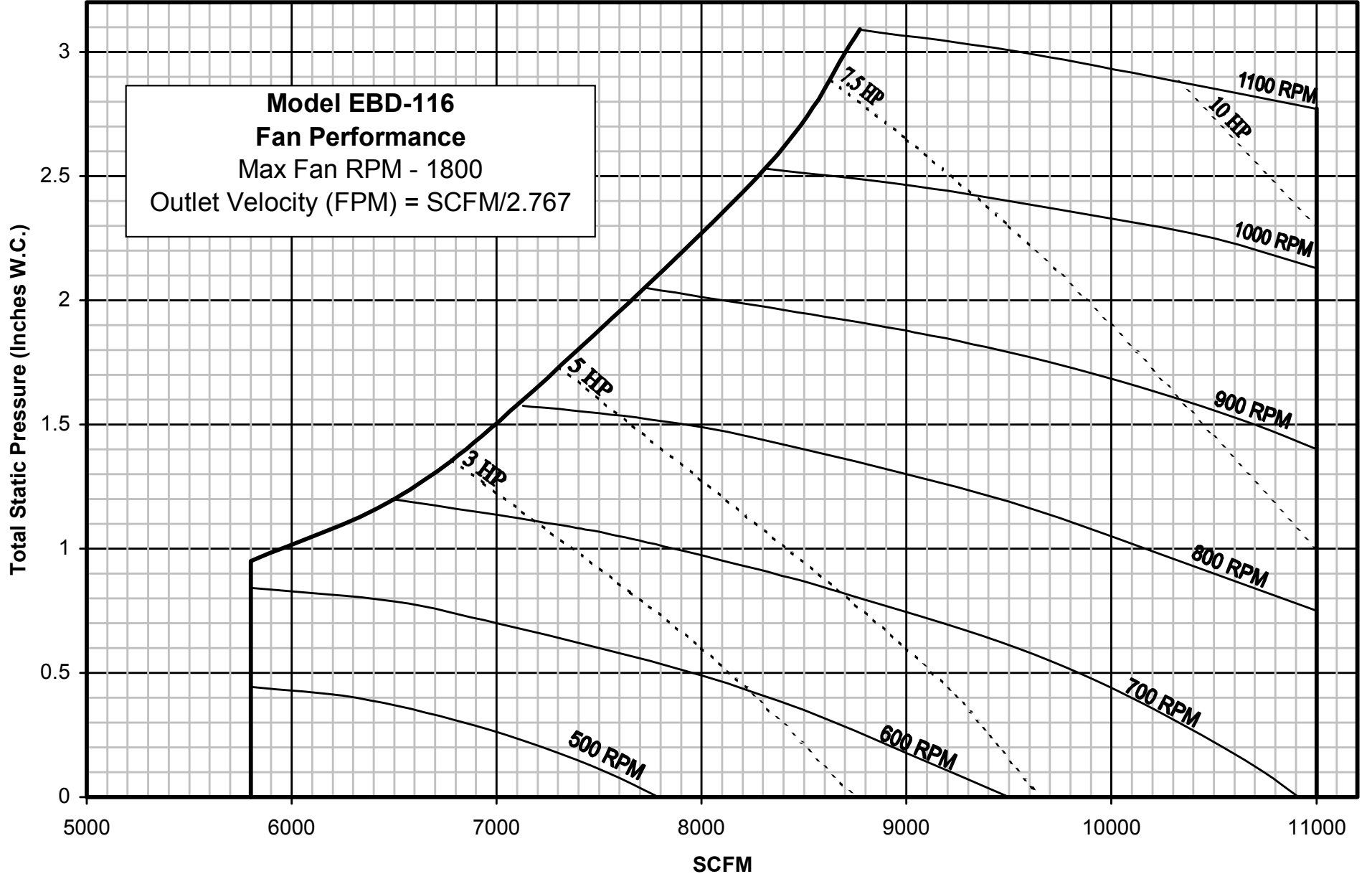
MODEL SELECTION TABLE NOTES:

