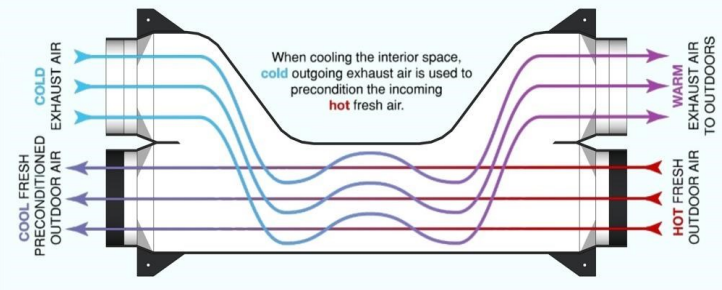
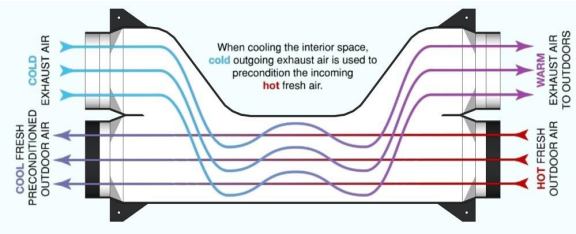
BPE ERV Demo

Duct work design tips
and possible layouts.

End View of ERV. Micro-tubes running longitudinally between similarly spaced layers. The bottom air stream encounters vertical spacers which isolate the air streams and create the pattern below.

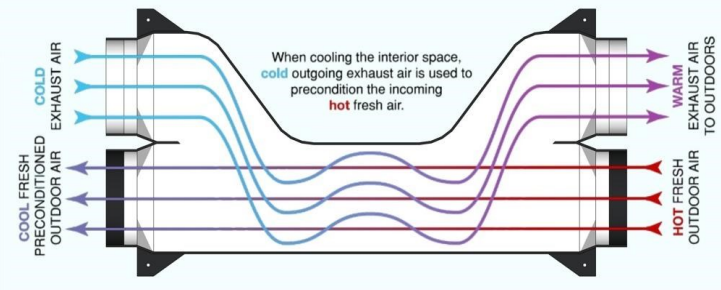


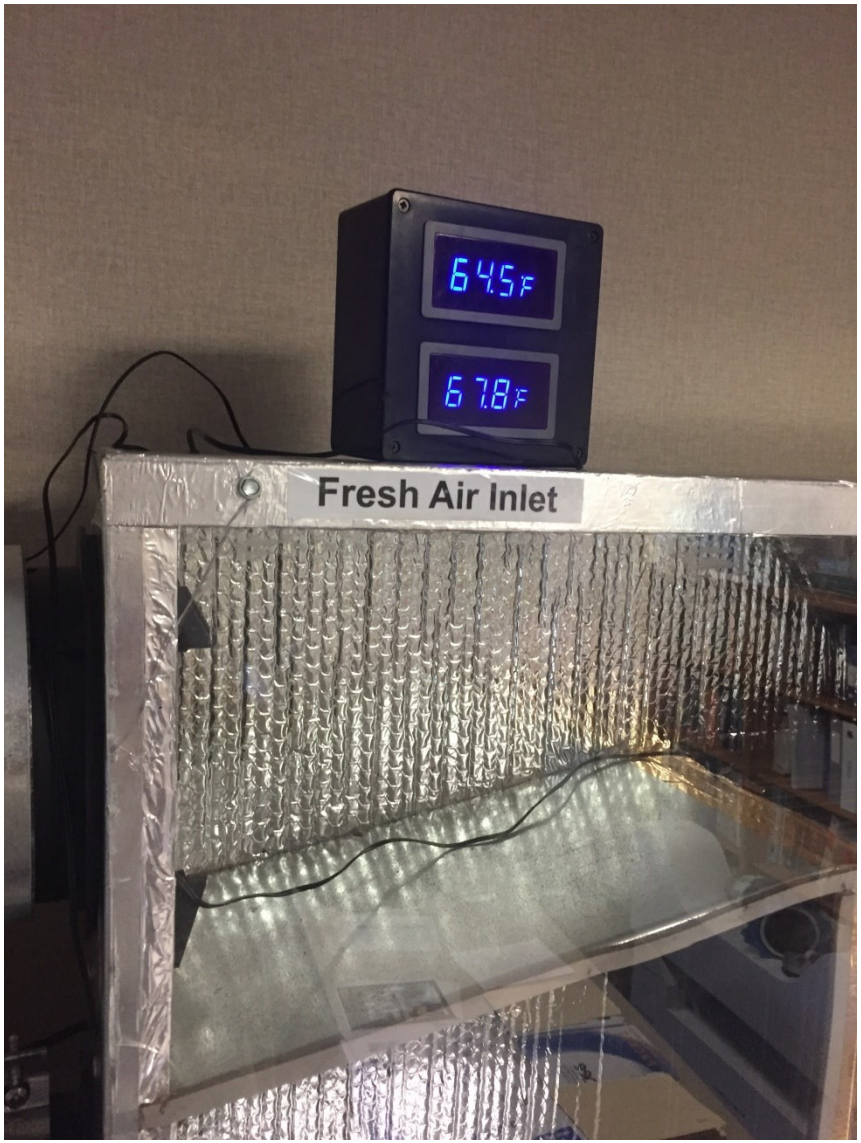


This is one of our smaller units set up as a demonstration. Not an extreme example of outdoor temperature but a clear illustration of the energy recovery.

The upper sensor shows the outside air (OA)temperature coming into the unit.

The lower sensor indicates the temperature of the tempered, but now stale air which we exhaust to the outside.





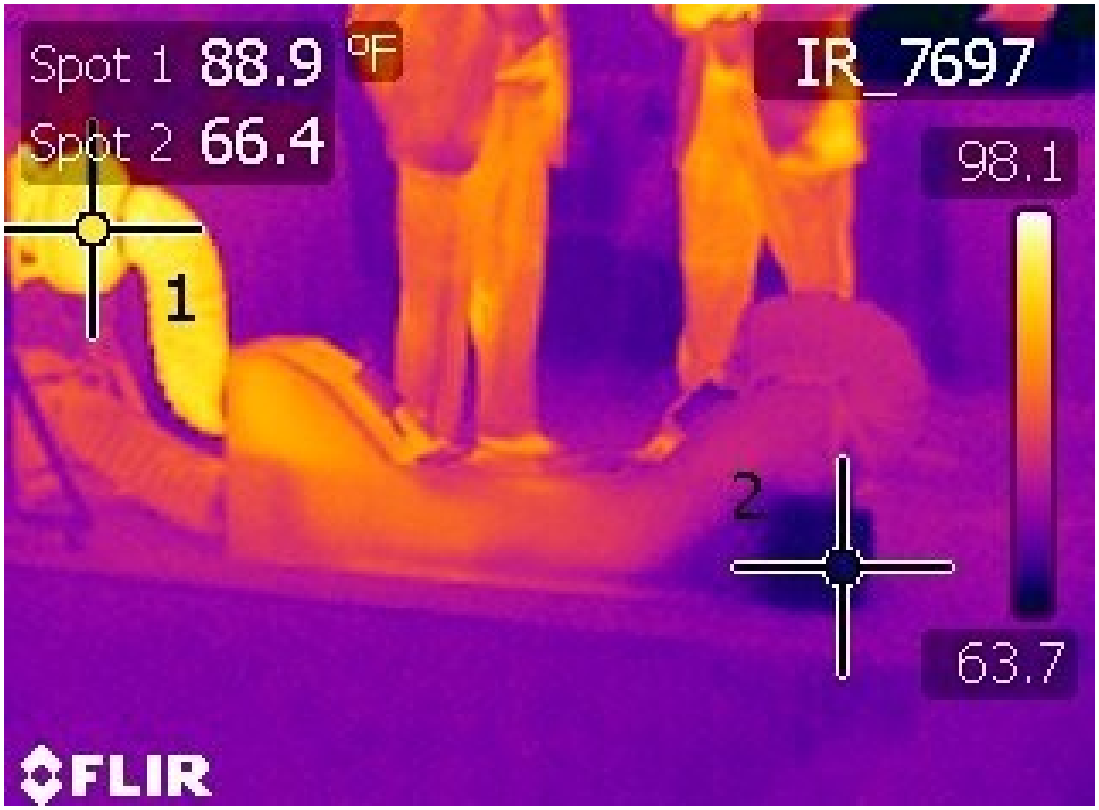
The top sensor is the temperature of the air leaving the ERV and being directed into the building HVAC system for circulation.

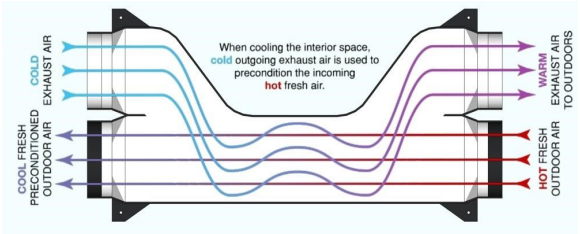
The lower sensor is an indication of the temperature of the indoor air being displaced by a new exchange of air and exhausted to the outside.

This particular unit is running at about 250 cfm and is achieving over 90% recovery.

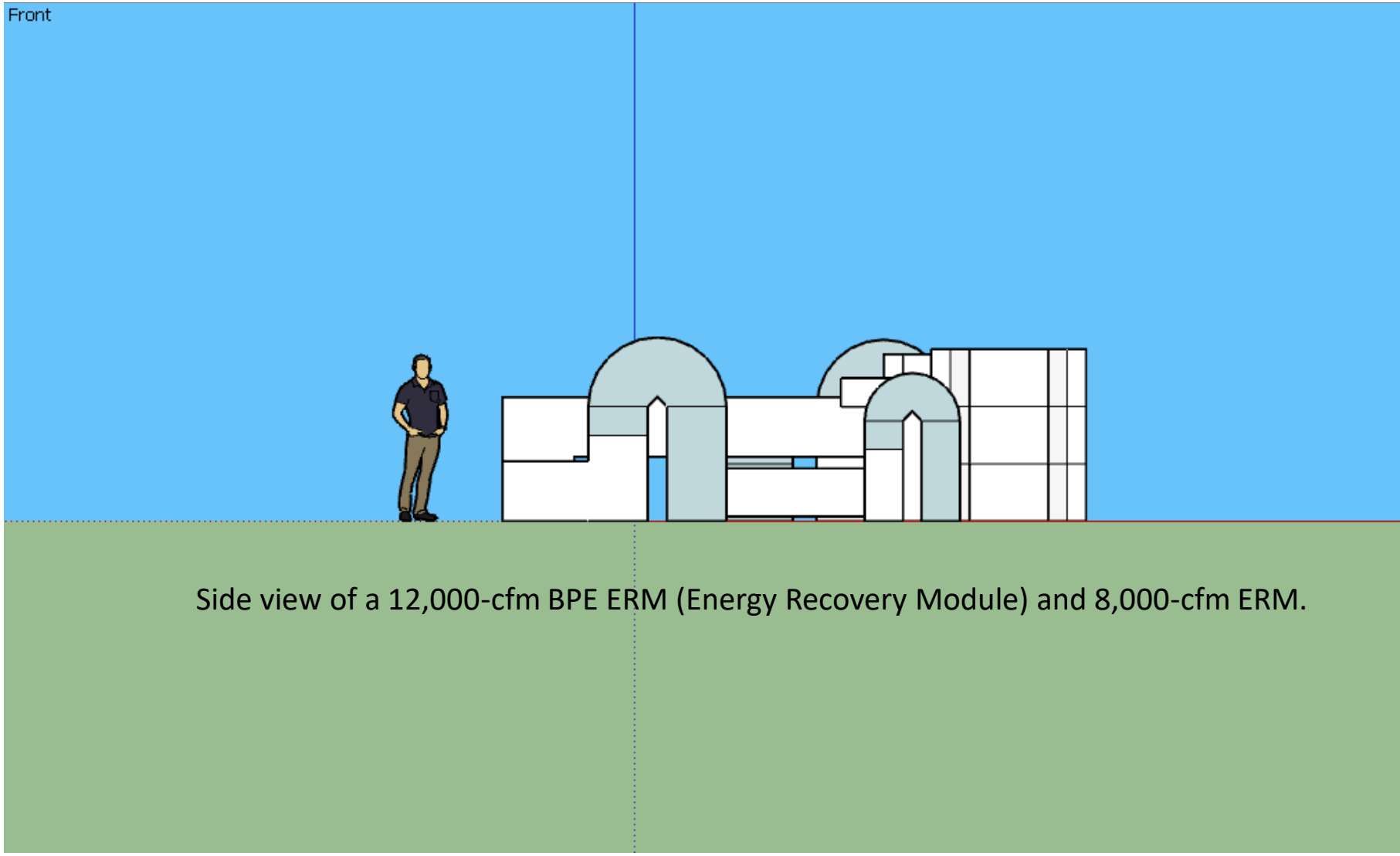
We can configure single pass units up to 20,000 cfm. Depending on the application, we achieve EER values between 36 and 160 routinely.

