

# AMERICAN COOLAIR CORPORATION

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## **SOUND POWER LEVELS TEMPERATURE AND ALTITUDE DENSITY CORRECTIONS**

Type VSBC– Backward Inclined Fans

Type VSAC– Airfoil Fans SWSI

Type VSBCJ– Junior Ventilating Sets



American Coolair certifies that the fans shown herein are licensed to bear the AMCA Seal for Sound and Air. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and AMCA Publication 311 and comply with the requirements of the AMCA Certified Ratings program.

The calculated sound power levels from these ratings are in decibels, referenced to  $10^{-12}$  watts calculated per AMCA Standard 301.

For Air Performance see form 740-15-1.



# VSBC and VSAC Sound Calculations

The sound power levels published in this have been determined by laboratory tests in accordance with AMCA Standard 300-96 and carry the AMCA Seal for VSBC, VSAC and VSBCJ fans. The sound power levels shown are in decibel (dB) levels referred to  $10^{-12}$  watts. We have listed sound power levels for the eight octave bands with frequency range as shown below.

OCTAVE BAND	1	2	3	4	5	6	7	8
FREQUENCY CENTER	45 to 90	90 to 180	180 to 355	355 to 710	710 to 1400	1400 to 2800	2800 to 5600	5600 11200
CENTER FREQUENCY	63	125	250	500	1000	2000	4000	8000

The sound power level (SPL) can be obtained using specific sound power level method as described below.

**Sound Power Level of a fan =  
Specific Sound Power Level + Capacity Fraction (M)**

Use of this method will be illustrated by the following example:

Calculate sound level for:

Size.....VSBC36	Elevation.....3000 ft.
CFM.....15500	RPM.....893
SP.....2.5" w.g.	OV.....2024
Temp.....300°F	

## 1. How to determine $L_{WK}$

We have published values for  $L_{WK}$  at various speeds and operating points on pages 3 through 9.

The operating point is a ratio of design CFM to the wide open volume (WOV). The WOV equals the CFM for a given RPM at zero static pressure. WOV can be calculated by multiplying fan RPM by the factors (Rf) shown in the table. Thus, WOV volume for 893 RPM = 29.050 x 893 = 35,942 CFM.

SIZE	Rf FOR		SIZE	Rf FOR	
	VSBC SWSI	VSAC SWSI		VSBC SWSI	VSAC SWSI
12	1.090	0.800	36	29.05	27.61
13	1.459	1.233	40	38.96	27.03
15	2.001	1.469	44	52.64	50.03
16	2.664	2.251	49	70.28	66.80
18	3.580	3.269	54	95.38	90.65
20	4.712	4.302	60	129.00	122.60
22	6.488	5.924	66	171.80	163.20
24	8.661	7.909	73	232.40	220.90
27	11.64	10.37	80	314.60	299.00
30	15.96	14.23	89	421.20	400.30
33	21.25	18.93	98	566.60	538.50

Rf FOR	
SIZE	VSJBC
9	0.414
10	0.584

Therefore, operating point falls at 60% (15,500/25942) of the WOV. Referring to the  $L_{WK}$  table for Size VSBC36, the specific sound power levels can be read as follows:

$L_{WK}$  = 38    37    35    29    26    22    17    12

## 2. How to determine M

The value of M can be taken from the tables on page 12 once the Total Pressure (TP) is calculated.

Total Pressure (TP) = Static Pressure (SP) + Velocity Pressure (VP) (all pressure at operating density.)  
 $VP = (\text{Outlet Velocity} / 4005)^2 \times \text{density factor}$ .

In our example  $VP = (2024 / 4005)^2 \times 0.624 = 0.16$ .

Therefore,  $TP = 2.5 + 0.16 = 2.66$ ; Thus, for 15500 CFM and 2.66" TP, M works out to be 51.

M can also be calculated using the formula,  $M = 10 \log \text{CFM} + 20 \log \text{TP}$ .

## 3. Combine $L_{WK}$ and M gives sound power levels.

Thus,

Octave Band	1	2	3	4	5	6	7	8
SPL =	38	37	35	29	26	22	17	12
	<u>51</u>	<u>51</u>	<u>51</u>	<u>51</u>	<u>51</u>	<u>51</u>	<u>51</u>	<u>51</u>
	89	88	86	80	77	73	68	63