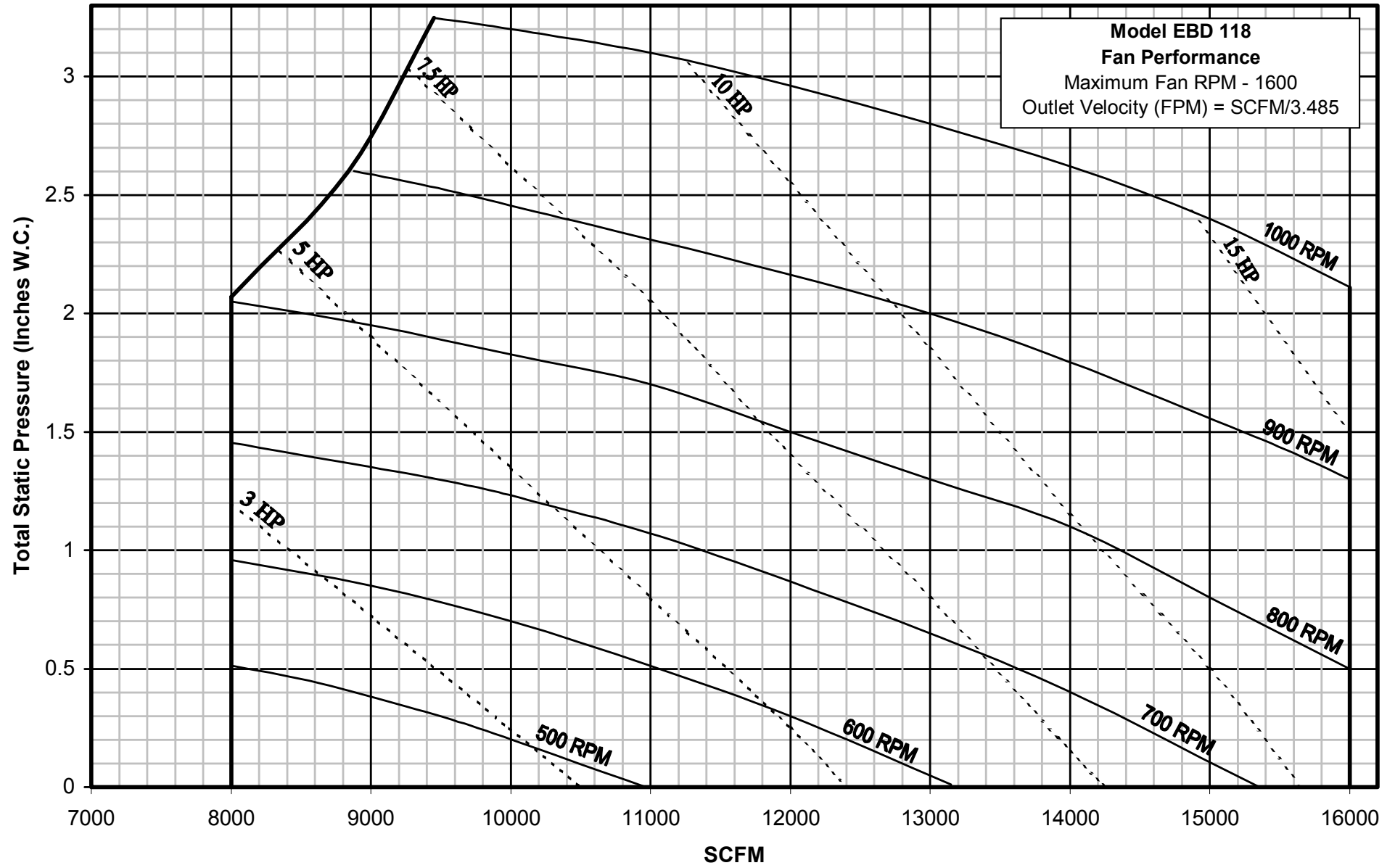
1. $\Delta T = (920 \times MBH) \div (1.08 \times SCFM)$ & $MBH = (1.08 \times SCFM \times \Delta T) \div 920$
2. Use Total Static Pressure column that will overcome Total System Resistance. This will include External Static Pressure of System and Internal Static Pressure of EBD unit components. The following must be included, as applicable – Approximate pressure drop for components and accessory items: Burners – 1/2"; Filter (dirty) – 1/4"; Intake Hood – 1/8"; Birdscreen – 1/8"; Discharge Louver – 1/8"; Damper resistance – may be ignored.
3. NA – Not Available, CHO – Contact Home Office

