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ENGINEERING SUPPLEMENT
ES-163
June 2007

DIRECT DRIVE - CLASS IV BACKWARDLY INCLINED CENTRIFUGAL FANS

Direct drive Arrangement 4, 7 and 8 fans often require narrow width wheel and housing construction to meet the performance requirements at standard AC motor speeds. The direct-drive performance curves shown in this supplement will guide the designer to potential fan sizes and models. It is recommended that final selection be made using New York Blower's Electronic Catalog soft-ware and that a New York Blower sales representative be consulted for assistance in optimizing the selection.

STEPS

EXAMPLE

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| <ol style="list-style-type: none"> 1. Plot the required performance on the appropriate curve. Where more than one size or speed meets the performance, selection should consider initial and operating costs. 2. Determine the full width volume at the required SP and RPM. NOTE: the curves on pages 2, 3 and 4 represent a performance range from full width, at the right side border, to 25% of full width, at the left side border. 3. Calculate the approximate "percent width" by dividing the full width CFM from Step 2 into the required CFM. NOTE: when using standard performance curves, the selection point must be within the minimum acceptable 25% width, 75% maximum reduction. 4. Calculate the approximate full width outlet velocity by dividing the outlet area from Table A into the full width volume from Step 2. NOTE: this step is not necessary if standard performance curves are used. 5. Calculate the velocity pressure (VP) for the full width fan, and add the VP to the SP to get total pressure (TP). NOTE: this step is not necessary if standard performance curves are used. 6. Calculate the approximate full width BHP by: (TP (from Step 5) x full width CFM) ÷ (6356 x efficiency factor from curve) <p>NOTE: the full width BHP can be read directly if standard performance curves are used.</p> <ol style="list-style-type: none"> 7. Calculate the approximate required BHP by multiplying the full width BHP from Step 6 times the blade width percentage from Step 2. 8. The complete specification includes fan size, type, narrow width, CFM, SP, approximate BHP and motor speed...nyb will determine the precise width and BHP. | <ol style="list-style-type: none"> 1. Size 36 AcoustaFoil® - 11,000 CFM at 11.5" SP at 1770 RPM. 2. 31,000 CFM at 11.5" SP at 1770 RPM. 3. $\left(\frac{11,000}{31,000}\right) \times 100\% = 35.5\%$ blade width. 4. $31,000 \div 7.66 = 4047 \text{ ft./min. (FPM)}$ 5. $\left(\frac{4047}{4005}\right)^2 = 1.02" \text{ VP}$
$1.02 + 11.5 = 12.52" \text{ TP}$ 6. $\left(\frac{12.52 \times 31,000}{6356 \times .88}\right) = 69.4$ full width BHP. 7. $69.4 \times 35.5\% = 24.6 \text{ BHP required.}$ 8. The fan will be a #36 AcoustaFoil®, Narrow Width for 11,000 CFM at 11.5" SP at 24.6 BHP at 1770 RPM. |
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The fan's outlet area does not vary in direct proportion to wheel width. Use the following steps to determine outlet area:

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| <ol style="list-style-type: none"> 9. Determine the approximate wheel width by multiplying the blade width from Table A times the blade width percentage from Step 3. 10. Subtract the narrow width dimension from the full width dimension. 11. The new housing width is the housing "M" dimension from Table A less the dimensional reduction from Step 10. 12. A fan's outlet area is determined by the housing's inside dimensions. The outlet area of a narrow width fan can be computed by multiplying the standard fan's outlet area by a ratio of the narrow to the standard housing widths. | <ol style="list-style-type: none"> 9. $12.75 \times 35.5\% = 4.5"$ 10. $12.75 - 4.5 = 8.25" \text{ reduction.}$ 11. $27.5 - 8.25 = 19.25" \text{ new housing width.}$ 12. $\left(\frac{19.25}{27.5}\right) \times 7.66 = 5.4 \text{ ft.}^2 \text{ outlet area.}$ |
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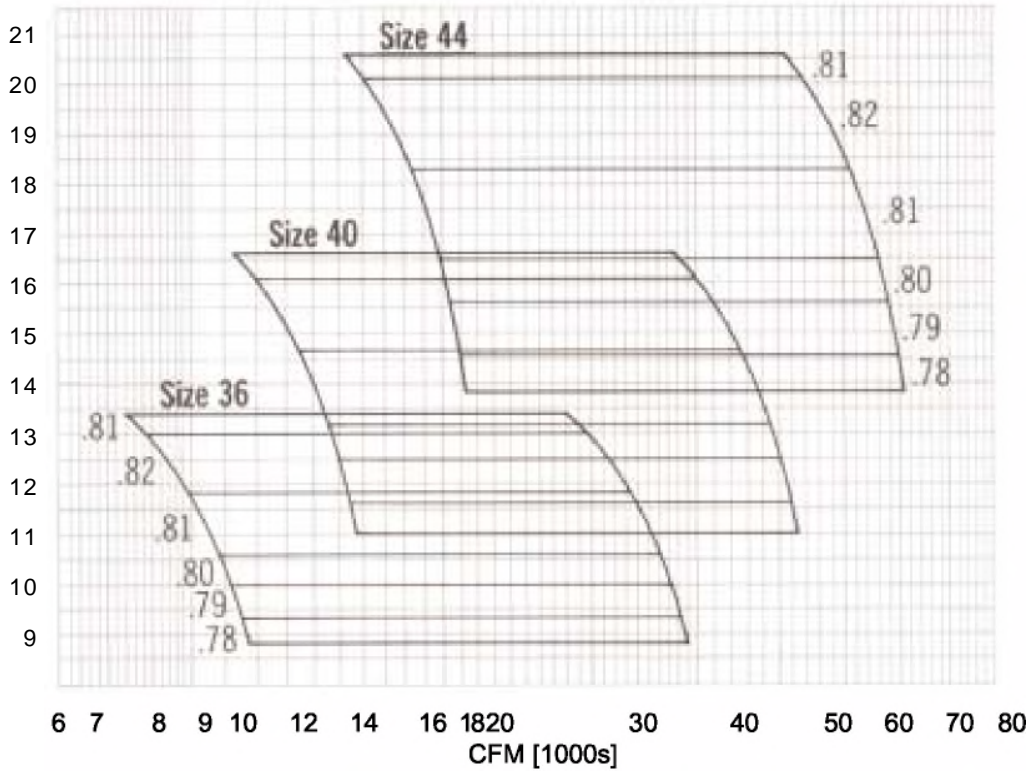
TABLE A - FULL WIDTH DIMENSIONS

Size	Standard Blade Width (inches)	Housing "M" Dimension (inches)	Standard Outlet Area (ft. ²)	Size	Standard Blade Width (inches)	Housing "M" Dimension (inches)	Standard Outlet Area (ft. ²)
18	6.750	13.875	1.92	40	14.125	30.375	9.31
22	7.875	16.875	2.85	44	15.500	33.500	11.39
24	8.875	18.500	3.45	49	17.125	36.875	13.80
27	9.750	20.375	4.19	54	18.875	40.750	16.92
30	10.750	22.625	5.17	60	20.750	45.000	20.70
33	11.625	24.875	6.26	66	22.875	49.500	25.05
36	12.750	27.500	7.66	73	25.375	54.750	30.64

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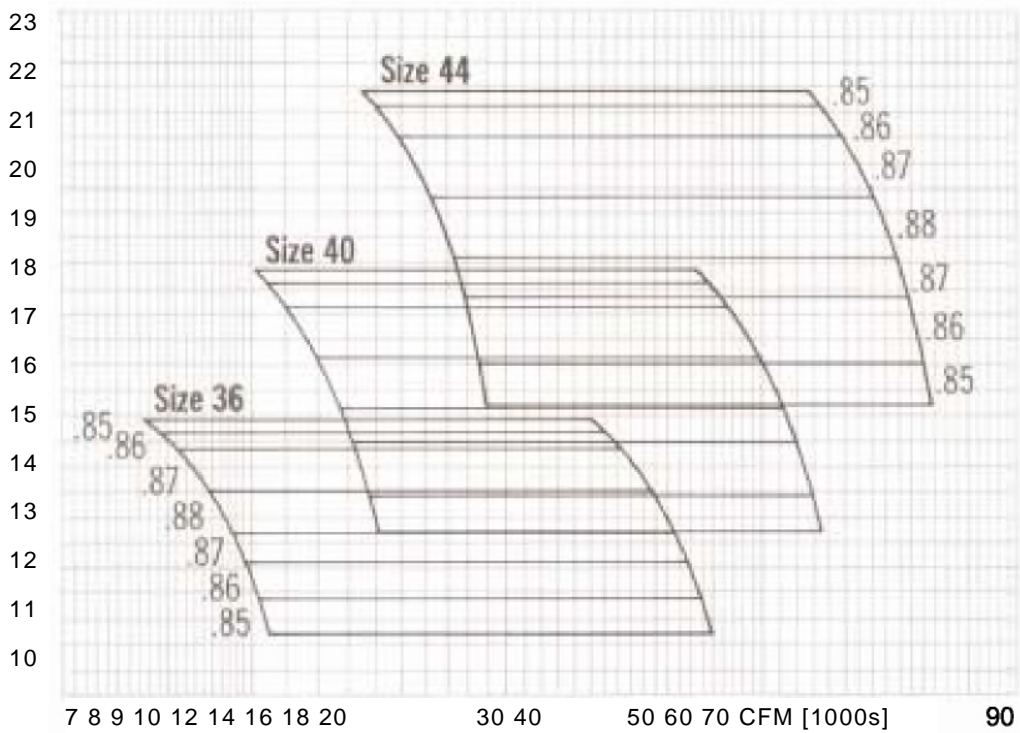
ACOUSTAFOIL @ 1770 RPM