A latent cooling effect is achieved by capturing water particles formed in the incoming air stream. Once captured, the moisture is wicked across to the outgoing air stream.

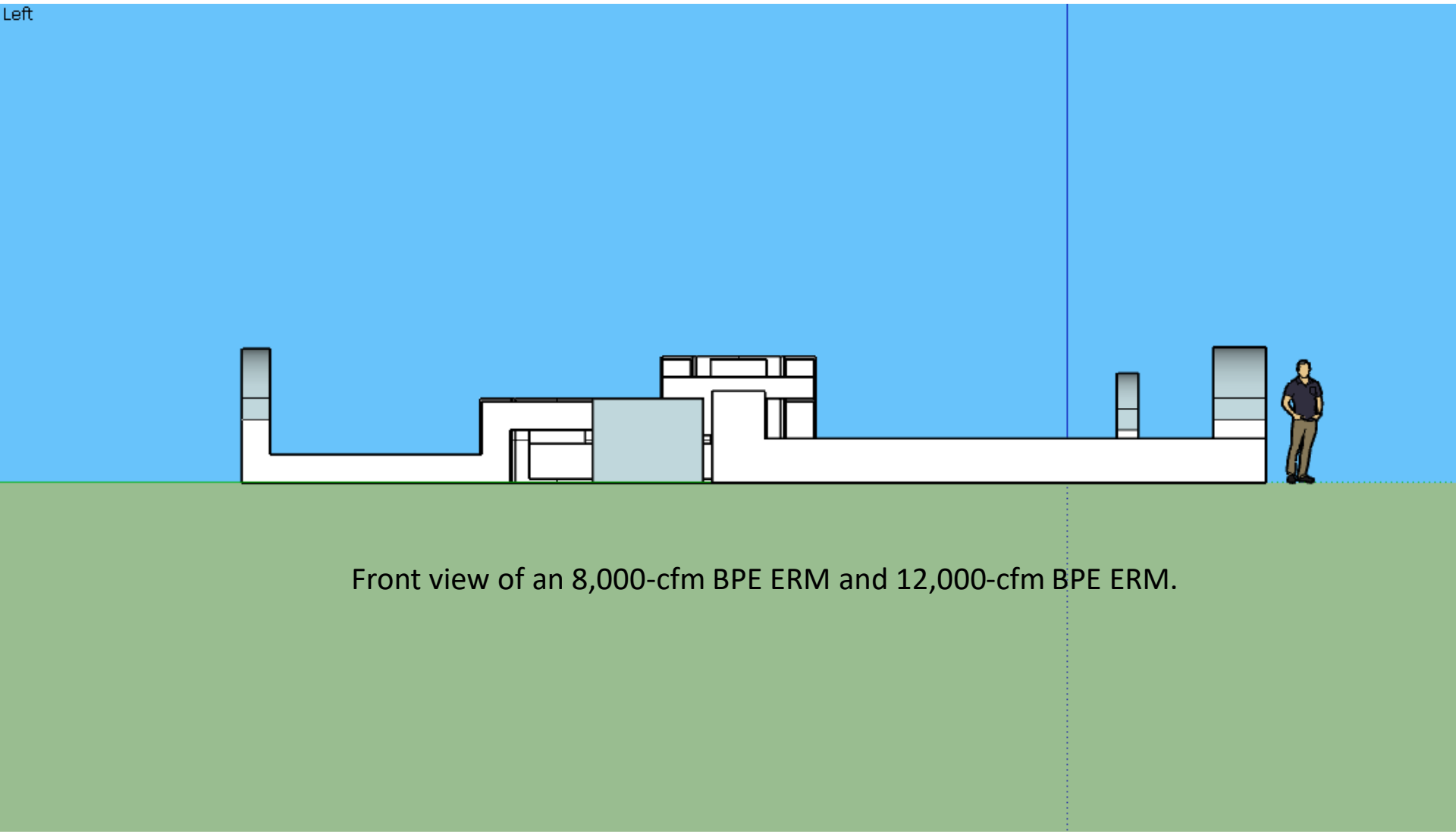




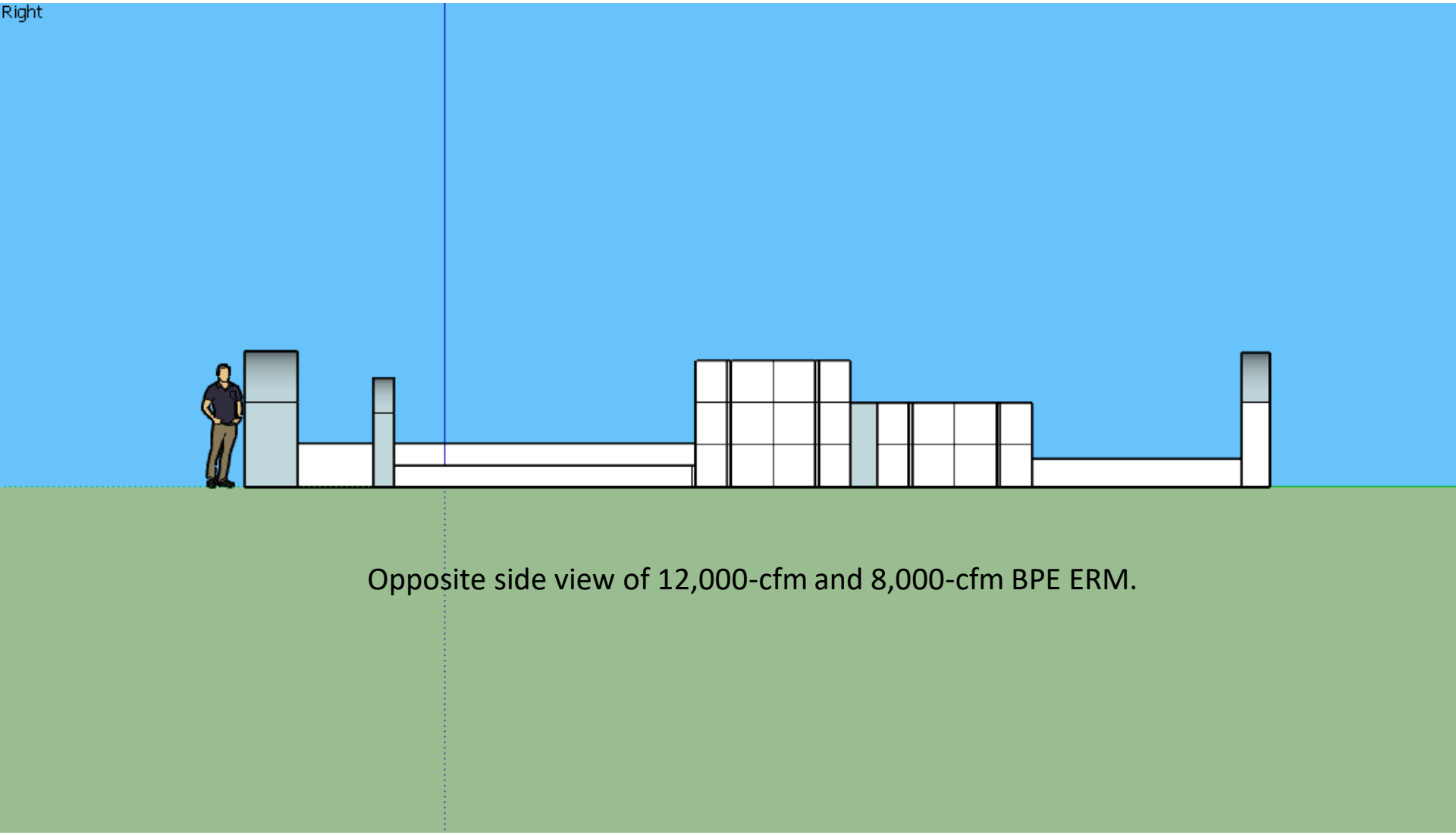
This is a thermal image of a similar unit with a more extreme test example. We configure the fan capacity in order to operate the units in the range which is most thermally efficient. In addition to sensible cooling, the units can achieve a latent cooling effect as high as 34%.