# *L<sub>WK</sub> Values for VSAC SWSI*

## Sizes 12 & 15

RPM	WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
4500	90	41	42	44	49	48	47	45	40
	80	38	39	40	44	43	41	39	36
	70	37	38	38	42	41	38	37	34
	60	36	37	37	41	40	37	36	34
	50	34	34	34	38	37	34	34	33
4200	90	41	43	44	49	48	47	45	39
	80	38	39	40	44	42	41	39	34
	70	37	38	39	42	40	38	37	33
	60	36	37	38	41	39	37	36	32
	50	34	34	35	38	36	34	33	31
3900	90	41	43	45	49	48	47	44	38
	80	38	39	41	44	42	41	38	33
	70	37	38	39	42	40	38	36	31
	60	36	37	38	41	39	37	36	31
	50	34	34	35	38	36	34	33	30
3600	90	41	43	46	49	48	47	44	36
	80	38	39	41	44	41	41	38	31
	70	37	38	40	42	39	38	36	30
	60	36	37	39	41	38	37	35	29
	50	34	34	36	38	35	34	33	28
3300	90	42	43	46	49	47	47	43	35
	80	38	39	42	44	41	40	37	30
	70	37	38	40	42	39	38	36	28
	60	36	37	39	41	38	37	35	27
	50	34	34	36	38	35	34	33	26
3000	90	42	43	47	49	48	47	43	34
	80	39	40	43	44	41	41	38	29
	70	38	39	41	42	39	38	36	27
	60	37	38	40	41	38	38	35	26
	50	35	35	38	39	35	35	34	25
2700	90	43	44	49	49	49	47	43	33
	80	40	41	44	44	42	41	38	28
	70	39	40	42	43	40	39	37	26
	60	38	39	42	42	39	38	36	26
	50	37	37	40	40	36	36	35	24
2400	90	44	45	49	49	49	48	44	32
	80	41	42	45	44	43	42	39	28
	70	40	41	43	43	41	40	37	26
	60	40	40	43	42	40	39	37	25
	50	38	38	41	40	38	37	36	24
2100	90	44	46	50	50	50	48	43	32
	80	42	43	45	45	44	43	38	27
	70	41	42	44	43	42	41	37	25
	60	41	41	43	42	41	40	36	25
	50	40	40	42	41	39	38	35	24
1800	90	45	47	50	51	51	48	42	31
	80	43	44	45	45	45	43	37	26
	70	42	43	44	43	43	41	35	25
	60	42	43	44	43	42	41	35	24
	50	42	42	43	41	40	39	34	23
1500	90	46	49	50	52	52	48	40	30
	80	44	45	46	46	46	43	35	25
	70	43	44	44	44	44	41	34	23
	60	43	44	44	44	43	41	33	23
	50	43	44	44	42	41	39	32	22
1200	90	46	49	50	51	50	47	36	26
	80	44	46	46	46	45	42	32	22
	70	44	45	45	44	44	41	31	20
	60	44	45	44	44	43	41	31	20
	50	44	45	44	43	41	40	30	19

## Sizes 13 & 16

RPM	%WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
4200	90	44	41	40	46	44	42	39	32
	80	39	37	36	44	40	36	33	26
	70	39	36	35	43	39	35	32	25
	60	37	34	32	38	35	32	28	22
	50	37	34	32	38	35	32	28	22
3900	90	43	41	41	46	43	42	39	31
	80	39	36	37	44	39	36	33	25
	70	38	36	36	43	38	35	31	24
	60	37	34	33	38	35	32	27	21
	50	37	34	33	38	35	32	27	21
3600	90	43	41	42	46	43	42	38	30
	80	39	36	38	44	38	36	32	24
	70	38	36	37	43	37	35	31	23
	60	37	33	34	38	34	31	27	20
	50	37	33	34	38	34	31	27	20
3300	90	43	40	43	46	43	42	37	29
	80	38	36	40	44	38	36	31	24
	70	38	35	39	43	36	35	30	22
	60	36	33	35	38	33	31	26	19
	50	36	33	35	38	33	31	26	19
3000	90	43	41	44	46	44	43	37	29
	80	38	36	41	43	38	36	31	23
	70	37	35	40	42	37	35	29	22
	60	36	33	36	38	33	31	26	19
	50	36	33	36	38	33	31	26	19
2700	90	43	41	45	46	45	43	37	28
	80	38	36	42	43	39	37	30	23
	70	37	36	41	42	38	35	29	22
	60	35	34	37	38	34	31	26	19
	50	35	34	37	38	34	31	26	19
2400	90	43	42	46	47	47	43	36	28
	80	37	37	42	42	40	37	30	23
	70	37	36	41	41	39	35	29	22
	60	35	34	38	37	35	31	26	19
	50	35	34	38	37	35	31	26	19
2100	90	43	43	47	48	49	42	35	27
	80	37	38	42	42	42	36	29	22
	70	37	37	41	41	40	35	28	21
	60	35	35	37	37	36	31	25	19
	50	35	35	37	37	36	31	25	19
1800	90	43	44	47	50	50	42	35	27
	80	37	39	42	43	43	35	29	22
	70	37	38	41	41	41	34	28	21
	60	35	36	37	37	36	31	25	18
	50	35	36	37	37	36	31	25	18
1500	90	44	46	48	52	49	41	33	26
	80	38	40	42	44	42	34	28	21
	70	37	39	41	43	41	33	27	20
	60	36	36	37	38	36	30	24	17
	50	36	36	37	38	36	30	24	17
1200	90	44	47	50	53	46	39	31	24
	80	38	40	43	45	39	32	26	18
	70	38	39	42	43	38	32	25	18
	60	36	37	37	38	34	29	23	15
	50	36	37	37	38	34	29	23	15
900	90	45	48	52	53	43	36	28	20
	80	39	41	44	45	36	30	23	15
	70	38	40	43	43	35	29	22	14
	60	36	37	38	38	32	26	20	12
	50	36	37	38	38	32	26	20	12

The calculated sound power levels from these ratings are in decibels, referenced to  $10^{-12}$  watts calculated per AMCA Standard 301. Values shown are for inlet  $L_{WK}$  specific sound power levels for: Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

