



# Sand Louvre Test STL-A

Final Report 59314/1

Carried out for  
Century Mechanical Systems Factory LLC

By Andrew Freeth

12 May 2016





# Sand Louvre Test STL-A

Carried out for:

**Century Mechanical Systems Factory LLC**  
PO Box 60270  
Dubai  
UAE

Contract: **Final Report 59314/1**

Date: **12 May 2016**

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# 1 INTRODUCTION

This report concerns tests conducted on a sand louvre to determine the Sand Penetration and the Pressure Drop versus Airflow Curve, with the associated Coefficient of Entry using the test methods contained within EN 13181 : 2001. The work was commissioned by Century Mechanical Systems Factory LLC and was carried out at BSRIA on 11 to 29 April 2016.

## Items received for test

| Test Item | BSRIA ID |
|-----------|----------|
| STL-A     | 59314A1  |

## 1.1 TEST ITEM INFORMATION

|                            |  |
|----------------------------|--|
| <b>Contract</b>            | 59314                                  |
| <b>Date</b>                | 11-4-16                                |
| <b>Manufacturer</b>        | Century Mechanical Systems Factory LLC |
| <b>Louvre Model</b>        | STL-A                                  |
| <b>Material</b>            | Aluminium                              |
| <b>Painted</b>             | White                                  |
| <b>Core Area - Height</b>  | 1008 mm                                |
| <b>Core Area - Width</b>   | 1008 mm                                |
| <b>Blade Pack Depth</b>    | 70 mm                                  |
| <b>Frame Depth</b>         | 100 mm                                 |
| <b>No. of Blades</b>       | 6                                      |
| <b>Blade Pitch</b>         | 150 mm                                 |
| <b>Blade Angle</b>         | 90° to the airflow                     |
| <b>No. of Banks</b>        | 2                                      |
| <b>Guard Type</b>          | Bird/Vermin                            |
| <b>Guard Spacing</b>       | 0 mm                                   |
| <b>Sand Catchment Tray</b> | Yes                                    |
| <b>Blade Orientation</b>   | Vertical                               |

Note: Louvre core area - product of the minimum height H and minimum width W of the front opening in the weather louvre assembly with the louvre blades removed

Blade Pack Depth refers to the distance from front of first bank to rear of last bank

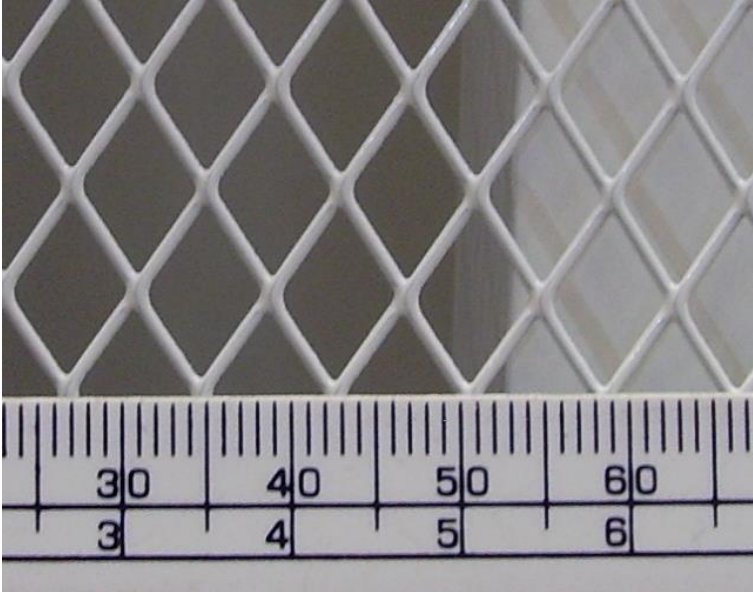
Figure 1 Test item 59314A1 (front)



Figure 2 Test item 59314A1 (rear)

