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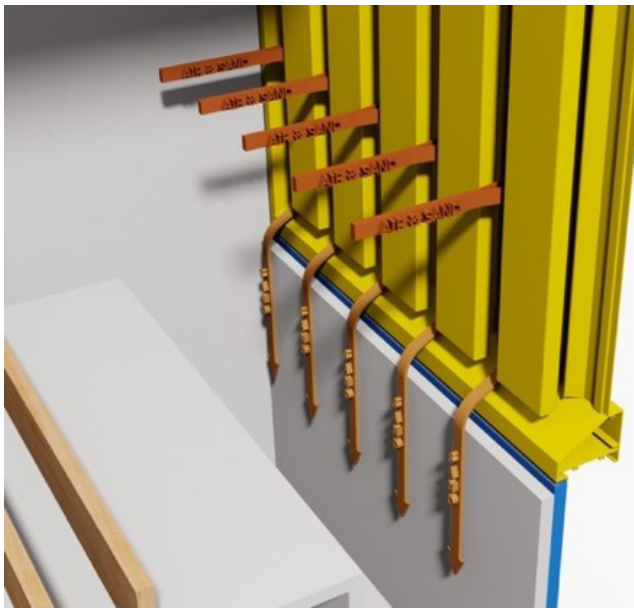
# How to Specify AMCA-Certified Sand Louvers

**An AMCA International White Paper**



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**AUTHORED BY THE AMCA INTERNATIONAL SAND LOUVER COMMITTEE**

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# How to Specify AMCA-Certified Sand Louvers

## ABSTRACT

**This white paper describes how airborne sand has posed an increasing challenge for HVAC service technicians and how and how specifying AMCA-certified sand louvers can help mitigate sand-related problems.**

For building owners in Persian Gulf countries, sand storms have long been a fact of life and a threat to HVAC equipment. For this reason, there is growing global attention on the quantity of sand that moves through the louvers installed on building facades and casements of equipment penthouses and enclosures. But a great help has been introduced in this struggle against sand penetration, and that is the introduction of louvers specifically designed, tested and certified to reject sand.

The Air Movement and Control Association International (AMCA) and its members have worked to improve the integrity of sand louver ratings and to make them simpler to specify. AMCA is a global association of manufacturers of louvers, fans and other dampers, as well as other air-system products. The association, which formed in 1917, has been administering the AMCA Certified Ratings Program (CRP) for nearly 75 years. In 2016, AMCA published an ANSI-accredited test procedure for rating wind-driven sand rejection, and the CRP expanded to include certification of wind-driven sand rejection for louvers.

This white paper describes the wind-driven sand problem, the AMCA test standard and ratings certification and how to specify AMCA-certified sand louvers for your next project.

Sand louver with a plate containing holes for sand to exit. *Image courtesy of Ruskin Titus Gulf.*

## AIRBORNE SAND PROBLEMS

HVAC equipment needs prescribed amounts of outdoor air to function properly, and that air is typically provided through weatherproof ventilation louvers installed on building facades. When an airstream loaded with sand particles makes its way through the louvers, it deposits the sand onto the floors and in the air near machinery, which then clogs the air filters of HVAC equipment in mechanical rooms.

