

# ENGINEERING REPORT

## TOPIC: LOUVER WATER PENETRATION TESTS

Report No. 502:1

MAY, 2002

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Water penetration resistance is one of the most important functions of wall louvers. For many years, the standard water penetration test utilized by U.S. louver manufacturers has been a “still air” test, with no consideration for the effect of wind driven rain. More recently, wind driven rain penetration tests have become available and many manufacturers have developed new louver models to provide protection in these weather conditions. The Air Movement and Control Association International (AMCA) has developed standards for both standard and wind driven rain water penetration tests. Following is a summary of the two tests.

### AMCA 500-L-99 Water Penetration Test

#### Purpose:

A benchmark comparison for different louver models, not necessarily indicative of actual louver performance in service conditions.

#### Specs:

Louver Test Sample: 48” x 48” (1.2 x 1.2), mill finish, no screen

Water Application Method: wetted wall above louver and manifold above louver simulating rain drops

Water Flow: 4” (102) per hour rain

Airflow: Maximum 1,250 fpm (6.3) through the louver free area drawn through louver from the rear. No air is blown at the louver face (no wind)

Test Duration: 15 minutes minimum

#### Test description:

The test louver is installed exterior face out in test chamber. Airflow is pulled through the louver from the rear as water is applied via manifold and wetted wall system. Water that penetrates the louver collects inside the test chamber and is measured after the test period.

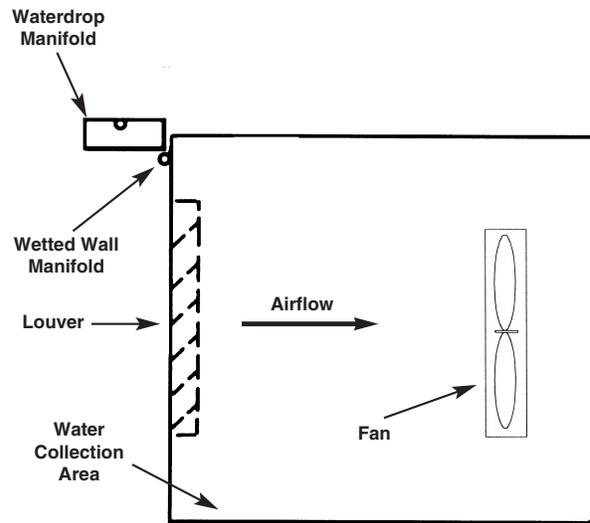
#### Performance:

Performance is presented as a mass (weight)

of water that penetrates a square foot of the louver’s free area at a certain free area velocity. The “beginning point of water penetration” is considered to be when .01 oz. water penetration per square foot ( $3g/m^2$ ) of louver free area occurs.

#### Products & Features:

Generally, this test is performed on traditional horizontal blade wall louvers. Drainable blade models provide better performance because the gutters in their blades and downspouts in the side frames capture and drain water out of the airstream. Some of the many Ruskin products tested in the AMCA Water Penetration Test include the ELF375DX and ELF6375DX models.



AMCA WATER PENETRATION CHAMBER

### AMCA 500-L-99

#### Wind Driven Rain Water Penetration Test

##### Purpose:

To determine a louver’s ability to reject wind driven water penetration while operating under system airflow conditions.

##### Specs:

Louver Test Sample: 39.38” x 39.38” (1 x 1) core area or 48” x 48” (1.2 x 1.2) outside

dimension, mill finish, no screen

**Water Application Method:** four spray nozzles installed in the airstream.

**Rainfall Rate:** standard test: 3" (75) per hour, extended range test: 8" (200) per hour

**Wind Velocity:** standard test: 29 mph, (13 m/s), extended range test: 50 mph (22.4 m/s).

**Airflow:** zero to 689 fpm (3.5 m/s) through the louver core (louver face area less the perimeter frame faces), increasing 98.4 fpm (.5 m/s) per each interval.

**Test Duration:** at least 30 minutes at each airflow rate.

### Test Description:

The test louver is installed in the chamber exterior face out. The wind simulator fan blows at the face of the louver while the four water spray nozzles mounted in the airstream spray water at the louver face. Water is sprayed through one nozzle at a time in an alternating sequence. System airflow is pulled by another fan through the rear of the louver. Water that penetrates the louver collects inside the test chamber and is measured during the test. Test intervals are run at each airflow rate and are complete when a minimum of four consecutive readings of water penetration values within the steady state tolerance have been noted.

Before a louver is tested, check tests are performed utilizing a plate with an opening the same size as the louver's core. Adjustments to the water flow rate and nozzle positions are made during the check tests to produce the required water penetration through the core area.

### Performance:

Performance is measured by the amount of water rejected by the louver that penetrates the open test plate under the same conditions. It is presented as a water rejection effectiveness or efficiency percentage at a core velocity airflow. Four rejection classes are utilized:

**Class A – 100 to 99% efficiency**

**Class B – 98.9 to 95% efficiency**

**Class C – 94.9 to 80% efficiency**

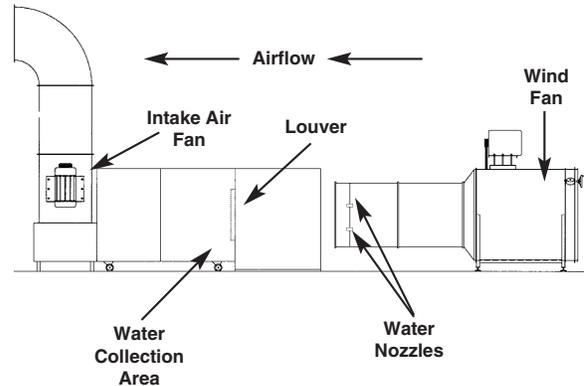
**Class D – Below 80% efficiency**

An example of performance would be 99%, or class A, efficiency at 591 (3.0 m/s) core velocity.

