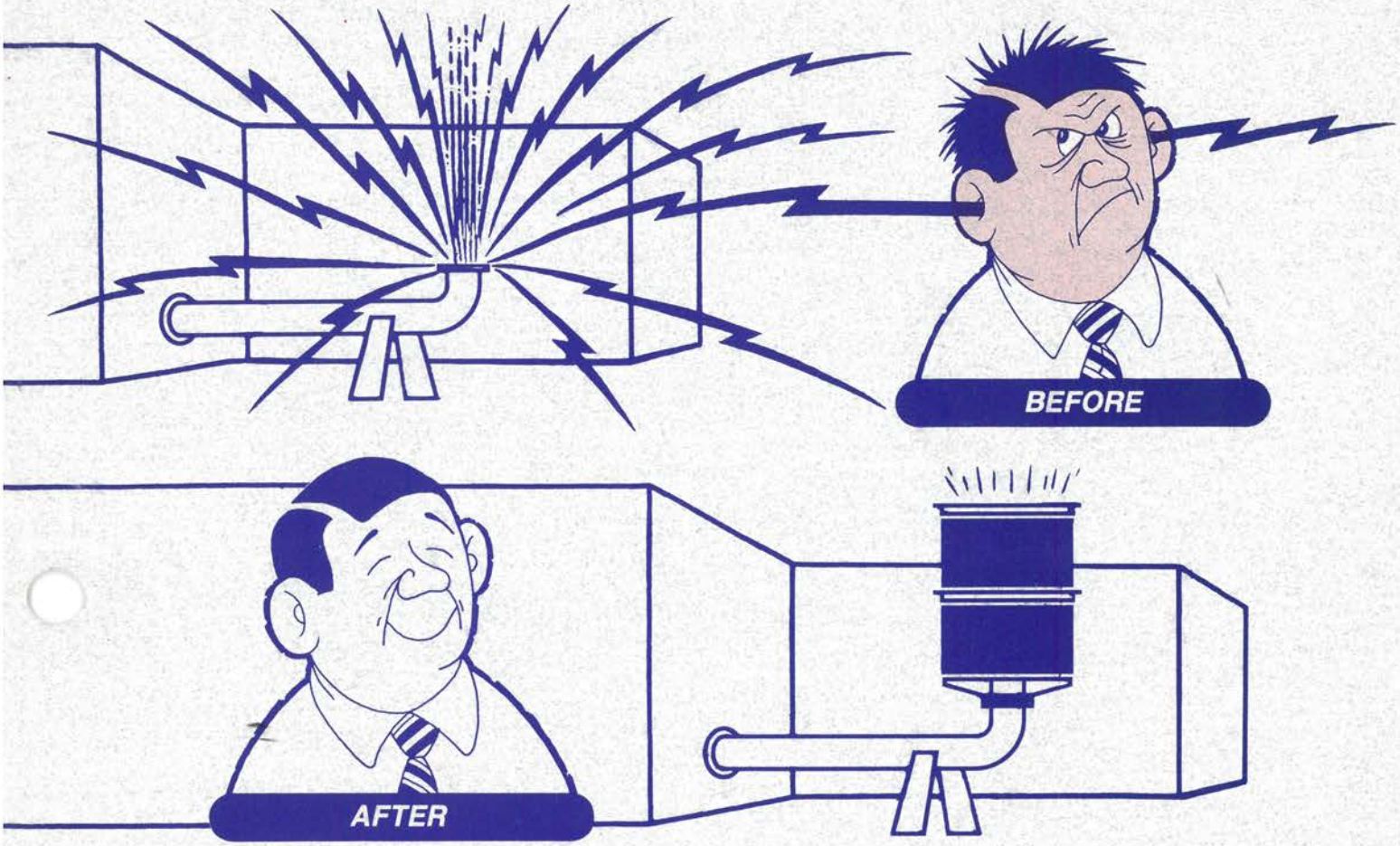
BULLETIN B-332A

BLOWOFF SILENCERS



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Blowoff Silencers

Whenever a gas under high pressure discharges into the atmosphere or to a lower pressure in a pipeline, a large amount of objectionable noise is generated.

