



Seminar 51: Why Isn't My Fan Working? The Complex World of Fan/System Interactions

Presentation 1: Fan and System Curve Basics and
Intro to System Effect

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ORLANDO 
2020 WINTER CONFERENCE
AND AHR EXPO

Learning Objectives

1. Understand how fans and blowers are tested for performance data.
2. Understand how fan and system curves are developed and read from the performance data. Learn how to apply engineering judgment to minimize the risk of unstable operation.
3. Describe factors that cause a change in system resistance and explain how this will affect the fan performance.
4. Explain the difference between system resistance and system effect and describe how each impacts the performance of a fan in a system.
4. Identify causes of system effect and describe how it can be minimized or compensated for in various applications.

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Catalog and Software

Fan Air Performance

STANDARD

**ANSI/AMCA
Standard 210-16**

**ASHRAE
Standard 51-16**

**Laboratory Methods of Testing
Fans for Certified Aerodynamic
Performance Rating**



**Air Movement and Control
Association International**

AMCA Corporate Headquarters

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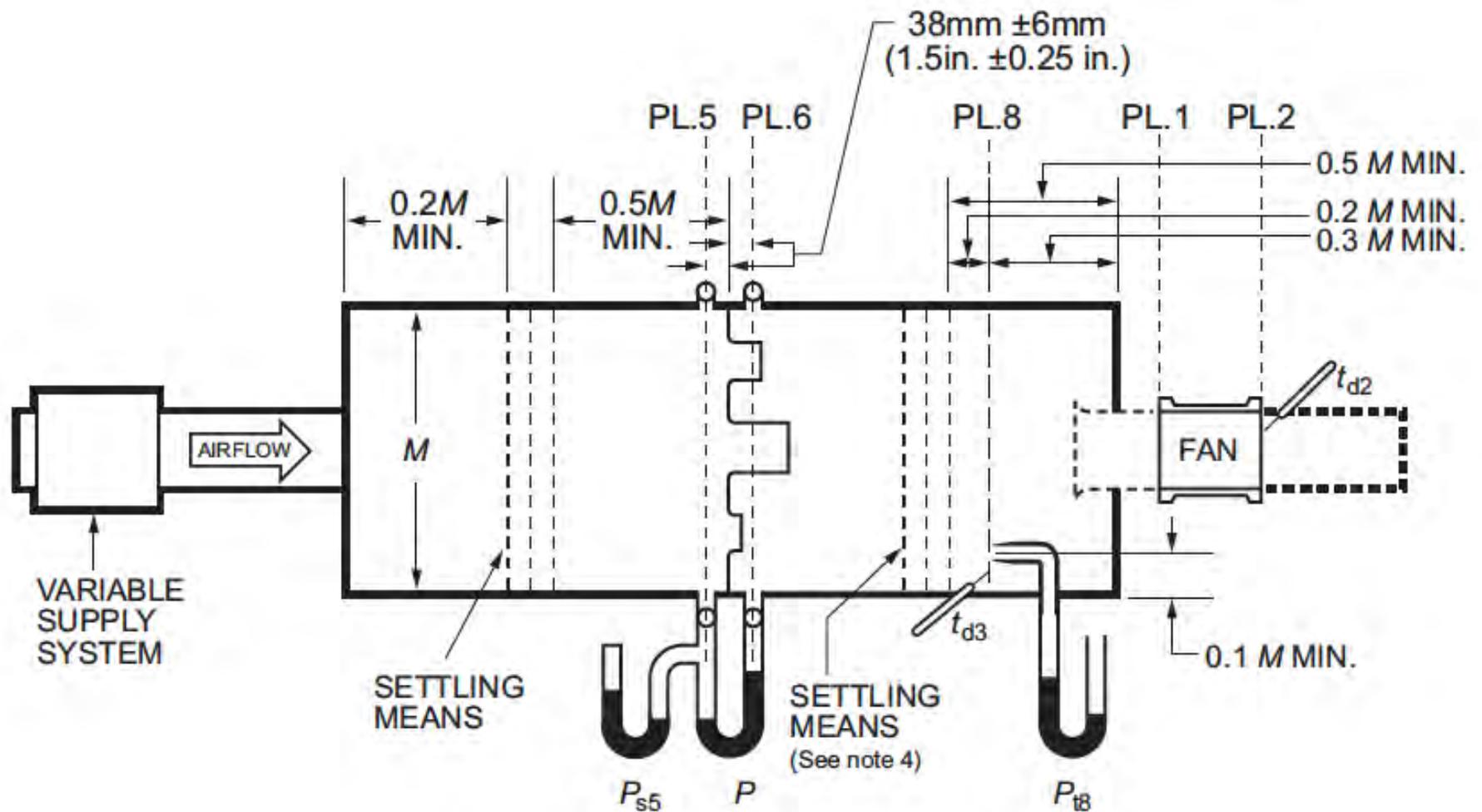
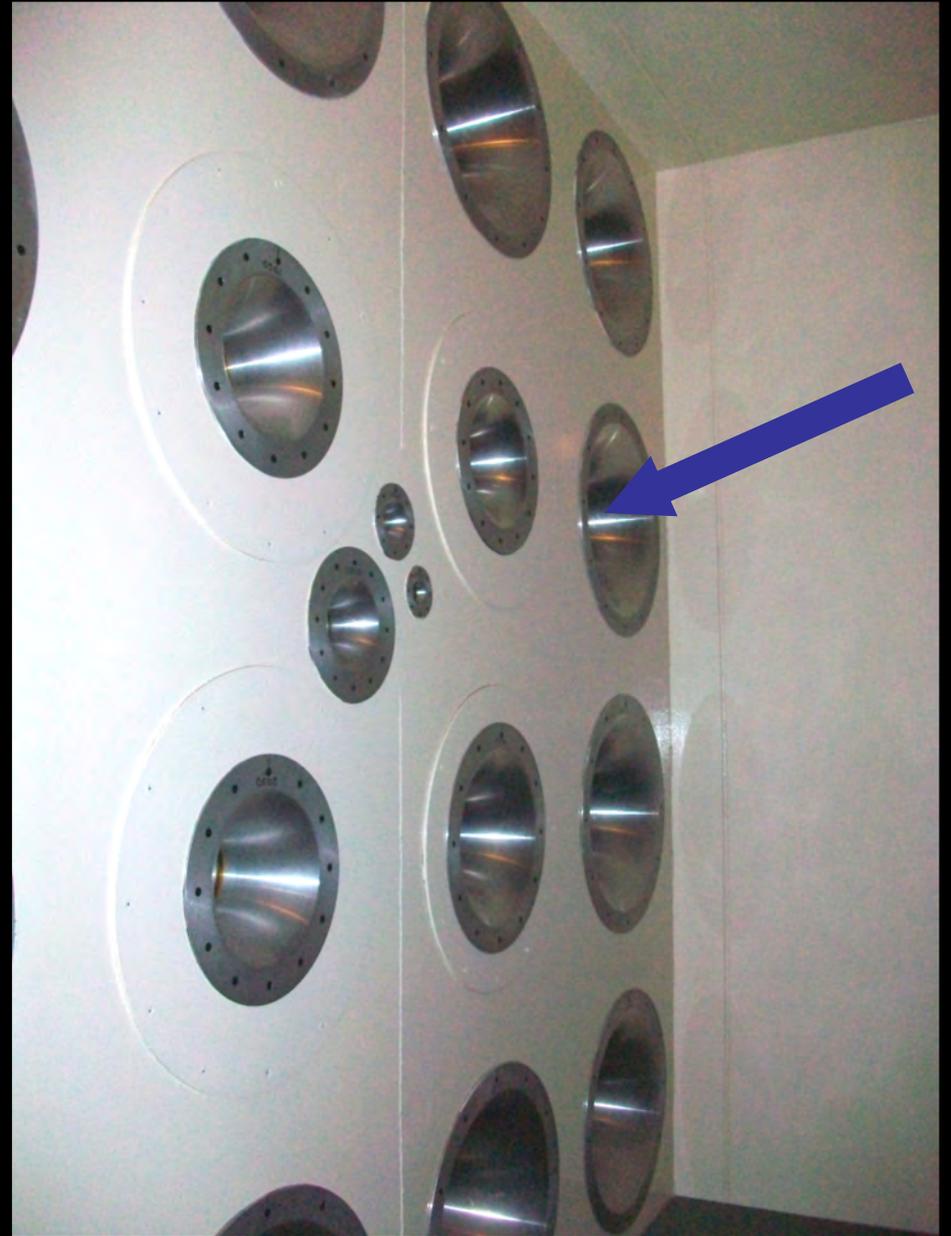
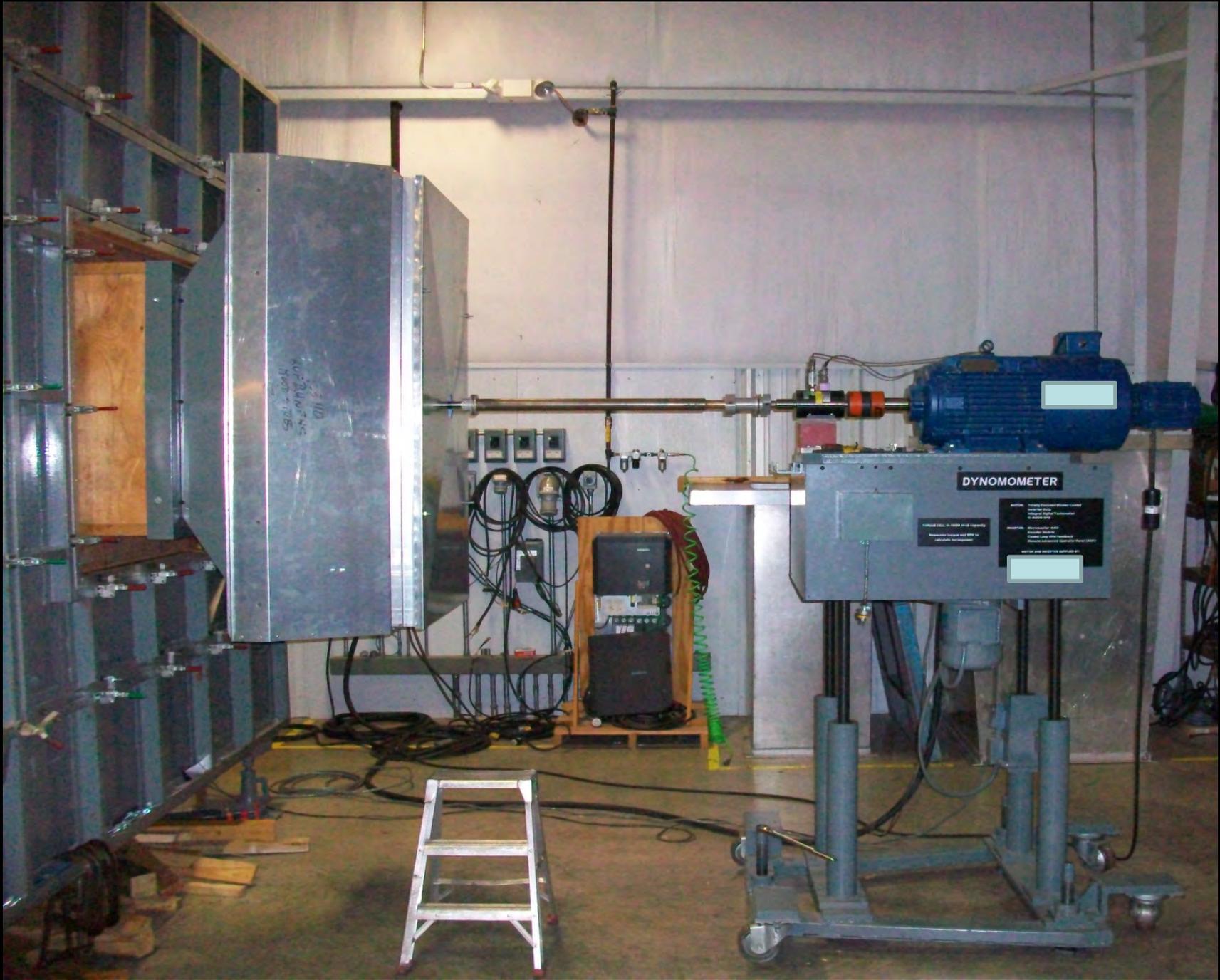


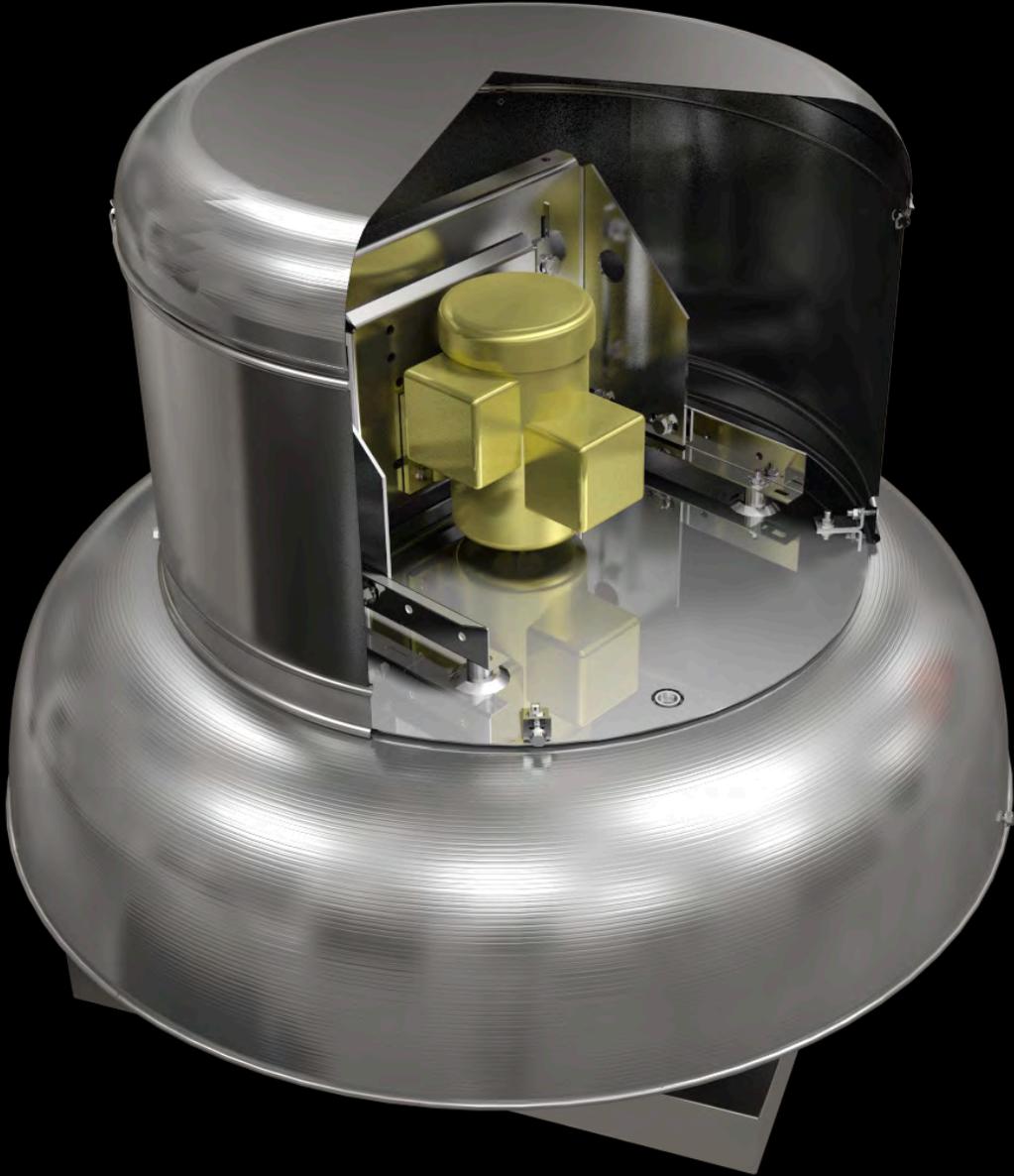
Figure 3.4 - Inlet Chamber Setup - Multiple Nozzles in Chamber
(ANSI/AMCA 210-99, Figure 15)

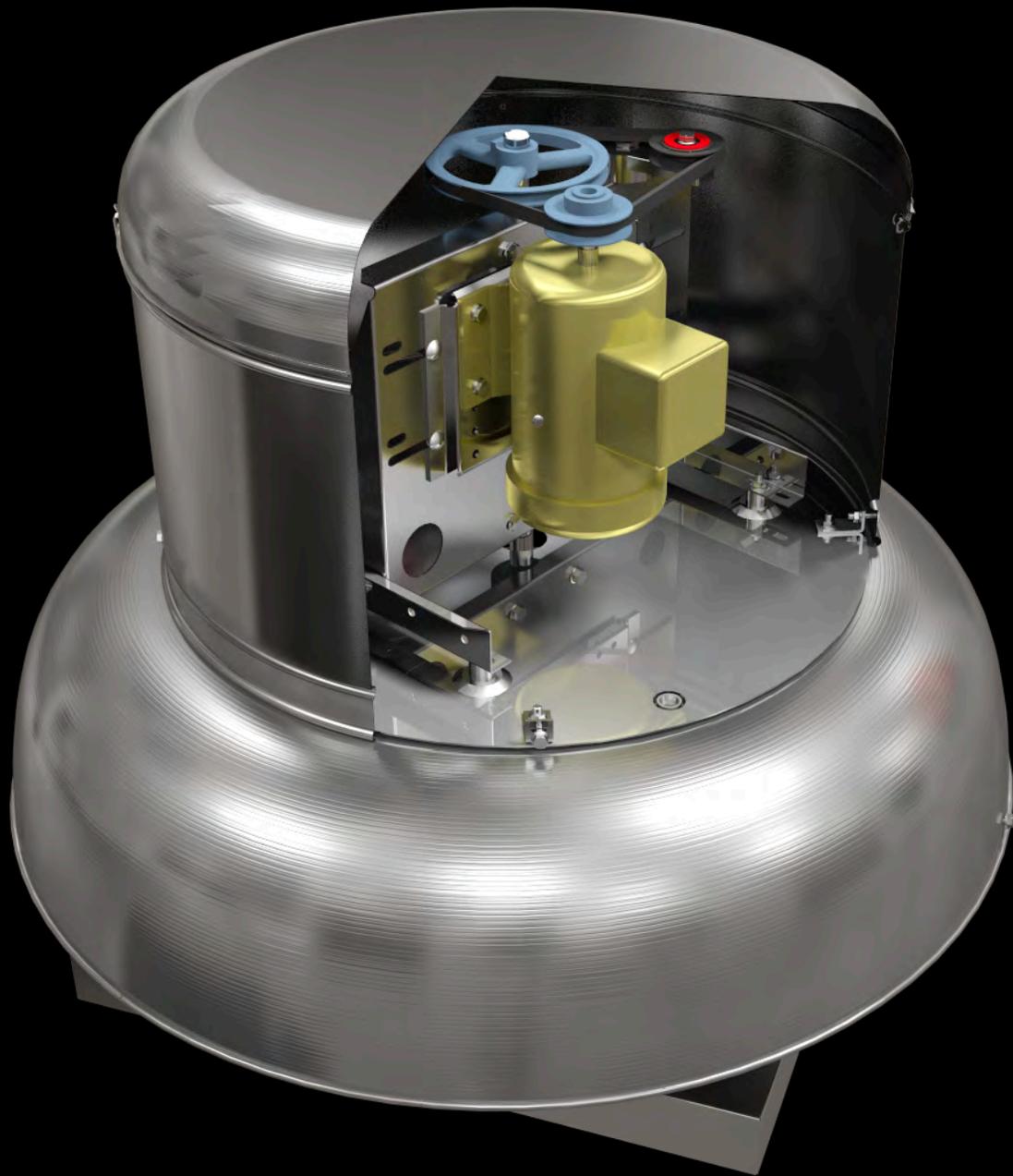




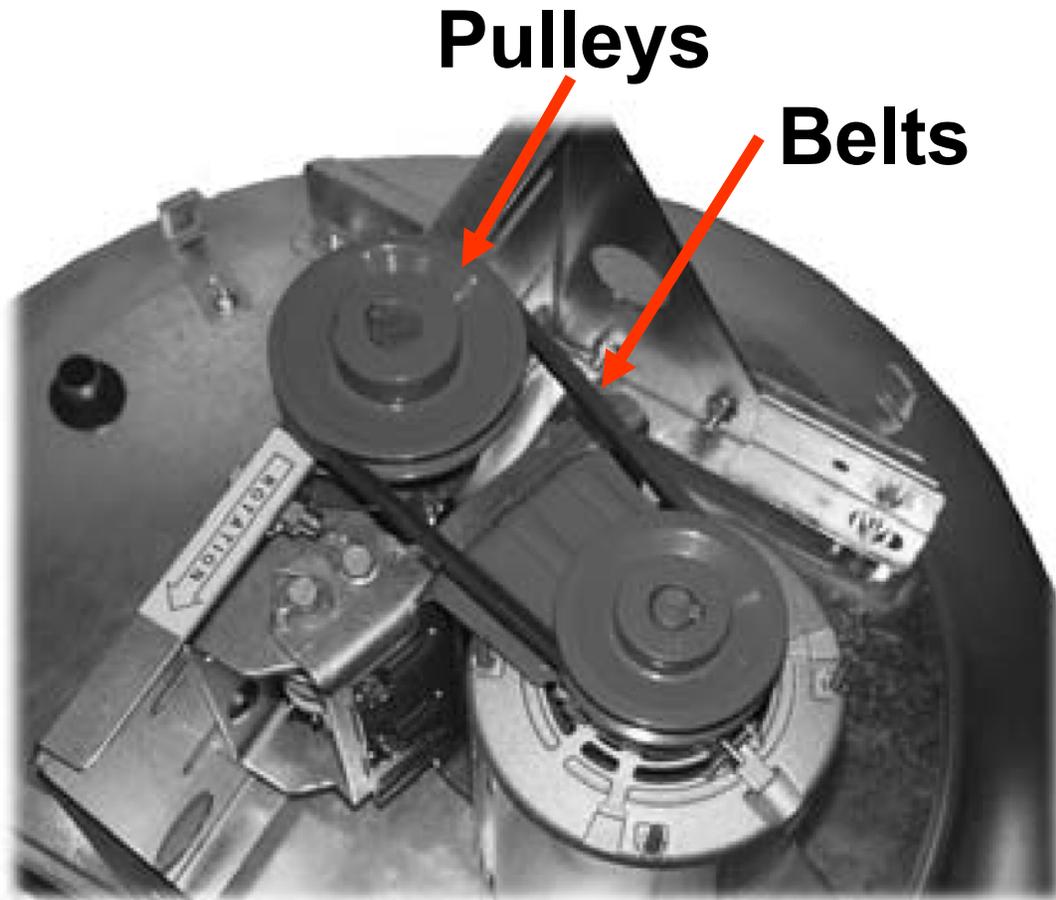
Nozzles: Calibrated to measure total pressure and air flow.