# *L<sub>WK</sub>* Values for VSAC SWSI

## Sizes 18 - 24

RPM	%WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
4200	90	45	44	43	45	48	41	36	32
	80	39	38	37	39	43	35	29	24
	70	37	36	36	37	41	33	27	22
	60	38	36	36	37	39	31	26	21
	50	38	36	36	36	36	29	24	20
3900	90	44	44	43	45	48	39	35	31
	80	38	38	37	39	43	33	28	23
	70	37	36	36	38	41	32	27	22
	60	38	36	36	37	39	30	25	21
	50	38	36	36	36	36	28	24	19
3600	90	44	44	43	46	48	38	35	29
	80	38	38	37	40	43	32	28	22
	70	37	36	36	39	41	30	26	21
	60	38	36	36	38	39	28	25	20
	50	38	36	36	36	36	27	23	19
3300	90	44	44	43	47	48	37	34	28
	80	38	37	37	41	43	31	27	21
	70	37	36	36	40	41	30	26	20
	60	37	36	36	38	39	28	24	19
	50	38	36	36	36	36	26	23	18
3000	90	44	43	43	48	47	37	34	27
	80	38	37	37	42	42	30	26	21
	70	37	36	36	41	40	29	25	19
	60	37	36	36	39	38	27	24	18
	50	37	36	36	36	35	26	22	17
2700	90	44	43	43	48	45	37	33	26
	80	38	37	37	43	40	30	26	20
	70	37	36	36	41	38	28	24	18
	60	37	36	36	39	36	27	23	17
	50	37	36	36	36	34	25	22	17
2400	90	44	43	44	48	43	37	33	25
	80	38	38	38	42	38	30	26	19
	70	37	36	37	41	36	29	24	18
	60	37	36	37	39	34	28	23	17
	50	37	36	37	37	32	26	22	17
2100	90	44	43	45	47	42	37	33	24
	80	39	38	39	42	36	31	26	19
	70	38	37	38	41	35	30	25	18
	60	37	37	38	39	33	28	24	17
	50	36	36	37	37	31	27	23	17
1800	90	44	44	46	46	41	37	31	23
	80	39	39	41	41	35	31	25	18
	70	38	38	39	40	34	30	24	17
	60	37	37	39	38	33	29	23	17
	50	36	37	38	36	31	28	23	16
1500	90	44	45	47	45	41	37	30	22
	80	40	40	41	40	35	31	24	18
	70	39	39	40	39	34	30	23	17
	60	37	38	39	37	33	29	23	16
	50	36	37	38	35	32	28	22	16
1200	90	44	46	46	44	41	36	28	21
	80	40	41	41	39	36	31	23	17
	70	39	40	40	38	34	29	22	16
	60	38	39	39	36	34	29	22	15
	50	36	39	38	35	32	28	21	15
900	90	44	46	44	43	39	32	25	19
	80	41	41	40	38	34	28	21	15
	70	40	40	39	37	33	27	20	14
	60	38	40	38	36	33	27	19	13
	50	37	39	36	34	32	26	19	13
600	90	46	45	43	41	36	27	21	15
	80	41	41	39	36	31	23	17	11
	70	40	40	38	35	30	22	16	11
	60	40	39	37	34	30	22	16	10
	50	39	38	35	33	29	22	15	9
300	90	45	43	41	36	27	21	15	9
	80	41	39	36	31	23	17	11	6
	70	40	38	35	30	22	16	11	5
	60	39	37	34	30	22	16	10	4
	50	38	35	33	29	22	15	9	3

## Sizes 27 - 33

RPM	WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
3000	90	48	48	47	47	39	38	37	31
	80	41	41	41	41	33	32	30	24
	70	41	41	41	41	33	31	29	23
	60	39	39	39	39	29	27	25	20
	50	38	38	38	38	28	26	23	18
2700	90	48	48	46	47	39	38	37	30
	80	41	41	41	41	33	32	29	23
	70	41	41	41	40	32	31	28	22
	60	39	39	39	38	29	27	24	19
	50	38	38	38	37	28	26	23	17
2400	90	48	48	46	45	39	38	37	28
	80	41	41	41	39	33	32	28	22
	70	41	41	41	39	32	31	27	21
	60	39	39	39	36	29	27	23	18
	50	38	38	38	35	27	25	22	16
2100	90	48	47	47	43	39	39	35	27
	80	41	41	41	37	32	31	27	21
	70	41	41	41	37	31	30	26	20
	60	39	39	39	34	28	27	22	17
	50	38	38	38	33	27	25	21	15
1800	90	48	47	47	41	38	38	34	25
	80	41	41	41	35	32	31	26	19
	70	41	41	41	35	31	30	25	18
	60	39	39	39	32	28	26	21	15
	50	38	38	38	30	26	24	19	14
1500	90	48	47	48	40	39	38	31	23
	80	42	42	42	35	32	30	25	18
	70	41	41	41	34	31	29	24	17
	60	40	40	40	31	28	26	20	15
	50	39	39	39	29	27	24	19	14
1200	90	48	48	47	42	39	37	28	21
	80	43	43	42	36	33	30	23	17
	70	43	43	41	35	32	29	22	17
	60	42	41	39	32	29	26	20	15
	50	41	41	38	30	27	24	18	14
900	90	49	49	46	41	39	34	26	20
	80	44	45	42	36	34	29	22	16
	70	44	44	41	35	33	28	21	15
	60	43	43	38	32	29	25	19	14
	50	43	42	36	30	27	23	18	13
600	90	49	50	45	41	38	29	23	17
	80	45	45	40	36	32	25	19	13
	70	45	44	39	35	31	24	19	13
	60	44	42	36	31	28	22	17	11
	50	44	41	34	29	27	21	16	11
300	90	50	45	41	38	29	23	17	11
	80	45	40	36	32	25	19	13	7
	70	44	39	35	31	24	19	13	7
	60	42	36	31	28	22	17	11	6
	50	41	34	29	27	21	16	11	5

The calculated sound power levels from these ratings are in decibels, referenced to  $10^{-12}$  watts calculated per AMCA Standard 301. Values shown are for inlet  $L_{WK}$  specific sound power levels for: Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