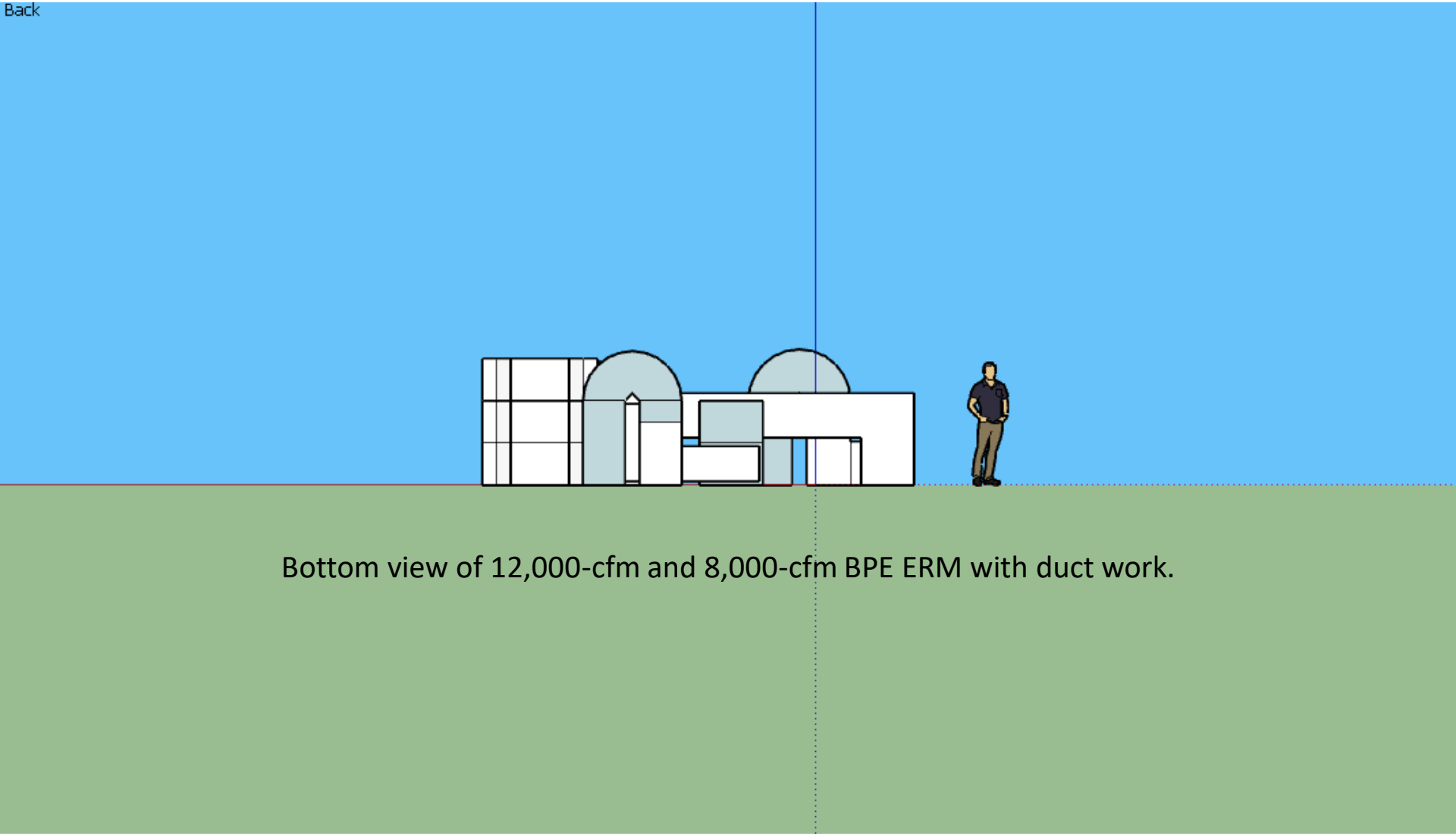
Side view of a 12,000-cfm BPE ERM (Energy Recovery Module) and 8,000-cfm ERM.



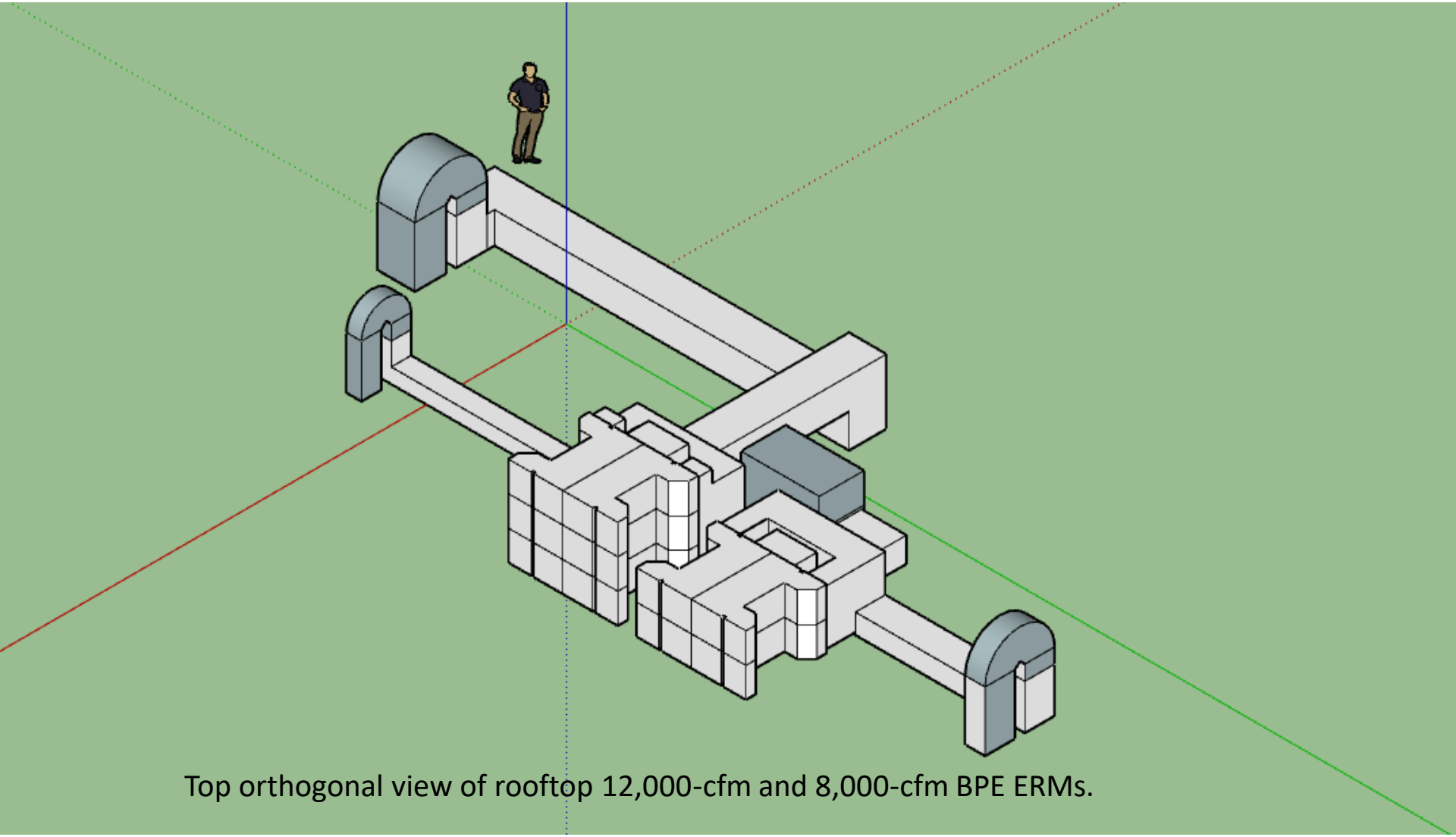
Front view of an 8,000-cfm BPE ERM and 12,000-cfm BPE ERM.



Opposite side view of 12,000-cfm and 8,000-cfm BPE ERM.



Bottom view of 12,000-cfm and 8,000-cfm BPE ERM with duct work.



Top orthogonal view of rooftop 12,000-cfm and 8,000-cfm BPE ERMs.

FIELD DUCT SIZING CHART

ROUND DUCT SIZE ESTIMATE

Flexible Duct

Duct Size	Design Airflow
5"	50
6"	75
7"	110
8"	160
9"	225
10"	300
12"	480
14"	700
16"	1000
18"	1300
20"	1700

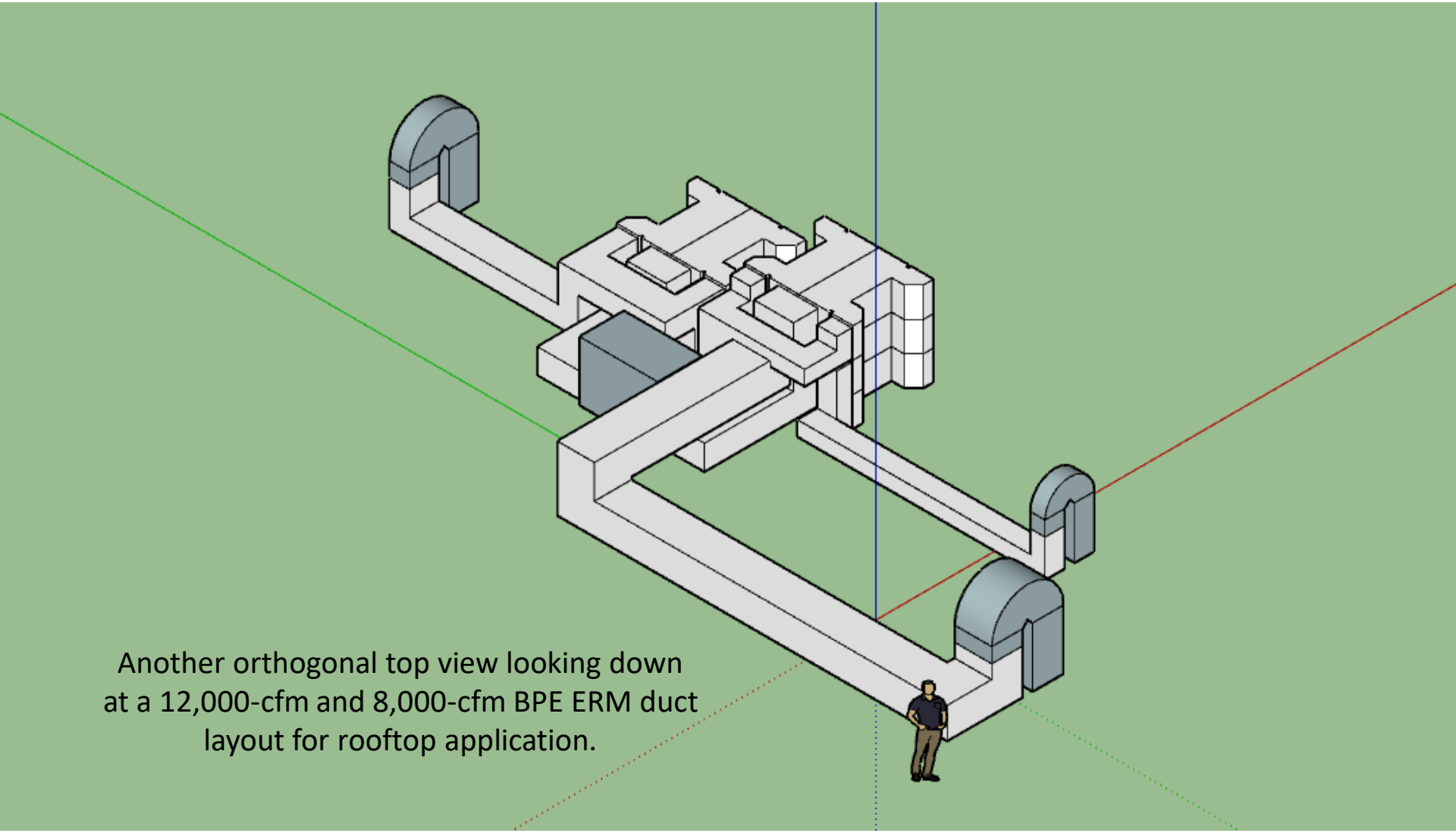
Flex duct = .05" on most metal duct calculator

Round Metal Pipe

Duct Size	Design Airflow
5"	50
6"	85
7"	125
8"	180
9"	240
10"	325
12"	525
14"	750
16"	1200
18"	1500
20"	2000

Round metal pipe = .06" on most metal duct calculators

Note: Undersized duct work wastes energy and requires over-sized fans. Quick Reference of well-installed flexible and rigid round duct work. This is the rule of thumb for projected air flows.