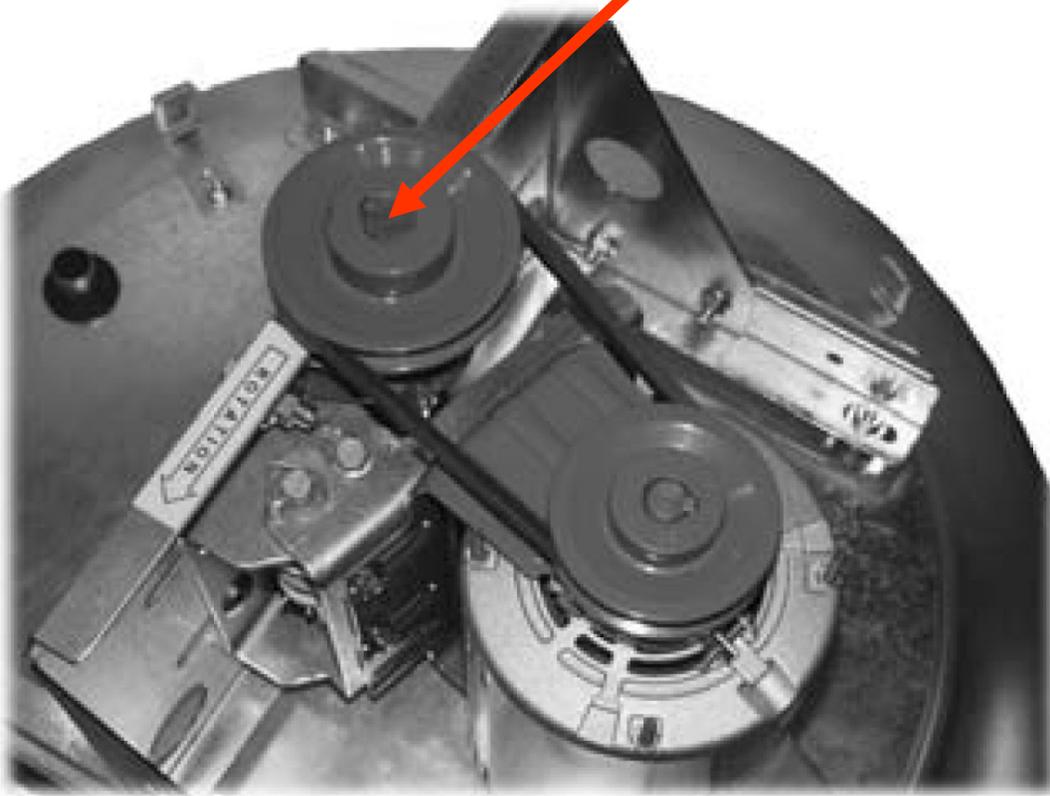
Drive Loss



**The fan is
not tested
with belts
and pulleys.**

Drive Loss

Fan Shaft BHP



**Only catalog
fan shaft BHP.**

AMCA Certified Performance

Air Performance

PUBLICATION

AMCA 211-13 (Rev. 10-18)

Certified Ratings Program Product Rating Manual
for Fan Air Performance



Air Movement and Control Association International

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About CRP



Certified Product Search



Listed Product Search



CRP Violations



Suspended Products



FEG Finder



Seals & Labels



Certification Checklists

The AMCA International Certified Ratings Program is a globally recognized third-party program that gives buyers, specifiers and users assurance that manufacturers' published data for air movement and control products are accurate.

Search by company name, product type, country, or license type

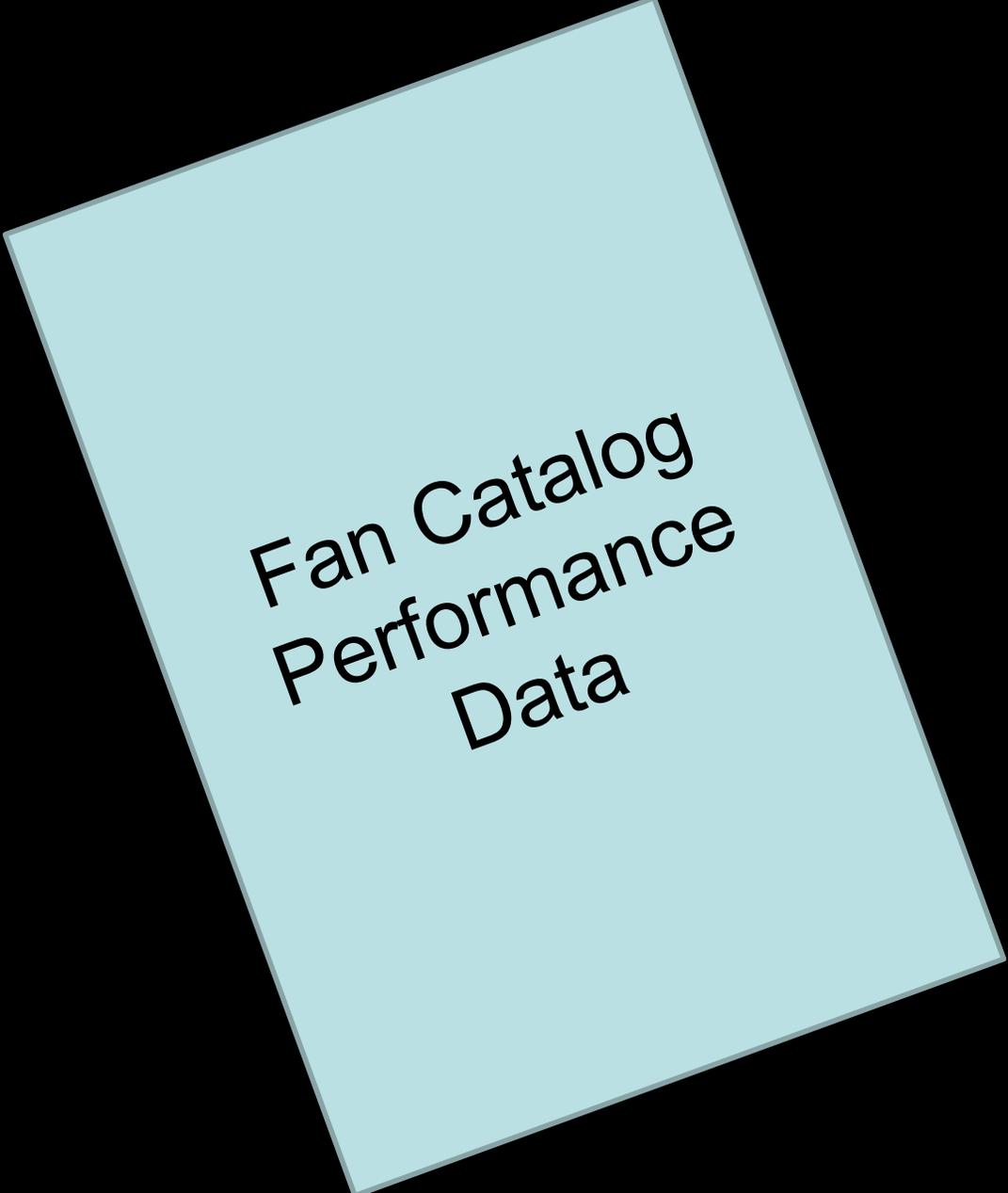


Product Types:

- Acoustic Duct Silencer
- Agricultural Fan
- Air Circulating Fan
- Air Curtains
- Airflow Measuring Station
- Axial Fan
- Ceiling Ventilator
- Centrifugal Fan
- Damper
- Energy Recovery Ventilator
- Evaporative Cooler
- Induced Flow
- Large Diameter Ceiling Fan
- Louver
- Mixed Flow Fan
- Positive Pressure Ventilator
- Power Roof Ventilator
- Propeller Fan
- Single Room Air Handler

License Types:

- Air Performance
- Sound
- Air Leakage
- Water Penetration
- Wind Driven Rain
- CFM per Watt
- Efficiency
- FEG
- Positive Pressure Ventilator
- Airflow Measurement Station
- Acoustic Duct Silencer
- Induced Flow Fan
- Circulating Fan
- Wind Driven Sand
- FEI
- Energy Star



Fan Catalog
Performance
Data

Catalog Number	Mo. HP/ Div. Wt.	Fan RPM	Tip Speed	CFM at Static Pressure																			
				0.00" SP		0.125" SP		0.250" SP		0.375" SP		0.500" SP		0.625" SP		0.750" SP		1.000" SP		1.250" SP		1.500" SP	
				Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP
34C21B	74 15 lbs	444	2781	4051	3651	3251																	
				5.8 32	5.3 24	4.5 25																	
34C24B	72 19 lbs	440	3076	4271	4031	3831																	
				6.7 31	6.6 32	5.9 33																	
34C25B	62 23 lbs	551	3534	3381	3251	3121																	
				8.8 46	8.7 48	8.1 50																	
34C26B	34 31 lbs	634	4106	3961	3821	3671																	
				11.1 70	11.3 72	10.7 75																	
34C27B	7	666	4271	4261	4061	3861																	
				12.2 81	12.2 84	11.9 86																	
34C28B	64/2 38 lbs	751	4876	4671	4521	4371																	
				13.2 94	13.3 97	13.1 99																	
34C29B	2	844	5131	4921	4771	4621																	
				17.2 142	17.2 146	17.0 149																	
34C30B	50 lbs	885	5876	5671	5521	5371																	
				20 190	20 194	20 197																	

Catalog Number	Mo. HP/ Div. Wt.	Fan RPM	Tip Speed	CFM at Static Pressure																			
				0.00" SP		0.125" SP		0.254" SP		0.375" SP		0.500" SP		0.625" SP		0.750" SP		1.000" SP		1.250" SP		1.500" SP	
				Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP
270C1B	14 5 lbs	360	2605	4441	4031	3716																	
				5.0 22	4.7 24	3.8 24																	
270C4B	13 9 lbs	408	2881	4711	4301	3981																	
				6.1 30	5.9 32	5.1 33																	
270C6B	12 21 lbs	443	3305	3961	3641	3321																	
				7.8 46	7.7 48	7.1 50																	
270C8B	14 31 lbs	504	3602	4331	4011	3691																	
				9.1 57	9.1 60	8.5 62																	
270C7B	7 36 lbs	394	4198	4181	3981	3781																	
				12.2 94	12.2 97	11.9 99																	
270C9B	14/2 36 lbs	633	4405	4191	3991	3791																	
				13.7 118	13.7 122	13.5 125																	
270C5B	2	717	5006	4801	4601	4401																	
				16.9 146	16.9 150	16.7 153																	
270C3B	51 lbs	752	5315	5111	4911	4711																	
				18.4 170	18.4 174	18.2 177																	

Catalog Number	Mo. HP/ Div. Wt.	Fan RPM	Tip Speed	CFM at Static Pressure																			
				0.00" SP		0.125" SP		0.254" SP		0.375" SP		0.500" SP		0.625" SP		0.750" SP		1.000" SP		1.250" SP		1.500" SP	
				Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP	Some BHP
000C1B	72 19 lbs	342	2384	5904	5271	4771																	
				6.1 30	5.2 32	4.4 33																	
000C2B	34 31 lbs	301	1084	6795	6271	5851																	
				8.0 46	7.2 48	6.4 50																	
000C3B	7 36 lbs	408	1810	6111	5781	5451																	
				10.7 70	10.9 73	10.7 75																	
000C4B	14 38 lbs	573	4801	6921	6591	6261																	
				12.4 142	12.3 146	12.1 149																	
000C5B	2 50 lbs	631	4955	6761	6431	6101																	
				16.9 146	16.9 150	16.7 153																	
000C6B	74 lbs	734	5885	6671	6341	6011																	
				21 223	21 230	21 244																	
000C7B	5 94 lbs	861	6762	6571	6241	5911																	
				25 273	25 282	25 297																	

Performance curves are for installation Type A. For inlet, free outlet. Power rating (BHP) shown in red indicate maximum fan speed. Performance ratings do not include the effects of equal friction across ducts. The shaded ratings shown are factory values at fan speed of 5 ft. (1.5 m) in a horizontal duct free field (as rated per AMCA Standard 20). Values shown are for installation Type A. Actual fan performance may vary. Shaded area indicates fan speed not available.

Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	0.00" SP		0.125" SP		0.250" SP		0.375" SP		0.500" SP		0.625" SP		0.750" SP		0.875" SP		1.000" SP		1.250" SP		1.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
300C4B	1/3 19 lbs.	342	2686	5904		5227		4171																	
				6.1	.30	5.2	.32	4.4	.33																
300C5B	1/2 23 lbs.	393	3086	6785		6216		5468		3986															
				8.0	.46	7.2	.49	6.4	.5	5.8	.46														
300C6B	3/4 31 lbs.	452	3550	7803		7317		6749		5999		4458													
				10.7	.70	9.9	.73	8.9	.75	8.2	.76	7.6	.69												
300C7B	1 36 lbs.	499	3919	8615		8178		7696		7096		6334													
				13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03												
300C8B	1-1/2 38 lbs.	573	4500	9892		9514		9115		8664		8123		7480		6581									
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53								
300C9B	2 50 lbs.	631	4955	10894		10551		10196		9813		9374		8865		8278		7529							
				18.9	1.90	18.9	1.94	17.8	1.99	16.9	2.02	16.3	2.05	15.6	2.07	15.0	2.08	14.3	2.06						
300C10B	3 74 lbs.	677	5317	11688		11369		11042		10696		10315		9878		9386		8825		8128					
				21	2.34	21	2.39	20	2.44	19.4	2.48	18.7	2.52	18.1	2.54	17.5	2.56	16.9	2.57	16.4	2.55				
		724	5686	12499		12201		11898		11581		11241		10864		10439		9970		9441		7742			
				24	2.87	24	2.92	23	2.97	22	3.02	21	3.06	21	3.09	20	3.11	19.5	3.13	18.9	3.14	17.9	2.98		
300C11B	5 98 lbs.	792	6220	13673		13401		13125		12842		12545		12228		11878		11493		11073		10098		8410	
				28	3.75	28	3.81	28	3.87	27	3.92	26	3.97	25	4.01	24	4.05	24	4.07	23	4.09	22	4.11	21	3.88
		861	6762	14864		14614		14362		14105		13839		13562		13265		12944		12594		11814		10882	
				33	4.82	33	4.89	33	4.95	31	5.01	30	5.07	29	5.12	29	5.16	28	5.20	28	5.22	26	5.27	25	5.28

Performance certified is for Installation Type A: free inlet, free outlet. Power rating (BHP) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories) in the airstream. The sound ratings shown are loudness values in fan sones at 5 ft. (1.5m) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for Installation Type A: free inlet fan sone levels. **Shaded area indicates reinforced wheel required.**

Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	0.00" SP		0.125" SP		0.250" SP		0.375" SP		0.500" SP		0.625" SP		0.750" SP		0.875" SP		1.000" SP		1.250" SP		1.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
300C4B	1/3 19 lbs.	342	2686	5904		5227		4171																	
				6.1	.30	5.2	.32	4.4	.33																
300C5B	1/2 23 lbs.	393	3086	6785		6216		5468		3986															
				8.0	.46	7.2	.49	6.4	.5	5.8	.46														
300C6B	3/4 31 lbs.	452	3550	7803		7317		6749		5999		4458													
				10.7	.70	9.9	.73	8.9	.75	8.2	.76	7.6	.69												
300C7B	1 36 lbs.	499	3919	8615		8178		7696		7096		6334													
				13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03												
300C8B	1-1/2 38 lbs.	573	4500	9892		9514		9115		8664		8123		7480		6581									
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53								
300C9B	2 50 lbs.	631	4955	10894		10551		10196		9813		9374		8865		8278		7529							
				18.9	1.90	18.9	1.94	17.8	1.99	16.9	2.02	16.3	2.05	15.6	2.07	15.0	2.08	14.3	2.06						
300C10B	3 74 lbs.	677	5317	11688		11369		11042		10696		10315		9878		9366		8825		8128					
				21	2.34	21	2.39	20	2.44	19.4	2.48	18.7	2.52	18.1	2.54	17.5	2.56	16.9	2.57	16.4	2.55				
		724	5686	12499		12201		11898		11581		11241		10864		10439		9970		9441		7742			
300C11B	5 98 lbs.	792	6220	13673		13401		13125		12842		12545		12228		11878		11493		11073		10098		8410	
				28	3.75	28	3.81	28	3.87	27	3.92	26	3.97	25	4.01	24	4.05	24	4.07	23	4.09	22	4.11	21	3.88
		861	6762	14864		14614		14362		14105		13839		13562		13265		12944		12594		11814		10882	
				33	4.82	33	4.89	33	4.95	31	5.01	30	5.07	29	5.12	29	5.16	28	5.20	28	5.22	26	5.27	25	5.28

Performance certified is for Installation Type A: free inlet, free outlet. Power rating (BHP) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories) in the airstream. The sound ratings shown are loudness values in fan sones at 5 ft. (1.5m) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for Installation Type A: free inlet fan sone levels. Shaded area indicates reinforced wheel required.

Standard Air
0 Elevation
70° Degrees F

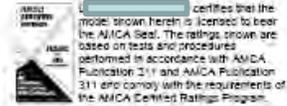
Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	0.00" SP		0.125" SP		0.250" SP		0.375" SP		0.500" SP		0.625" SP		0.750" SP		0.875" SP		1.000" SP		1.250" SP		1.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
300C4B	1/3 19 lbs.	342	2686	5904		5227		4171																	
				6.1	.30	5.2	.32	4.4	.33																
300C5B	1/2 23 lbs.	393	3086	6785		6216		5468		3986															
				8.0	.46	7.2	.49	6.4	.5	5.8	.46														
300C6B	3/4 31 lbs.	452	3550	7803		7317		6749		5999		4458													
				10.7	.70	9.9	.73	8.9	.75	8.2	.76	7.6	.69												
300C7B	1 36 lbs.	499	3919	8615		8178		7696		7096		6334													
				13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03												
300C8B	1-1/2 38 lbs.	573	4500	9892		9514		9115		8664		8123		7480		6581									
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53								
300C9B	2	631	4955	10894		10551		10196		9813		9374		8865		8278		7529							
300C10B	3 74 lbs.	677	5317	11688		11369		11042		10696		10315		9878		9366		8825		8128					
				21	2.34	21	2.39	20	2.44	19.4	2.48	18.7	2.52	18.1	2.54	17.5	2.56	16.9	2.57	16.4	2.55				
				12499	12201	11898	11581	11241	10864	10439	9970	9441	7742												
300C11B	5 98 lbs.	792	6220	13673		13401		13125		12842		12545		12228		11878		11493		11073		10098		8410	
				28	3.75	28	3.81	28	3.87	27	3.92	26	3.97	25	4.01	24	4.05	24	4.07	23	4.09	22	4.11	21	3.88
				14864	14614	14362	14105	13839	13562	13265	12944	12594	11814	10882											
				33	4.82	33	4.89	33	4.95	31	5.01	30	5.07	29	5.12	29	5.16	28	5.20	28	5.22	26	5.27	25	5.28

Performance certified is for Installation Type A: free inlet, free outlet. Power rating (BHP) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories) in the airstream. The sound ratings shown are loudness values in fan sones at 5 ft. (1.5m) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for Installation Type A: free inlet fan sone levels. Shaded area indicates reinforced wheel required.