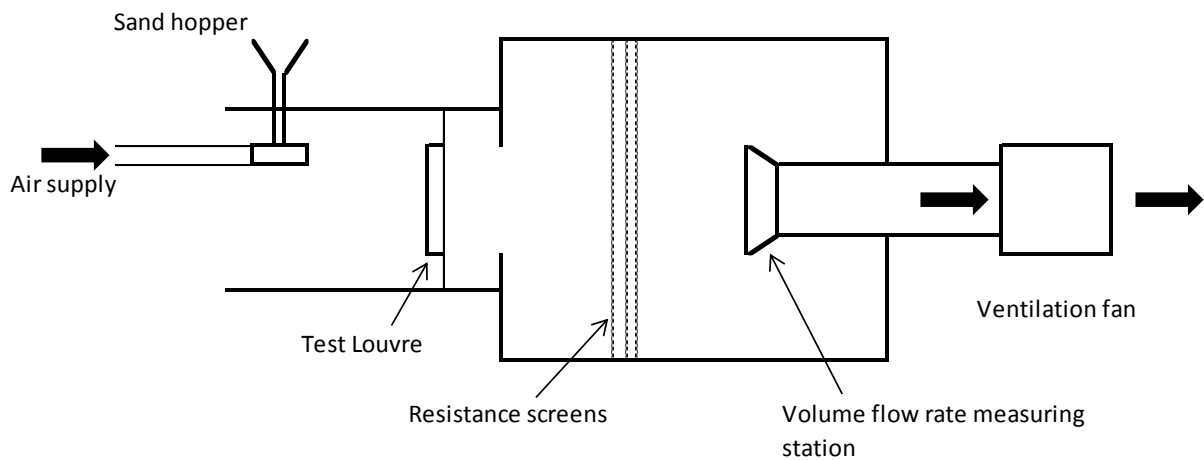


**Figure 3 Close-up of mesh**



## 2 TEST METHOD

A schematic representation of the rig used during testing



The test comprises of two parts:

### 2.1 SAND PENETRATION

The sand louvre is subjected to wind driven sand at an airflow speed of 20 - 25 m/s measured in the injection tube with various sand masses and delivery rates as shown in Table 1 below. In addition to the simulated wind and sand, air is drawn through the louvre at a range of velocities (0, 0.5, 1.3, 2.0, 2.8, and 3.5 m/s, or the maximum achievable). Table 2 shows the graded sand requirements for 1 Kg of standard test sand.

After each sand delivery, the fans are kept running for a further 5 minutes.

The rejected sand in the louvre and in the area in front of it, is collected, weighed and recorded. A range of measurements are taken to give the characteristic curve for the test louvre.

**Table 1 Core air velocities, weights of sand and sand discharge durations**

| Airspeed (m/s) | Sand mass (Kg) | Discharge duration (s) |
|----------------|----------------|------------------------|
| 0              | 1              | Not timed*             |
| 0.5            | 1              | 200                    |
| 1.3            | 1              | 75                     |
| 2.0            | 2              | 100                    |
| 2.8            | 2              | 70                     |
| 3.5            | 2              | 60                     |

\* Note: Although 0 m/s is not required as a test velocity, it has been included for information purposes. For 0 m/s the ventilation fan is turned off.



**Table 2 Standard sand requirements**

| Grade size<br>µm | Mass<br>% | Mass required for 1kg<br>sample (kg) |
|------------------|-----------|--------------------------------------|
| > 699            | 0.5       | 0.005                                |
| 423 to 699       | 3.0       | 0.03                                 |
| 353 to 422       | 12.0      | 0.12                                 |
| 251 to 352       | 30.0      | 0.3                                  |
| 211 to 250       | 20.0      | 0.2                                  |
| 152 to 210       | 27.0      | 0.27                                 |
| 104 to 151       | 6.0       | 0.06                                 |
| 76 to 103        | 1.0       | 0.01                                 |
| < 76             | 0.5       | 0.005                                |

## 2.2 PRESSURE DROP

For this test, the Aerodynamic Measuring Section (AMS) is separated from the main rig. The louvre is then mounted in the upstream opening of the AMS.

Pressure tappings in the plenum walls of the AMS allow measurement of the static pressure within the plenum during testing. The airflow volume is calculated from the differential pressure at the measuring cones. The plenum has a set of settling screens within to produce even flow through the cones and therefore give accurate reading of the total volume.

By adjusting the fan speed, the total airflow through the system varies and therefore changes the pressure on the louvre under test. A range of measurements are taken to give the characteristic curve for the test louvre.