The noise of these unsilenced gas discharges is generated by the turbulent reaction of the supersonic velocity gas jets with the surrounding atmosphere plus supersonic shock waves at the discharge. The AEROACOUSTIC blowoff silencers quiet these jets by first diffusing the jet down to a relatively low subsonic velocity, then an acoustically absorptive section follows the diffuser section providing the additional silencing required.

We have redesigned our blowoff silencers to update the old design which was developed in 1965. These redesigned silencers incorporate more efficient internals as well as reduced costs.

These new silencers are sized for maximum flow rates of air, methane and steam per Table 1. Each flow determined size is supplied with three degrees of noise reduction capability, designated BO-size-1, BO-size-2 or BO-size-3. Acoustic performance is given in Table 3.

The maximum permissable flows for all Model silencers are given in Table 1. These units will handle and silence any flow up to that tabulated. Exceeding the tabulated flow rates may result in damage to the silencers, so be certain of the design flow.

For blowoff silencer applications requiring the treatment of exceptionally high pressure and volume gas discharges, The AEROACOUSTIC Corporation has designed a special series of blowoff silencers. These models focus on the acoustical treatment of unusual and abnormal direct gas discharge to atmosphere. Due to the complex design calculations required for these silencers, it is recommended that all necessary criteria be forwarded to our Engineering Division for factory recommended selection.

Clustering Discharges

All Models can be provided with several inlet connections, to allow one silencer to service several discharge lines. Sizing is still based on maximum total flow per Table 1.

The Model BO Blowoff Silencer can be equipped with side inlet and outlet flanges for temporary blowdown applications. The debris in lines is trapped in the diffuser section and easily removed.

Due to the extremely complicated noise generation sources in a high pressure discharge, i.e. velocity noise, plus shock waves at the valve, bends in the piping and discharge, values of silencer Net Insertion Loss is of limited value when specifying a Blowoff Silencer.

Dimensions, metal gages and weights, including optional snowhoods are given in Table 2.

Snowhoods

In climates in which snow occurs, a snowhood or other device to keep snow out of the silencer discharge is required. This is because only the diffuser section, which is made of drilled steel pipe, is subjected to and designed to withstand high pressures. If ice and snow accumulate in the discharge, the shell may be damaged at the next blow off as the shell is designed for pressures on the order of only 100" H_2O.

TABLE 1

		Maximum Flow Capacity Steam - PPH/1000				Maximum Flow Capacity Air @ 100°F Atmospheric Pressure 14.7 PSIA CFM/1000	Maximum Flow Capacity Methane @ 100°F Atmospheric Pressure 14.7 PSIA CFM/1000
Model	Dimension	312°F	467°F	700°F	1000°F	100°F	100°F
BO - .5	9" x 8"	6.2	5.6	5.02	4.5	2	2.8
- 1	9" x 16"	12.3	11.2	10	8.9	4	5.6
- 1.5	18" x 12"	18.5	16.9	15.1	13.4	6	8.4
- 2	18" x 16"	24.7	22.5	20	17.9	8	11.2
- 2.5	18" x 20"	31	28	25	22.3	10	14
- 3	18" x 24"	37	33.7	30.1	26.8	12	16.8
- 4	27" x 21"	49.3	45	40	35.7	16	22.4
- 5	27" x 27"	62.5	56.9	50.8	45.3	20	28.3
- 6	27" x 32"	74	67.4	60.2	53.6	24	33.6
- 8	36" x 32"	98.8	90	80.4	71.6	32	44.9
- 10	36" x 40"	123	112	100	89.4	40	56
- 12	36" x 48"	148	135	120	107	48	67.2
- 15	45" x 48"	185	169	151	134	60	84
- 20	45" x 64"	247	225	201	179	80	112
- 25	54" x 66"	305	278	249	221	100	139
- 30	63" x 68"	367	334	299	266	120	167
- 35	63" x 80"	432	393	352	313	140	196
- 40	72" x 80"	493	449	402	357	160	224
- 45	81" x 80"	555	506	452	402	180	252
- 50	81" x 88"	611	556	497	442	200	277
- 60	90" x 96"	740	674	602	536	240	336
- 70	90" x 112"	863	786	703	626	280	392
- 80	99" x 116"	987	899	803	715	320	448
- 90	108" x 120"	1,110	1,011	904	804	360	504
- 100	117" x 123"	1,233	1,123	1,004	894	400	560

