

# ENGINEERING BULLETIN

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### *Wind Driven Rain Louver Performance*

- The Air Movement & Control Association (AMCA) expresses Wind Driven Rain (WDR) louver performance in terms of Effectiveness. The following table is a duplicate of the AMCA Table 5.1 WDR Effectiveness Classification Table, shown here for easy reference during this discussion.

**Table 5.1 Wind Driven Rain Effectiveness Classification Table**

Class	Effectiveness	Maximum allowed penetration of simulated rain l/hr/m <sup>2</sup> (gal/hr/ft <sup>2</sup> )	
		75 mm/hr (3 in/hr) Rainfall & 13 m/s (29 mph) Wind Velocity	200 mm/hr (8 in/hr) Rainfall & 22 m/s (50 mph) Wind Velocity
A	1 to 0.990	.75 (0.018)	2 (0.049)
B	0.989 to 0.950	3.75 (0.092)	10 (0.245)
C	0.949 to 0.800	15.0 (0.368)	40 (0.982)
D	Below 0.800	Greater than 15.0 (0.368)	Greater than 40 (0.982)

- AMCA has four (4) Wind Driven Rain (WDR) Effectiveness Classifications. They are designated as A, B, C and D. The Class A designation is the best performing classification and is 99 to 100% effective at stopping WDR penetration through the louver. The B, C and D Classifications are 95 to 98.9%, 80% to 94.9% and below 80% effective respectively.
- So, how much rain penetration is this?** Lets look at an example.

If a 4' x 4' louver was tested for WDR penetration performance, at a rainfall rate of 3 in/hr, the louver would be exposed to 4 cubic feet of rain in 1 hour (4' x 4' x .25' = 4). This equates to 29.92 gal/hr. To obtain a Class A performance rating, only one percent (1%) of this rain, 0.2992 gal/hr, would be allowed to penetrate the louver (29.92 gal/hr x .01 = 0.2992 gal/hr). If we divide the maximum rain penetration allowed by the square footage of louver face area, we get 0.018-gal/hr/sq ft of louver area (0.2992 gal/hr / 16 sq ft = 0.018 gal/hr/sq ft). This equates to **2.39 ounces/hr/sq ft of louver area**. Thus a 4' x 4' louver could allow up to **38.29 ounces/hr** (2.39 ounces/hr/sq ft x 16 sq ft = 38.29 ounces/hr) of rain to penetrate in one hour and still have a Class A rating! Similarly, the other B, C and D Classifications would allow the following rain penetration values.

Class	Effectiveness	Maximum allowed penetration of simulated rain (oz/hr/sq ft)		Maximum allowed penetration simulated rain (oz/hr) 4' x 4' louver	
		3 in/hr Rainfall & 29 mph Wind Velocity	8 in/hr Rainfall & 50 mph Wind Velocity	3 in/hr Rainfall & 29 mph Wind Velocity	8 in/hr Rainfall & 50 mph Wind Velocity
A	99 to 100%	2.39	6.37	38.29	102
B	95 to 98.9%	11.95	31.86	191.45	511
C	80 to 94.9%	47.80	127.46	765.80	2042
D	Below 80%	> 47.80	> 127.46	> 765.8	> 2042

So, although 99% effectiveness is a good performance for an air intake louver, it still has some magnitude of rain penetration. Additionally, the larger the louver or the greater the number of louvers on a job, the greater the total rain penetration. This is due to the increased louver square footage. Thus, the question becomes: **Are engineers aware of the magnitude of rain penetration they are specifying?**

**NOTE:** It should be pointed out that traditional old style “storm-proof” louvers have, at best, a Class D performance rating. Thus, a significant improvement in rain penetration performance can be gained by specifying an AMCA WDR Louver with a Class A rating.

- AMCA has also established two simulated rainfall rates that the louvers can be tested to. They are **3 or 8 inches of rain per hour**. Additionally, there are two simulated wind rates that the louvers can be tested to. They are **29 or 50 mph**. Finally, there are 8 air intake test velocities for each WDR Louver performance rating at a given Wind Speed and Rainfall Rate. These 8 test points are at zero, 100, 200, 300, 400, 500, 600 and 700 fpm air intake velocities.
- The following table illustrates that the Air Intake Velocity is different for each WDR test point at a given wind and simulated rainfall rate.

29 mph Wind & 3"/ hr Rainfall Rate								
Intake Face Velocity (fpm)	0	100	200	300	400	500	600	700
WDR Classification Rating	A	A	A	A	B	B	C	D

50 mph Wind & 8"/ hr Rainfall Rate								
Intake Face Velocity (fpm)	0	100	200	300	400	500	600	700
WDR Classification Rating	A	B	B	C	C	C	D	D

As you can see, a WDR louver can have several different Classifications with the same louver design! The example above shows that **a given louver design can have all 4 Water Penetration Classifications, from good to poor, depending on the Wind Speed and Air Intake Velocity used.**

Thus, one must be careful to insure that the Classification rating desired is based on the Wind Speeds and Air Intake Velocities expected for the project.

We recommend that a WDR louver be specified for the best water penetration performance possible, for all 8-test points, at the desired Wind Speed and Rainfall Rate for the project.

**Air Balance Inc.** has several models with excellent rain penetration ratings at all 8 test points. The following lists the products available with these superior ratings.

29 mph Wind & 3"/ hr Rainfall Rate								
Intake Face Velocity (fpm)	0	100	200	300	400	500	600	700
Model	WDR Classification Rating							
A420	A	A	A	A	A	A	A	A
A590	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
A620	A	A	A	A	A	A	A	A
A667 VWD	A	A	A	A	A	A	A	A

50 mph Wind & 8"/ hr Rainfall Rate								
Intake Face Velocity (fpm)	0	100	200	300	400	500	600	700
Model	WDR Classification Rating							
A420	A	A	A	A	A	A	A	A
A590	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
A620	A	A	A	A	A	A	A	A
A667 VWD	A	A	A	A	A	A	A	A

**NOTE:** It should also be pointed out that the AMCA test at a 3" per hour rainfall rate and 29 mph wind speed is the same test that is recognized in Europe and tested under **the HEVAC test standard**. The Europeans also classify their rain penetration ratings with the A, B, C and D designations noted earlier. Thus, AMCA has carried the WDR testing performance one step further by adding rain penetration ratings for an 8 inch / hour rainfall rate at a wind speed of 50 mph.