# *L<sub>WK</sub> Values for VSAC SWSI*

## **Sizes 36**

RPM	WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
2100	90	48	47	43	43	39	39	34	26
	80	44	43	38	39	34	32	28	21
	70	43	43	38	38	33	31	27	20
	60	41	41	36	35	30	28	24	18
	50	39	38	34	32	26	23	19	14
1800	90	48	45	44	42	39	38	32	24
	80	44	41	39	37	34	31	26	19
	70	43	41	39	36	33	30	25	18
	60	41	39	37	34	30	27	22	16
	50	39	36	35	30	25	22	18	13
1500	90	48	43	46	40	39	37	30	22
	80	44	39	41	36	33	30	25	17
	70	43	38	40	35	32	29	24	16
	60	41	37	38	32	29	26	21	15
	50	39	35	36	28	25	21	17	12
1200	90	48	43	45	40	38	35	27	19
	80	44	38	40	35	32	29	23	15
	70	43	38	39	34	31	28	22	14
	60	42	36	37	31	28	25	19	13
	50	39	34	34	27	24	21	16	11
900	90	48	46	42	39	37	32	24	17
	80	43	41	38	34	31	27	20	13
	70	42	41	37	33	30	26	19	12
	60	41	39	35	31	27	24	17	11
	50	39	37	32	27	24	21	15	10
600	90	49	44	40	37	34	27	20	14
	80	44	40	36	32	29	23	16	10
	70	43	40	35	31	29	22	16	10
	60	42	38	33	29	27	20	15	9
	50	41	35	30	26	25	18	13	8
300	90	44	40	37	34	27	21	15	8
	80	40	36	32	29	22	17	11	5
	70	40	35	31	29	22	16	10	4
	60	37	33	29	27	20	15	9	4
	50	36	30	26	25	19	13	8	4
100	90	38	35	30	23	17	11	5	-1
	80	34	30	26	19	13	7	1	-5
	70	33	30	25	18	13	7	1	-5
	60	30	27	23	17	11	6	1	-4
	50	28	25	22	15	10	6	1	-4

The calculated sound power levels from these ratings are in decibels, referenced to  $10^{-12}$  watts calculated per AMCA Standard 301. Values shown are for inlet  $L_{WK}$  specific sound power levels for: Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

# *L<sub>WK</sub> Values for VSBC SWSI*

## Sizes 12 & 13

RPM	%WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
4200	90	36	45	47	50	48	46	44	38
	80	33	42	43	46	44	41	39	33
	70	31	41	42	45	42	39	37	31
	60	31	41	42	44	41	38	36	30
	50	31	40	41	39	37	35	34	28
3900	90	37	46	47	50	48	46	44	37
	80	34	43	44	46	43	41	38	32
	70	32	42	42	45	42	39	36	29
	60	32	41	42	44	40	38	36	29
	50	32	41	40	39	37	35	34	27
3600	90	38	46	48	50	47	46	43	36
	80	35	43	44	46	43	40	38	30
	70	33	42	43	45	41	38	36	28
	60	33	41	42	44	40	38	35	28
	50	33	41	40	39	36	35	33	26
3300	90	39	46	48	50	47	46	42	35
	80	36	43	45	46	42	40	37	29
	70	35	42	43	45	40	38	35	27
	60	35	41	43	44	39	37	34	27
	50	34	41	40	39	36	35	33	25
3000	90	41	46	49	50	46	45	42	34
	80	37	43	45	46	41	40	36	28
	70	36	42	44	45	39	38	34	26
	60	36	41	43	44	39	37	34	25
	50	36	41	39	39	36	35	32	23
2700	90	43	47	50	50	47	46	42	34
	80	40	44	47	46	42	41	37	28
	70	39	42	45	44	40	39	35	26
	60	39	42	44	43	39	39	35	26
	50	38	41	40	39	36	36	33	24
2400	90	46	48	51	50	48	48	43	34
	80	43	44	48	45	43	43	38	28
	70	41	43	46	43	41	41	36	26
	60	41	43	45	42	40	40	35	26
	50	40	42	42	39	37	38	34	24
2100	90	48	49	51	50	49	49	43	33
	80	45	45	47	45	44	44	38	28
	70	43	44	46	43	42	42	36	26
	60	43	44	45	42	42	42	36	25
	50	42	43	42	39	39	40	35	24
1800	90	49	51	51	50	51	49	42	32
	80	46	47	47	45	46	45	38	27
	70	44	46	45	43	44	43	36	25
	60	44	45	45	42	43	43	36	25
	50	43	44	42	39	41	42	34	23
1500	90	50	52	50	51	52	49	41	31
	80	46	48	46	45	48	45	37	26
	70	45	47	44	43	46	44	35	24
	60	45	47	43	42	45	43	35	23
	50	44	46	42	39	43	42	34	22
1200	90	51	53	51	53	54	49	39	29
	80	47	50	46	48	49	45	35	24
	70	46	48	43	45	48	44	33	22
	60	46	48	43	45	47	43	33	21
	50	45	47	41	42	46	43	32	20
900	90	52	52	52	54	52	45	35	24
	80	48	47	46	49	49	41	30	19
	70	47	46	44	47	47	40	29	17
	60	47	45	43	46	47	39	28	17
	50	46	44	40	43	46	39	27	15