For air or methane at temperature or atmospheric pressure other than 100°F, 14.7 PSIA.

$$\text{Enter table at actual flow } \frac{(CFM)}{1000} \times \sqrt{\frac{P \times 560}{14.7 \times (T + 460)}}$$

P = atmospheric pressure, PSIA

T = gas total temp, °F

TABLE 2

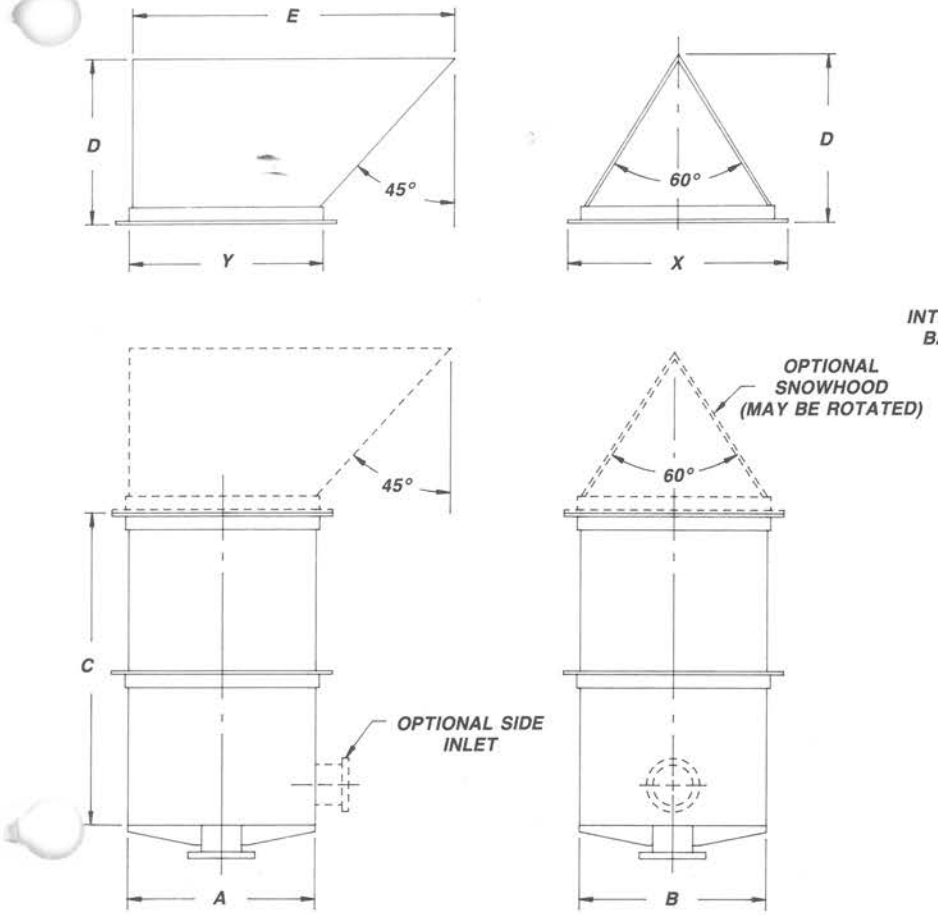
SILENCER DIMENSIONS AND WEIGHTS

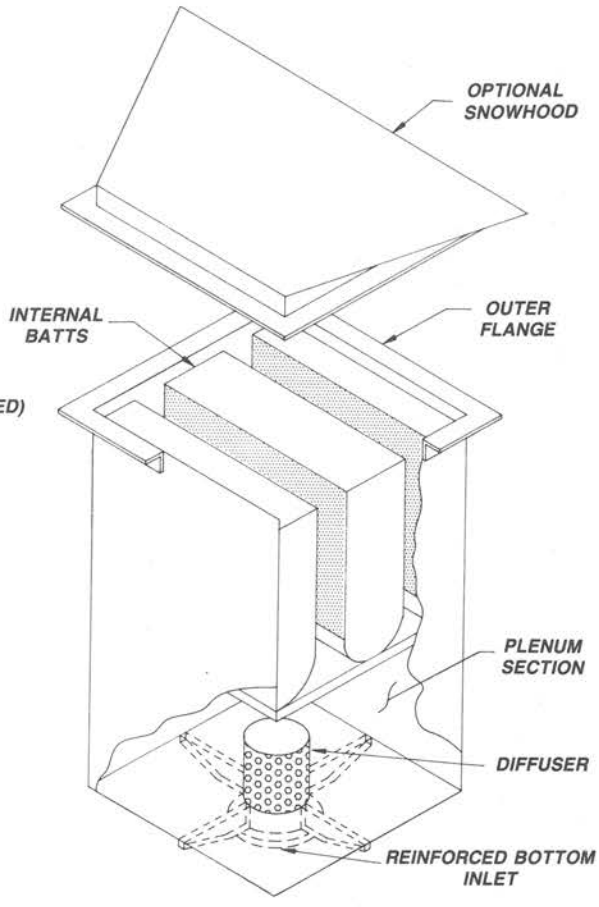
Model	A*	B*	C-1	Wgt.	C-2	Wgt.	C-3	Wgt.	Shell Gage	Internal Gage
BO-5	9	8	28	110	43	144	73	213	11 Ga.	14 Ga.
-1	9	16	29	170	44	221	74	329	11 Ga.	14 Ga.
-1.5	18	12	29	226	44	296	74	442	11 Ga.	14 Ga.
-2	18	16	31	325	46	431	76	650	3/16	14 Ga.
-2.5	18	20	32	375	47	498	77	750	3/16	14 Ga.
-3	18	24	32	426	47	564	77	850	3/16	14 Ga.
-4	27	21	33	528	48	697	78	1046	3/16	14 Ga.
-5	27	27	34	664	49	879	79	1327	3/16	14 Ga.