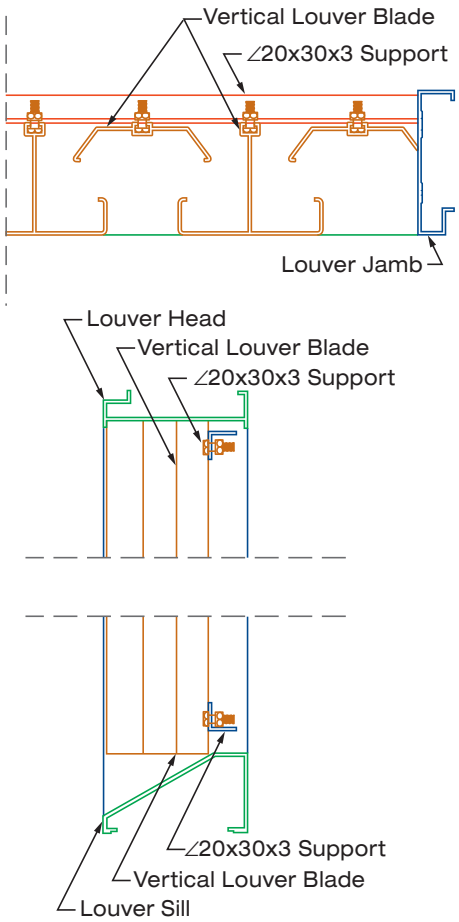


Figure 1. Cross section of a sand trap louver showing how sand is stripped from the airstream and allowed to fall to a bottom rail and fall toward the ground outside the building. *Image courtesy of McGill Architectural Products.*

These sand-related problems have created real costs for HVAC service companies. MERV-rated air filters intercept low-range particle sizes of 0.3–10 microns and up to 62.5–80 microns on the high range. As the filter becomes clogged, energy use increases, and the resistance to airflow takes a toll on the air handling unit compensating for the blockage of airflow. Building owners, then, will deal with more than the need to frequently replace air filters; they will also see sand intrusion drive up utility bills and take a toll on their equipment.

More severe costs begin to accumulate as well. The reduced airflow from clogged air filters can cause a chain reaction of costly problems. Insufficient airflow through a heating and cooling system can cause overheating of the air handling unit, heat exchanger and generator, which in turn can cause a premature shutoff. If that shutoff happens too often, the electronic limit switch safeguard can fail, and then the air handling unit will not function until it is serviced. Parts and labor for this can easily cost in the $200 range.

Cleanup costs will also begin to mount for a building in a sand-afflicted zone. Sand needs to be removed from floors, ducts, air handling units, rooftop air conditioners and other air-system components. Service calls are frequent, creating a drain on time and budget.

These are all preventable expenses, because there exists a cost-effective means of trapping sand and depositing it on the ground along the building façade. This solution is the sand louver. Basically, sand lovers are prefilters. They solve the problem of excessive sand intrusion before the building envelope is even breached.

## A HISTORY OF THE PREFILTER SOLUTION

The use of sand louvers as prefilters is relatively new, only beginning to come into use in the 1980s. Historically, the HVAC industry has relied on filters *inside* HVAC and other mechanical equipment, rated in accordance with two different ASHRAE test standards: ASHRAE Standard 52.1[1], which rates filters according to dust spot efficiency, and ASHRAE Standard 52.2[2], which rates filters for minimum efficiency reporting value. ASHRAE 52.1 has been withdrawn, so ASHRAE 52.2 is the active ASHRAE filter-rating standard.

Additionally, wind-driven particles traveling at high speeds would be intercepted by a fan unit's filters, rated in accordance with ASHRAE 52.2. Conventional louvers not tested for sand infiltration allow wind-driven sand and dust particles travelling at high speed to be intercepted by MERV filters, and this sand penetration leads to rapid clogging and choking of the ventilation equipment. Only frequently-scheduled or alarm-driven maintenance measures can prevent this. The problem is compounded since, over the last decade, HVAC equipment has become more air-quality sensitive. Some facilities report as much as an 80% increase in maintenance cost due to dust/sand infiltration, and that substantial increase is not an anomaly—it is a trend. The need for a prefilter solution appears to only be increasing as HVAC equipment technology advances.

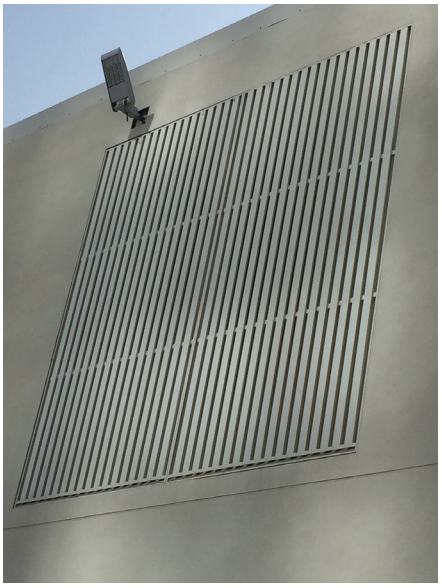

Figure 2. Sand louver with inclined plate, usually called a drain sill. *Image courtesy of Ruskin Titus Gulf.*