Manufacturer Name

Manufacturer Model Name



Performance

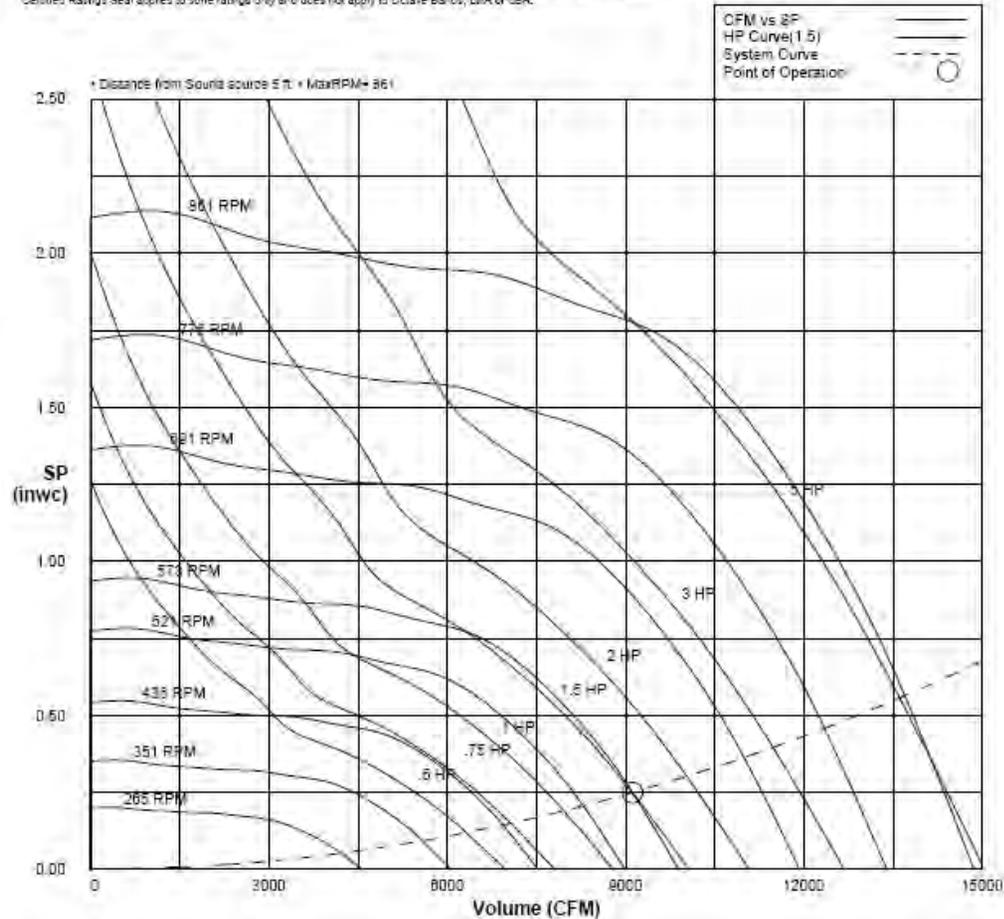
Model	CFM	SP	Fan RPM	Power HP	Motor HP	OVEL (fpm)	TSPD (fpm)	SE	TEMP (°F)	ELEV (Ft)
300	5115	.25	573	1.5	1.5	1547	4500	23%	70	0

Sound Data 8 Octave Bands 10-12 Watts

1	2	3	4	5	6	7	8	LwA	dBA	SONES
83	84	81	73	71	67	58	51	78	66	14.9

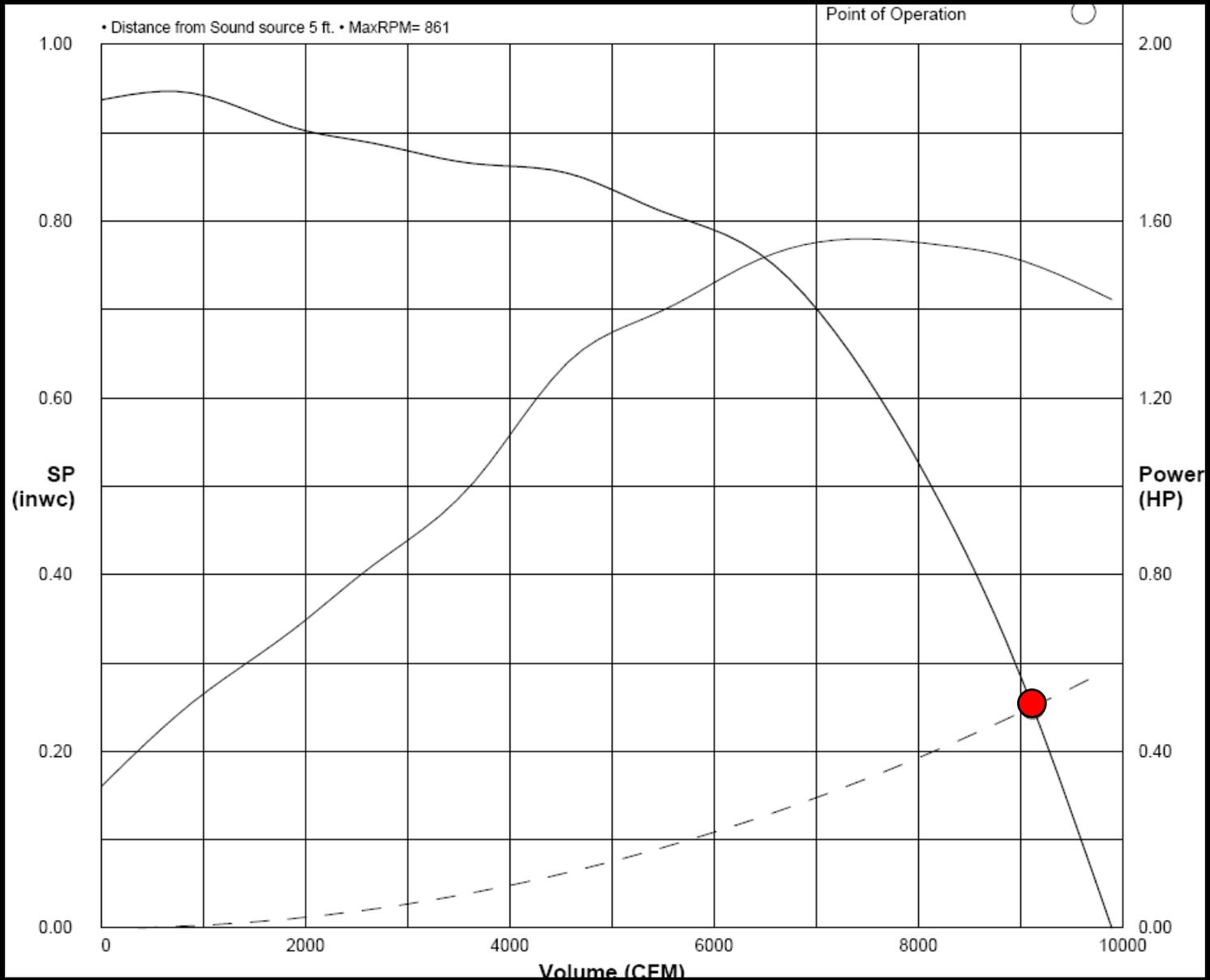
Performance certified for installation type A: free inlet, free outlet. Power rating (BHP/W) does not include transmission losses. Performance ratings do not include the effects of apparatuses (accessories). The sound ratings shown are loudness values in hemispherical zones at 5 ft. In a hemispherical free field calculated per AMCA Standard 301. Values shown are for installation type A: free inlet hemispherical zone levels.

The sound power level ratings shown are in decibels, referred to 10⁻¹² watts, calculated per AMCA Standard 301. Values shown are for inlet LwA and LwA sound power levels for installation type A: free inlet, free outlet. Ratings do not include the effects of duct and connector. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. The AMCA Certified Ratings Seal applies to some ratings only and does not apply to Octave Bands, LwA or dBA.

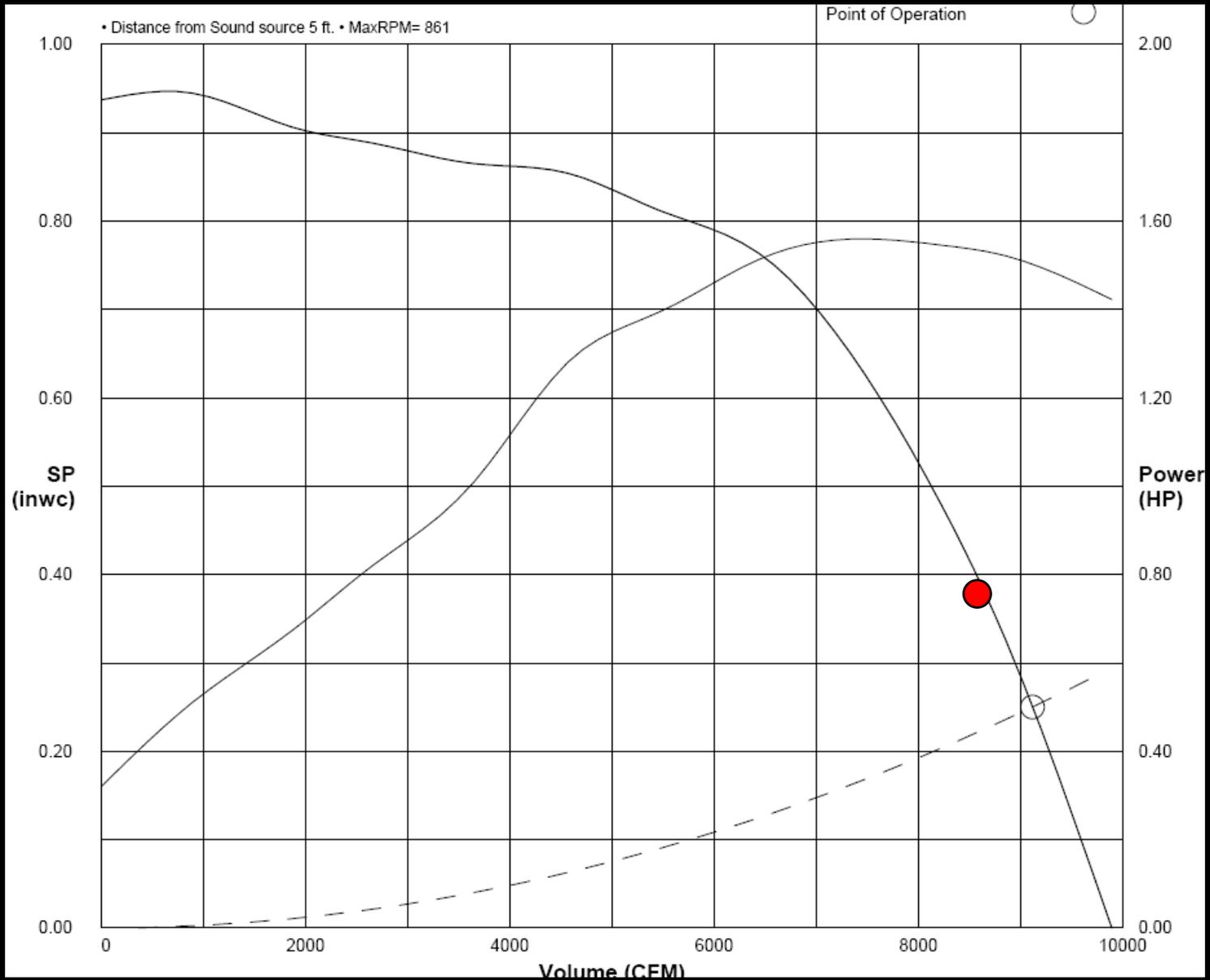


Catalog Number	Mtr. HP/ Drv. Wt.	Fan RPM	Tip Speed	0.00" SP		0.125" SP		0.250" SP		0.375" SP		0.500" SP		0.625" SP		0.750" SP		0.875" SP		1.000" SP		1.250" SP		1.500" SP	
				Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP	Sone	BHP
300C4B	1/3 19 lbs.	342	2686	5904		5227		4171																	
				6.1	.30	5.2	.32	4.4	.33																
300C5B	1/2 23 lbs.	393	3086	6785		6216		5468		3986															
				8.0	.46	7.2	.49	6.4	.5	5.8	.46														
300C6B	3/4 31 lbs.	452	3550	7803		7317		6749		5999		4458													
				10.7	.70	9.9	.73	8.9	.75	8.2	.76	7.6	.69												
300C7B	1 36 lbs.	499	3919	8615		8178		7696		7096		6334													
				13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03												
300C8B	1-1/2 38 lbs.	573	4500	9892		9514		9115		8664		8123		7480		6581									
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53								
300C9B	2	631	4955	10894		10551		10196		9813		9374		8865		8278		7529							
300C10B	3 74 lbs.	677	5317	11688		11369		11042		10696		10315		9878		9366		8825		8128					
				21	2.34	21	2.39	20	2.44	19.4	2.48	18.7	2.52	18.1	2.54	17.5	2.56	16.9	2.57	16.4	2.55				
				12499		12201		11898		11581		11241		10864		10439		9970		9441		7742			
300C11B	5 98 lbs.	792	6220	13673		13401		13125		12842		12545		12228		11878		11493		11073		10098		8410	
				28	3.75	28	3.81	28	3.87	27	3.92	26	3.97	25	4.01	24	4.05	24	4.07	23	4.09	22	4.11	21	3.88
				14864		14614		14362		14105		13839		13562		13265		12944		12594		11814		10882	
				33	4.82	33	4.89	33	4.95	31	5.01	30	5.07	29	5.12	29	5.16	28	5.20	28	5.22	26	5.27	25	5.28

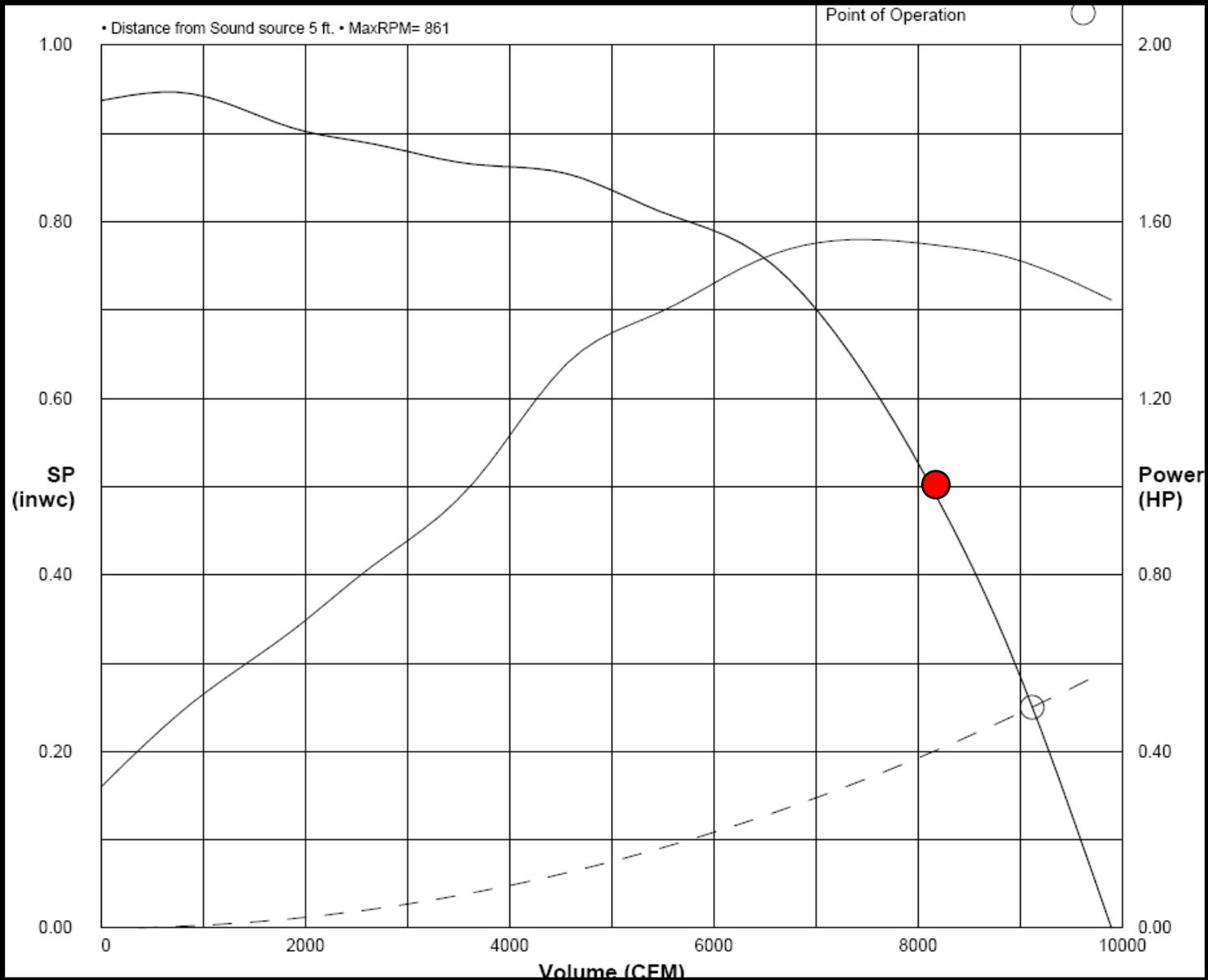
Performance certified is for Installation Type A: free inlet, free outlet. Power rating (BHP) does not include transmission losses. Performance ratings do not include the effects of appurtenances (accessories) in the airstream. The sound ratings shown are loudness values in fan sones at 5 ft. (1.5m) in a hemispherical free field calculated per AMCA Standard 301. Values shown are for Installation Type A: free inlet fan sone levels. Shaded area indicates reinforced wheel required.



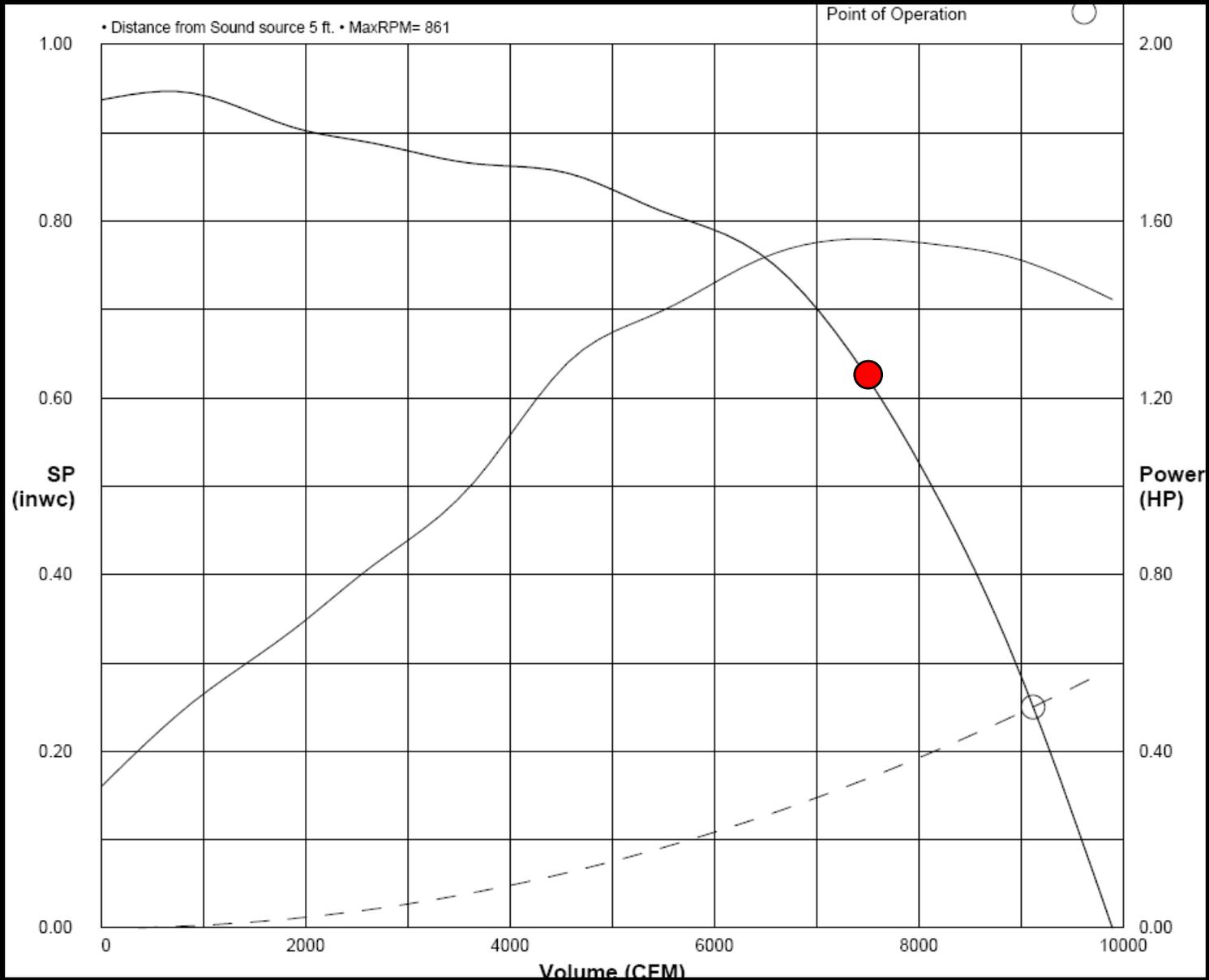
	36 lbs.			13.0	.94	12.5	.97	11.5	1.00	10.5	1.02	9.8	1.03						
300C8B	1-1/2 38 lbs.	573	4500	9892		9514		9115		8664		8123		7480		6581			
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53		
300C9B	2	631	4955	10894		10551		10196		9813		9374		8865		8278		7529	