-6	27	32	35	748	50	991	80	1498	3/16	14 Ga.
-8	36	32	37	1011	52	1315	82	1950	3/16	14 Ga.
-10	36	40	38	1126	53	1484	83	2233	3/16	14 Ga.
-12	36	48	39	1320	54	1743	84	2610	3/16	14 Ga.
-15	45	48	42	2243	57	2925	87	4370	1/4	11 Ga.
-20	45	64	44	2989	59	3773	89	5634	1/4	11 Ga.
-25	54	66	46	3500	61	4540	91	6760	1/4	11 Ga.
-30	63	68	46	4130	61	5320	91	7915	1/4	11 Ga.
-35	63	80	46	4590	61	5980	91	8950	1/4	11 Ga.
-40	72	80	46	5195	61	6760	91	10,100	1/4	11 Ga.
-45	81	80	46	5810	61	7540	91	11,240	1/4	11 Ga.
-50	81	88	47	6245	62	8115	92	12,130	1/4	11 Ga.
-60	90	96	49	7410	64	9615	94	14,370	1/4	11 Ga.
-70	90	112	51	8720	66	11,270	96	16,765	1/4	11 Ga.
-80	99	116	52	9890	67	12,750	97	18,925	1/4	11 Ga.
-90	108	120	54	11,125	69	14,315	99	21,200	1/4	11 Ga.
-100	117	123	56	12,700	71	16,350	101	24,200	1/4	11 Ga.

