Good News
From the Doctor

Wall Propeller Fans and Wall Mounted Louvers

In order to obtain in the field the AMCA certified performance that was determined in a clinical lab and catalogued by the manufacturer of your choice, this fan *has to be installed in the same manner in which it was tested.*

Sounds logical . . . . . but it's not always practical to enter and leave a fan with long, even, straight pieces of duct . . . . . therefore, when you ask a fan to perform a duty and you punish it by entering or leaving the fan with twisting ductwork, you should take this into account when you select the fan. Recommended reading on this subject is the "AMCA Publication #201, Fans and Systems."

This is good reading for Centrifugal fans, but how about a Wall Propeller Fan?

Look at any wall propeller catalog. Check the panel size versus the "wall opening" size (a typical 36" wall propeller fan has a panel size of 44" x 44" and a suggested wall opening size of 38" x 38"). An accepted practice is to bolt the panel to the inside of the wall, let the fan orifice stick into the undersized wall opening, and have a gravity shutter bolted to the outside of the wall. This works fine for the fan because a **wide open** gravity shutter offers little or no resistance.

How about our AIA brothers who object to a flapping, bright aluminum shutter on the front of their latest version of the TAJ Mahal? Well . . . . . they have the solution . . . . . cover it up with a dark bronze louver!

Now we have to cram a 4" deep louver, a 6" (tip to tip) deep gravity shutter, and a 3" deep protruding fan orifice into a 12" thick wall . . . . . the proverbial 13 pounds of sand in a 12 pound bag.

To further compound the problem, louvers do not have 100% free area (as shutter approaches) because the blades are set at a fixed angle somewhere between 37 to 45 degrees, depending upon model and manufacturer.

Let us take the case of a 36" wall propeller fan moving 15,000 CFM.

Panel Size	44" x 44"
Wall Opening	38" x 38"

Louver Size	38" x 38"
Typical Louver Free Area	4.76 sq. ft.
Louver Free Area Velocity	3,151 F/M
Theoretical Louver P.D.	1.0" w.g.

The **theoretical** louver pressure drop would be 1.0" w.g. if the air were approaching the louver in laminar flow; however, since the fan blade/hub assembly is located just inches away from the back side of the louver, there is not only a void of air flow behind the hub (causing even higher velocities at the perimeter), the air leaving the fan is **corkscrewing** off the blades and striking the back of the louver. What we have here is a **tornado** occurring in this small space between the rotating fan blades and the back side of the louver.

Would you like to make a guess as to the pressure drop the louver is now offering? It could be as much as 150-200% higher than the *clinical lab/theoretical/laminar flow* pressure drop catalogued in the "AMCA certified louver pressure drop tables in the louver catalog."

Watch out . . . . . your favorite fan and favorite louver may place **you** in a not-so-favorable situation.

So much for the problem . . . . . How about a **solution**?

The simplest solution is to use a gravity (or motorized) shutter in lieu of a fixed bladed louver. The shutter blades open up (almost) horizontally and offer a small amount of resistance, allowing the fan to produce the amount of CFM catalogued.