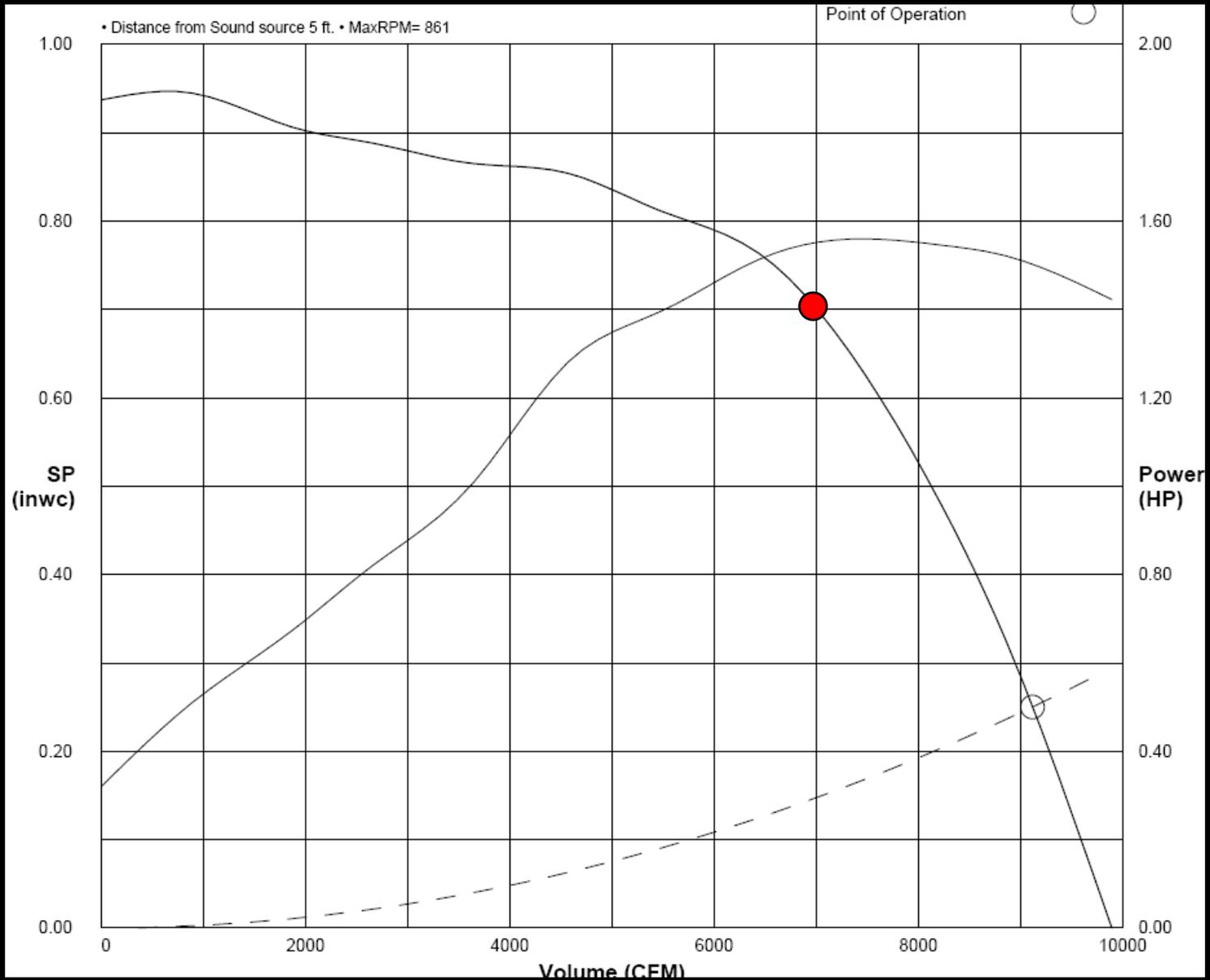
	36 lbs.			13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03						
300C8B	1-1/2 38 lbs.	573	4500	9892		9514		9115		8664		8123		7480		6581			
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53		
300C9B	2	631	4955	10894		10551		10196		9813		9374		8865		8278		7529	



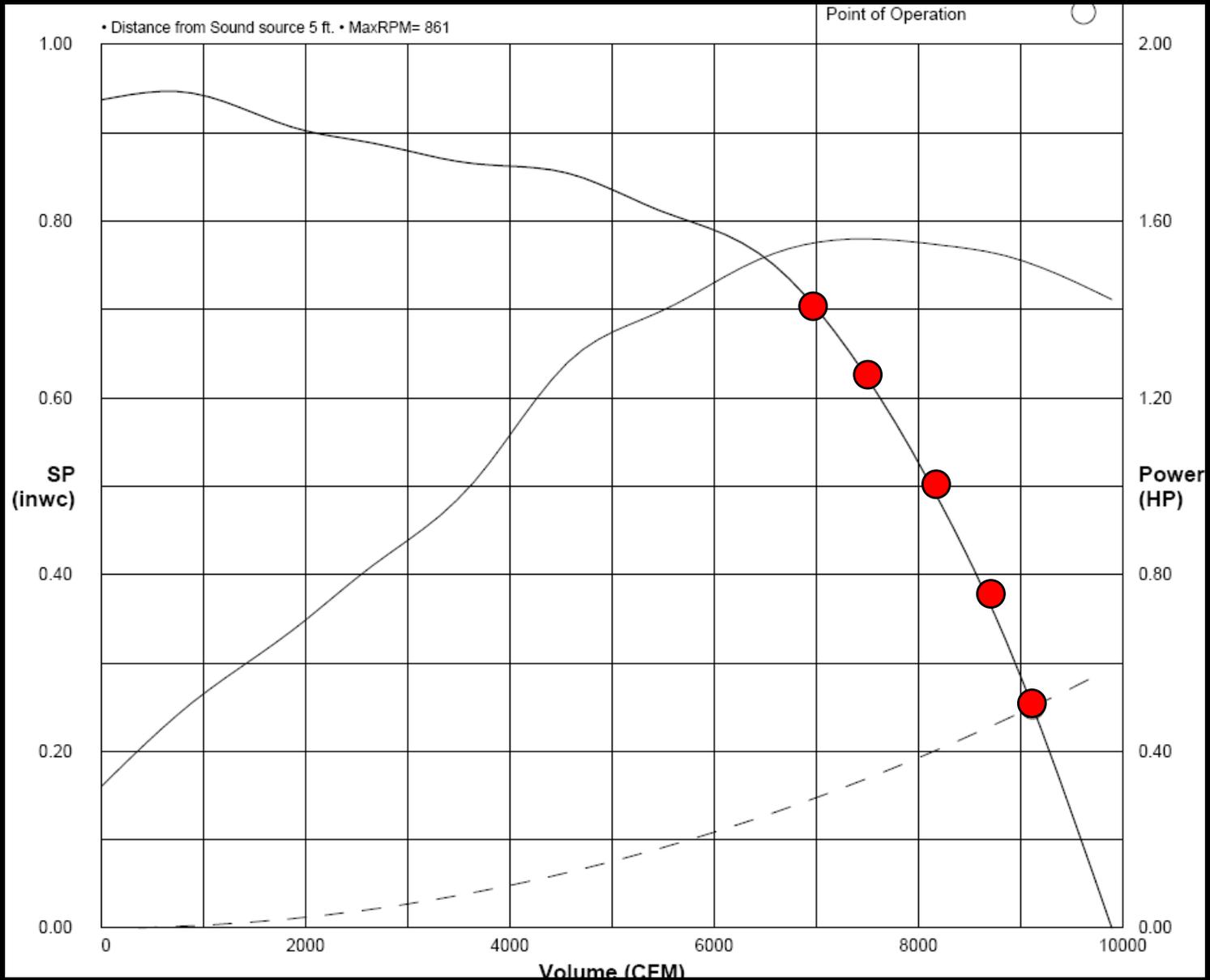
	36 lbs.			13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03						
300C8B	1-1/2 38 lbs.	573	4500	9892	9514	9115	8664	8123	7480	6581									
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53		
300C9B	2	631	4955	10894	10551	10196	9813	9374	8865	8278	7529								



	36 lbs.			13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03						
300C8B	1-1/2 38 lbs.	573	4500	9892		9514		9115		8664		8123		7480		6581			
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53		
300C9B	2	631	4955	10894		10551		10196		9813		9374		8865		8278		7529	

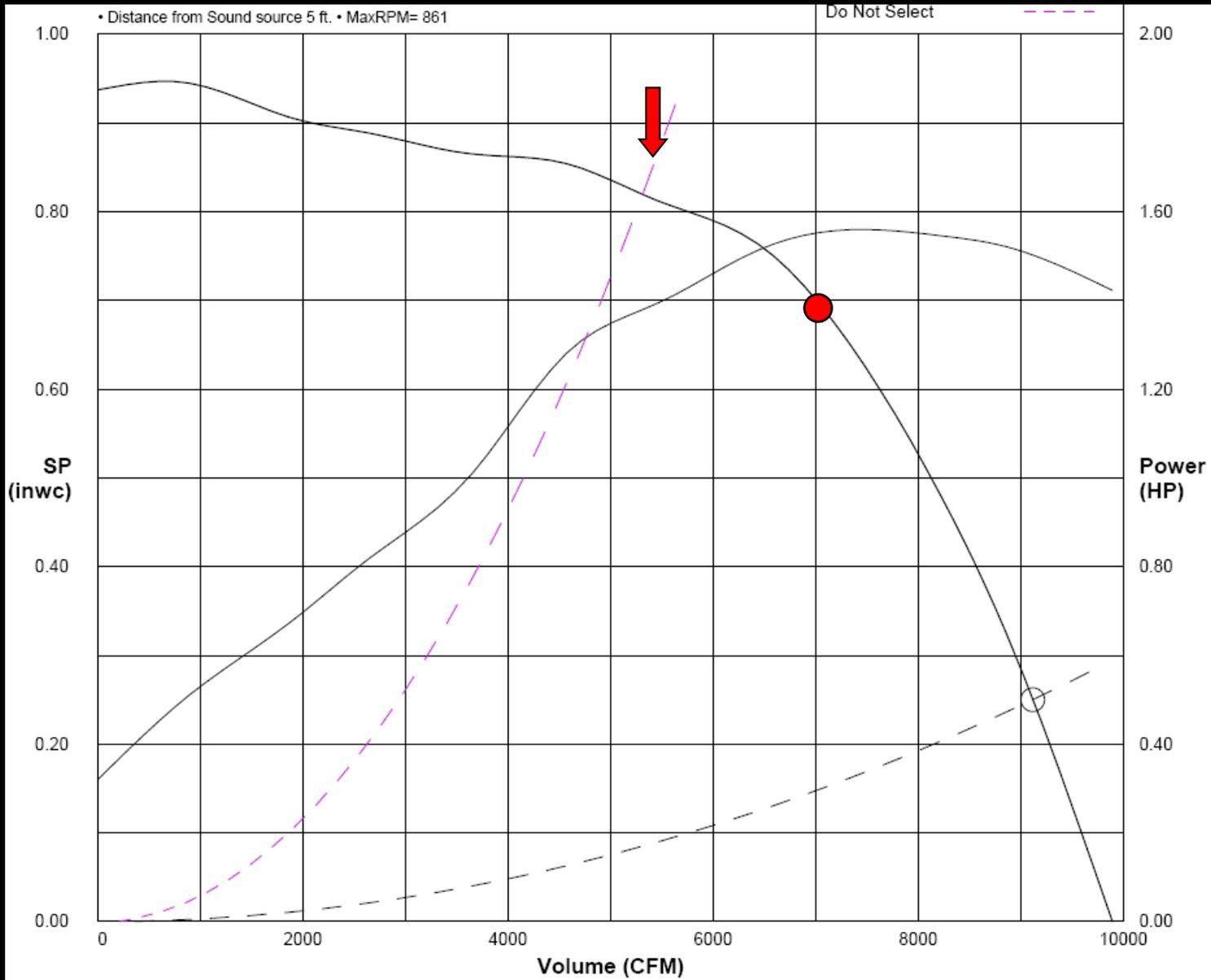


	36 lbs.			13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03						
300C8B	1-1/2 38 lbs.	573	4500	9892		9514		9115		8664		8123		7480		6581			
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53		
300C9B	2	631	4955	10894		10551		10196		9813		9374		8865		8278		7529	



↓

	36 lbs.		13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03						
300C8B	1-1/2 38 lbs.	573	4500	9892	9514	9115	8664	8123	7480	6581								
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53	
300C9B	2	631	4955	10894	10551	10196	9813	9374	8865	8278	7529							

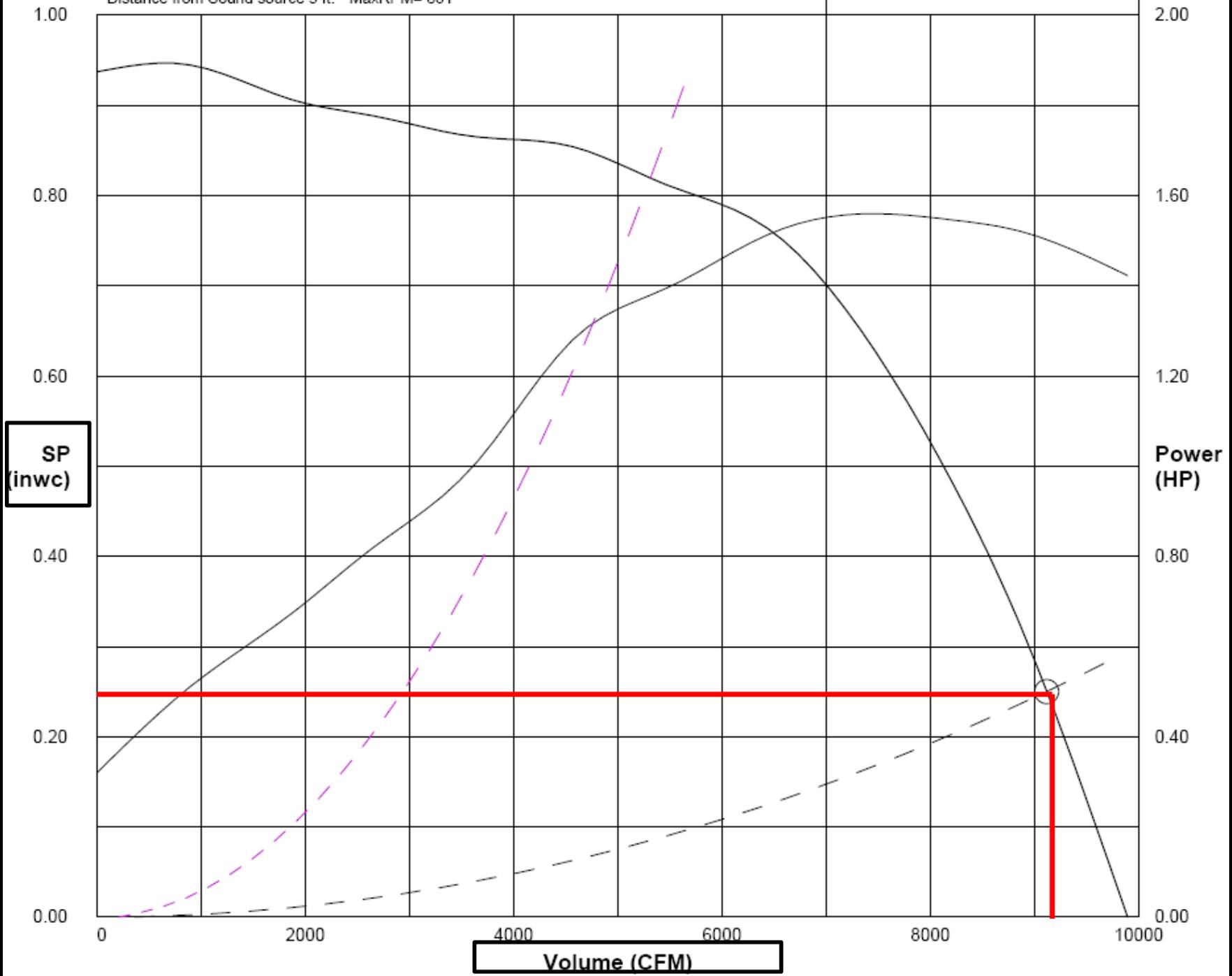


	36 lbs.			13.0	.94	12.5	.97	11.3	1.00	10.5	1.02	9.8	1.03						
300C8B	1-1/2 38 lbs.	573	4500	9892		9514		9115		8664		8123		7480		6581			
				16.4	1.42	16.1	1.46	14.9	1.50	14.0	1.53	13.3	1.55	12.7	1.56	12.1	1.53		
300C9B	2	631	4955	10894		10551		10196		9813		9374		8865		8278		7529	

Reading a Fan Curve

• Distance from Sound source 5 ft. • MaxRPM= 861

Do Not Select



Manufacturer Name

Manufacturer Model Name



_____ certifies that the model shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 311 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Performance

Model	CFM	SP	Fan RPM	Power HP	Motor HP	OVEL (fpm)	TSPD (fpm)	SE	TEMP (°F)	ELEV (Ft)
300 _____	3115	25	573	1.5	1.5	1547	4500	23%	70	0

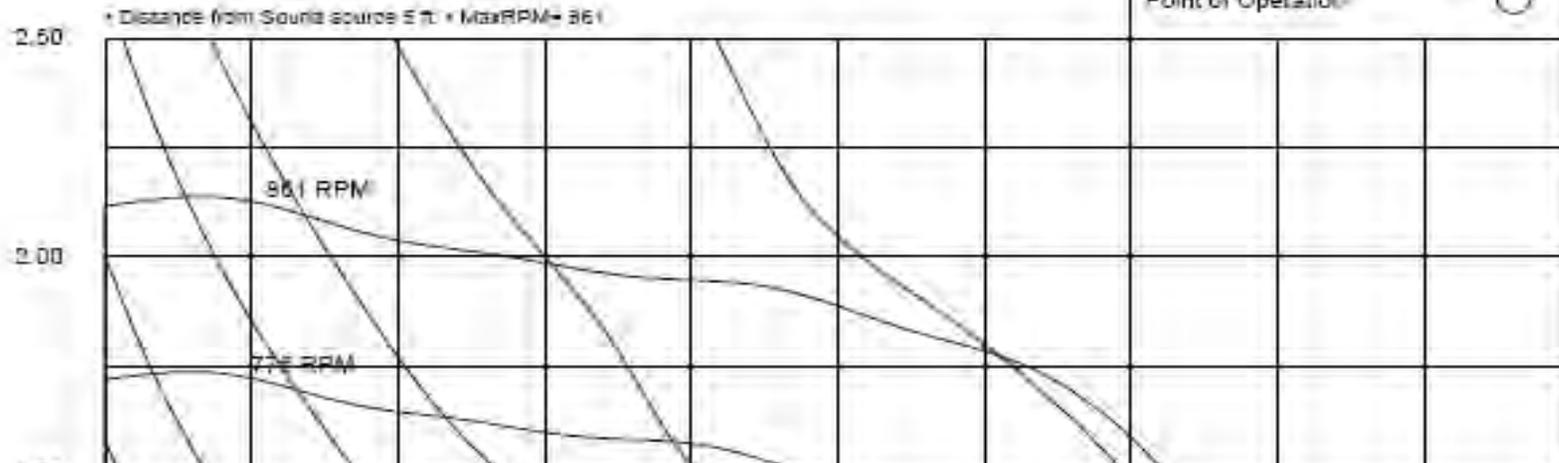
Sound Data - 8 Octave Bands 10⁻¹² Watts

1	2	3	4	5	6	7	8	LwA dBA	SONES
83	84	81	73	71	67	58	51	78	14.9

Performance certified for installation type A: free inlet, free outlet. Power rating (BHP/MV) does not include transmission losses. Performance ratings do not include the effects of accessories (accessories). The sound ratings shown are loudness values in hemispherical sones at 5 ft. in a hemispherical free field calculated per AMCA Standard 301. Values shown are for installation type A: free inlet hemispherical sone levels.