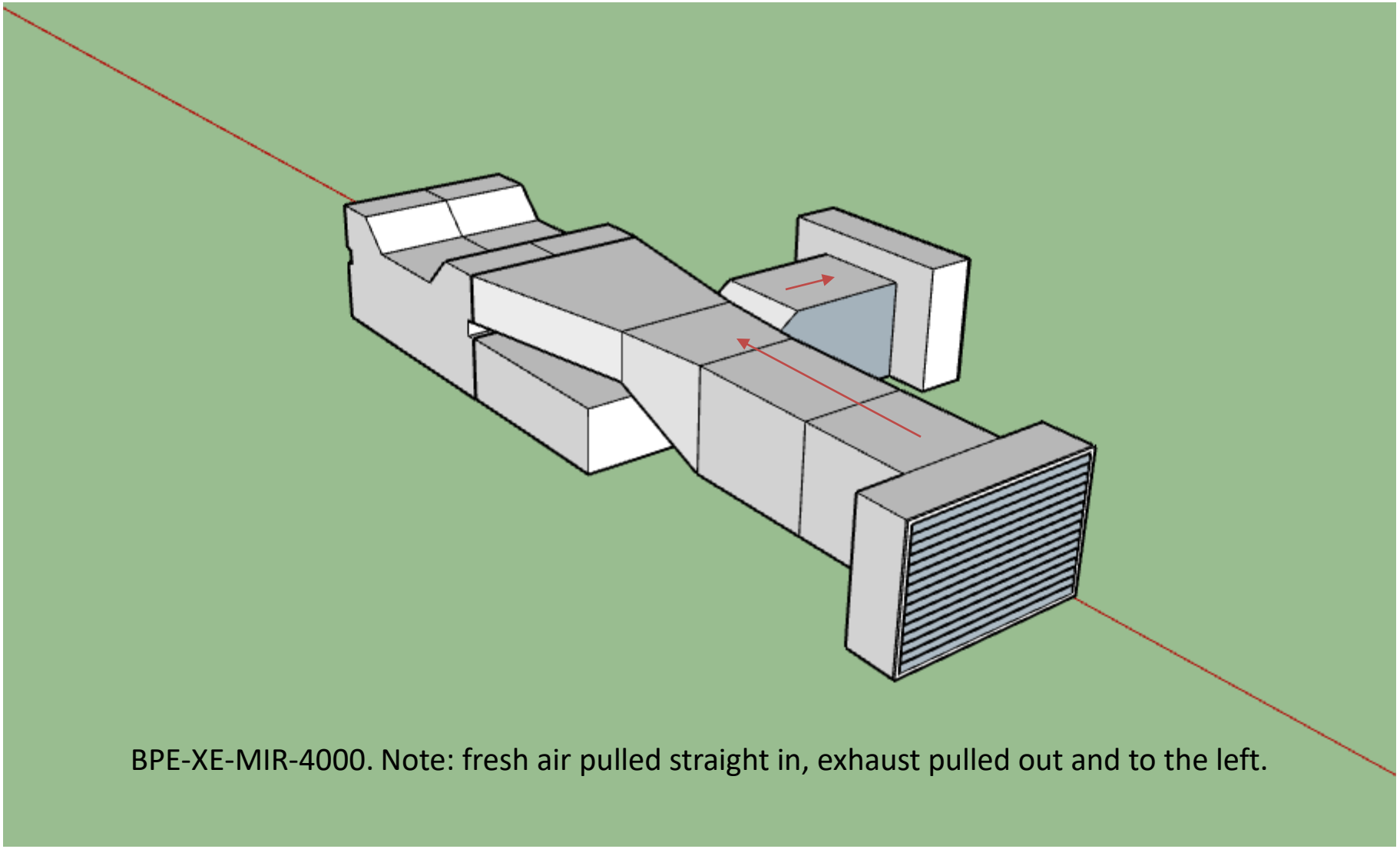
Another orthogonal top view looking down at a 12,000-cfm and 8,000-cfm BPE ERM duct layout for rooftop application.

RECTANGULAR DUCT SIZE ESTIMATE

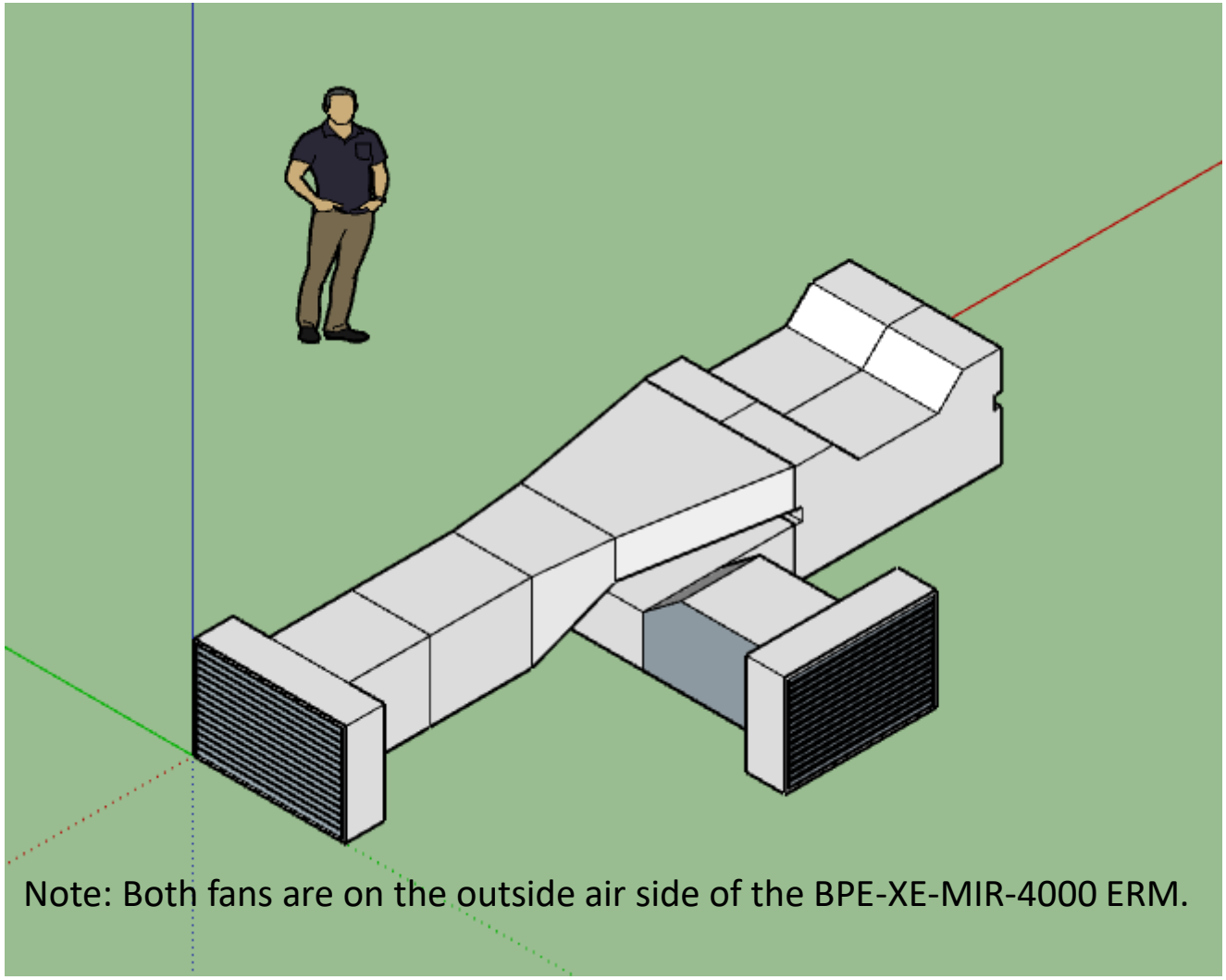
Design CFM	Duct Height - Net inside dimension in inches								
	4"	CFM	**6"**	CFM	**8"**	CFM	**10"**	CFM	**12"**
60	**6x4**	60	**4x6**	90	**4x8**	120	**4x10**	150	**4x12**
90	**8x4**	110	**6x6**	160	**6x8**	215	**6x10**	270	**6x12**
120	**10x4**	160	**8x6**	230	**8x8**	310	**8x10**	400	**8x12**
150	**12x4**	215	**10x6**	310	**10x8**	430	**10x10**	550	**10x12**
180	**14x4**	270	**12x6**	400	**12x8**	550	**12x10**	680	**12x12**
210	**16x4**	320	**14x6**	490	**14x8**	670	**14x10**	800	**14x12**
240	**18x4**	375	**16x6**	580	**16x8**	800	**16x10**	950	**16x12**
270	**20x4**	430	**18x6**	670	**18x8**	930	**18x10**	1100	**18x12**
300	**22x4**	490	**20x6**	750	**20x8**	1060	**20x10**	1250	**20x12**
330	**24x4**	540	**22x6**	840	**22x8**	1200	**22x10**	1400	**22x12**
		600	**24x6**	930	**24x8**	1320	**24x10**	1600	**24x12**
		650	**26x6**	1020	**26x8**	1430	**26x10**	1750	**26x12**
		710	**28x6**	1100	**28x8**	1550	**28x10**	1950	**28x12**
		775	**30x6**	1200	**30x8**	1670	**30x10**	2150	**30x12**
40	**21/2 x10**			1300	**32x8**	1800	**32x10**	2300	**32x12**
70	**21/2 x14**			1400	**34x8**	1930	**34x10**	2450	**34x12**
150	**21/2 x30**			1500	**36x8**	2060	**36x10**	2600	**36x12**
		100	**31/2 x14**			2200	**38x10**	2750	**38x12**
		220	**31/2 x30**			2350	**40x10**	2900	**40x12**
								3050	**42x12**