## Sizes 15 & 16

RPM	%WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
3900	90	44	41	42	49	46	43	41	40
	80	44	40	39	44	41	38	35	34
	70	44	39	38	43	40	37	35	33
	60	44	39	38	42	38	36	34	32
	50	43	39	37	39	36	33	32	30
3600	90	44	41	44	49	46	43	41	40
	80	43	39	40	44	40	38	35	34
	70	43	39	39	43	39	37	34	33
	60	43	39	38	42	38	35	33	32
	50	43	39	37	39	35	33	32	30
3300	90	43	41	45	49	45	43	41	40
	80	43	39	41	44	39	37	35	34
	70	43	39	40	43	38	36	34	33
	60	43	39	39	42	37	35	33	32
	50	42	38	37	39	34	33	31	30
3000	90	43	41	46	49	44	43	41	40
	80	42	39	42	44	39	37	35	34
	70	42	38	41	43	38	36	34	33
	60	42	38	40	42	37	35	33	32
	50	42	38	38	39	34	33	31	30
2700	90	42	41	47	49	45	43	41	39
	80	41	38	42	44	39	38	36	34
	70	41	38	42	43	39	37	35	33
	60	41	38	40	41	37	36	34	32
	50	41	37	38	39	35	34	32	30
2400	90	42	41	47	48	45	44	41	39
	80	40	38	42	43	40	39	36	34
	70	40	37	42	42	39	38	36	33
	60	40	37	40	41	38	37	35	32
	50	40	37	38	38	36	35	33	30
2100	90	41	41	47	47	46	45	41	38
	80	39	38	42	42	41	40	37	33
	70	39	38	41	42	40	39	36	32
	60	39	37	40	40	39	38	35	31
	50	39	37	38	38	37	37	33	29
1800	90	41	42	47	47	46	45	41	36
	80	39	39	42	42	42	41	36	31
	70	38	38	41	42	41	40	35	30
	60	38	38	40	40	40	39	35	29
	50	38	37	39	38	38	38	33	28
1500	90	41	43	48	48	47	45	40	34
	80	38	39	43	43	43	41	35	29
	70	38	38	42	42	42	40	34	28
	60	38	38	41	41	41	40	33	27
	50	38	38	39	39	40	38	32	26
1200	90	41	43	48	47	47	44	37	31
	80	38	39	44	44	44	41	33	26
	70	38	38	43	43	43	40	32	25
	60	38	38	42	42	43	39	31	24
	50	38	38	40	40	42	38	29	23
900	90	41	45	48	47	47	41	34	28
	80	39	42	44	44	44	37	30	23
	70	38	41	43	43	43	37	29	22
	60	38	40	42	42	42	36	28	22
	50	38	39	40	40	41	34	27	21

The calculated sound power levels from these ratings are in decibels, referenced to  $10^{-12}$  watts calculated per AMCA Standard 301. Values shown are for inlet  $L_{WK}$  specific sound power levels for: Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

# *L<sub>WK</sub> Values for VSBC SWSI*

## Sizes 18 - 24

RPM	%WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
3600	90	43	42	41	44	45	40	37	31
	80	41	40	38	39	41	36	33	27
	70	41	40	38	39	40	35	32	26
	60	41	40	37	38	39	33	30	24
	50	41	40	36	36	38	30	27	22
3300	90	43	42	41	44	45	40	37	30
	80	40	39	38	40	41	36	32	26
	70	40	39	38	40	40	35	31	25
	60	41	39	37	38	39	32	29	23
	50	41	39	36	37	38	29	26	21
3000	90	42	42	41	45	45	39	36	29
	80	40	39	38	40	40	35	31	25
	70	40	39	37	40	40	34	31	24
	60	41	39	37	39	38	32	28	22
	50	41	39	35	37	37	29	26	20
2700	90	42	42	41	45	44	39	35	28
	80	40	39	38	41	39	35	31	23
	70	40	39	37	40	39	34	30	23
	60	40	38	36	39	37	31	28	21
	50	41	38	35	38	35	29	25	19
2400	90	42	41	42	45	43	38	35	26
	80	40	38	38	41	38	34	30	22
	70	40	38	38	40	38	33	29	22
	60	40	38	36	39	36	31	27	20
	50	40	38	35	38	34	28	24	18
2100	90	43	42	43	45	42	38	34	25
	80	41	39	39	41	38	34	29	21
	70	41	39	39	40	37	33	28	21
	60	41	39	38	39	35	31	26	20
	50	41	38	37	37	32	28	24	18
1800	90	44	43	44	45	41	38	32	24
	80	41	40	40	41	37	33	28	20
	70	41	40	40	40	36	33	27	20
	60	41	39	39	38	34	31	25	19
	50	41	39	38	37	31	28	23	18
1500	90	45	44	45	44	41	37	30	22
	80	42	41	41	40	37	32	26	19
	70	42	41	40	40	36	32	26	18
	60	42	40	39	38	34	30	24	18
	50	42	40	38	35	31	28	23	17
1200	90	45	45	44	43	40	35	28	20
	80	43	41	40	39	36	31	25	17
	70	43	41	40	39	35	30	24	16
	60	43	41	39	36	33	29	23	16
	50	43	40	37	34	31	27	22	15
900	90	46	45	44	43	39	33	26	17
	80	43	41	40	39	34	29	22	13
	70	43	41	40	38	34	28	22	13
	60	43	40	38	36	32	27	21	13
	50	43	40	35	33	30	26	20	12
600	90	46	45	44	41	36	29	21	12
	80	42	41	40	36	31	25	17	8
	70	42	40	39	36	31	25	17	8
	60	42	39	37	34	29	24	16	8
	50	41	37	34	31	28	23	16	7