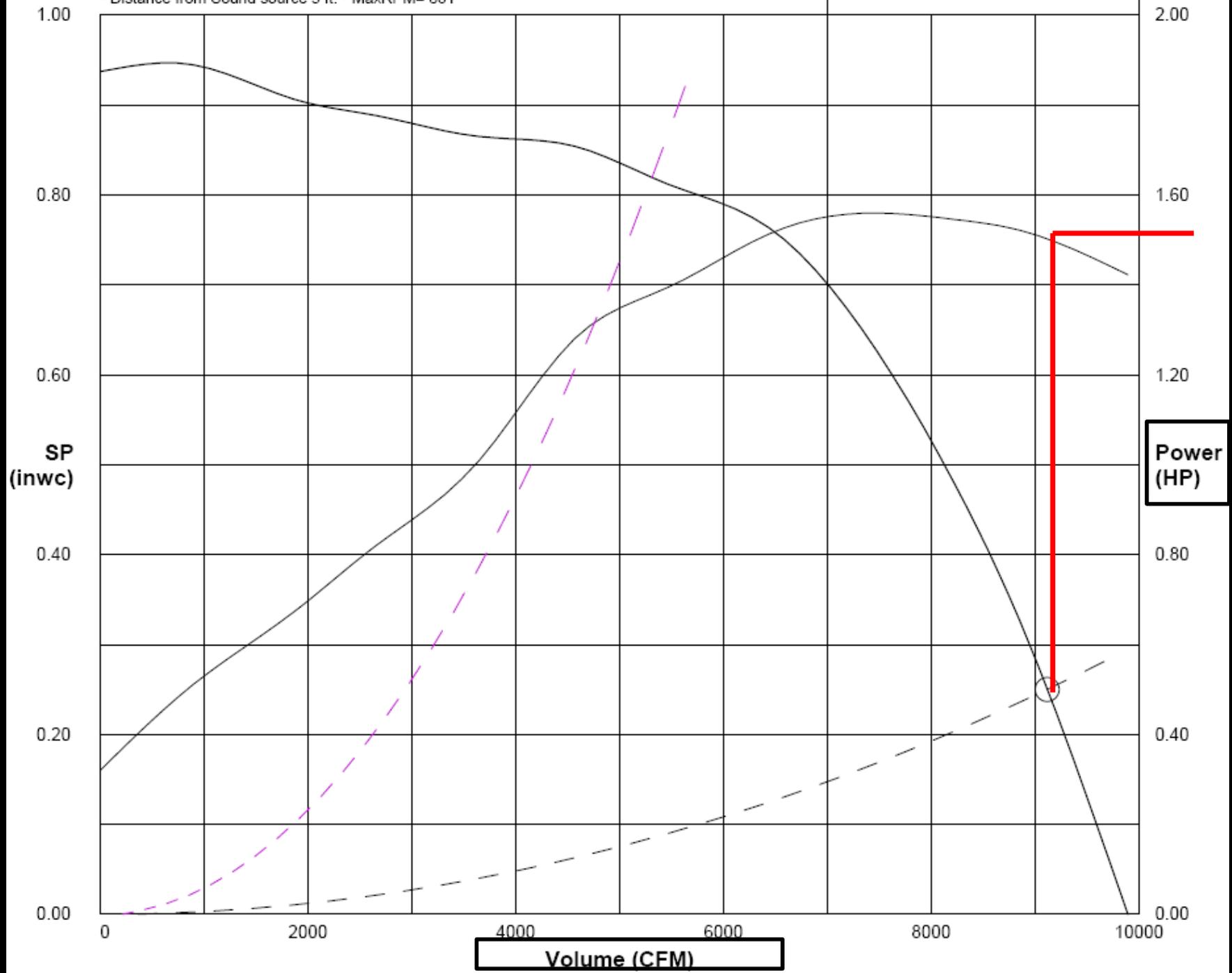
The sound power level ratings shown are in decibels, referred to 10⁻¹² watts, calculated per AMCA Standard 301. Values shown are for inlet LwA and LwA sound power levels for installation type A: free inlet, free outlet. Ratings do not include the effects of duct and correction. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. The AMCA Certified Ratings Seal applies to sone ratings only and does not apply to Octave Bands, LwA or dBA.

CFM vs SP
HP Curve (1.5)
System Curve
Point of Operation



• Distance from Sound source 5 ft. • MaxRPM= 861

Do Not Select



Manufacturer Name

Manufacturer Model Name



certified that the model shown herein is licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 311 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings Program.

Performance

Model	CFM	SP	Fan RPM	Power HP	Motor HP	OVEL (fpm)	TSPD (fpm)	SE	TEMP (°F)	ELEV (Ft)
300	3115	.25	573	1.5	1.5	1547	4500	23%	70	0

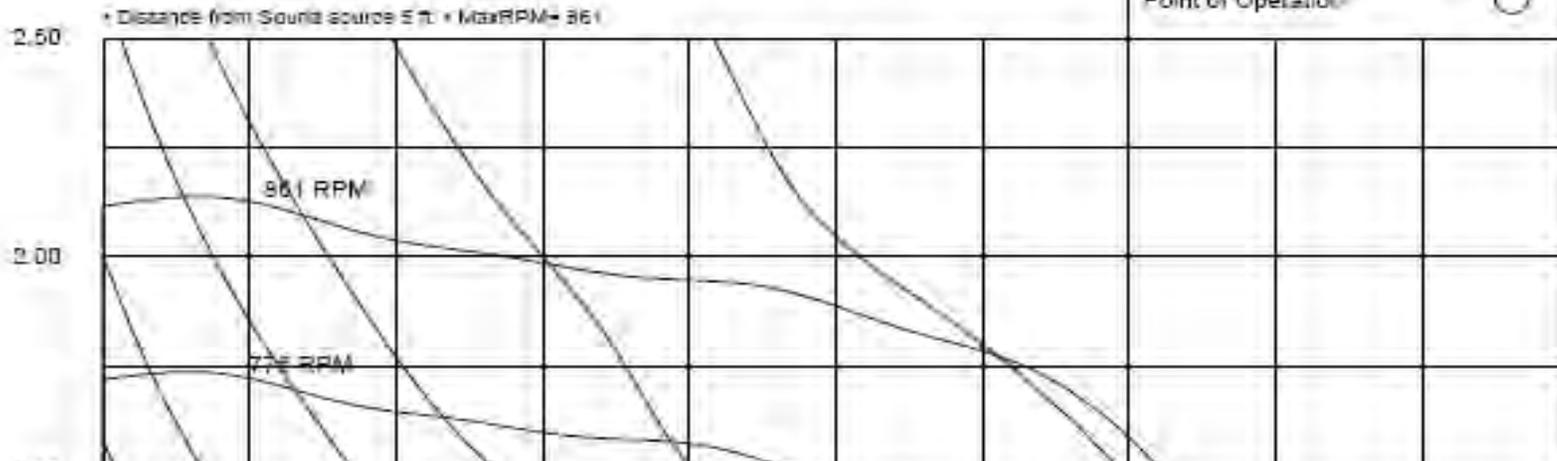
Sound Data 8 Octave Bands 10⁻¹² Watts

1	2	3	4	5	6	7	8	LWA	dBA	SONES
83	84	81	73	71	67	58	51	78	66	14.9

Performance certified is for installation type A: free inlet, free outlet. Power rating (BHP/HP) does not include transmission losses. Performance ratings do not include the effects of accessories (accessories). The sound ratings shown are loudness values in hemispherical sones at 5 ft. In a hemispherical free field calculated per AMCA Standard 301. Values shown are for installation type A: free inlet hemispherical sone levels.

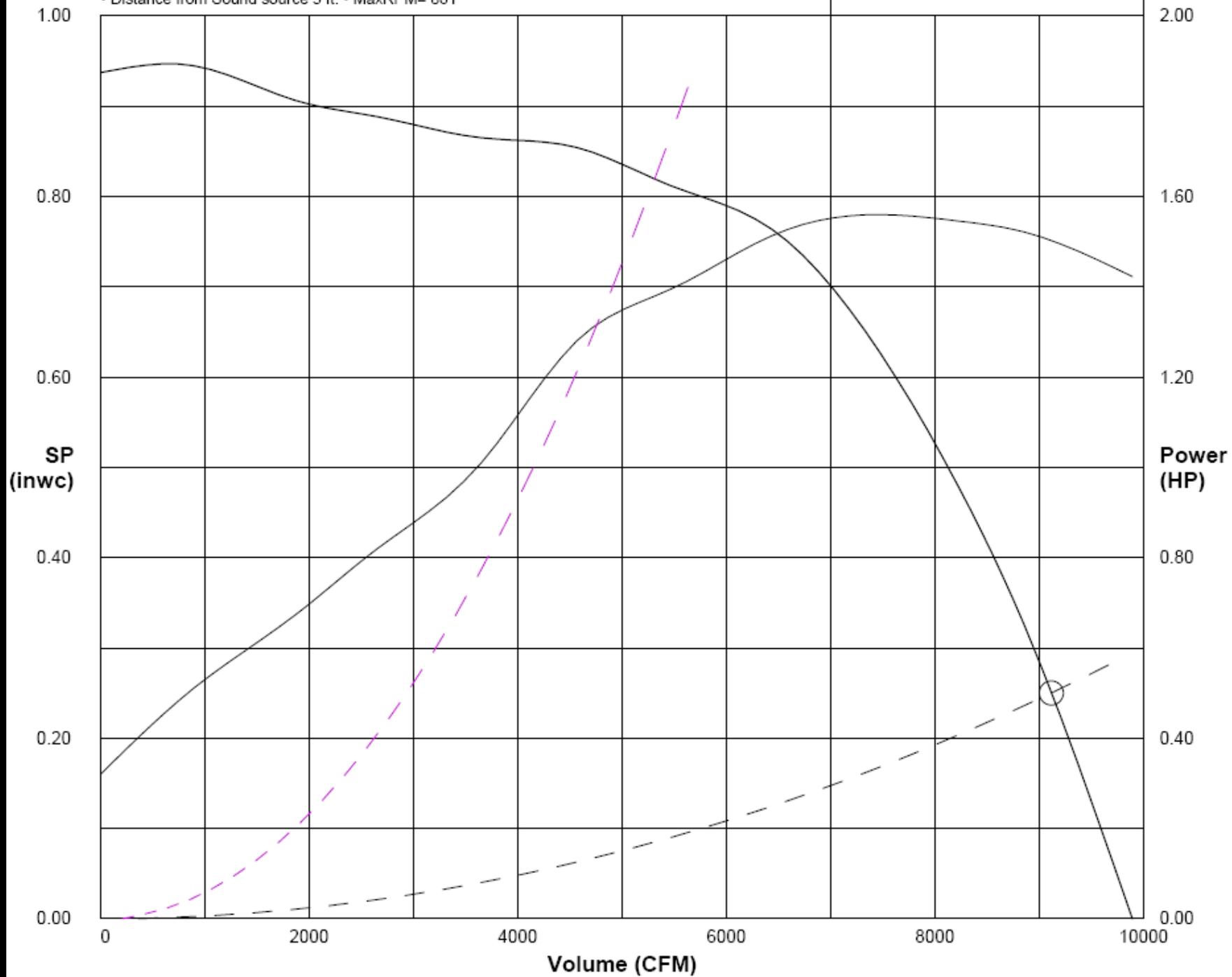
The sound power level ratings shown are in decibels, referred to 10⁻¹² watts, calculated per AMCA Standard 301. Values shown are for inlet Lw and LwA sound power levels for installation type A: free inlet, free outlet. Ratings do not include the effects of duct and correction. The A-weighted sound ratings shown have been calculated per AMCA Standard 301. The AMCA Certified Ratings Seal applies to sone ratings only and does not apply to Octave Bands, LwA or dBA.

CFM vs SP
HP Curve (1.5)
System Curve
Point of Operation



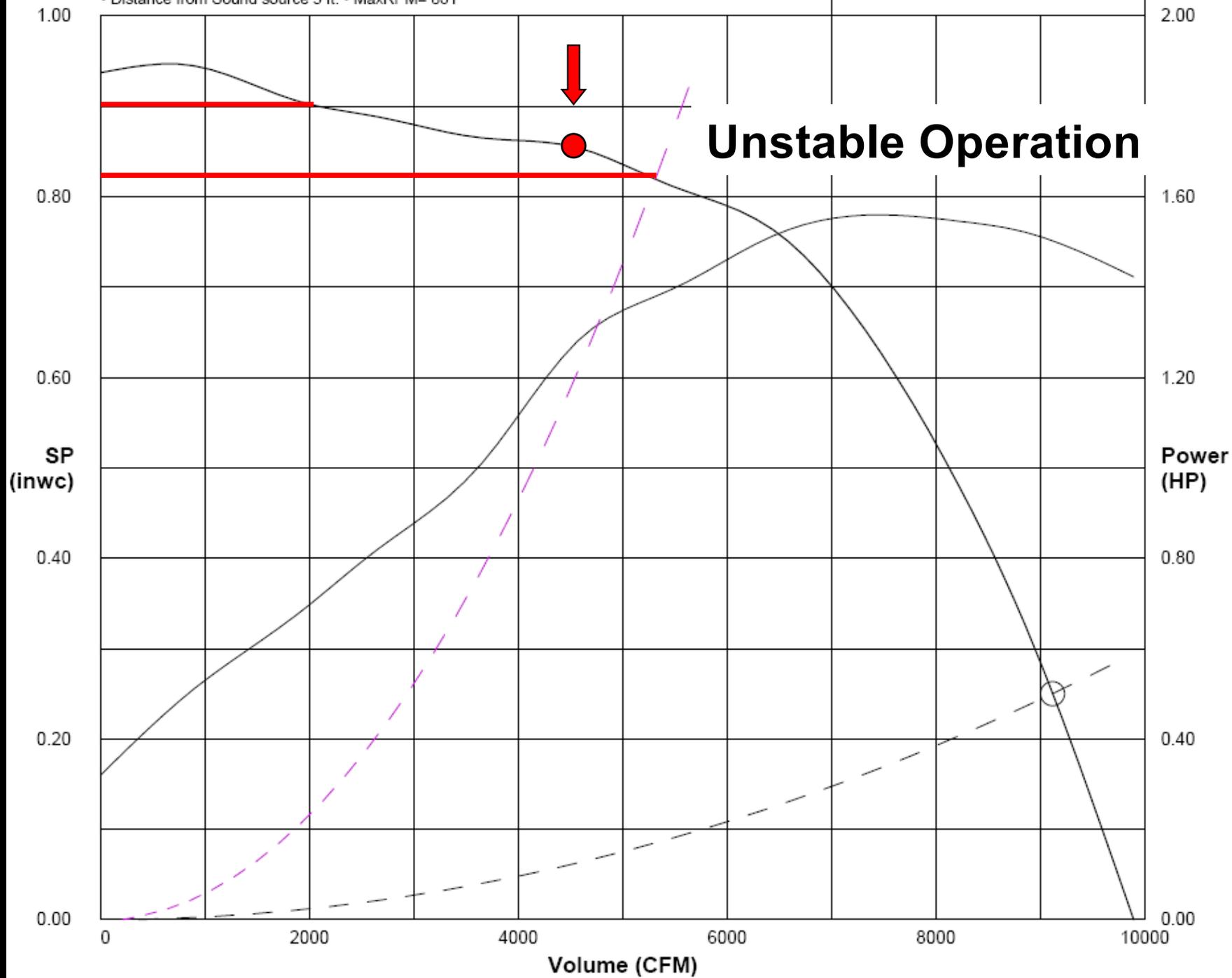
• Distance from Sound source 5 ft. • MaxRPM= 861

Do Not Select



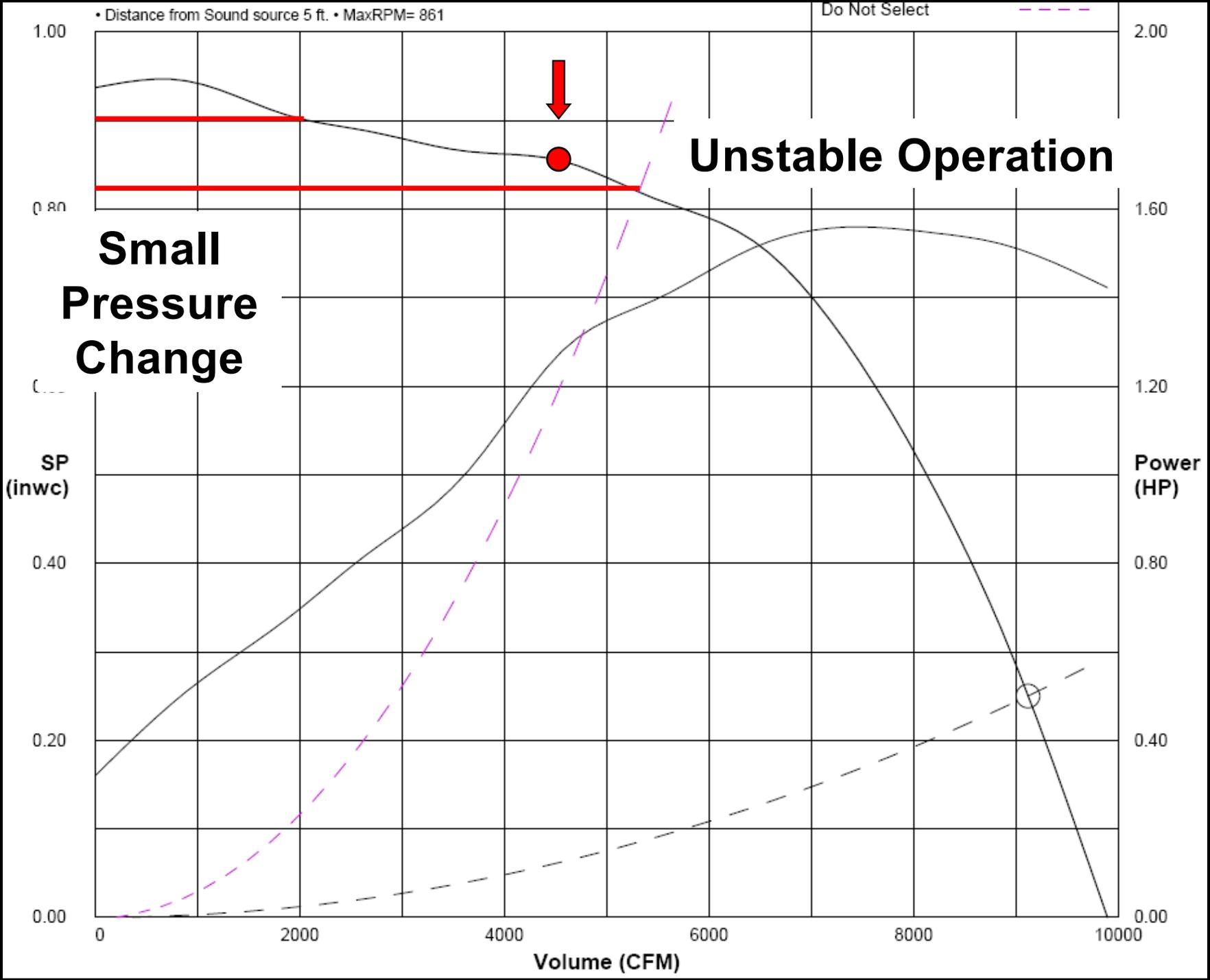
• Distance from Sound source 5 ft. • MaxRPM= 861

Do Not Select



• Distance from Sound source 5 ft. • MaxRPM= 861

Do Not Select



Small
Pressure
Change

Unstable Operation

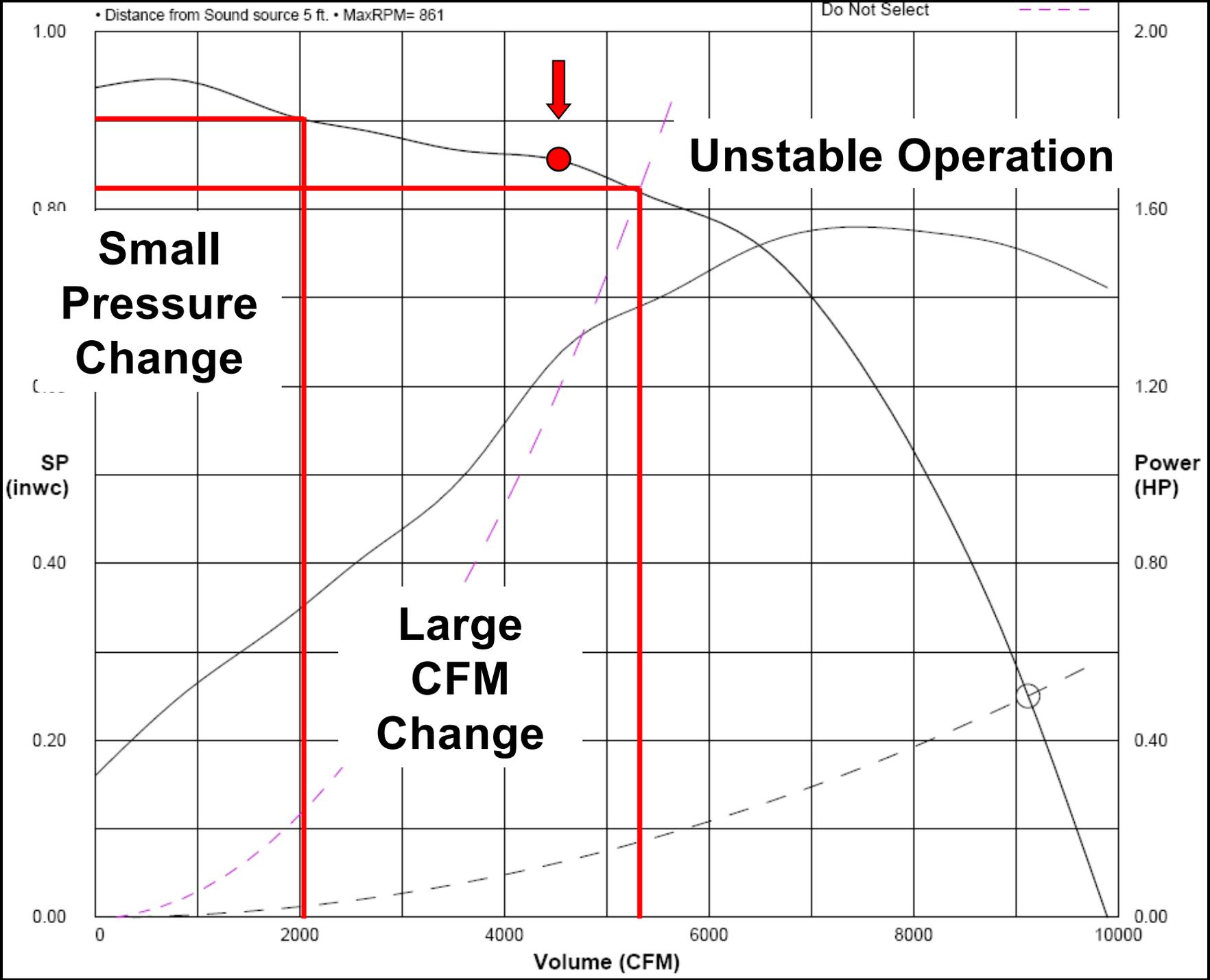
SP
(in w/c)