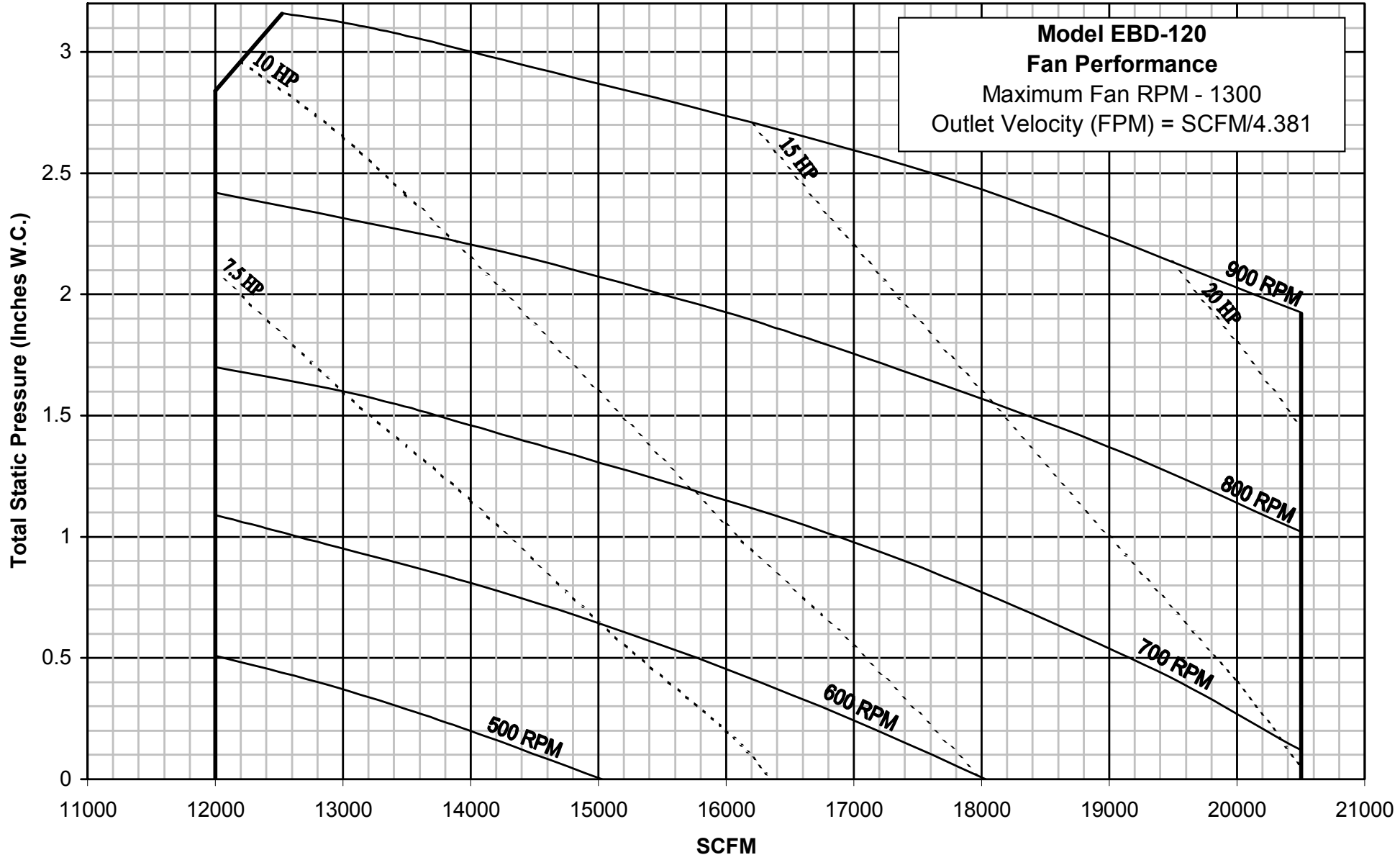
SAFETY AND LIMIT CONTROLS OF EBD SYSTEMS