Rectangular sheet metal duct = .07" on most metal duct calculators

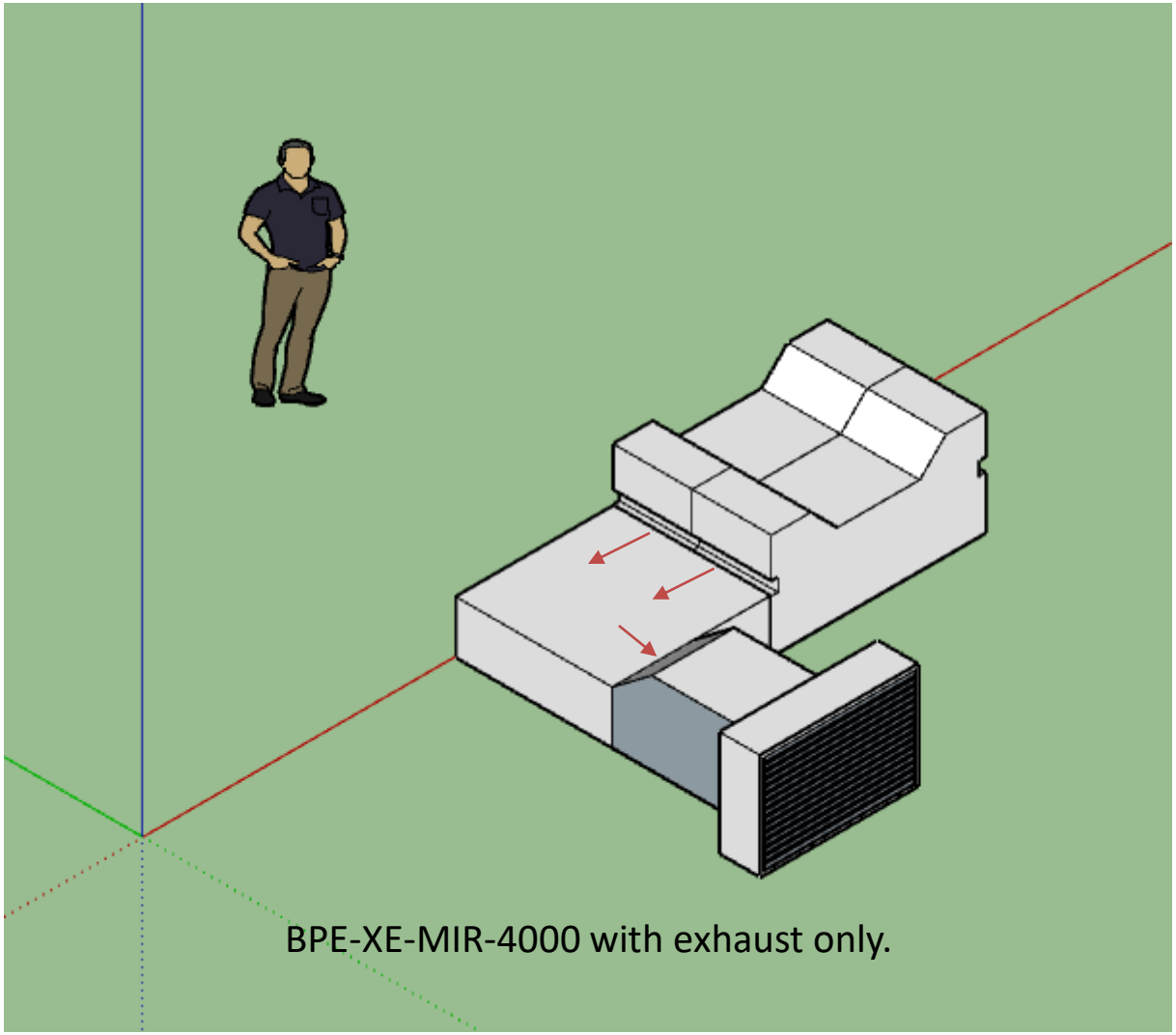
Duct sizing reference sheet for metal rectangular duct with minimal or reasonable pressure drops. Undersized duct work wastes energy.



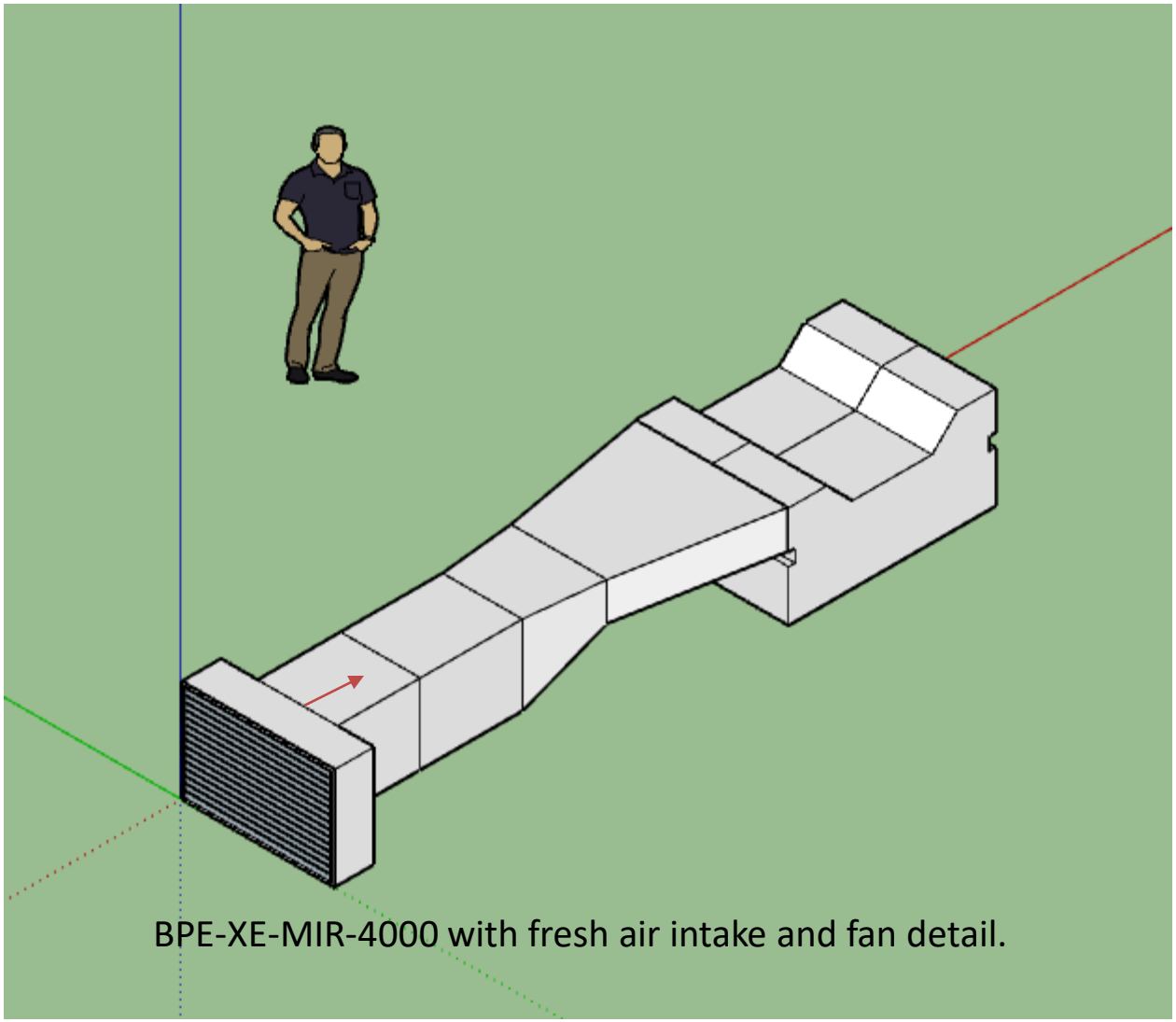
BPE-XE-MIR-4000. Note: fresh air pulled straight in, exhaust pulled out and to the left.



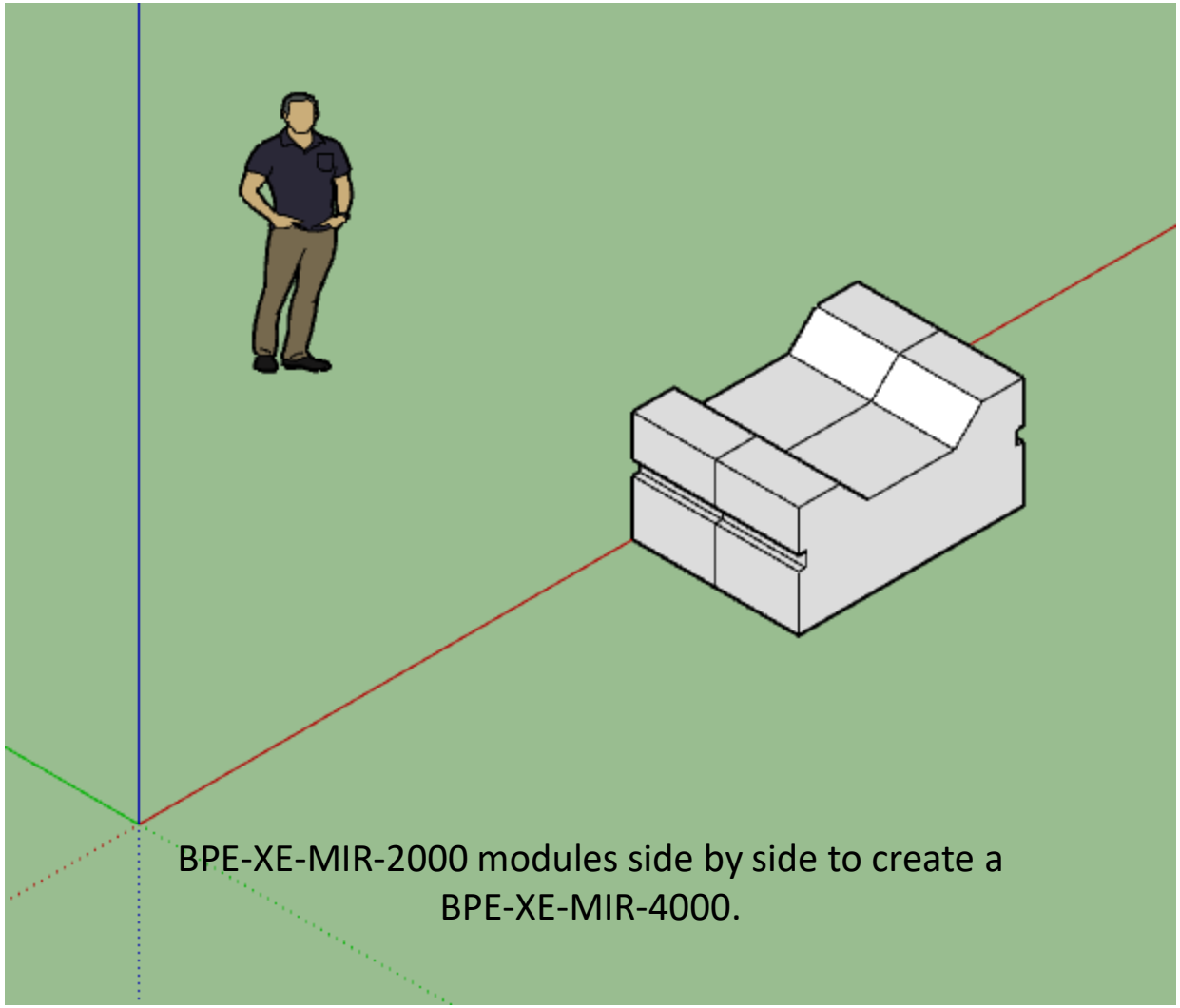
Note: Both fans are on the outside air side of the BPE-XE-MIR-4000 ERM.