## Sizes 27 - 33

RPM	%WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
3000	90	50	48	46	46	39	39	37	32
	80	45	44	43	43	35	35	32	28
	70	45	43	42	42	34	34	31	26
	60	42	40	40	40	30	30	27	22
	50	41	39	39	40	29	28	25	20
2700	90	50	47	46	46	39	39	37	31
	80	45	43	43	42	35	35	32	27
	70	45	42	42	42	34	33	30	25
	60	42	39	40	40	30	29	26	21
	50	41	38	39	39	29	28	24	19
2400	90	50	46	46	45	39	39	36	30
	80	45	42	43	41	35	34	31	26
	70	45	41	42	40	34	33	30	24
	60	42	39	40	38	30	29	25	20
	50	41	38	40	36	29	27	24	19
2100	90	50	46	46	43	39	39	35	29
	80	45	42	43	39	35	34	30	24
	70	45	41	42	38	34	33	29	23
	60	42	38	40	35	30	29	24	19
	50	41	37	40	34	29	27	23	18
1800	90	49	46	46	41	39	38	34	27
	80	45	42	43	37	35	33	29	23
	70	44	41	42	36	34	32	28	22
	60	41	39	40	33	30	28	23	18
	50	40	38	40	31	29	26	22	17
1500	90	48	46	47	40	39	37	32	25
	80	44	43	43	36	35	32	28	21
	70	43	42	42	35	34	31	26	20
	60	40	40	41	31	30	27	22	17
	50	39	39	40	29	28	25	21	16
1200	90	47	47	46	41	39	36	30	23
	80	43	44	42	38	35	32	26	20
	70	43	43	41	36	34	31	25	19
	60	41	42	39	33	30	27	22	17
	50	40	41	38	31	29	26	20	16
900	90	47	47	45	41	38	34	27	21
	80	44	44	42	38	34	30	24	19
	70	44	44	41	37	33	29	24	18
	60	43	42	38	33	30	27	21	16
	50	42	42	37	32	29	25	20	16
600	90	49	48	45	40	38	30	26	20
	80	45	44	41	35	33	27	22	16
	70	45	44	40	35	33	26	22	16
	60	44	42	38	32	31	24	20	14
	50	44	41	36	31	29	23	19	14
300	90	48	45	40	38	30	26	20	14
	80	44	41	35	33	27	22	16	10
	70	44	40	35	33	26	22	16	10
	60	42	38	32	31	24	20	14	9
	50	41	36	31	29	23	19	14	8

The calculated sound power levels from these ratings are in decibels, referenced to 10<sup>-12</sup> watts calculated per AMCA Standard 301. Values shown are for inlet L<sub>WK</sub> specific sound power levels for: Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

# *L<sub>WK</sub> Values for VSBC SWSI*

## **Size 36**

RPM	%WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
2100	90	45	44	42	46	41	39	34	28
	80	40	39	37	41	36	33	29	22
	70	39	38	35	40	35	32	27	21
	60	38	36	32	36	31	28	23	18
	50	38	36	32	36	31	28	23	18
1800	90	45	43	43	46	40	38	33	26
	80	40	37	38	41	35	33	27	21
	70	39	37	37	40	33	31	26	20
	60	38	35	34	36	29	27	22	17
	50	38	35	34	36	29	27	22	17
1500	90	45	41	45	45	39	37	31	24
	80	39	36	41	41	34	31	26	19
	70	39	35	39	39	33	30	24	18
	60	38	32	36	36	29	26	20	15
	50	38	32	36	36	29	26	20	15
1200	90	45	41	46	43	39	35	29	21
	80	39	36	41	38	34	30	24	17
	70	39	35	40	37	32	28	22	16
	60	37	31	36	33	28	24	19	14
	50	37	31	36	33	28	24	19	14
900	90	46	46	45	39	37	32	26	18
	80	41	41	41	34	31	27	20	14
	70	40	40	40	33	30	26	20	13
	60	38	37	35	29	26	22	17	12
	50	38	37	35	29	26	22	17	12
600	90	48	47	42	37	34	28	21	14
	80	44	42	37	32	29	23	17	10
	70	43	41	36	30	28	22	16	10
	60	40	37	31	27	25	20	14	9
	50	40	37	31	27	25	20	14	9
300	90	47	41	37	34	28	21	15	8
	80	42	37	31	29	23	17	11	4
	70	41	35	30	28	22	16	10	4
	60	37	31	27	25	20	14	9	4
	50	37	31	27	25	20	14	9	4

The calculated sound power levels from these ratings are in decibels, referenced to  $10^{-12}$  watts calculated per AMCA Standard 301. Values shown are for inlet  $L_{WK}$  specific sound power levels for: Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

# *L<sub>WKi</sub> Inlet Values for VSBJC*

## **Size 90**

RPM	% WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
3500	90	60	57	52	51	52	50	45	37
	80	57	53	48	45	45	43	39	31
	70	56	52	46	43	43	41	37	29
	60	56	52	45	41	41	39	35	28
3000	90	59	56	51	51	52	49	43	34
	80	56	52	46	44	45	42	37	28
	70	55	51	45	42	43	40	35	27
	60	55	50	44	41	40	38	34	26
2500	90	52	53	52	51	53	50	43	34
	80	48	49	47	45	46	43	37	28
	70	47	47	45	43	44	41	36	26
	60	47	47	44	41	42	39	35	26
2000	90	45	53	52	54	56	49	43	33
	80	41	49	47	47	49	43	37	27
	70	40	47	45	45	47	41	35	25
	60	39	46	44	43	44	40	35	25
1750	90	46	53	51	55	56	48	41	32
	80	41	49	46	49	49	42	36	26
	70	40	47	44	46	47	40	34	24
	60	39	46	43	44	44	39	33	23
1500	90	48	53	51	56	54	47	39	29
	80	44	49	45	50	48	41	34	23
	70	42	47	43	47	45	39	32	21
	60	42	46	42	44	43	38	31	21
1150	90	53	53	52	56	51	45	36	25
	80	48	48	46	50	45	39	30	19
	70	46	46	44	47	43	38	28	17
	60	46	45	42	44	41	37	28	16