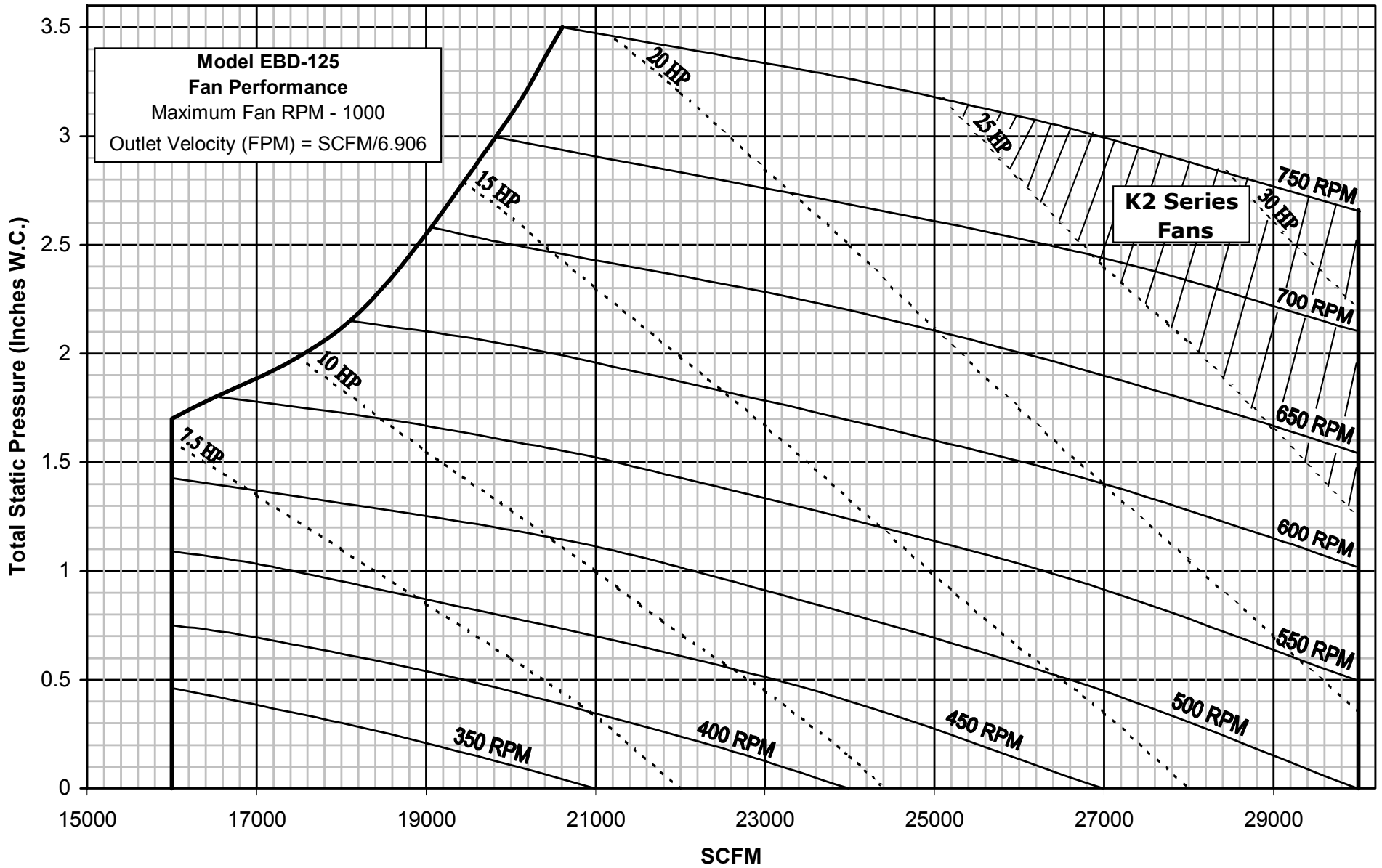


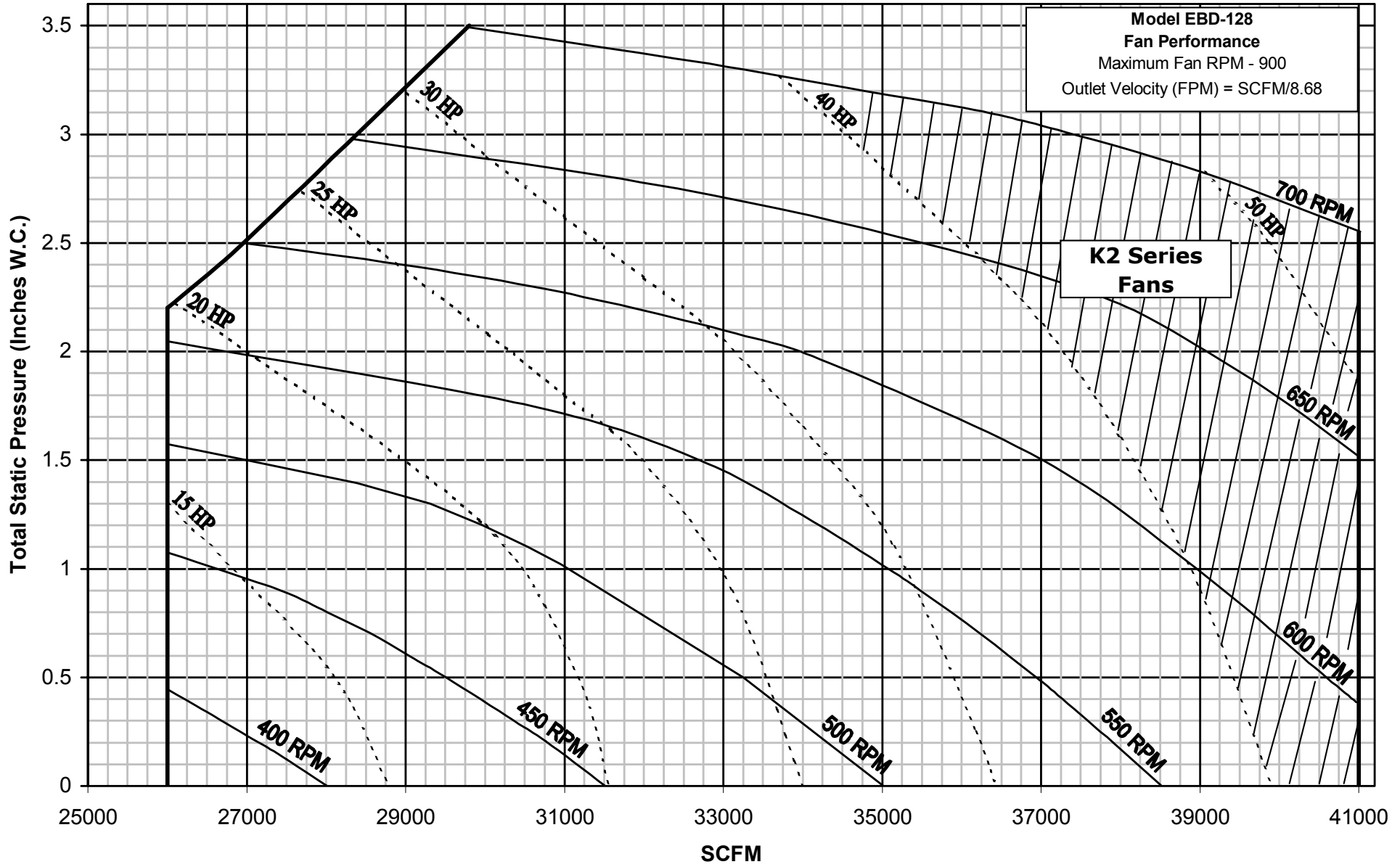