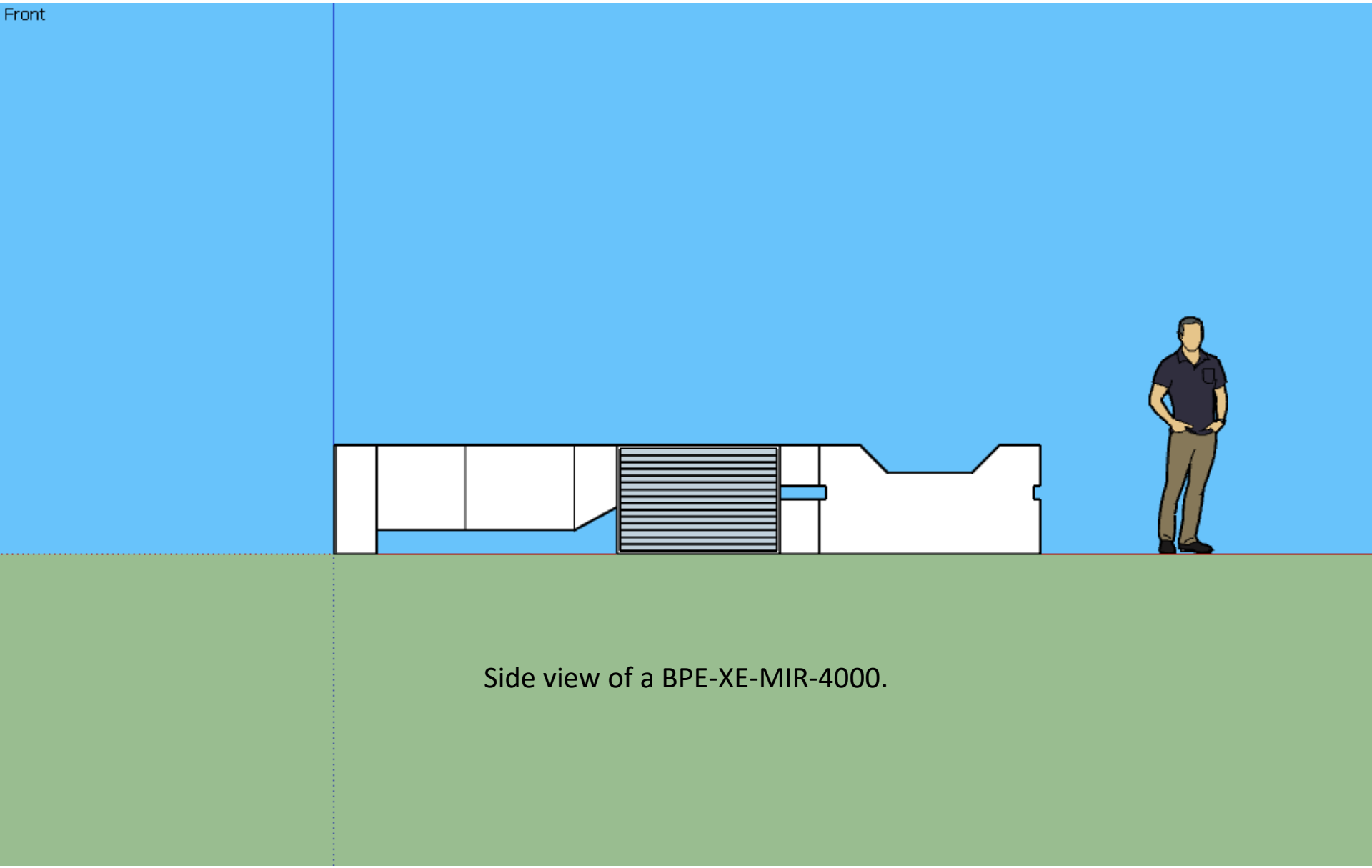
BPE-XE-MIR-4000 with exhaust only.



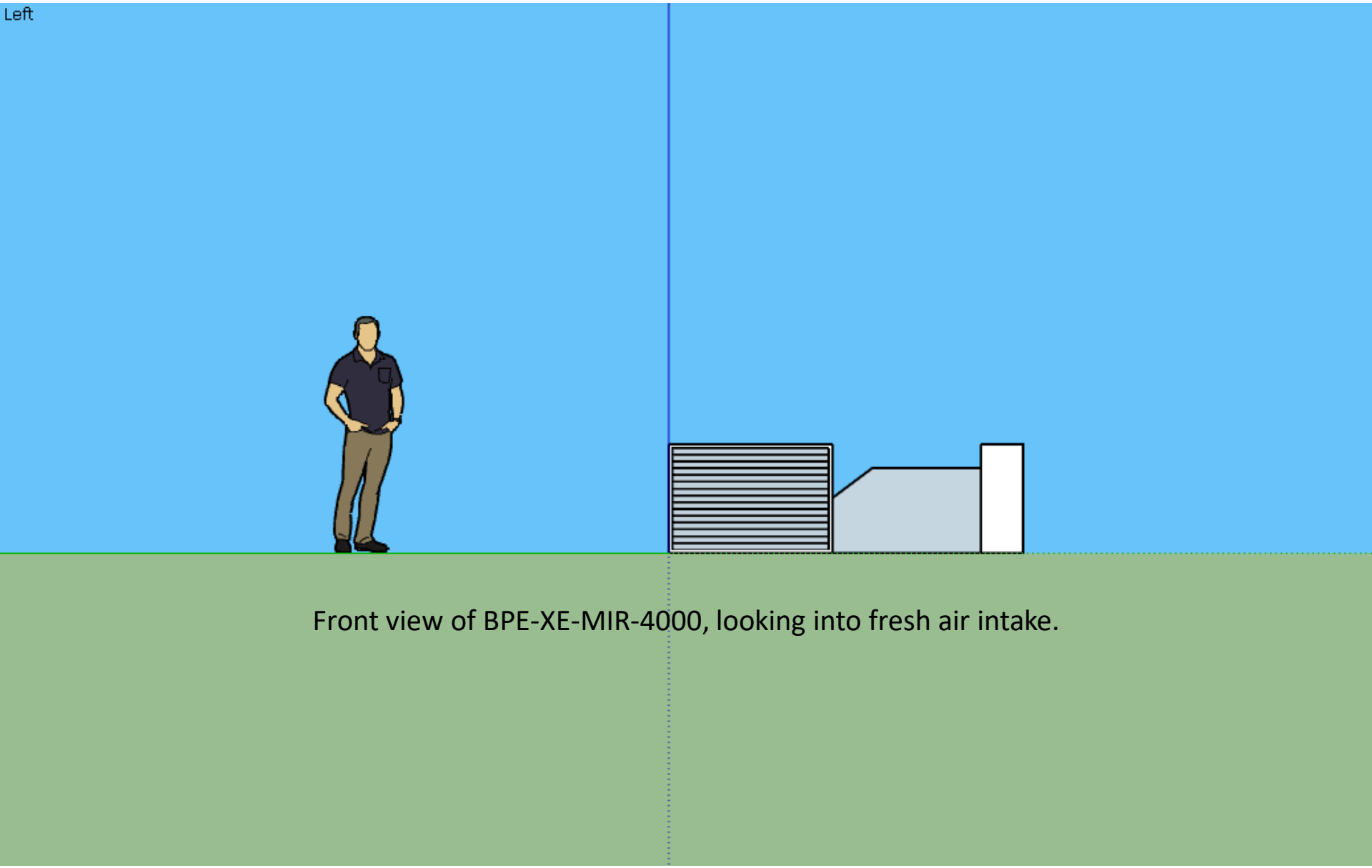
BPE-XE-MIR-4000 with fresh air intake and fan detail.



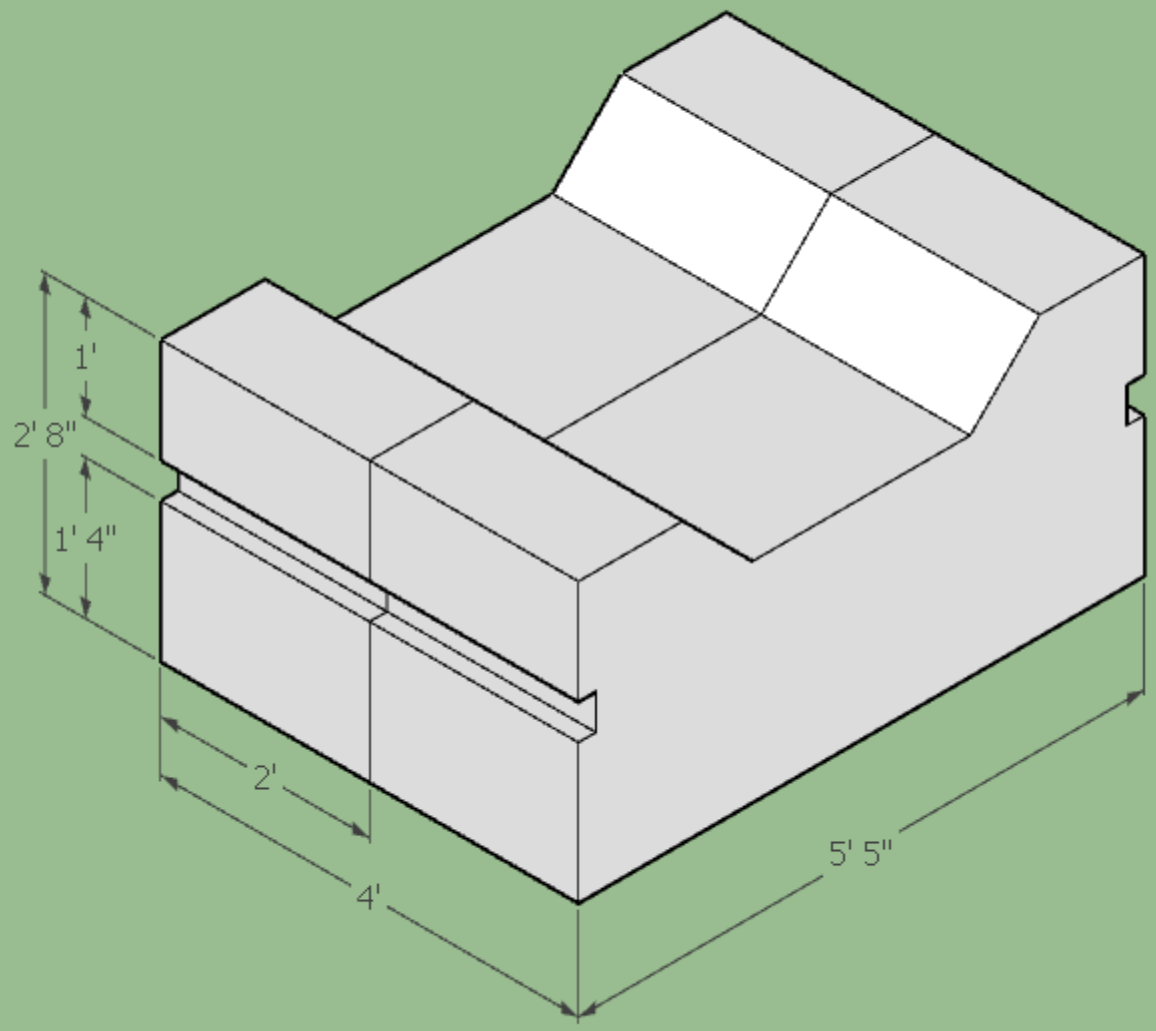
BPE-XE-MIR-2000 modules side by side to create a BPE-XE-MIR-4000.