## **Size 10**

RPM	% WOV	OCTAVE BAND							
		1	2	3	4	5	6	7	8
3500	90	56	50	46	47	50	50	43	36
	80	54	46	41	42	45	45	38	31
	70	54	46	41	41	43	43	37	30
	60	54	45	39	39	40	39	35	28
3000	90	55	49	46	48	50	48	42	34
	80	52	45	41	43	45	43	36	29
	70	52	44	40	42	44	42	35	28
	60	52	44	39	39	40	38	33	26
2500	90	47	46	46	49	51	47	41	33
	80	43	41	42	44	46	42	36	28
	70	43	40	41	43	45	41	36	27
	60	42	39	39	40	41	38	34	26
2000	90	41	45	48	51	52	46	40	32
	80	37	41	43	46	47	41	36	27
	70	36	40	42	45	46	40	35	26
	60	34	38	40	42	42	39	33	25
1750	90	41	46	49	52	52	45	39	30
	80	36	41	44	47	47	41	35	26
	70	36	40	43	45	46	40	34	25
	60	34	39	41	42	42	38	32	24
1500	90	42	47	49	52	51	44	37	28
	80	38	42	44	47	45	39	33	24
	70	37	41	43	46	44	39	32	23
	60	35	39	41	43	42	37	31	22
1150	90	44	48	50	52	48	42	34	25
	80	40	43	45	47	43	38	29	20
	70	39	42	44	46	42	37	29	19
	60	37	40	42	43	40	35	27	18

The calculated sound power levels from these ratings are in decibels, referenced to  $10^{-12}$  watts calculated per AMCA Standard 301. Values shown are for inlet  $L_{WK}$  specific sound power levels for: Installation Type B: free inlet, ducted outlet. Ratings do not include the effects of duct end correction.

# M Capacity Fraction

CFM	TOTAL PRESSURE AT DENSITY																			
	1/4	3/8	1/2	5/8	3/4	7/8	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2	
100	8	11	14	16	18	19	20	22	24	26	28	30	31	32	33	34	35	36	36	
150	10	13	16	18	19	21	22	24	25	28	30	31	33	34	35	36	37	37	38	
200	11	14	17	19	21	22	23	25	27	29	31	33	34	35	36	37	38	39	39	
300	13	16	19	21	22	24	25	27	28	31	33	34	36	37	38	39	40	40	41	
500	15	18	21	23	24	26	27	29	31	33	35	37	38	39	40	41	42	43	43	
750	17	20	23	25	26	28	29	31	32	35	37	38	40	41	42	43	44	44	45	
1000	18	21	24	26	28	29	30	32	34	36	38	40	41	42	43	44	45	46	46	
1500	20	23	26	28	29	31	32	34	35	38	40	41	43	44	45	46	47	47	48	
2000	21	24	27	29	31	32	33	35	37	39	41	43	44	45	46	47	48	49	49	
3000	23	26	29	31	32	34	35	37	38	41	43	44	46	47	48	49	50	50	51	
5000	25	28	31	33	34	36	37	39	41	43	45	47	48	49	50	51	52	53	53	
7500	27	30	33	35	36	38	39	41	42	45	47	48	50	51	52	53	54	54	55	
10000	28	31	34	36	38	39	40	42	44	46	48	50	51	52	53	54	55	56	56	
15000	30	33	36	38	39	41	42	44	45	48	50	51	53	54	55	56	57	57	58	
20000	31	34	37	39	41	42	43	45	47	49	51	53	54	55	56	57	58	59	59	
30000	33	36	39	41	42	44	45	47	48	51	53	54	56	57	58	59	60	60	61	
50000	35	38	41	43	44	46	47	49	51	53	55	57	58	59	60	61	62	63	63	
75000	37	40	43	45	46	48	49	51	52	55	57	58	60	61	62	63	64	64	65	
100000	38	41	44	46	48	49	50	52	54	56	58	60	61	62	63	64	65	66	66	
150000	40	43	46	48	49	51	52	54	55	58	60	61	63	64	65	66	67	67	68	
200000	41	44	47	49	51	52	53	55	57	59	61	63	64	65	66	67	68	69	69	

CFM	TOTAL PRESSURE AT DENSITY																			
	7	8	9	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	
100	37	38	39	40	42	43	44	45	46	47	48	48	49	50	50	51	51	52	52	
150	39	40	41	42	43	45	46	47	48	49	49	50	51	51	52	52	53	53	54	
200	40	41	42	43	45	46	47	48	49	50	51	51	52	53	53	54	54	55	55	
300	42	43	44	45	46	48	49	50	51	52	52	53	54	54	55	55	56	56	57	
500	44	45	46	47	49	50	51	52	53	54	55	55	56	57	57	58	58	59	59	
750	46	47	48	49	50	52	53	54	55	56	56	57	58	58	59	59	60	60	61	
1000	47	48	49	50	52	53	54	55	56	57	58	58	59	60	60	61	61	62	62	
1500	49	50	51	52	53	55	56	57	58	59	59	60	61	61	62	62	63	63	64	
2000	50	51	52	53	55	56	57	58	59	60	61	61	62	63	63	64	64	65	65	
3000	52	53	54	55	56	58	59	60	61	62	62	63	64	64	65	65	66	66	67	
5000	54	55	56	57	59	60	61	62	63	64	65	65	66	67	67	68	68	69	69	
7500	56	57	58	59	60	62	63	64	65	66	66	67	68	68	69	69	70	70	71	
10000	57	58	59	60	62	63	64	65	66	67	68	68	69	70	70	71	71	72	72	
15000	59	60	61	62	63	65	66	67	68	69	69	70	71	71	72	72	73	73	74	
20000	60	61	62	63	65	66	67	68	69	70	71	71	72	73	73	74	74	75	75	
30000	62	63	64	65	66	68	69	70	71	72	72	73	74	74	75	75	76	76	77	
50000	64	65	66	67	69	70	71	72	73	74	75	75	76	77	77	78	78	79	79	
75000	66	67	68	69	70	72	73	74	75	76	76	77	78	78	79	79	80	80	81	
100000	67	68	69	70	72	73	74	75	76	77	78	78	79	80	80	81	81	82	82	
150000	69	70	71	72	73	75	76	77	78	79	79	80	81	81	82	82	83	83	84	
200000	70	71	72	73	75	76	77	78	79	80	81	81	82	83	83	84	84	85	85	