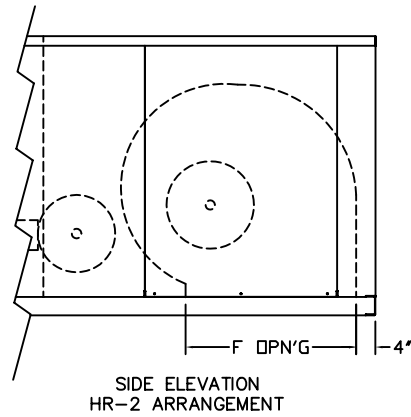
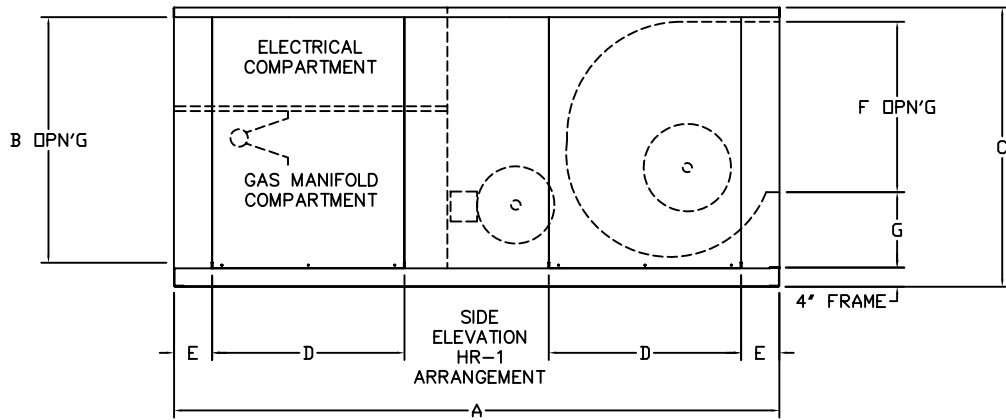
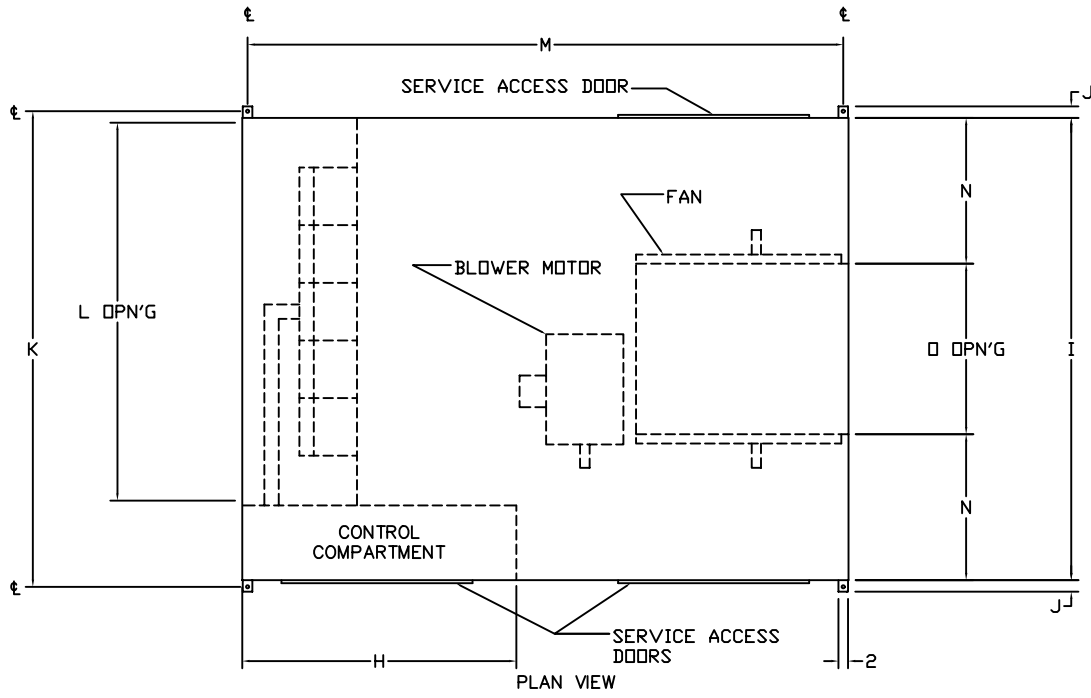