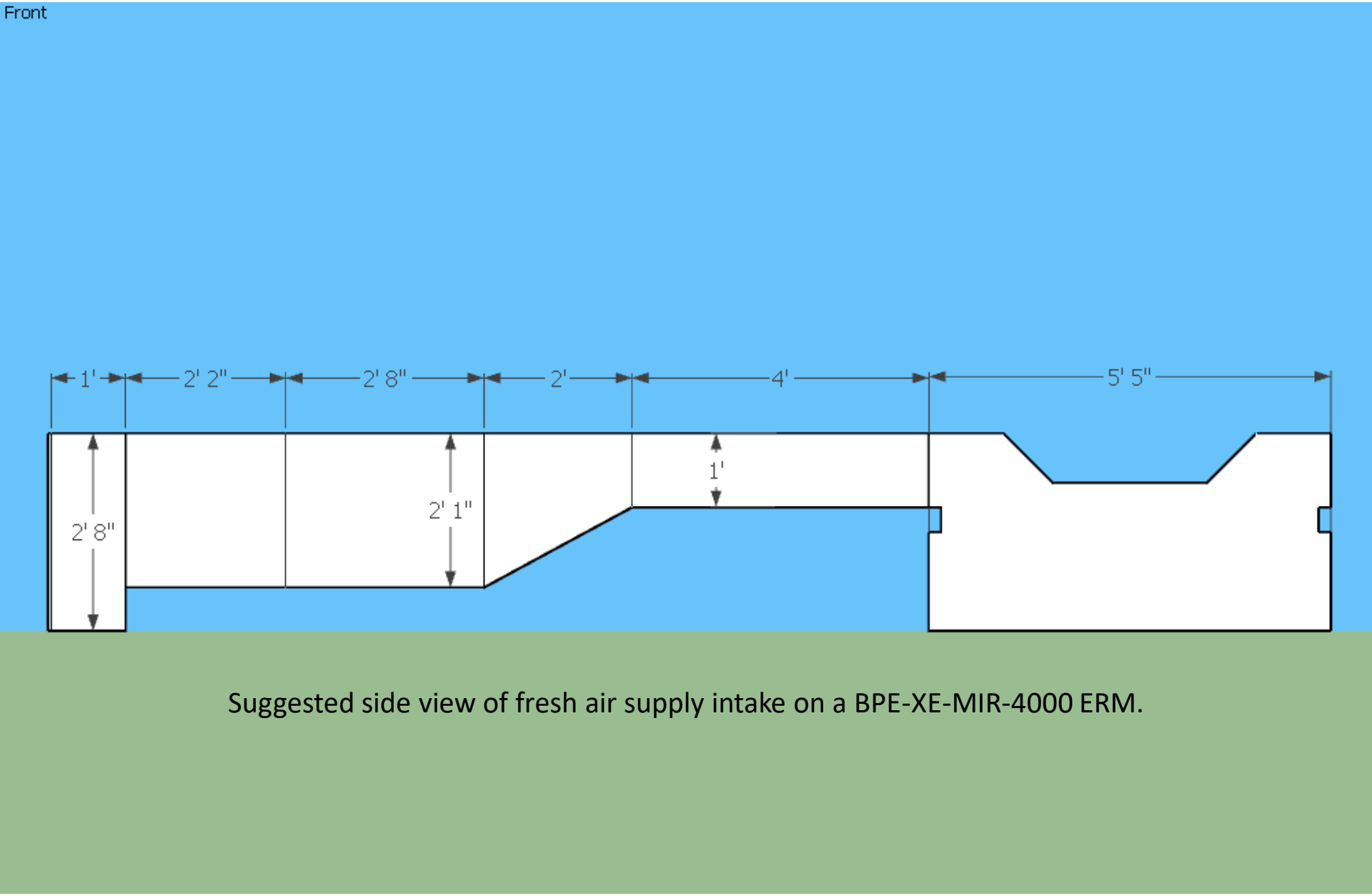
Side view of a BPE-XE-MIR-4000.



Front view of BPE-XE-MIR-4000, looking into fresh air intake.

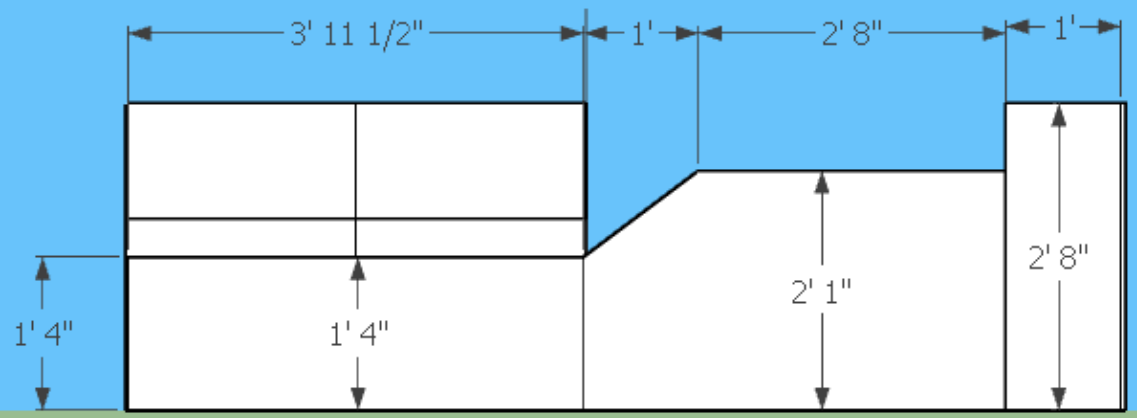


Dimensions of BPE-XE-MIR-4000 ERM.



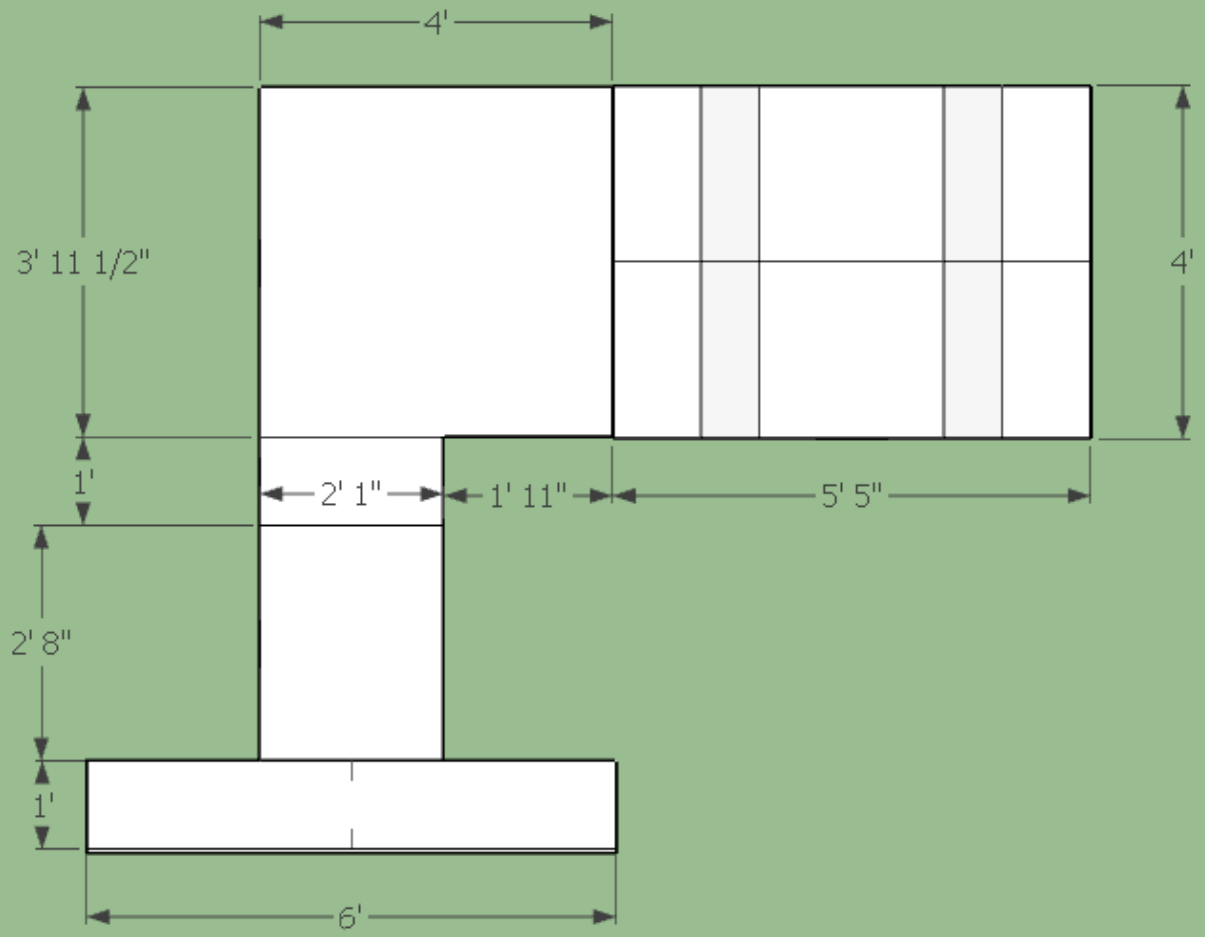
Suggested side view of fresh air supply intake on a BPE-XE-MIR-4000 ERM.