Power
(HP)

Volume (CFM)

• Distance from Sound source 5 ft. • MaxRPM= 861

Do Not Select



Small Pressure Change

Large CFM Change

Unstable Operation

Field Performance Data





Test Setups and Field Installations



Fan: Power Roof Ventilator

Test Setups and Field Installations



Fan: Power Roof Ventilator



Roof Curb

Test Setups and Field Installations



Fan: Power Roof Ventilator



Back Draft Damper



Roof Curb

Test Setups and Field Installations



**The fan test does
NOT include
pressure drop for the
backdraft damper.**

Test Setups and Field Installations

Fan tests do not include *any* accessories. Some examples:

Dampers

Filters

Guards

Test Setups and Field Installations

Fan tests do not include:

Drive losses

Duct transitions / systems

Duct fittings

System Effect

PUBLICATION

AMCA 203-90 (R2011)

Field Performance Measurement of Fan Systems



Air Movement and Control Association International

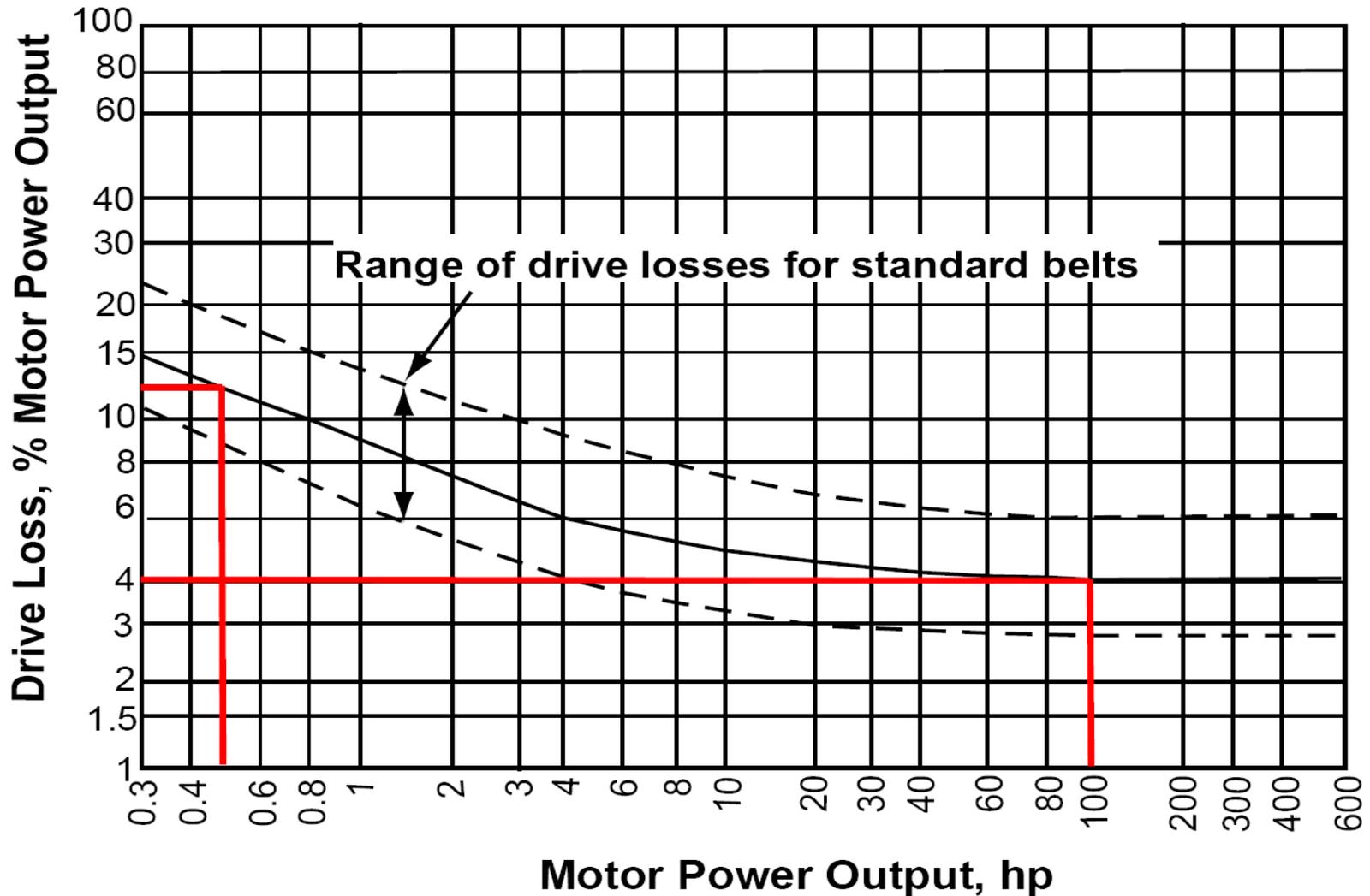
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Drive Loss: AMCA 203-90

Estimated Belt Drive Loss†



Drive Loss: AMCA 203-90

Notes:

Higher belt speeds tend to have higher losses than lower belt speeds at the same horsepower.

Drive losses are based upon the conventional v-belt which has been the workhorse of the industry for many decades.

ASHRAE Research

1769-RP ***Experimental Evaluation of the Efficiency of Belt Drives for Fans***

September 2018 – August 2020; AMCA International, Inc; **Principal Investigator**, Mark DeRoo;
TC 5.1 Fans; Co-sponsors: None; **AHRTI** \$12,000 Co-funder

The results of this research effort will provide tools to air system designers to allow them to separate out the impacts of belt part-load efficiency on system efficiency, to compare the efficiency levels of belt- and direct-driven fans, and to balance energy savings with other requirements used in the fan system selection process.

Introduction to System Effect

ASHRAE

2016

ASHRAE HANDBOOK

ASHRAE

HVAC Systems
and Equipment

ASHRAE

11th Edition

Supported by ASHRAE Research

ASHRAE

CHAPTER 21

FANS

Types of Fans	21.1	System Effects	21.8
Principles of Operation	21.1	Selection	21.9
Testing and Rating	21.4	Parallel Fan Operation	21.10
Field Testing of Fans for		Series Fan Operation	21.10
Air Performance	21.5	Noise	21.11
Fan Laws	21.5	Vibration	21.11
Fan and System Pressure Relationships	21.6	Arrangement and Installation	21.12
Temperature Rise Across Fans	21.7	Fan Control	21.12
Duct System Characteristics	21.7	Symbols	21.13

A FAN uses a power-driven rotating impeller to move air. The impeller does work on the air, imparting to it both static and kinetic energy, which vary in proportion, depending on the fan type.

1. TYPES OF FANS

Fans are generally classified as centrifugal, axial, mixed, or cross flow according to the direction of airflow through the impeller. [Figure 1](#) shows the general configuration of a centrifugal fan. The components of an axial-flow fan are shown in [Figure 2](#). [Table 1](#) compares typical characteristics of some of the most common fan types.

Unhoused centrifugal fan impellers are used as circulators in some industrial applications (e.g., heat-treating ovens) and are identified as plug fans. In this case, there is no duct connection to the fan because it simply circulates the air within the oven. In some HVAC installations, the unhoused fan impeller is located in a plenum chamber with the fan inlet connected to an inlet duct from the system. Outlet ducts are connected to the plenum chamber. This fan arrangement is identified as a plenum fan.

2. PRINCIPLES OF OPERATION

All fans produce pressure by altering the airflow's velocity vector. A fan produces pressure and/or airflow because the rotating blades of the impeller impart kinetic energy to the air by changing its

velocity. Velocity change is in the tangential and radial velocity components for centrifugal fans, and in the axial and tangential velocity components for axial-flow fans.

Centrifugal fan impellers produce pressure from the (1) centrifugal force created by rotating the air column contained between the blades and (2) kinetic energy imparted to the air by its velocity leaving the impeller. This velocity is a combination of rotational velocity of the impeller and airspeed relative to the impeller. When the blades are inclined forward, these two velocities are cumulative; when backward, oppositional. Backward-curved blade fans are generally more efficient than forward-curved blade fans.

Axial-flow fan impellers produce pressure principally by the change in air velocity as it passes through the impeller blades, with none being produced by centrifugal force. These fans are divided into three types: propeller, tubeaxial, and vaneaxial. Propeller fans, customarily used at or near free air delivery, usually have a small-hub-to-tip-ratio impeller mounted in an orifice plate or inlet ring. Tubeaxial fans usually have reduced tip clearance and operate at higher tip speeds, giving them a higher total pressure capability than the propeller fan. Vaneaxial fans are essentially tubeaxial fans with guide vanes and reduced running blade tip clearance, which give improved pressure, efficiency, and noise characteristics.

[Table 1](#) includes typical performance curves for various types of fans. These performance curves show the general characteristics of various fans as they are normally used; they do not reflect fan characteristics reduced to common denominators such as constant

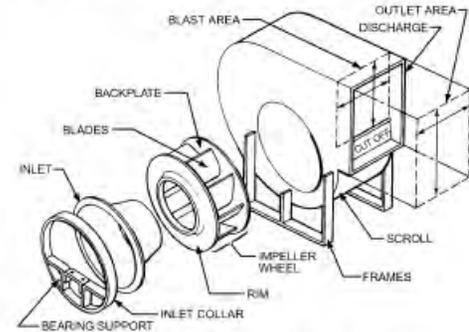
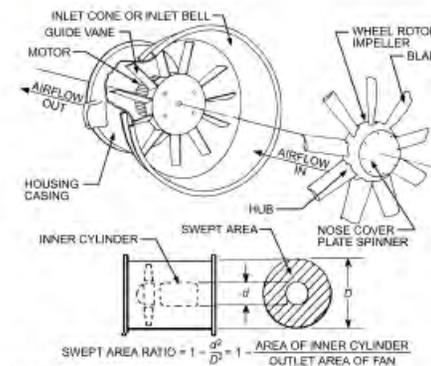


Fig. 1 Centrifugal Fan Components
Source: Adapted from AMCA Publication 201-02, Fans and Systems, with written permission from Air Movement and Control Association International, Inc.

The preparation of this chapter is assigned to TC 5.1, Fans.



Note: The sweep area ratio in axial fans is equivalent to the blast area ratio in centrifugal fans.

Fig. 2 Axial Fan Components

Chapter 21 - Fans

Notes:

Section 3. – Testing and Rating

Section 4. – Field Testing of Fans for Air Performance

Section 5. – Fan Laws

Section 6. – Fan and System Pressure Relationships

Section 8. – Duct System Characteristics

Section 9. – System Effects

Section 10. – Selection

PUBLICATION

AMCA 201-02 (R2011)

Fans and Systems



**Air Movement and Control
Association International**

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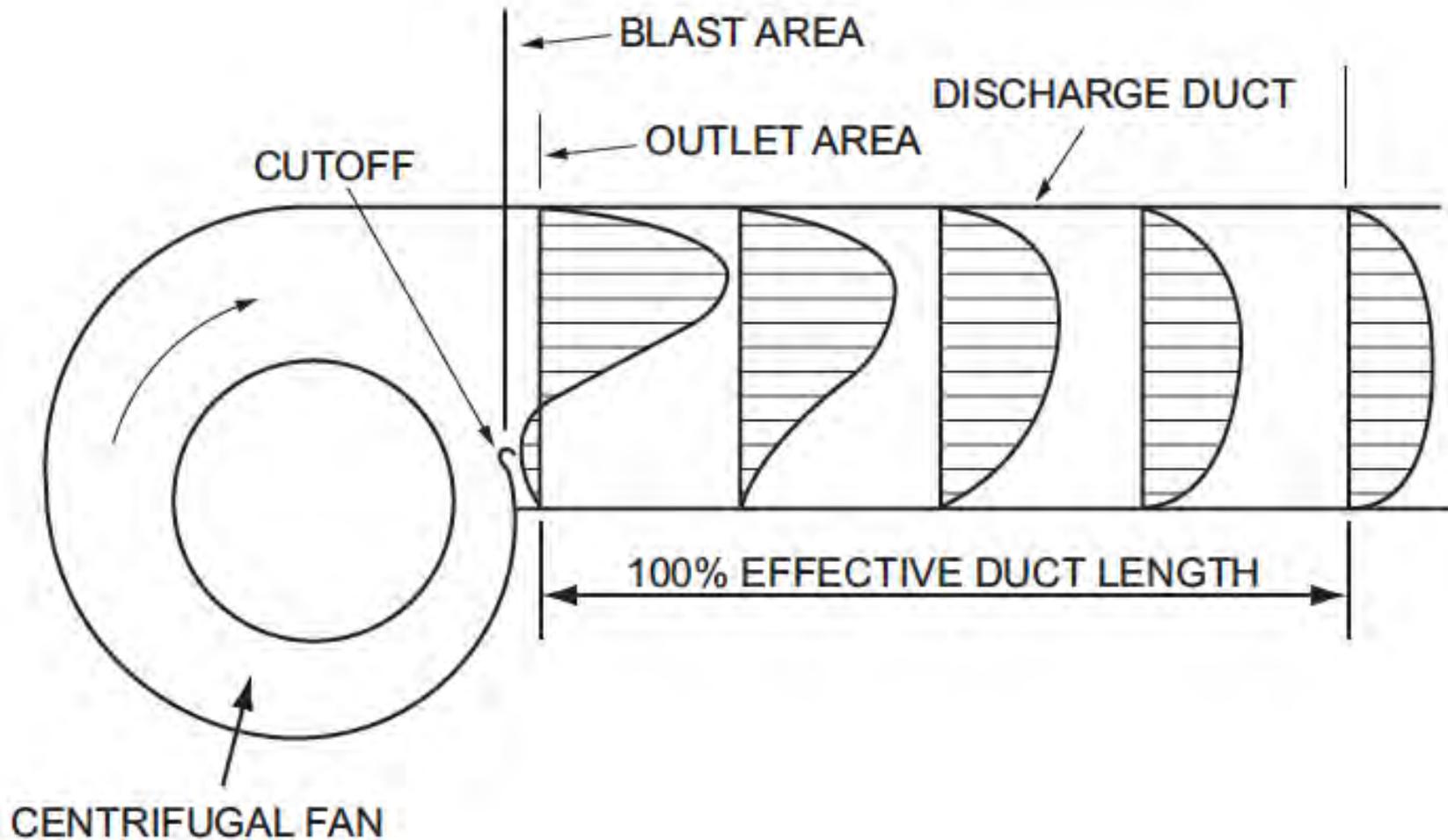


Figure 3.3 - Controlled Diffusion and Establishment of a Uniform Velocity Profile in a Straight Length of Outlet Duct

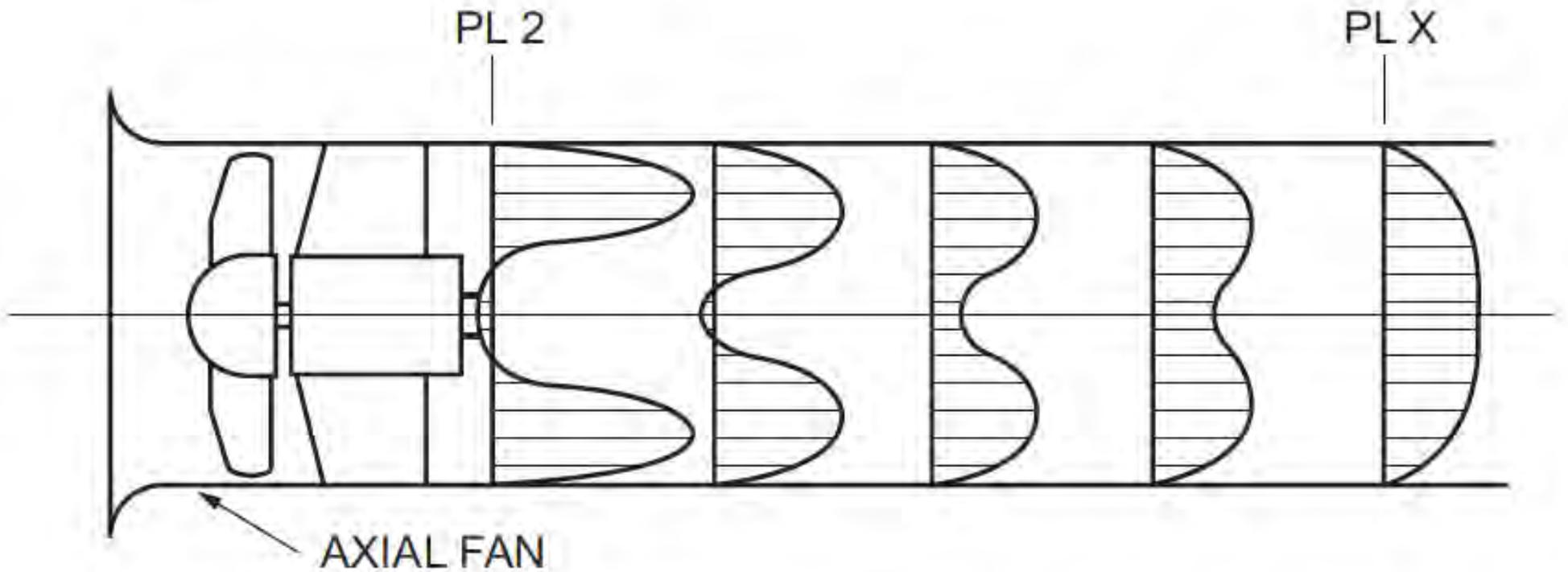
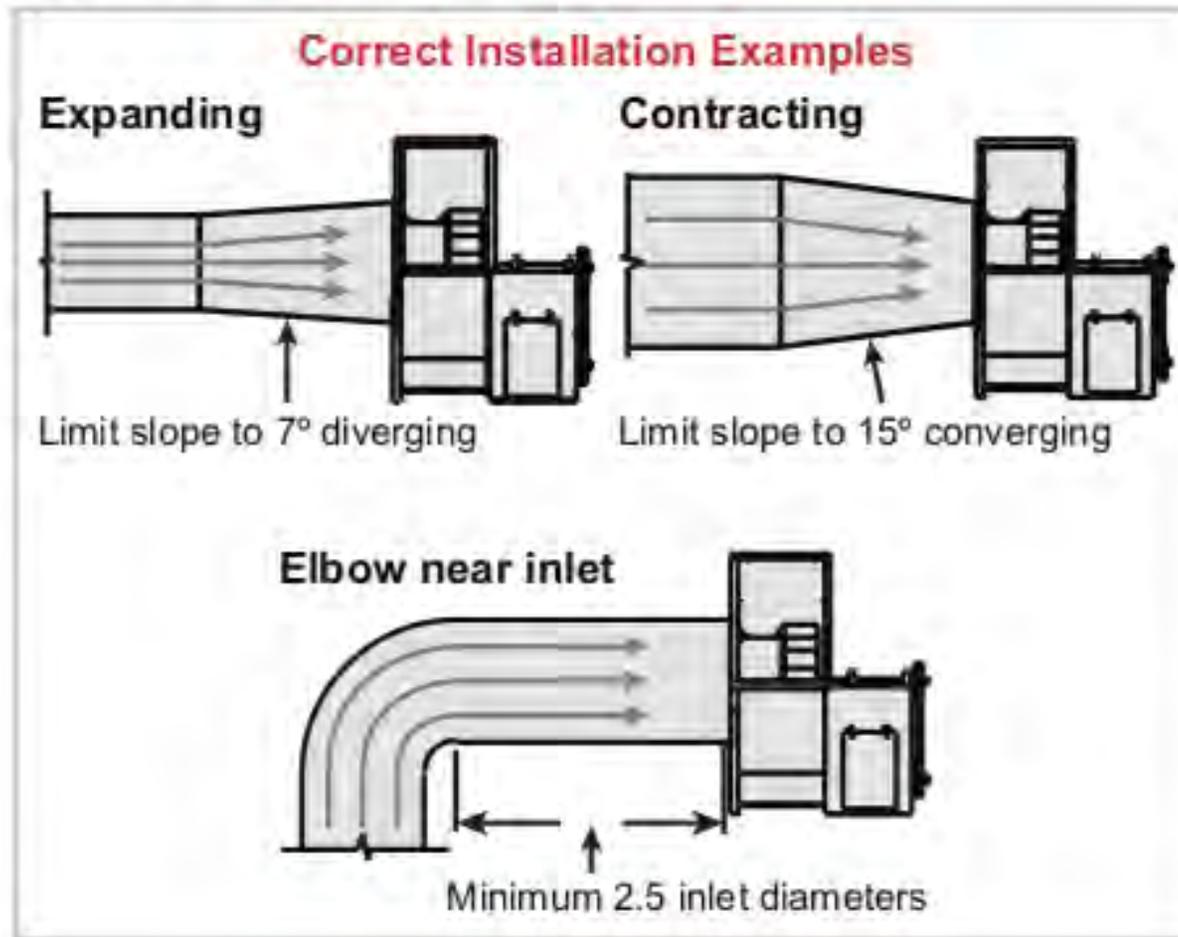