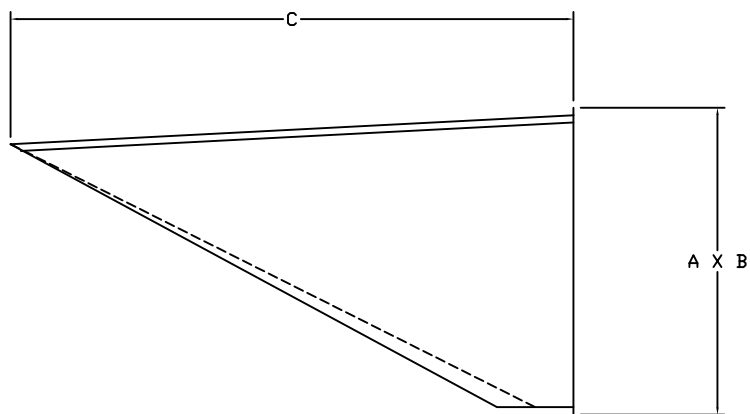
EBD - HORIZONTAL MODEL BASE UNIT

EBD - 112 THRU 128

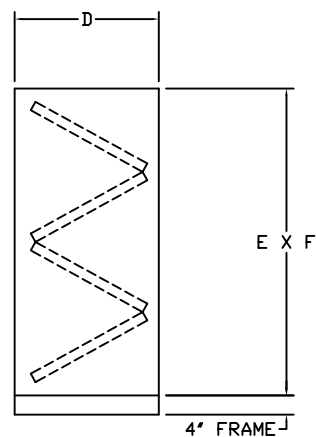


SIZE	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
112						16	7							24	16
116	124	32 9/64	39 3/16	40	7	20	8 7/8	54	64	2 1/2	66 1/2	49 1/8	122	22	20
118						22 1/2	10							20 3/4	22 1/2
120						25 1/8	10 13/16							35 9/16	25 1/8
125	126	51 1/8	58 1/8	40	8	31 9/16	13 3/4	57	96 1/4	2 3/8	99	78 5/8	124	32 11/32	31 9/16
128						35 1/2	15 21/32							30 3/8	35 1/2