Left

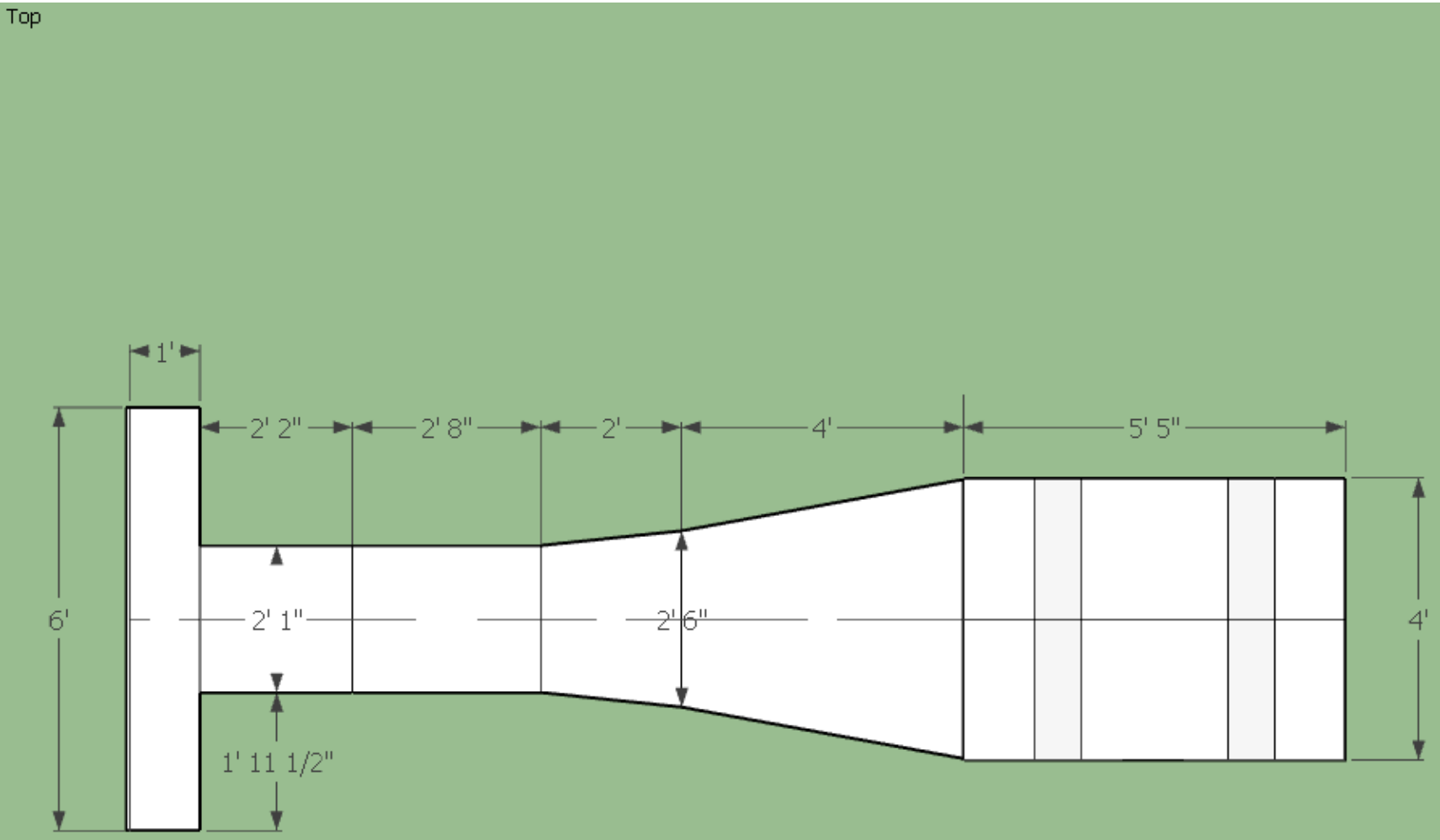


Side view of BPE-XE-MIR-4000 exhaust duct work.

Top



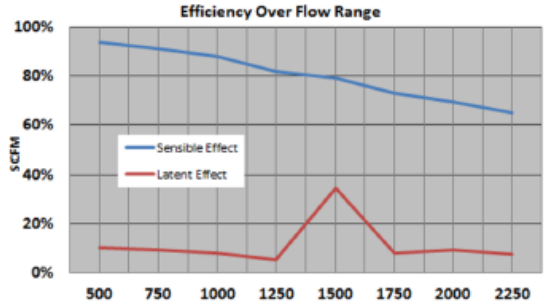
Top View of BPE-XE-MIR-4000 ERM duct work dimensions.

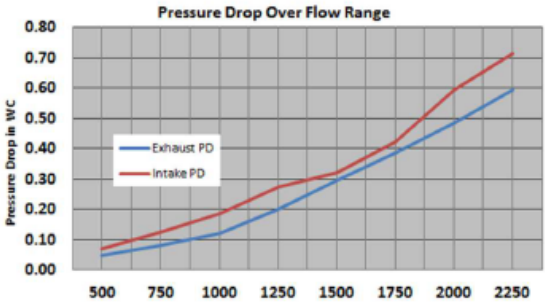


Top view of BPE-XE-MIR-4000 ERM duct work layout and dimensions.

Application schedule selection for BPE computer selection.

BPE Performance





Procedure for Fan Sizing:

1. Determine flow in CFM and efficiency desired.
2. If efficiency is not acceptable, step up to next size model.
3. Determine static pressure of both exhaust and fresh air intakes in ERM, duct, filters, louvers and diffusers.
4. Add margin or safety factor.
5. Consider adding speed controllers.

ARI 1060 Testing

Project Name _____

Location _____

Application _____

Design Conditions

Summer

Outdoor Air (FA)		CFM		in W.C		°F DB	°F WB
Indoor Air (EA)		CFM		in W.C		°F DB	°F WB
			% Thermal Effectiveness				% Latent Effectiveness

Winter

Outdoor Air (FA)		CFM		in W.C		°F DB	°F WB
Indoor Air (EA)		CFM		in W.C		°F DB	°F WB
			% Thermal Effectiveness				% Latent Effectiveness

Component	Intake (Inches WC)	Exhaust (Inches WC)
Louver		
Filter		
Duct work		
ERV		
Diffuser		
Total Static		
Add 25% - Safety Factor		
Fan Static =		
Fan CFM =		
Fan Manufacture		
Fan Model		

Procedure for Fan Sizing:

1. Determine flow in CFM and efficiency desired.
2. If efficiency is not acceptable, step up to next size model.
3. Determine static pressure of both exhaust and fresh air intakes in ERM, duct, filters, louvers and diffusers.
4. Add margin or safety factor.
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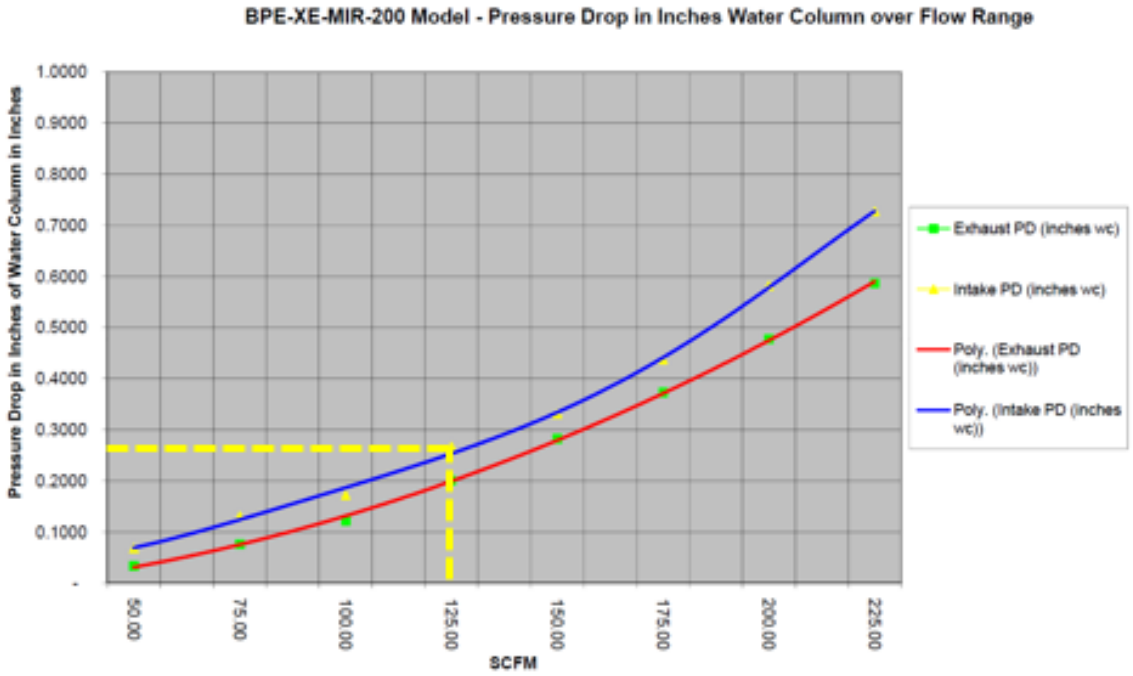
Determining the Pressure Drop

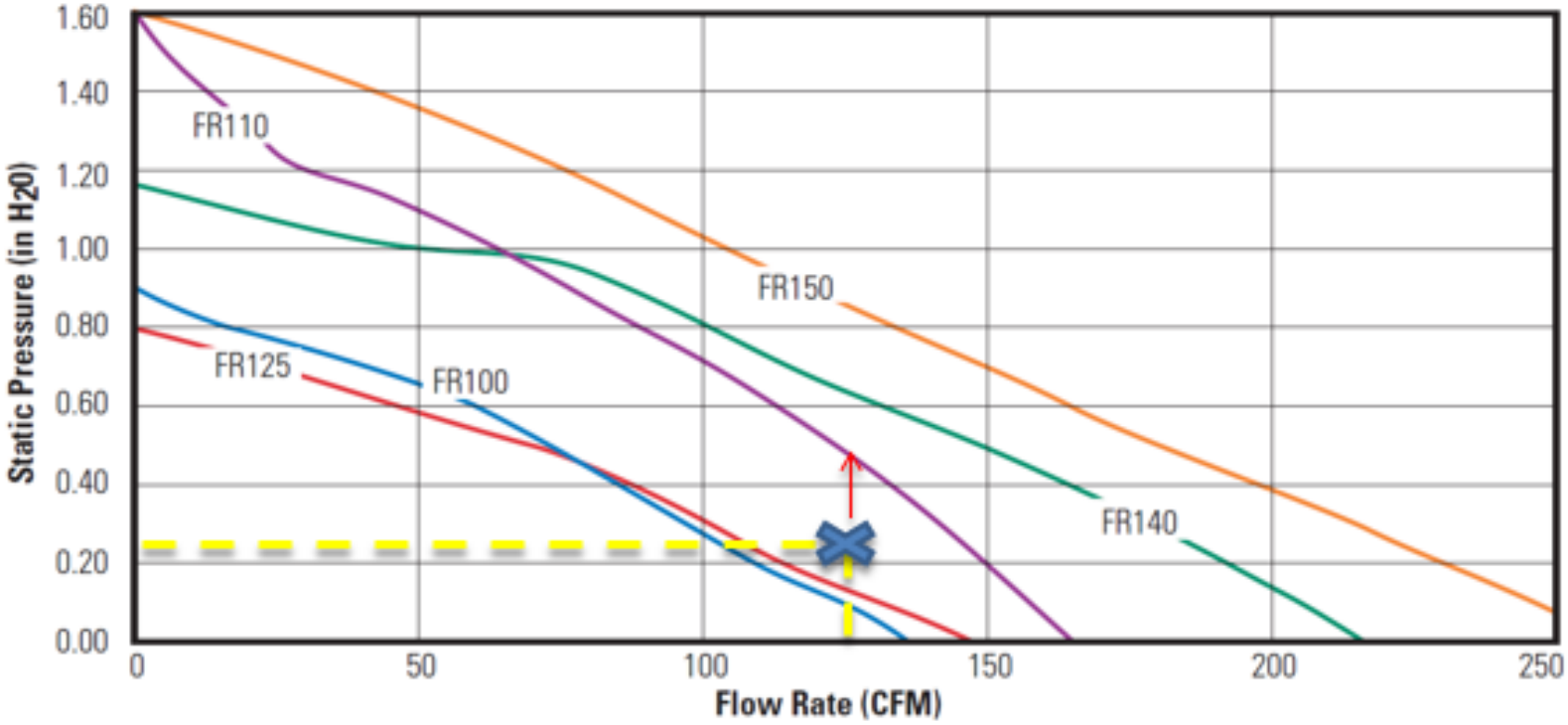
- Once the airflow rate and ERV is known
- Use the Pressure Drop Graph



Example: BPE-XE-MIR-200 operating at 125 cfm

Approximately .26” W.C.

AIR PERFORMANCE GRAPHS



Any fan curve that is above the state point can be used but typically the closest one will be the most efficient fan to select. In this exercise the FR-110 would be selected.

Component	Intake (Inches WC)	Exhaust (Inches WC)
Louver		
Filter		
Duct work		
ERV		
Diffuser		
Total Static		
Add 25% - Safety Factor		
Fan Static =		
Fan CFM =		
Fan Manufacture		
Fan Model		