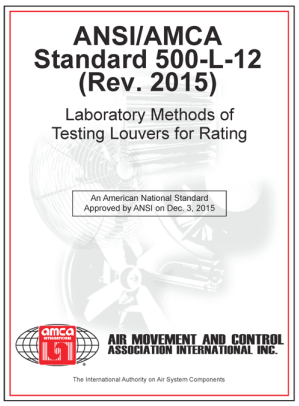


Figure 3. Current ANSI/AMCA Standard 500-L cover. *Image courtesy of AMCA International*

## SAND LOUVERS TO THE RESCUE

Sand louvers are increasingly chosen as a solution by building managers who struggle with wind-driven sand, as the equipment shields their building from sand before it becomes a problem. When airstreams with windborne sand impinge on the face of the louver blade, the terminal velocity of the airborne sand particle is greatly reduced. Gravity pulls the particles to the sloped louver sill before depositing them on the ground outside the building, sweeping them away from the clean airstream that passes through the louver blade gaps. (Figure 1).

Sand that is stripped from the airstream will fall to the bottom of the louver and exits via a sloped sill (Figure 2). Typically, this sand simply then blows away.

## ANSI/AMCA STANDARD 500-L—A NEW TEST STANDARD FOR SAND-RESISTANCE

There is no contesting that the prefiltering action of sand louvers can provide significant savings in maintenance. But building manufacturers must also be certain that sand louvers perform as promised. It is important that there be a standard way to put sand louvers to the test and evaluate their effectiveness.

In January 2016, AMCA International published a new test standard within its ANSI-accredited Standard 500-L, *Laboratory Methods of Testing Louvers for Rating*[3] (Figure 3). ANSI/AMCA Standard 500-L already had rating test procedures for air pressure drop, wind-driven rain and other conditions. A test for wind-driven sand resistance was added in the new version.

When developing the sand louver test, the following qualities were considered:

- fairness
- repeatability
- performance rating
- comparable testing
- airborne particle size
- mass distribution
- re-entrainment

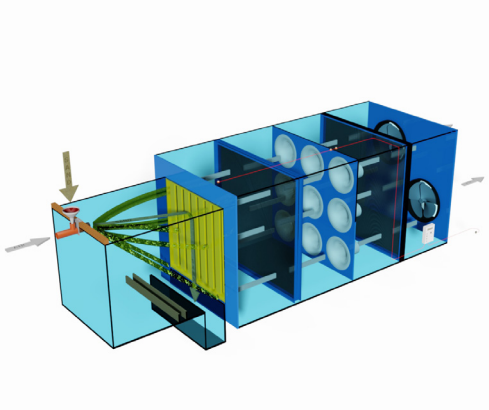

Figure 4. Test louver rig for sand louver testing at Thomas Bell-Wright Independent Consultants, Dubai. *Image courtesy of McGill Architectural Products.*

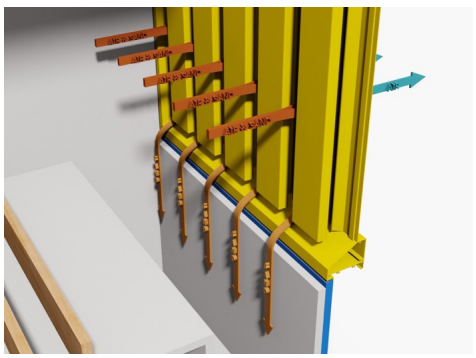

Figure 5. Close up of the sand louver free area under test. *Image courtesy of McGill Architectural Products.*

The new standard addresses wind-driven sand of particle sizes ranging from 74–699 microns. It adds a new, self-cleaning prefiltration media for the ventilation industry. The essential test output is sand rejection effectiveness ($E_s$), which is defined by ANSI/AMCA Standard 500-L as the total mass of sand rejected divided by the total mass of sand injected times 100. $E_s$ is reported as a percentage. The airflow pressure drop measurement through the airflow chamber also is reported, and it is certified by AMCA as "air performance."