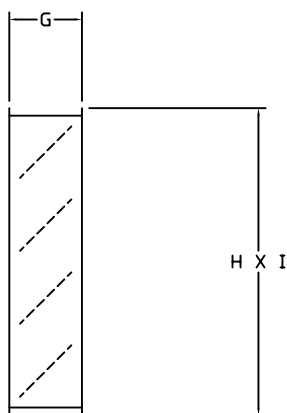
ACCESSORY ITEMS



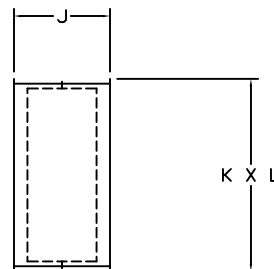
INTAKE HOOD WITH BIRDSCREEN



FILTER SECTION



INTAKE DAMPER



DISCHARGE DAMPER

SIZE	A	B	C	D	E	F	G	H	I	J	K	L
112											20	20
116	33 1/2	49 1/4	58	30	33 1/2	49 1/4	10	33 1/2	49 1/4	10	24	24
118											26 1/2	26 1/2
120											29 1/8	29 1/8
125	54 1/8	80 1/4	63	30	54 1/8	80 1/4	10	54 1/8	80 1/4	10	35 1/2	35 1/2
128											39 1/2	39 1/2

Engineer's Specifications

Furnish and Install the following Hastings HVAC, Inc. Direct Gas-Fired Make-Up Air System:

Blower and Cabinet:

- A. Blower Wheel shall be statically and dynamically balanced forward curved, double width, double inlet, Class 2.
- B. Blower Wheel shall be mounted on solid turned ground shaft with keyways for driven shaft.
- C. Pillow Block ball bearings shall be L10 Rated for Min. 100,000 hours. Self Aligning, and Greasable, with Extended Grease Lines to Cabinet Exterior.
- D. Blower housings, bearings and adjustable motor base shall be elastically mounted on a rigid unit base frame to minimize vibration transmission and ensure quiet operation.
- E. The driver and driven sheaves shall be of the keyed hub type. The driven sheave shall be of a fixed pitch diameter and the driver sheave shall be of a variable pitch diameter through 10 HP and fixed pitched above 10 HP. V-belt drives shall be sized for 135% of motor horsepower.
- F. Cabinet shall be constructed of high quality galvanized steel to ensure long rust-free life.
- G. 1" double wall insulated cabinet constructed with 18 ga. exterior and 22 ga. interior galvanized steel.
- H. Access panels shall be provided to allow easy access to motors, controls, piping, drives, and filters (if ordered).

Burner Assembly:

- A. The burner shall be a direct gas-fired burner suitable for complete combustion of natural gas, propane or propane-air mixture, and having a turndown ratio of up to 22:1.
- B. Burner combustion must be clean and odorless. Combustion efficiency must limit the products of combustion to a maximum of 5ppm carbon monoxide and a maximum of 0.5ppm nitrogen dioxide.

- C. The burner shall have stainless steel combustion baffles, non-clogging gas ports, direct spark ignition and flame safeguard system.
- D. Observation port shall be provided in cabinet.
- E. Profile plates to control proper air velocity across the burner shall be factory installed, adjusted during a firing test, and locked in place before shipment.

Motor:

Premium Energy Efficient T-frame, ODP, 1800 RPM pre-lubricated ball bearing type motor shall be furnished for voltage as scheduled.

Gas and Electric Controls:

The following controls shall be furnished with the direct gas-fired make-up air system:

- Fireeye Flame Safeguard.
- Flame Rod Sensor.
- Gas Pilot Ignition.
- High Temperature Limit Switch.
- Electronic Modulating Discharge Air Temperature Controller.
- Control System and Ignition Transformer.
- Electrical Fuses.
- Main Gas Shut-off Valves.
- Airflow Proving Switch.
- Motor Starter and Overloads.
- Auxiliary Starter Contact.

Assembly:

The system shall be factory assembled and wired with the exception of controls that are remote to the unit.

Options and Accessories:

The following items are to be furnished (Insert desired items from this bulletin.)

In order to maintain our policy of continuous product improvement, we reserve the right to change prices, specification, ratings or dimensions without notice or obligation.



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REPRESENTED BY:

A large, empty rectangular box with a thin red border, intended for a signature or stamp.