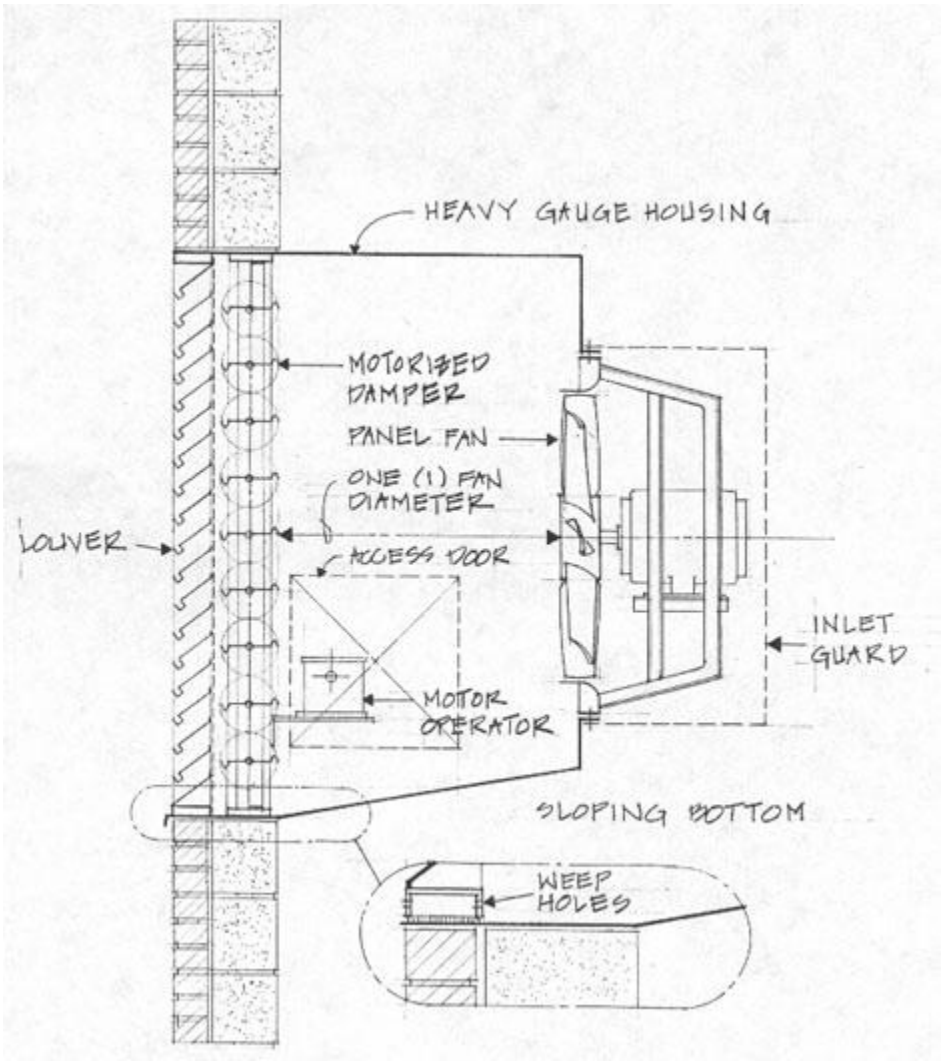
If this is not possible (Taj Mahal considerations), then we have developed a set of guidelines to use and a detail that you can modify to suit your own situations.

The louver has to be "oversized" to produce lower "free area" velocities. Our method is to set the louver "free area" at 125% of the fan panel size, i.e., let us again take the case of a 36" wall propeller fan moving 15,000 CFM.

Panel Size	44" x 44"
Panel Gross Area	44 x 44/144 = 13.44 sq. ft.
125% of Panel Gross Area	13.44 x 1.25 = 16.81 sq. ft.
Typical Louver Free Area	
66 x 66 - 15.90 sq. ft. free area	
72 x 72 - 19.20 sq. ft. free area	(Select the 72 x 72)
Louver Free Area Velocity 15000/19.2	782 ft./min.
Theoretical Louver P.D.	0.06" w.g.

This 72" x 72" "oversized" louver now presents a mounting problem with a wall propeller fan having a panel size of 42" x 42". Consideration also has to be given to the "corkscrewing" column of air leaving the fan.

Our method is to use a 14 gauge sheet metal plenum the same size as the louver and as deep as one (1) fan wheel diameter (in this case it would be 36") to be installed on the back of the louver. The wall propeller fan would then be installed as indicated in the detail shown. This plenum would not produce "laminar flow" against the back side of the louver blades, however, it would act as a small "pressure plenum", which would increase the likelihood that the louver pressure drop would be near what was anticipated.



Also note that the theoretical velocity through the damper will be 15,000/36.0 sq. ft., or 417 ft./min., therefore, we would suggest the use of a motorized damper (with blade and jamb seals to minimize leakage when the damper is closed).

The bottom of the plenum should be sloped towards the louver and extended under the louver sill. Weep holes should be drilled in the louver sill so that any moisture that was blown back

through the louver blades when the fan was off would then drain back to the outside. All joints inside the plenum should be sealed with 100 year mastic. It would be a good thought to add a small plenum door so that maintenance could have access to the inside of the plenum.

Always remember . . . . . .

(1) part empherical formula + (2) parts horse sense =

"good design techniques"

Doc

"Good news from the Doctor" is an occasionally written letter based on "Bad News" experiences we have encountered while trying to earn the groceries. This letter is intended to make you aware of certain pitfalls we have already enjoyed and recommend that you perform your own research and draw your own conclusions so you won't blame us if it doesn't work! Be aware that your school days education is the cheapest education you'll ever get!