STATIC PRESSURE [INCHES OF WATER]



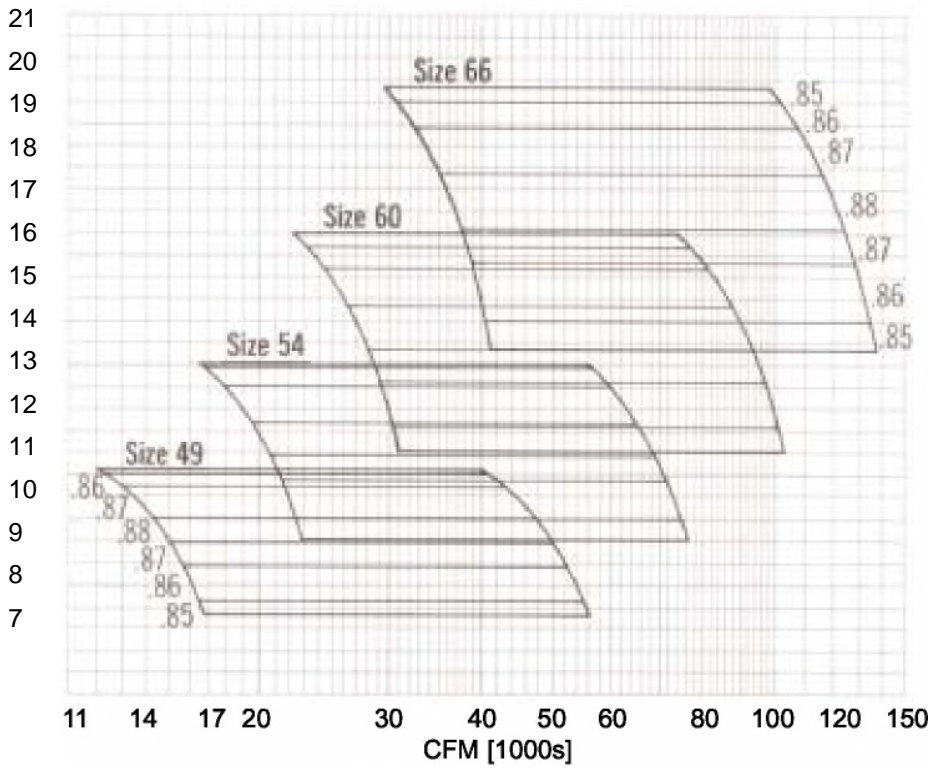
PLR @ 1770 RPM

STATIC PRESSURE [INCHES OF WATER]