# Fan Selection Guidelines

The performance tables in form 740-15-1 are based on fans handling standard air at a density of 0.075 pounds per cubic foot. This is equivalent to air at 70°F at sea level (29.92" Hg barometric pressure). When specified performance is at a density different than standard, it must be converted to the equivalent standard conditions before the fan can be selected from the performance tables. The equivalent standard conditions can be calculated by using the Temperature and Altitude Density Ratios shown in Table 1.

Table 1. Temperature and Altitude Density Ratios

AIR TEMP °F	ALTITUDE IN FEET ABOVE SEA LEVEL											
	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	15000
	BAROMETRIC PRESSURE IN INCHES OF MERCURY											
	29.92	28.86	27.82	26.82	25.84	24.90	23.98	23.09	22.22	21.39	20.58	16.89
-50	1.293	1.247	1.201	1.159	1.116	1.076	1.036	0.997	0.960	0.924	0.889	0.729
0	1.152	1.111	1.071	1.032	0.995	0.959	0.923	0.889	0.856	0.824	0.792	0.650
50	1.039	1.003	0.967	0.932	0.897	0.864	0.833	0.801	0.772	0.743	0.715	0.586
70	1.000	0.964	0.930	0.896	0.864	0.832	0.801	0.772	0.743	0.714	0.688	0.564
100	0.946	0.912	0.880	0.848	0.818	0.787	0.758	0.730	0.703	0.676	0.651	0.534
150	0.869	0.838	0.808	0.770	0.751	0.723	0.696	0.671	0.646	0.620	0.598	0.490
200	0.803	0.774	0.747	0.720	0.694	0.668	0.643	0.620	0.596	0.573	0.552	0.453
250	0.747	0.720	0.694	0.669	0.645	0.622	0.598	0.576	0.555	0.533	0.514	0.421
300	0.697	0.672	0.648	0.624	0.604	0.580	0.558	0.538	0.518	0.498	0.480	0.393
350	0.654	0.631	0.608	0.586	0.565	0.544	0.524	0.505	0.486	0.467	0.450	0.369
400	0.616	0.594	0.573	0.552	0.532	0.513	0.493	0.476	0.458	0.440	0.424	0.347
450	0.582	0.561	0.542	0.522	0.503	0.484	0.466	0.449	0.433	0.416	0.401	0.328
500	0.552	0.532	0.513	0.495	0.477	0.459	0.442	0.426	0.410	0.394	0.380	0.311
550	0.525	0.506	0.488	0.470	0.454	0.437	0.421	0.405	0.390	0.375	0.361	0.296
600	0.500	0.482	0.465	0.448	0.432	0.416	0.400	0.386	0.372	0.352	0.344	0.282
650	0.477	0.460	0.444	0.427	0.412	0.397	0.382	0.368	0.354	0.341	0.328	0.269
700	0.457	0.441	0.425	0.410	0.395	0.380	0.366	0.353	0.340	0.326	0.315	0.258
750	0.439	0.423	0.407	0.393	0.379	0.365	0.351	0.338	0.326	0.313	0.303	0.225
800	0.420	0.404	0.389	0.375	0.362	0.350	0.336	0.323	0.311	0.300	0.290	0.237
850	0.404	0.391	0.376	0.363	0.349	0.336	0.324	0.312	0.300	0.289	0.279	0.288
900	0.389	0.376	0.363	0.349	0.336	0.324	0.312	0.300	0.289	0.279	0.268	0.220
950	0.376	0.363	0.350	0.337	0.325	0.313	0.301	0.290	0.279	0.269	0.259	0.212
1000	0.363	0.350	0.338	0.325	0.314	0.302	0.291	0.280	0.270	0.259	0.250	0.205

## Example

Assume a VSBC36 SWSI fan to handle 15,500 CFM, 2.5" SP, at 300°F and 3000 ft altitude.

1. For the operating conditions of 300°F and 3000 ft altitude, the factor can be found in Table 1 to be 0.624.
2. Divide the operating SP by this factor. Thus,  $2.5"/0.624 = 4"$  SP, which is the equivalent static pressure at standard air density.
3. From the VSBC36 performance table find the fan RPM and BHP for 15,500 cfm and 4" SP to be 893 RPM and 12.86 BHP (by interpolation) at standard conditions. 12.86 BHP is also referred to as "cold" or "starting" brake horsepower.
4. To determine the BHP at operating conditions, multiply the BHP at standard conditions by the factor from Table 1 ( $12.86 \times 0.624 = 8.04$  BHP). The BHP at operating conditions is 8.04 BHP.