ANSI/AMCA Standard 500-L also defines a new wind-driven sand simulation rig that is capable of producing an airflow rate through the sand louver's free area under test over the range of 1 m/s (197 fpm) to 7 m/s (1,378 fpm). These rates are consistent with the common airflow specifications used by most of the HVAC designers for inlets through louvers.

The test rig (Figures 4 and 5) was constructed by Thomas Bell-Wright Independent Consultants in Dubai, which is an AMCA independent accredited laboratory after undergoing rigorous certification procedures. Tests are conducted on a louver with outside dimensions of 1220 mm x 1220 mm (48 in. x 48 in.) with a tolerance of +0, -6.3 mm (+0, -0.25 in.). Sample products are required to be as-built, unpainted, cleaned, degreased and without additional factory-applied coating on the product surface. They are tested in the full open position without a screen across the air passages of the louver.

The wind-driven sand chamber is equipped with ducted sand injector equipment capable of blowing calibrated sand, in accordance with ISO 14688-1 and ISO 14688-2, at an air velocity of 20–25 m/s (Figure 6). ANSI/AMCA Standard 500-L requires the test sand to be dry and to have particles size distributions conforming to Table 1, which closely resembles desert sand.

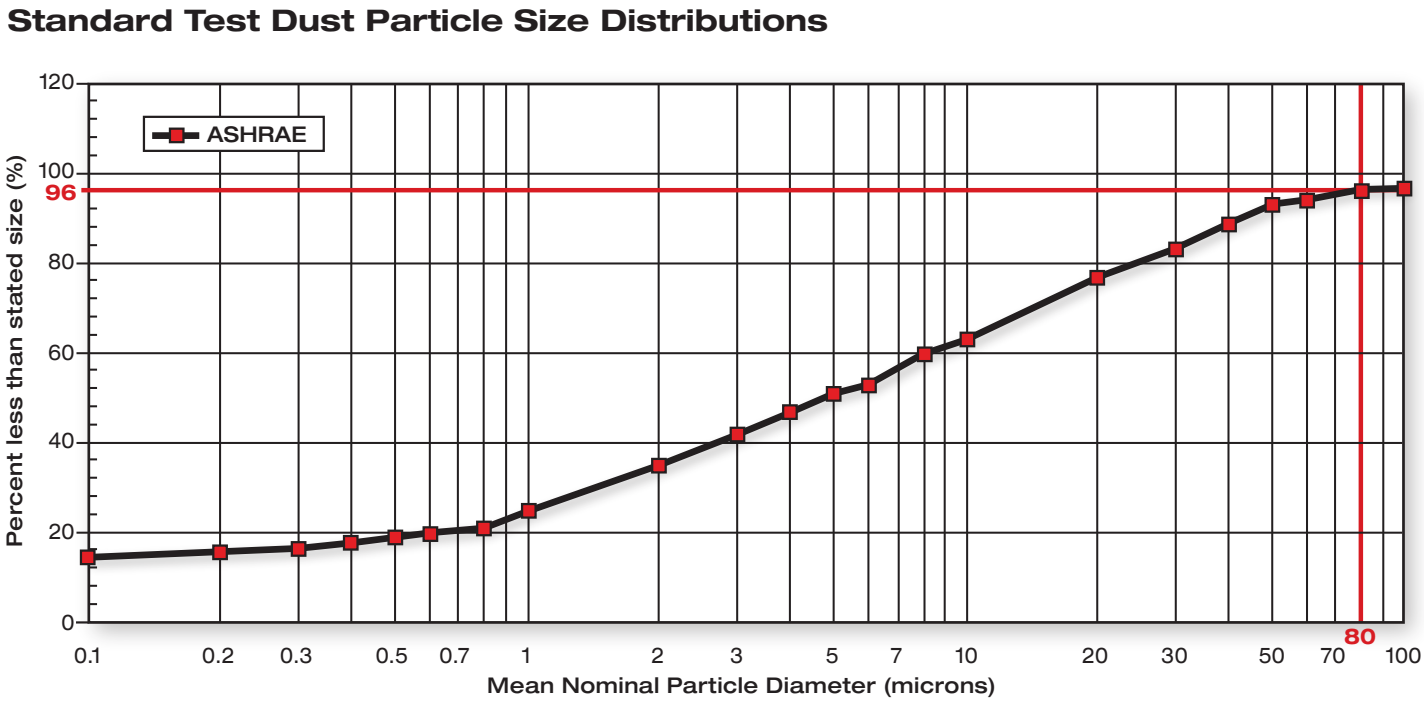


Figure 6. Standard test dust particle size distributions for different test procedures. *Image courtesy of McGill Architectural Products.*

| Grade (µm) | Mass (%) |
|---|---|
| >699 | 0.5 |
| 423-699 | 3.0 |
| 353-422 | 12.0 |
| 251-352 | 30.0 |
| 211-250 | 20.0 |
| 152-210 | 27.0 |
| 104-151 | 6.0 |
| 76-103 | 1.0 |
| <76 | 0.5 |

Table 1. Requirements for standard test sand (Table 8 from ANSI/AMCA Standard 500-L.


Figure 7. AMCA Certified Ratings Program seal for sand louvers. *Image courtesy of AMCA International.*

In addition to publishing a sand louver test standard, AMCA International amended its certified ratings program, allowing for the certification of sand louver ratings test data and manufacturers' published catalog data. AMCA Publication 511[4] outlines the procedures for certifying sand louvers and explains how a product can be licensed to bear the AMCA Certified Ratings Program seal (Figure 7).

