

PRODUCT APPLICATION

A technical bulletin for engineers, contractors and students in the air movement and control industry

Wind-Driven Rain Testing for Louvers

Different regions of the world often require special considerations for building construction and component design to withstand harsh weather. One consideration is for climates where severe wind and rain events, such as hurricanes, occur. Typical louvers were not designed to handle these extreme conditions. Engineers, architects and building owners requested louvers with higher levels of protection. Multiple organizations including the Air Movement and Control Association, International, Inc. (AMCA), developed louver performance test standards addressing concerns that apply specifically to buildings exposed to extreme weather events. Once the test standards were developed, louver manufacturers developed a new class of louver referred to as the wind-driven rain louver.

The following describes the testing requirements used (*Table 1*) for these common test standards:

1. AMCA 500-L Water Penetration
2. AMCA 500-L Wind-Driven Rain
3. AMCA 550 High Velocity Wind-Driven Rain

	AMCA 500-L Water Penetration	AMCA 500-L Wind-Driven Rain	AMCA 550 High Velocity Wind-Driven Rain
Sample Size	48 in. x 48 in. Outside Dimension	1 m x 1 m Core Dimension	1 m x 1 m Core Dimension
Water Application Method	Wetted Wall and Simulated Rainfall	External Spray	External Spray
Water Rate	4 in. / hr.	3 in. / hr. or 8 in. / hr. optional	8.8 in. / hr.
External Air Movement (Wind-Driven)	N/A	29 mph or 50 mph optional	35, 70, 90 and 110 mph
Internal Air Movement (Drawn Through)	Max of 1250 fpm free area velocity	0, .5, 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5 and 5 m/s core area velocity	N/A
Duration	15 min. per test velocity	30 min. per test velocity	15 min.: 35, 70 and 90 5 min.: 110 mph
Water Carry-Over Limit	Beginning point of water penetration @ .01 oz. of water per sq. ft. of free area	Effectiveness ratings: A = 99% to 100% B = 80% to 98.99% C = 80% to 94.99% D = <80%	Less than 1% of total water sprayed can pass throughout the duration of the test
Certification	AMCA 511 Certified Ratings Program	AMCA 511 Certified Ratings Program	AMCA 512 Listing Program

Table 1 - Compares Test Requirements for Each Standard

Manufacturers are not required to test in accordance with any or all test standards. However, a manufacturer may opt to test a louver to one or all standards. To evaluate each manufacturer's performance claims effectively, it is important to understand the differences between the different test standards.

AMCA 500-L Water Penetration Test

The least demanding test standard most manufacturers test louvers to is the AMCA 500-L Water Penetration test. This test is a simulation of a four-inch per hour rainfall with a wetted trough mounted directly above the louver test specimen. Air is pulled through the louver using a fan that is ducted to the back of the louver, gradually increasing the velocity from zero to 1250 feet per minute (fpm). The test determines the beginning point of water penetration. The definition of the beginning point of water penetration is the point when .01 oz. of water per square foot of louver free area passes through the louver. The test does not introduce external air movement, which would simulate wind. It simply simulates rainfall falling vertically. (Figure 1)

AMCA 500-L Wind-Driven Rain Test

Louvers tested using the AMCA 500-L Wind-Driven Rain standard are a better option for locations where wind-driven rain is a factor or having less features in place to manage the water that does pass. (Figure 2) In this test, an external face wind is applied using water jets placed in front of the louver simulating a wind-driven rain. Airflow pulled through the louver using a fan ducted to the louver simulates air intake into the building. Simulated rainfall of three inches per hour is applied from the exterior along with a 29 mph face wind. Effectiveness ratings are taken at 11 velocities applied with the internal fan simulating air intake. These ratings appear on a chart showing whether the louver has an A, B, C or D ratings at the various velocities. Because 11 points of velocity are checked, a given louver could potentially receive each of the four ratings. For example, a louver may reject 99.5% of the water when tested at 98 fpm, giving it an A effectiveness rating. However, the louver may be only 97% effective, causing it to receive a B effectiveness rating when tested at 492 fpm.