Figure 3.3 - Controlled Diffusion and Establishment of a Uniform Velocity Profile in a Straight Length of Outlet Duct

Inlet Conditions

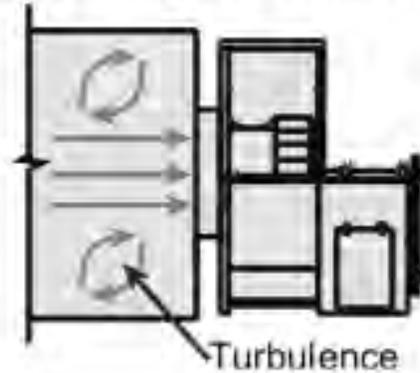


*Adapted from AMCA Standard 99-10
"Engineering Cookbook", Page 75*

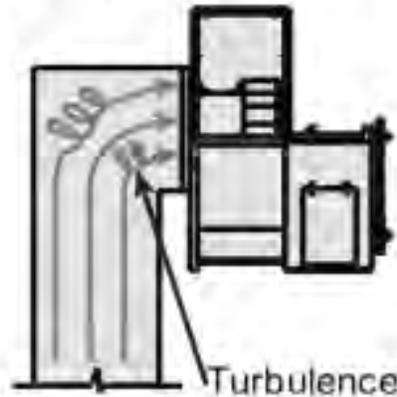
Inlet Conditions

Incorrect Installation Examples

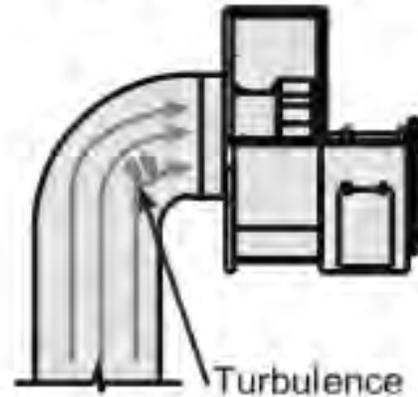
Abrupt contraction near inlet



Elbow near inlet

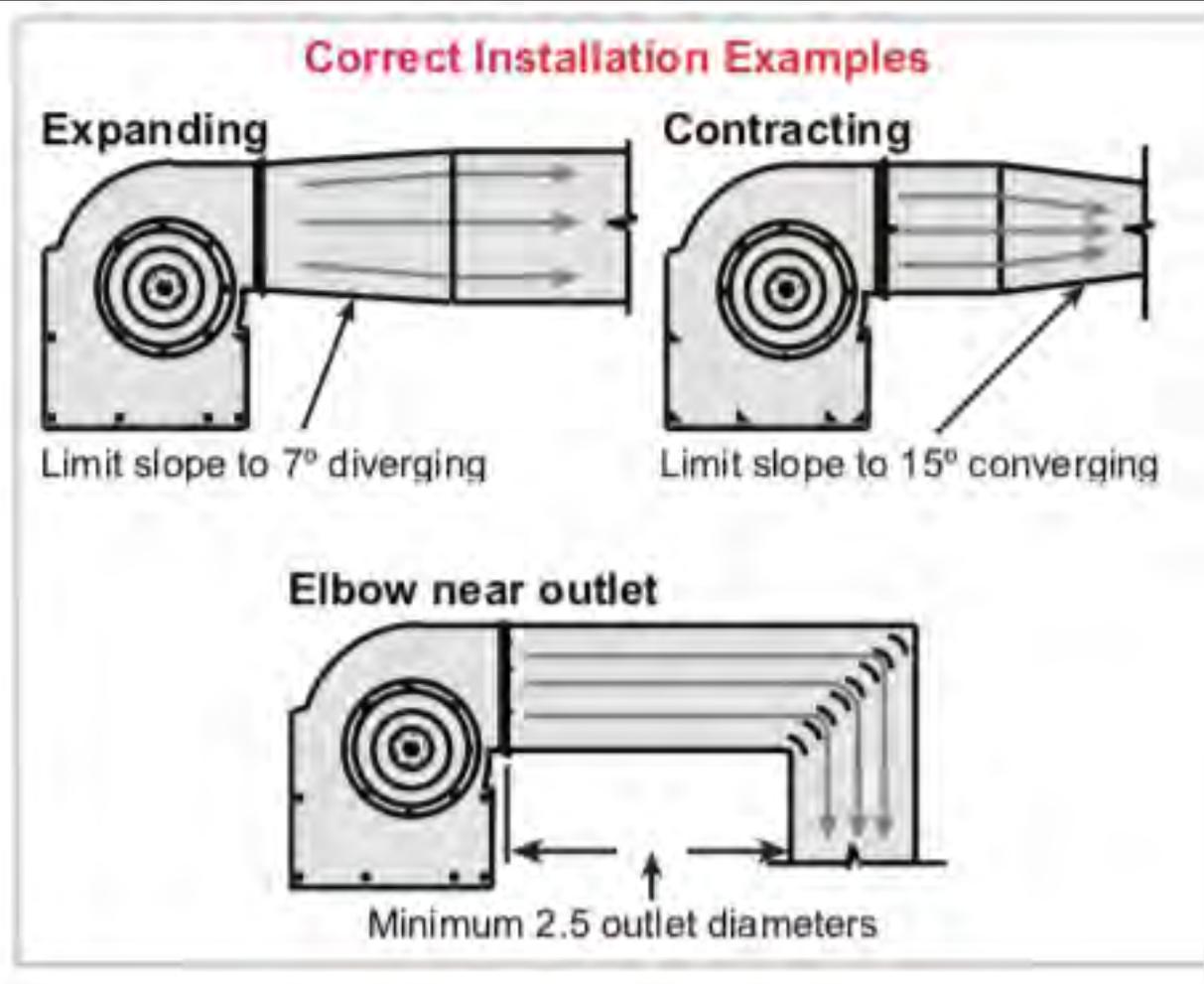


Elbow near inlet



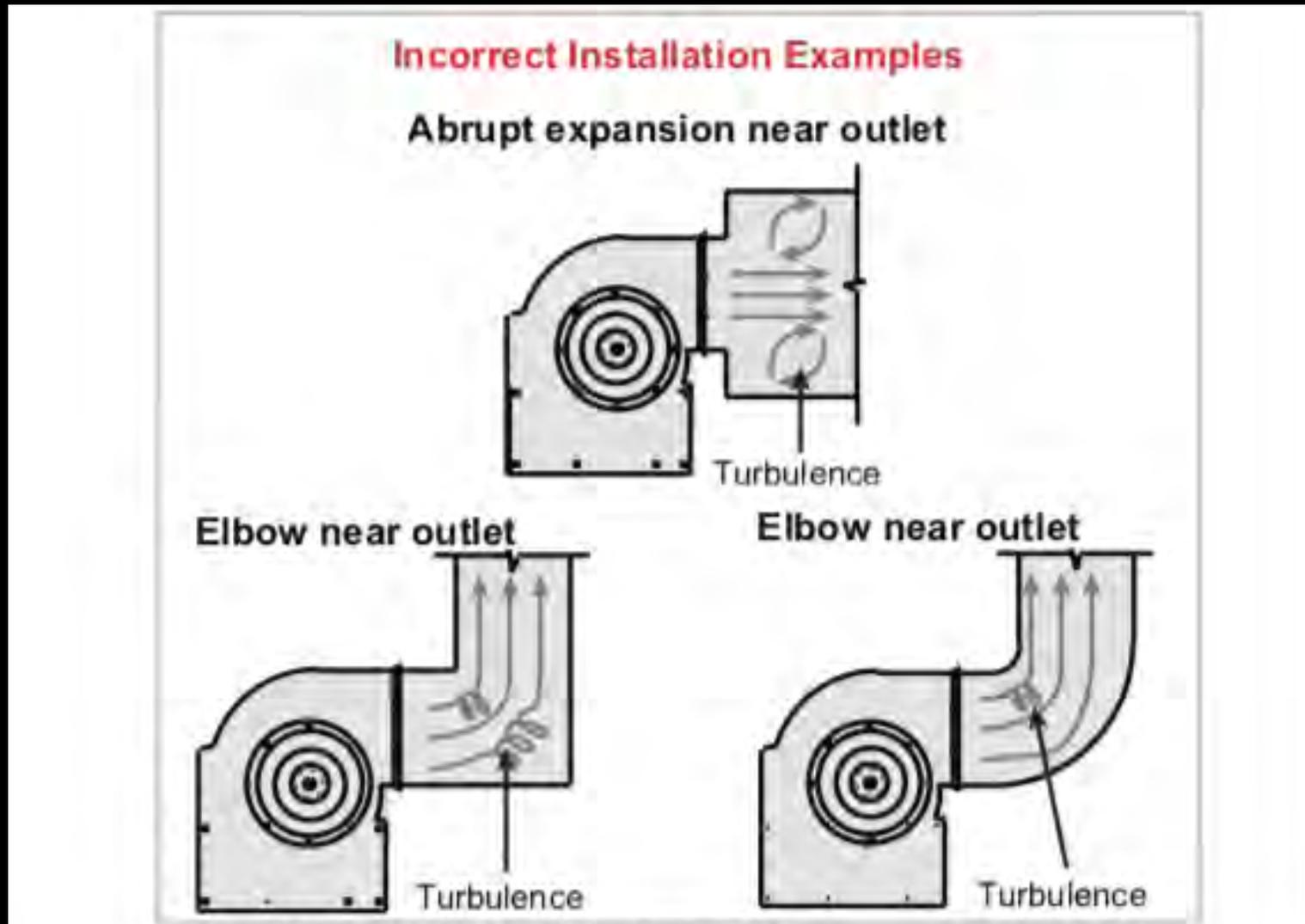
***Adapted from AMCA Standard 99-10
"Engineering Cookbook", Page 75***

Outlet Conditions



*Adapted from AMCA Standard 99-10
"Engineering Cookbook", Page 76*

Outlet Conditions



*Adapted from AMCA Standard 99-10
"Engineering Cookbook", Page 76*

STANDARD

ANSI/AMCA 99-16

Standards Handbook

This standard in English, Chinese, European Spanish,
and Latin American Spanish may be purchased at
www.amca.org/store.

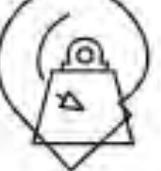


Air Movement and Control Association International

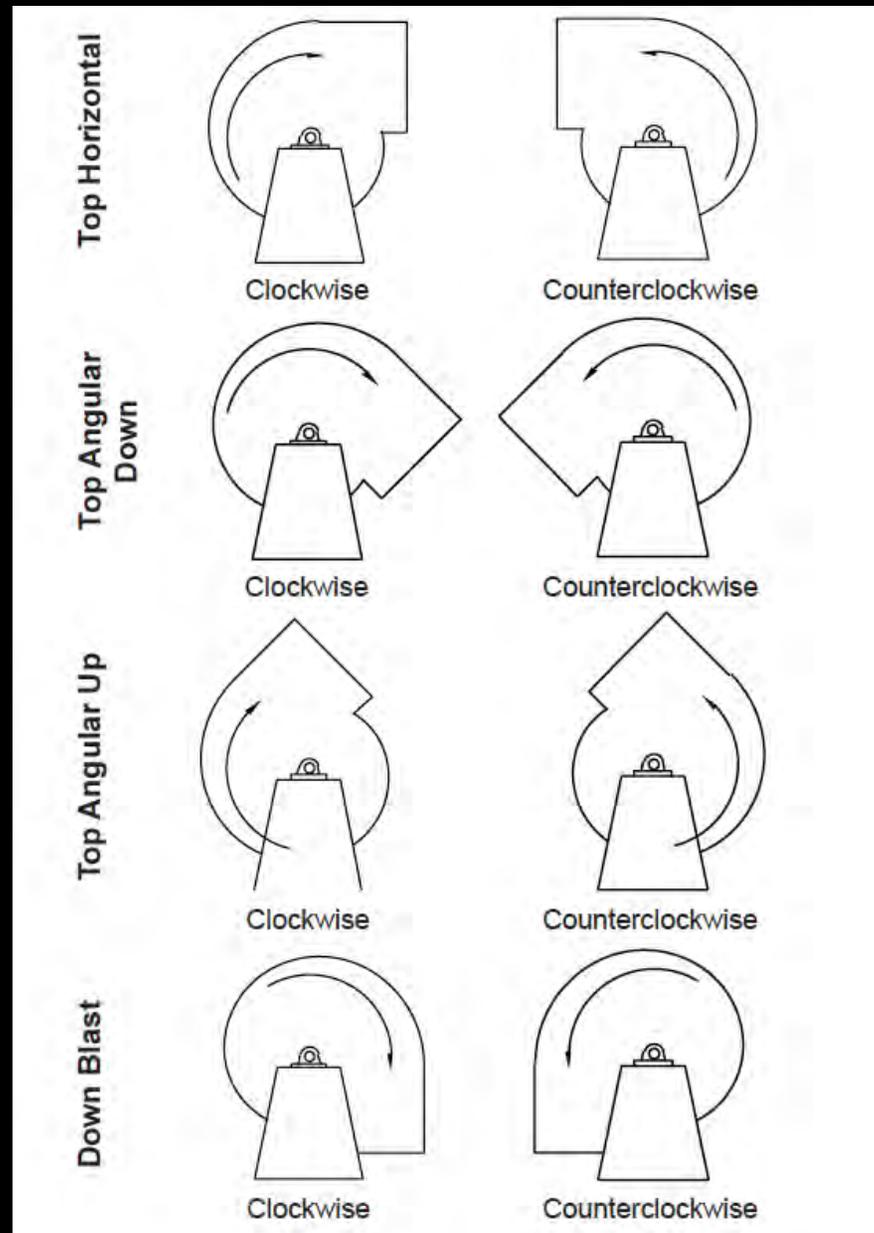
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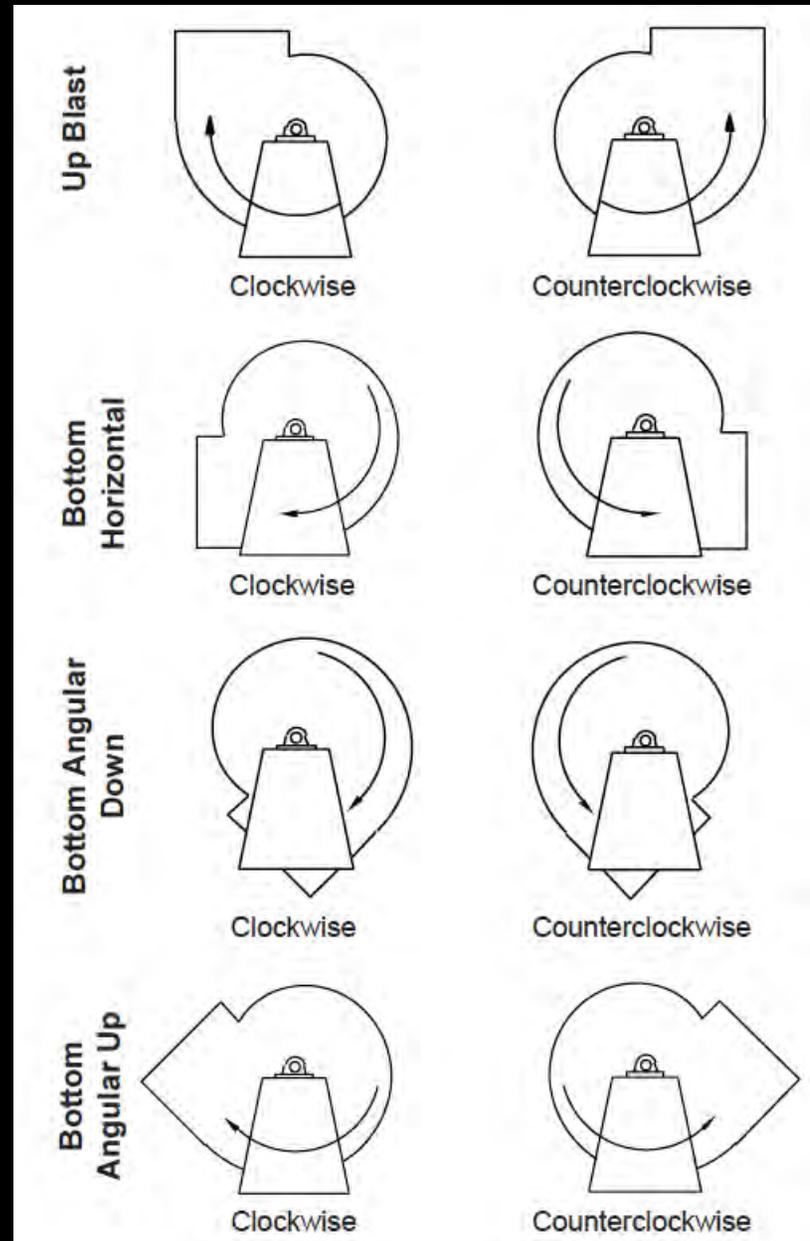
 <p>Clockwise Up Bias CW 360</p>	 <p>Clockwise Top Angular Up CW 45</p>	 <p>Clockwise Top Horizontal CW 90</p>	 <p>Clockwise Top Angular Down CW 135</p>	 <p>Clockwise Down Bias CW 180</p>	 <p>Clockwise Bottom Angular Down CW 225</p>	 <p>Clockwise Bottom Horizontal CW 270</p>	 <p>Clockwise Bottom Angular Up CW 315</p>
 <p>Counterclockwise Up Bias CCW 360</p>	 <p>Counterclockwise Top Angular Up CCW 45</p>	 <p>Counterclockwise Top Horizontal CCW 90</p>	 <p>Counterclockwise Top Angular Down CCW 135</p>	 <p>Counterclockwise Down Bias CCW 180</p>	 <p>Counterclockwise Bottom Angular Down CCW 225</p>	 <p>Counterclockwise Bottom Horizontal CCW 270</p>	 <p>Counterclockwise Bottom Angular Up CCW 315</p>