### Products & Features:

Louvers that successfully perform the Wind Driven Rain test are generally of "Wind Driven Rain Resistant" design, featuring close blade spacing and sophisticated blade profiles.

Vertical blade models usually provide the best performance. Wind driven rain resistant louvers provide much better water penetration resistance than identically sized standard louvers while handling the same or higher airflow volumes. Ruskin offers the EME6625 and EME520DD with AMCA Wind Driven Rain certification.



Wind Driven Rain Test Chamber

### SUMMARY

Now, design professionals have two AMCA test standards to choose from when selecting louvers for their applications. The standard **Water Penetration Test** is a good benchmark for comparing standard wall louvers with system airflow in no-wind conditions. Models certified in this test are still widely used because of their economical price. They are also usually simple in design when compared to wind driven rain louvers, making them more suitable for custom fabrication to accommodate the special installation needs of specific projects. However, consideration should be given for potential water penetration when sizing and installing this type of louver. They should be sized so that the free area velocity through the louver is below the beginning point of water penetration velocity to allow for potential wind effects. Installations utilizing standard louvers should also incorporate means of managing water penetration, such as floor drains in mechanical rooms. Designing ductwork and plenums with drains, sloped bottoms and connections to the tops of louver water stops will also lessen the potential of water penetration problems.

The **Wind Driven Rain Water Penetration Test** provides a better indication of louver performance under actual storm conditions. Models certified in this test provide the most protection from water penetration and can furnish solutions to high volume/limited opening size problems. Wind driven rain resistant

louvers may be more difficult to modify for special applications due to their design. They also are generally more expensive due to a higher material and labor content. However, for applications where minimal water penetration is an absolute must, these louvers should be utilized. The higher initial cost of wind driven rain resistant louvers can be offset in many ways; reduced overall size of louvers due to their higher airflow capacity, less water management requirements for the duct-

work/plenums and less building maintenance costs resulting from water penetration damage. Additionally, their prevention of water infiltration can reduce the potential of mold growth and “sick building” symptoms. Ruskin and other louver manufacturers are continuously updating and improving wind driven rain designs to make them more economical and to offer more aesthetic and installation flexibility. These models represent the “next generation” of louver products.

## LOUVER PERFORMANCE CHARTS

BASED ON 48” x 48” (1.2 x 1.2) SIZE

MODEL	DESCRIPTION	FREE AREA	WATER PENETRATION
ELF375DX	Standard design, 4” (102) deep, drainable blade	8.58 ft <sup>2</sup> (.80m <sup>2</sup> )	.01oz @ 873 fpm (3 g/m <sup>2</sup> @ 266 m/min)
ELF6375DX	Standard design, 6” (152) deep, drainable blade	9.08 ft <sup>2</sup> (.84m <sup>2</sup> )	.01oz @ 1023 fpm (3 g/m <sup>2</sup> @ 312 m/min)
EME520DD	Wind driven rain design, 5” (127) deep, horizontal blade	6.99 ft <sup>2</sup> (.65m <sup>2</sup> )	above 1250 fpm (above 381 m/min)
EME6625	Wind driven rain design, 6” (152) deep, vertical blade	6.80 ft <sup>2</sup> (.63m <sup>2</sup> )	N/A

MODEL	WIND DRIVEN RAIN RESISTANCE	INTAKE PRESSURE DROP (PASCALS)	MAXIMUM VOLUME
ELF375DX	N/A	.15” @ 873 fpm (37.4 @ 266 m/min)	7490 cfm* (212 m <sup>3</sup> /min)
ELF6375DX	N/A	.16” @ 1023 fpm (39.8 @ 311 m/min)	9289 cfm* (263 m <sup>3</sup> /min)
EME520DD	99.3% @ 1139 fpm 5.8 m/min)	.18” @ 1139 fpm (44.8 @ 346 m/min)	7962 cfm (225 m <sup>3</sup> /min)
EME6625	99.3% @ 1528 fpm 7.8 m/min)	.20” @ 1528 fpm (49.8 @ 465 m/min)	10390 cfm (293 m <sup>3</sup> /min)

### Notes:

- \* indicates volume derived from velocity at beginning point of water penetration. Actual design volume should be less to allow for potential wind effect.
- EME520DD wind driven rain resistance

data is from standard 3” per hour/29 mph (75 mm/hr 13 m/s) test.

- EME6625 wind driven rain resistance data is from extended range 8” per hour/50 mph (200 mm/hr 22.4 m/s) test.

# RUSKIN LOUVER MODELS



**ELF375DX**  
**4" Deep Standard**  
**Drainable Design**



**ELF6375DX**  
**6" Deep Standard**  
**Drainable Design**



**EME520DD**  
**5" Deep Wind Driven**  
**Rain Resistant Design**



**EME6625**  
**6" Deep Wind Driven**  
**Rain Resistant Design**

***RUSKIN***<sup>®</sup> *Specified By Many – Equaled By None*