** Dimensions are inside the shell.*

SNOWHOOD DIMENSIONS AND WEIGHTS

Model	X*	Y*	D	E	Shell Gage	Wgt.
BOS-0.5	9	8	7.8	16	11 Ga.	25
-1	16	9	13.9	23	11 Ga.	40
-1.5	18	12	15.6	28	11 Ga.	50
-2	18	16	15.6	31.6	3/16	80
-2.5	20	18	17.3	35.3	3/16	95
-3	24	18	20.8	39	3/16	125
-4	27	21	23.4	43	3/16	150
-5	27	27	23.4	50	3/16	180
-6	32	27	27.7	55	3/16	230
-8	36	32	31.2	63	3/16	290
-10	40	36	34.6	71	3/16	360
-12	48	36	41.6	78	3/16	460
-15	48	45	41.6	86	1/4	710
-20	60	48	55.4	100	1/4	1050
-25	66	54	57	111	1/4	1200
-30	68	63	59	122	1/4	1370
-35	80	63	69	132	1/4	1710
-40	80	72	69	141	1/4	1840
-45	80	81	69	150	1/4	1980
-50	88	81	76	157	1/4	2250
-60	96	90	83	173	1/4	2690
-70	112	90	97	187	1/4	3320
-80	116	99	100	200	1/4	3680
-90	120	108	104	212	1/4	4050
-100	123	117	106	228	1/4	4390





NOTE: INLET CONNECTION SIZED TO CUSTOMERS REQUIREMENT, FLANGED OR WELD-NECK.
IF SNOWHOOD IS USED, DISCHARGE SHOULD FACE AWAY FROM NOISE SENSITIVE AREA.

THE BO SILENCER, AS SHOWN ABOVE, IS AN ISOMETRIC CUT-AWAY VIEW TO ILLUSTRATE THE INTERNAL CONSTRUCTION.

TABLE 3

					BASE SILENCED SPLA @ 50′ dBA		
					BO-Size-1	BO-Size-2	BO-Size-3
STEAM	A.	1000°F	3000 PSIA	100,000 PPH	80	70	65
	B.	700°F	1000 PSIA	100,000 PPH	80	70	65
	C.	500°F	500 PSIA	100,000 PPH	80	70	65
	D.	400°F	200 PSIA	100,000 PPH	75	65	60
METHANE	E.	100°F	900 PSIA	100 PPS	90	80	75
AIR	F.	60°F	115 PSIA	300,000 SCFM	85	75	65
AIR	G.	150°F	250 PSIA	300,000 SCFM	90	80	70

The following corrections must be added to or subtracted from the base silenced SPLA @ 50′ to obtain the actual dBA.

For distances other than 50′, correct by: $-20 \log \left[\frac{\text{actual distance in ft.}}{50'} \right]$

For flows other than those tabulated, correct by: $+10 \log \left[\frac{\text{actual flow}}{\text{base flow}} \right]$

EXAMPLE

A boiler discharges 50,000 PPH of steam at 600°F and 500 PSIA. The noise requirement is 72 dBA at 20′ from the silencer discharge. Determine the silencer model required to meet these conditions.

1. Select a silencer model - using Table 1 and the given flow and temperature, the proper selection is a Model BO-5.
2. Determine the base SPLA - using Table 3 and the given gas, pressure and temperature, the proper selection is line C. Reading across line C, the base SPLA is given for the three degrees of noise reduction.
3. Calculate the SPLA - using the determined base and the corrections for distance and flow listed in Table 3, the table below illustrates the acoustic performance of the three Model BO-5 available.
4. The proper selection for the above conditions is a Model BO-5-3.

	Model BO-5-1	Model BO-5-2	Model BO-5-3
Base SPLA @ 50′	80	70	65
Correction for distance = $-20 \log \left[\frac{20}{50} \right]$	+8	+8	+8
Correction for flow = $+10 \log \left[\frac{50{,}000}{100{,}000} \right]$	−3	−3	−3
SPLA @ 20′, dBA	85	75	70

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