## HOW TO SPECIFY AMCA-CERTIFIED SAND LOUVERS

Seven manufacturers now have AMCA-certified sand louvers, assuring that ample products exist for off-the-shelf sand louvers for new construction and retrofit projects. Additional manufacturers have products undergoing rigorous ratings tests and certification, so the list of AMCA-certified sand louvers is growing fast.

You can improve system designs and specifications by specifying AMCA-certified sand louvers. Just add the sentence below to your specifications and enforce it throughout the procurement process:

> *The sand louver shall be tested in accordance with AMCA Standard 500-L and licensed to bear the AMCA Certified Ratings Program seal for air performance and wind-driven sand in accordance with AMCA Publication 511.*

## CONCLUSION

Increased cleaning frequency, overheating fans, frequent air filter replacements, system downtime to accommodate sand-related service calls—without the prefiltering effect of sand louvers, the costs of maintenance in desert or coastal areas are high. Sand intrusion takes a toll on the market.

The new AMCA testing procedure and certification of ratings will help establish a credible foundation for evaluation of these cost-saving pieces of equipment. Architects, engineers and building owners will not only be able to accurately evaluate the benefit of sand louvers; they will also be able to better understand the specific performance requirements for effectiveness for their projects.

## REFERENCES


1 ASHRAE Standard 52.1. *Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter*. Atlanta: ASHRAE, 1992.

2 ASHRAE Standard 52.1. *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.* Atlanta: ASHRAE, 2012.

3 ANSI/AMCA Standard 500-L-12 (Rev. 2015). *Laboratory Methods of Testing Louvers for Rating*. Arlington Heights, AMCA, 2015.

4 AMCA Publication 511. Certified Ratings Program—Product Rating Manual for Air Control Devices. Arlington Heights, AMCA, 2015.


## RESOURCES

AMCA International Headquarters and Laboratory
**www.amca.org**

AMCA White Papers
**www.amca.org/whitepapers**

CRP Publications (no cost) and Standards (cost)
**www.amca.org/store**

AMCA Web Page for Sand Louver Resources and Certification
**www.amca.org/sandlouver**

Thomas Bell-Wright
**www.bell-wright.com**


DIN EN 13181:2001. *Performance Testing of Louvres Subject to Simulated Sand*. Berlin: Deutsches Institut fur Normung E.V., 2001.

EN ISO 14688-1:2002. *Geotechnical Investigation and Testing—Identification and Classification of Soil*. Switzerland: ISO, 2002.


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