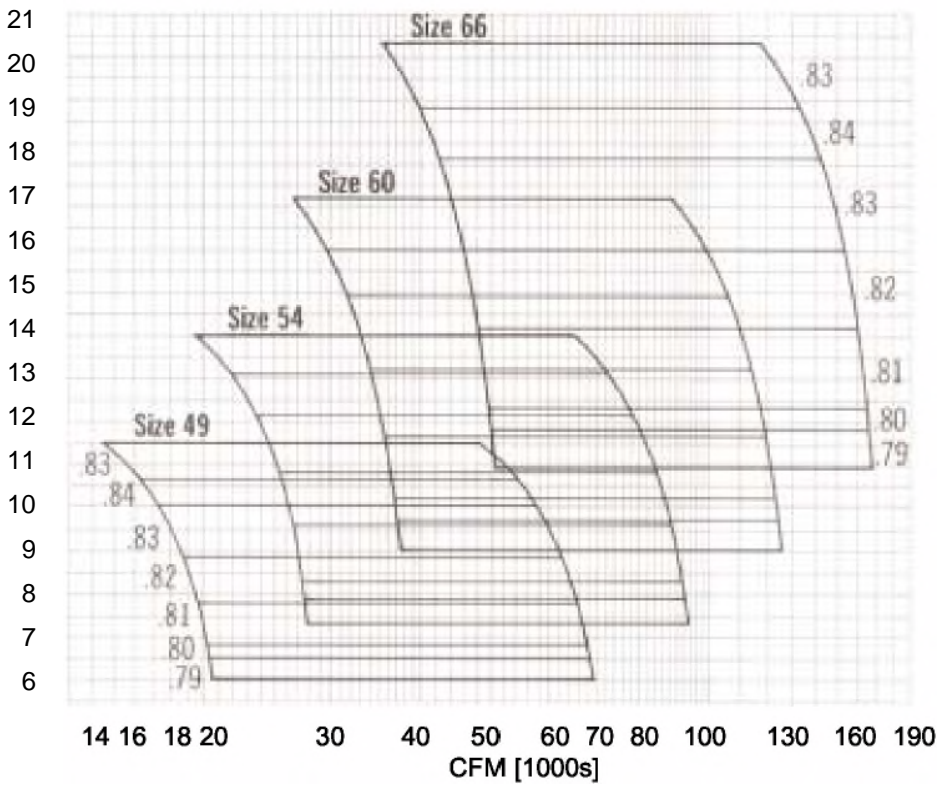
STATIC PRESSURE [INCHES OF WATER]

ACOUSTAFOIL @ 1175 RPM



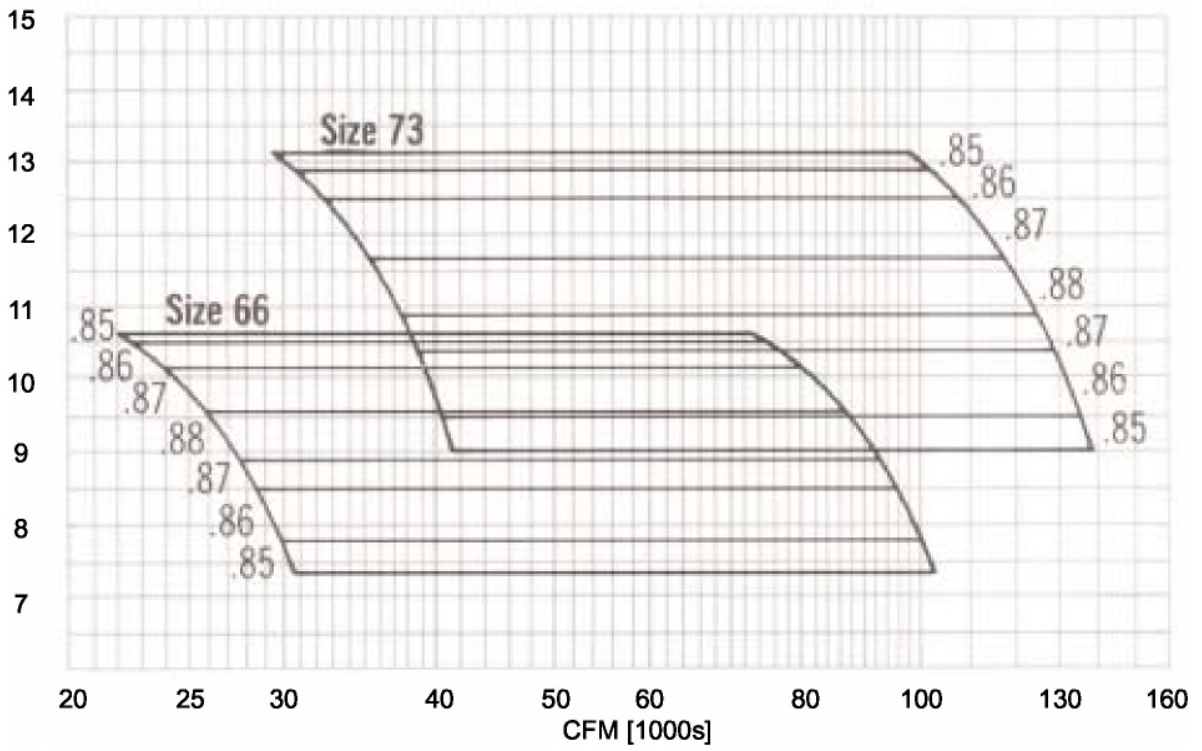
PLR @ 1175 RPM

STATIC PRESSURE [INCHES OF WATER]



ACOUSTAFOIL @ 875 RPM

STATIC PRESSURE INCHES OF WATER



PLR @ 875 RPM

STATIC PRESSURE INCHES OF WATER