AMCA 500-L - Water Penetration Test Arrangement

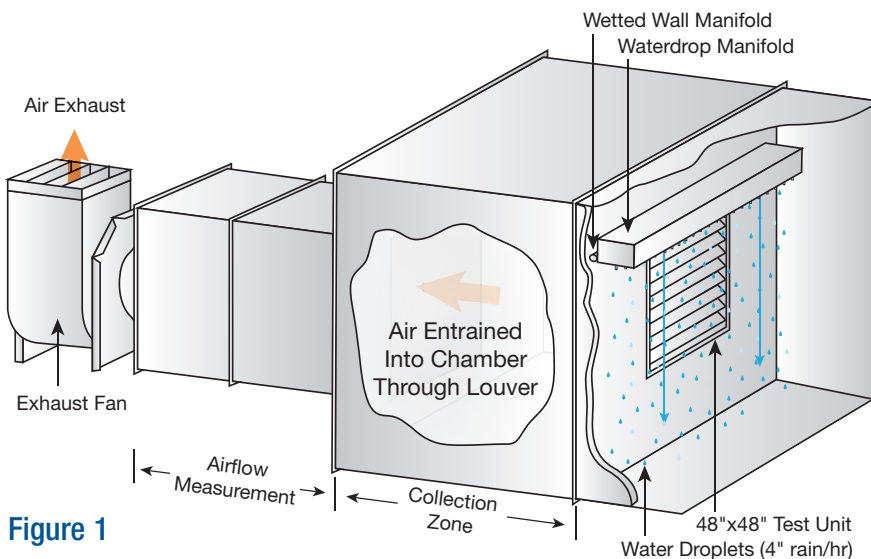


Figure 1

AMCA 500-L - Wind-Driven Rain Test Arrangement

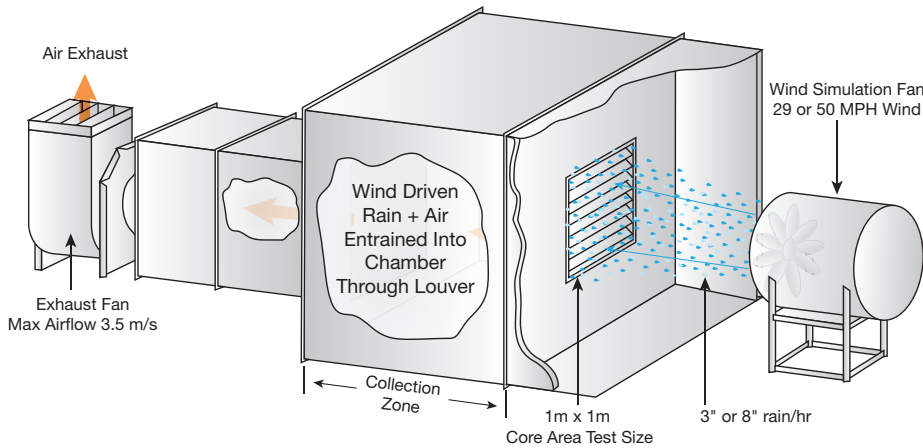


Figure 2

This test also has an optional portion that applies an eight-inch per hour of rainfall with a 50 mph face wind.

AMCA 550 High Velocity Wind-Driven Rain Test

Of the test standards used by louver manufacturers today, the AMCA 550 High Velocity Wind-Driven Rain test is the most demanding. This test identifies louvers suitable for use in the Hurricane Prone Region as defined by the International Building Code (IBC) where AMCA 550 louvers are required per the International Mechanical Code (IMC). The Florida Mechanical Code (FMC) also requires the use of AMCA 550 louvers. No fan simulating air intake is used in this test. The backside of the louver instead has an open plenum with a water collection system to catch water that passes. The removal of the fan eliminates any chance of water being removed from the airstream by passing through the entire system.

Water nozzles placed 10 feet from the front of the louver simulates an 8.8-inch per hour rainfall. This test uses multiple wind speeds for varying lengths of time. The test begins with a 35 mph wind for 15 minutes followed by a 5-minute period with no airflow. A 15-minute period each of 70 and 90 mph wind follows with a 5-minute period with a 0 mph wind. Finally, the louver receives a 110 mph wind to its face for another 5 minutes. Less than 1% of the total water sprayed during this period is allowed to pass through the louver in order for the louver to receive the AMCA 550 Listing (Figure 3).

AMCA 550 / High Velocity Wind-Driven Rain Test Arrangement

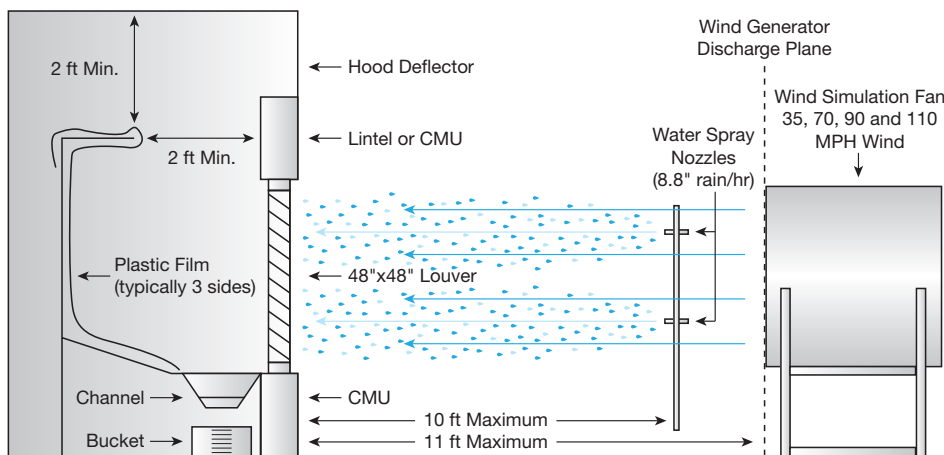


Figure 3

Summary

Any louver can be tested to and receive a beginning point of water penetration rating using the AMCA 500-L Water Penetration test shown in Figure 1. Any louver model can be tested using the AMCA 500-L Wind-Driven Rain test shown in Figure 2, however, only the best performing models will be able to achieve an A rating as the test progresses. Finally, models for use in the Hurricane Prone Region must comply with AMCA 550 High Velocity Wind-Driven Rain test to meet IMC and FMC requirements. With the wide variety of certified and listed products available, you can be sure to find the correct louver for your project's location and application.

Benefits of AMCA Certified Ratings and Listing Programs

Using products that bear the AMCA seal ensures the performance data found on the product submittal is accurate. The AMCA Certified Ratings Program encompasses the AMCA 500-L tests relative to louvers. These provide beginning points of water penetration or ratings allowing for quick comparisons of various products to see which meet the requirements and how it compares to other products on the market. These products have an AMCA sticker indicating testing for air, water and/or sound. The AMCA Listing Program, which applies to the AMCA 550 test, is similar; however, this program only indicates whether the product passed or failed. These bear a sticker that shows the products are part of the AMCA Listing Program along with the passed tests that apply.