Rotation and Discharge Designations



Adapted from AMCA Standard 99-10 – "Engineering Cookbook", Page 13

Rotation and Discharge Designations

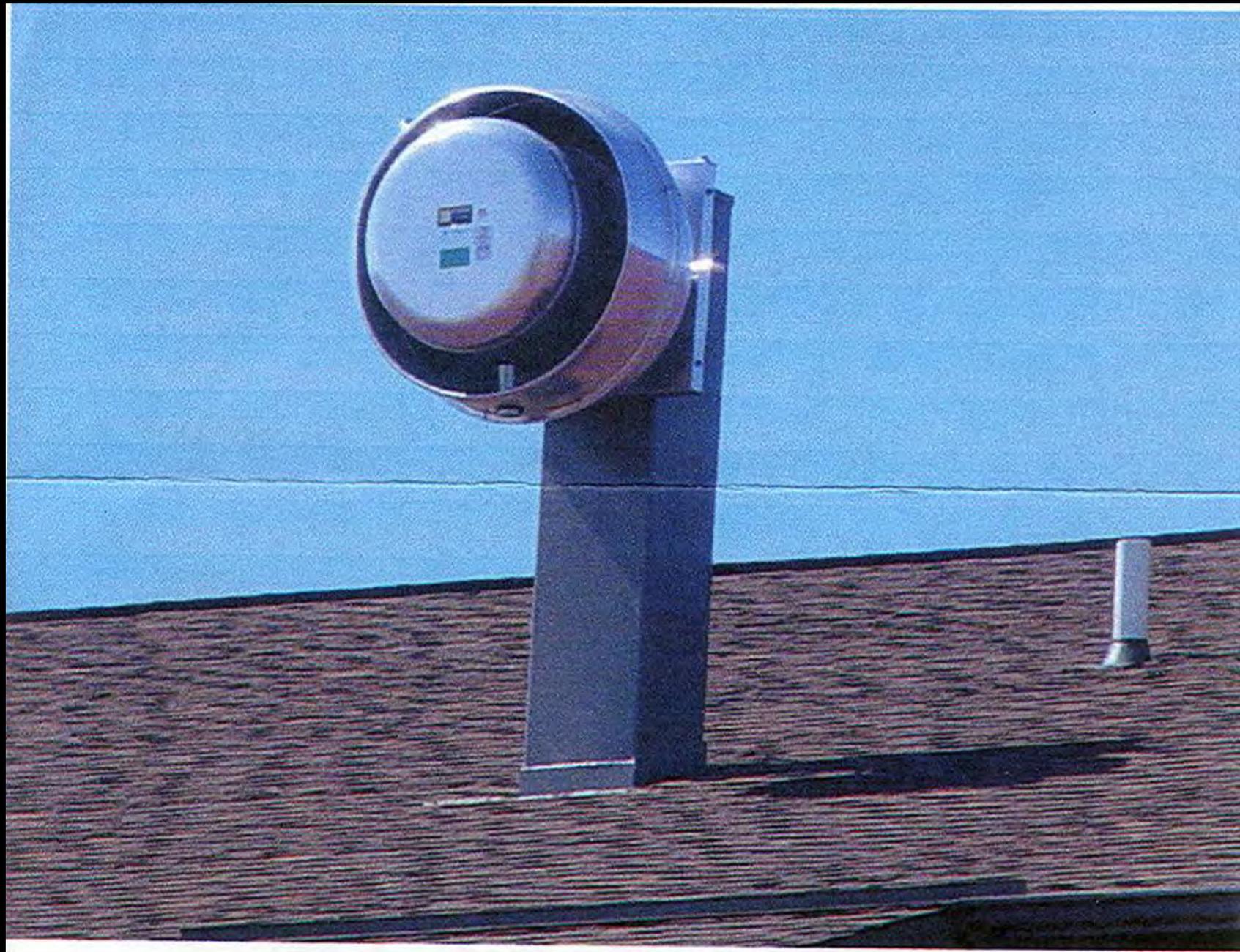


Adapted from AMCA Standard 99-10, "Engineering Cookbook", Page 14

System Effect

Real World Examples

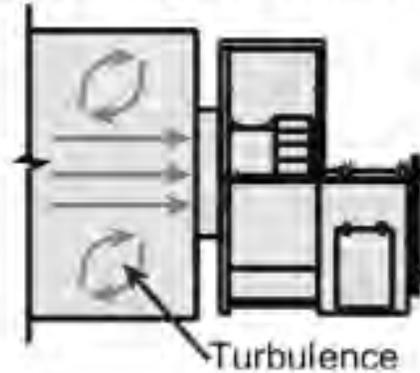




Inlet Conditions

Incorrect Installation Examples

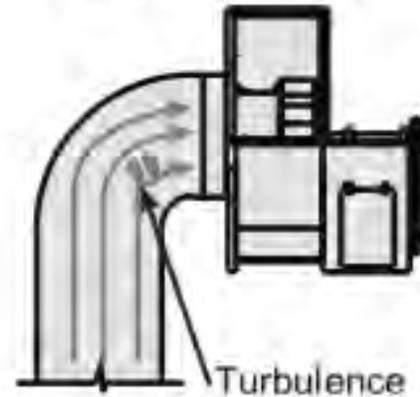
Abrupt contraction near inlet



Elbow near inlet



Elbow near inlet



Adapted from AMCA Standard 99-10

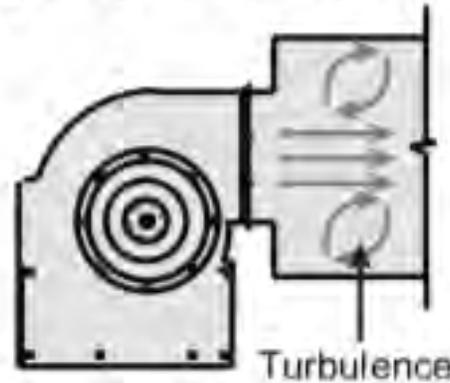




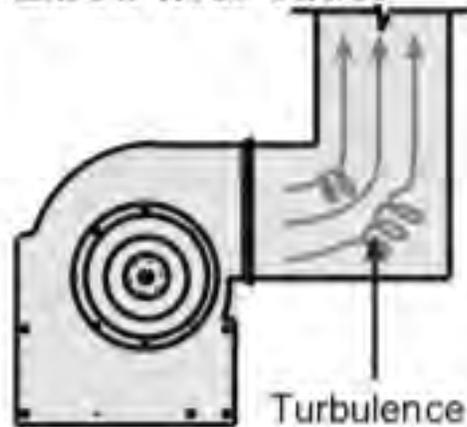
Outlet Conditions

Incorrect Installation Examples

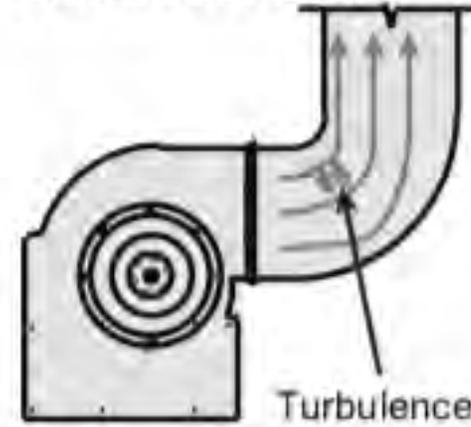
Abrupt expansion near outlet



Elbow near outlet



Elbow near outlet



Adapted from AMCA Standard 99-10



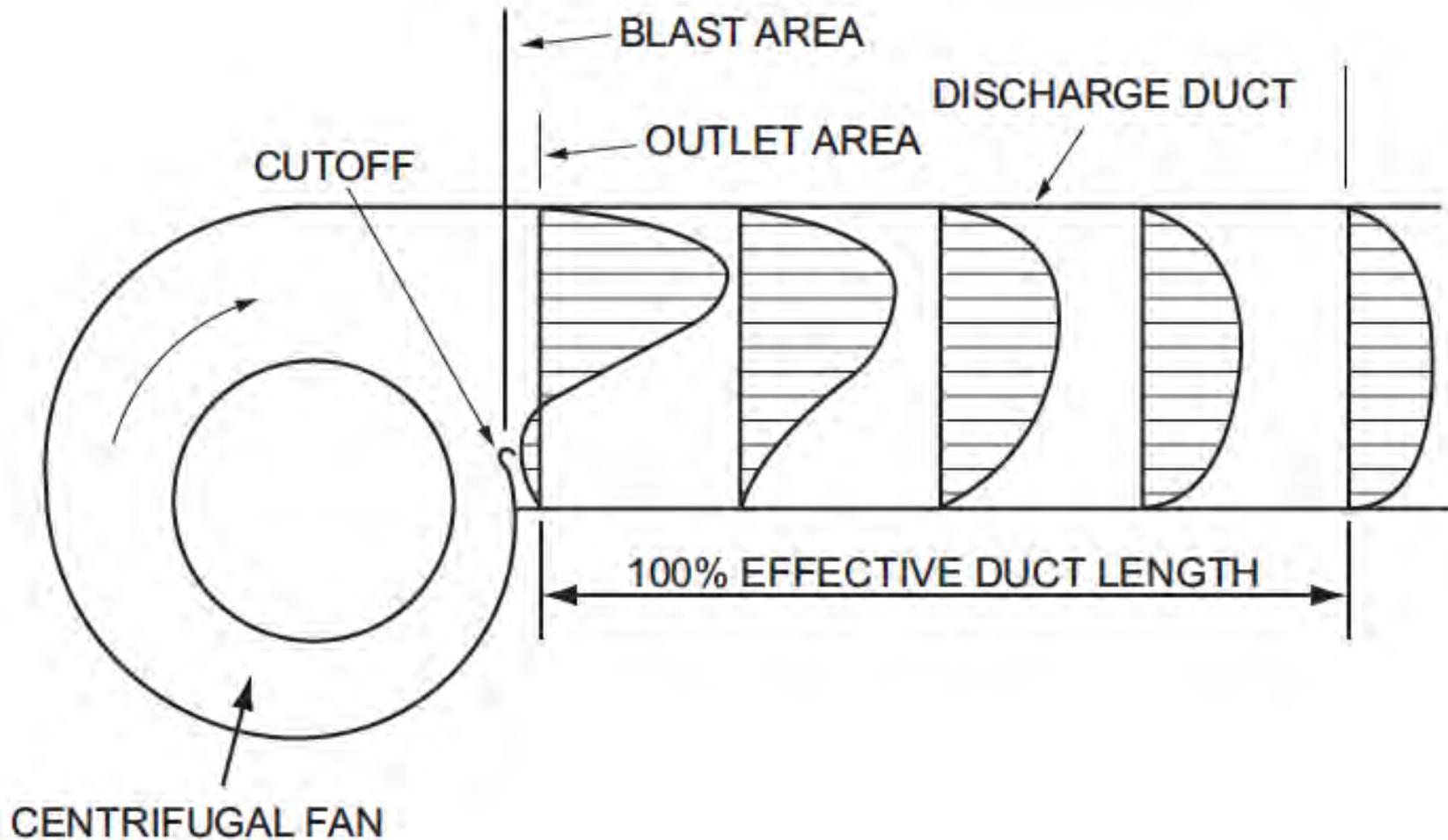
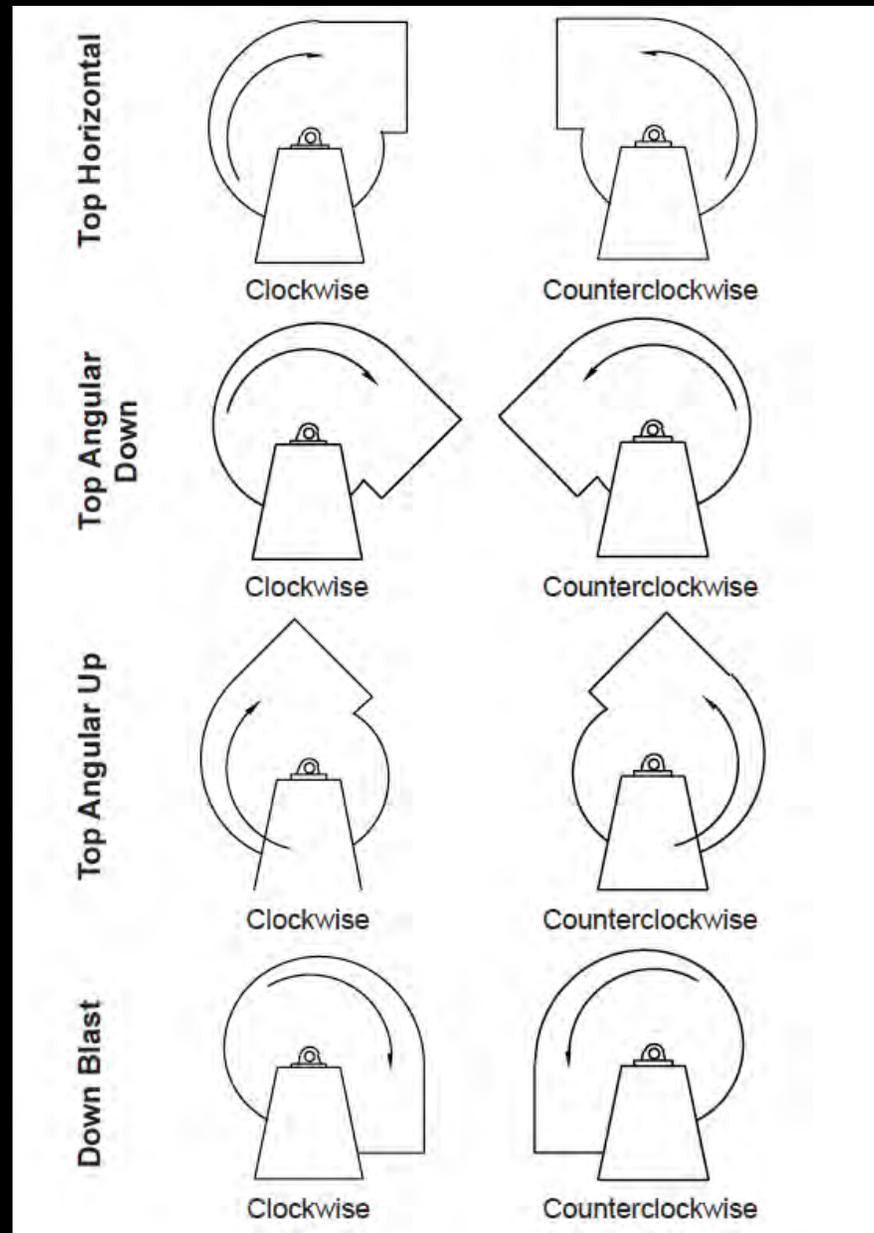


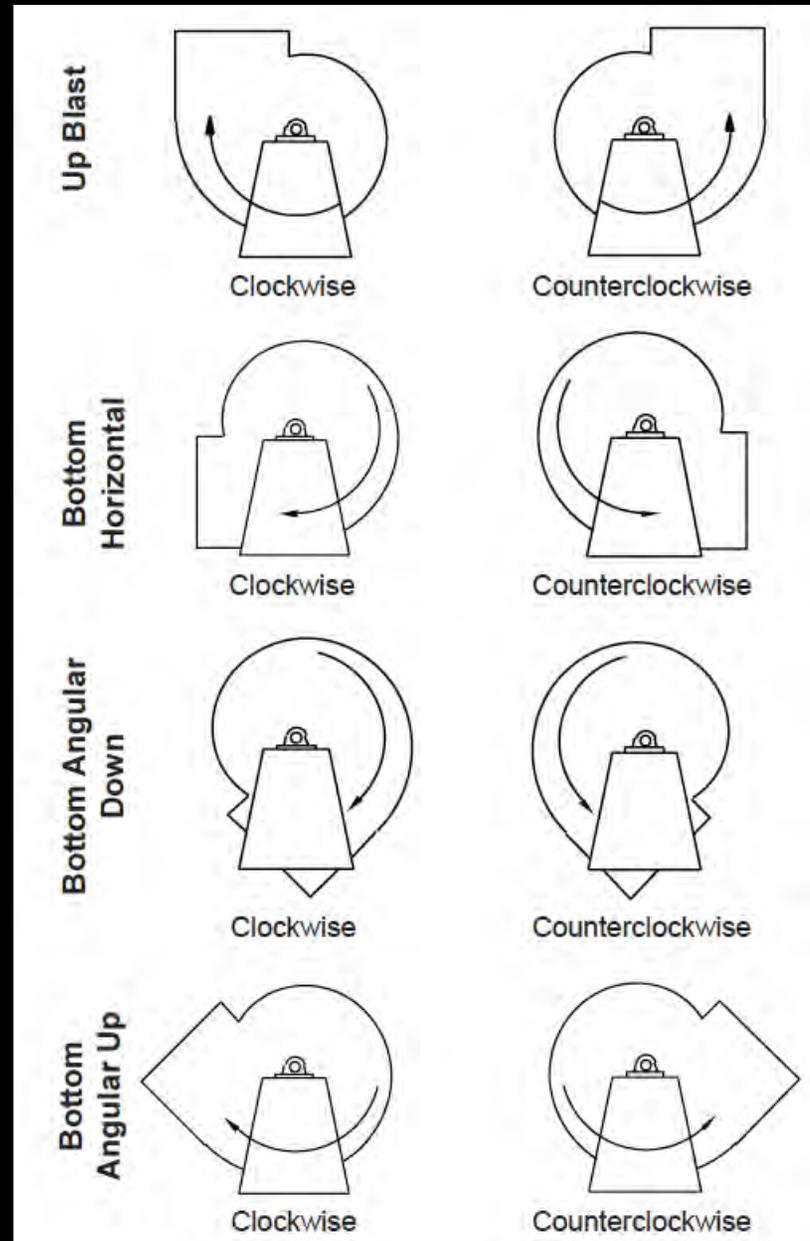
Figure 3.3 - Controlled Diffusion and Establishment of a Uniform Velocity Profile in a Straight Length of Outlet Duct

Rotation and Discharge Designations



Adapted from AMCA Standard 99-10

Rotation and Discharge Designations



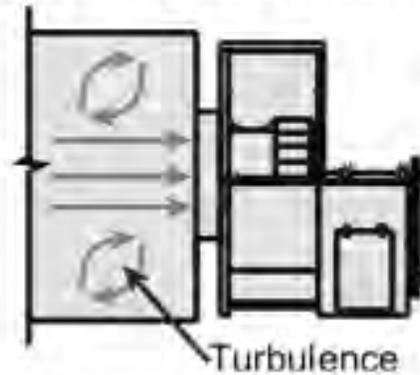
Adapted from AMCA Standard 99-10



Inlet Conditions

Incorrect Installation Examples

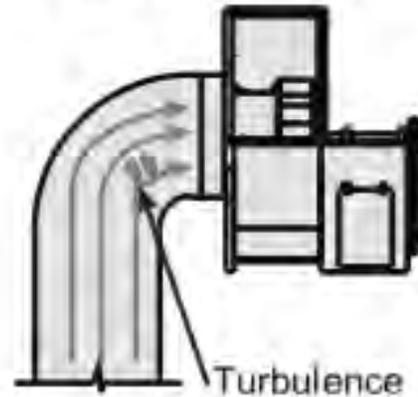
Abrupt contraction near inlet



Elbow near inlet



Elbow near inlet



Adapted from AMCA Standard 99-10

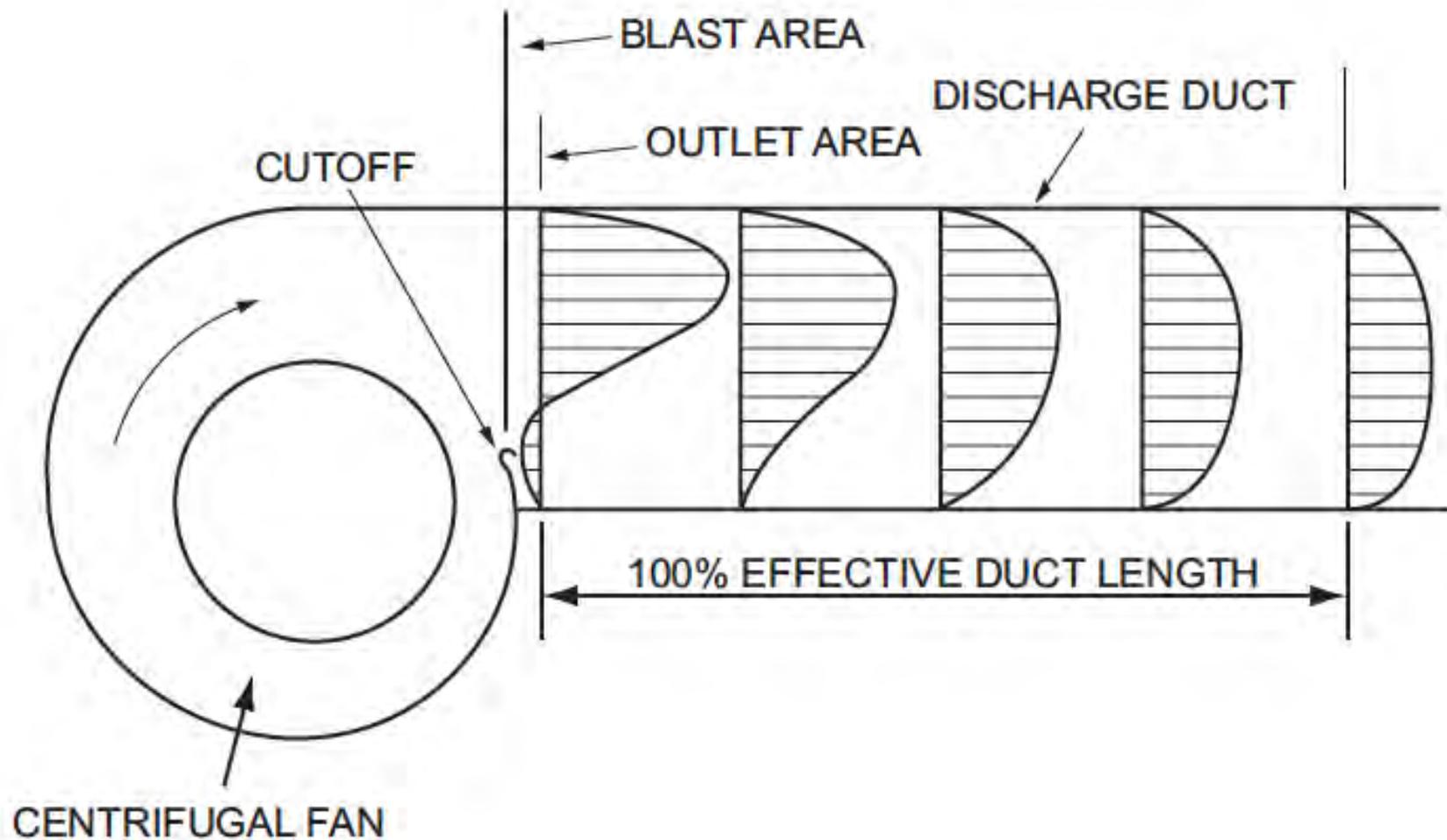


Figure 3.3 - Controlled Diffusion and Establishment of a Uniform Velocity Profile in a Straight Length of Outlet Duct



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Questions?



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