## 2.3 TEST EQUIPMENT USED

| Test equipment         | BSRIA ID | Calibration Expiry date |
|------------------------|----------|-------------------------|
| Airflow cones          | 364      | 9-1-17                  |
| Micromanometer         | 5        | 16-2-17                 |
| Micromanometer         | 682      | 5-1-17                  |
| Scales                 | 219      | 23-3-17                 |
| Sand injection nozzles | 364      | 17-9-16                 |

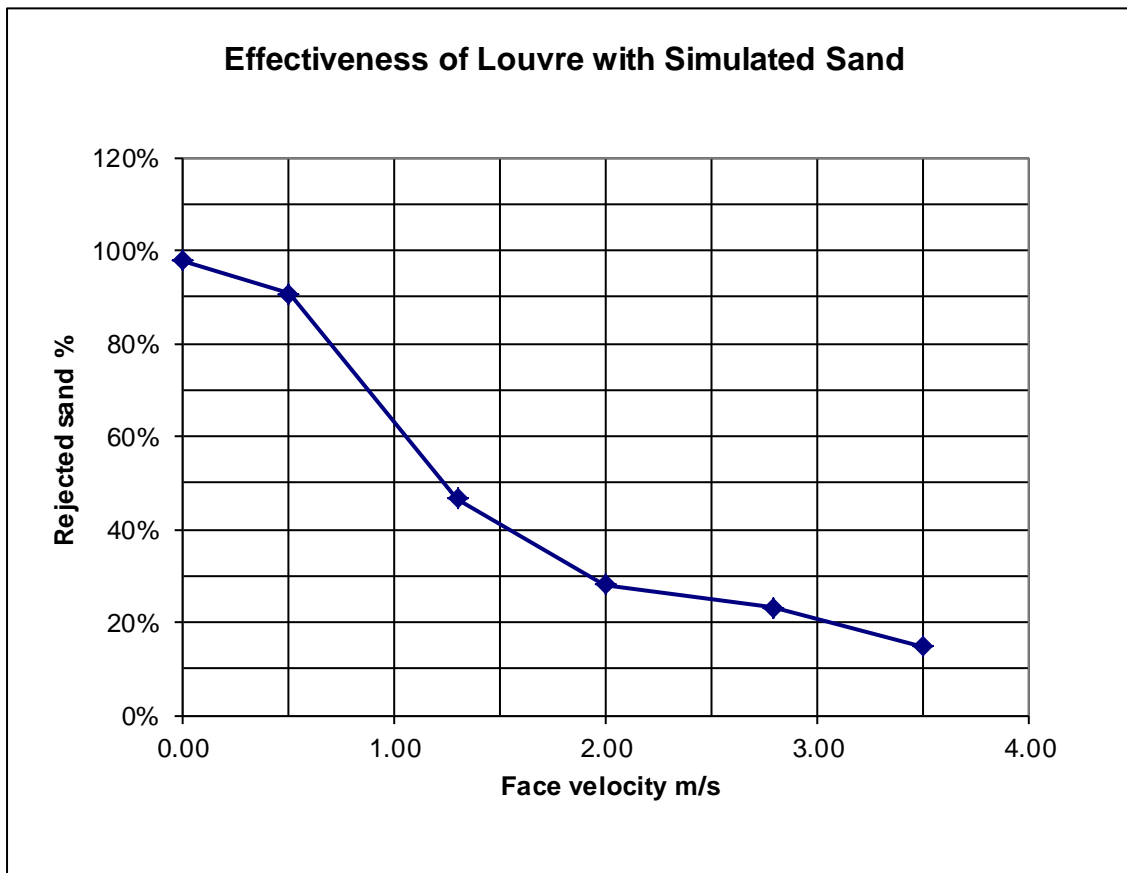
### 3 RESULTS

#### 3.1 SAND PENETRATION

MANUFACTURER Century Mechanical Systems Factory LLC Date 11/04/2016  
 MODEL STL-A Contract 59314

louvre height 1008 mm  
 louvre width 1008 mm  
 louvre area 1.016 m<sup>2</sup>

| VENTILATION RATE            |                 | SAND MASS      |                | Effectiveness |
|-----------------------------|-----------------|----------------|----------------|---------------|
| Volume<br>m <sup>3</sup> /s | Velocity<br>m/s | Injected<br>kg | Rejected<br>kg |               |
| 0.00                        | 0.00            | 1.00           | 0.98           | 98%           |
| 0.51                        | 0.50            | 1.00           | 0.91           | 91%           |
| 1.32                        | 1.30            | 1.00           | 0.47           | 47%           |
| 2.03                        | 2.00            | 2.00           | 0.56           | 28%           |
| 2.84                        | 2.79            | 2.00           | 0.46           | 23%           |
| 3.56                        | 3.50            | 2.00           | 0.30           | 15%           |

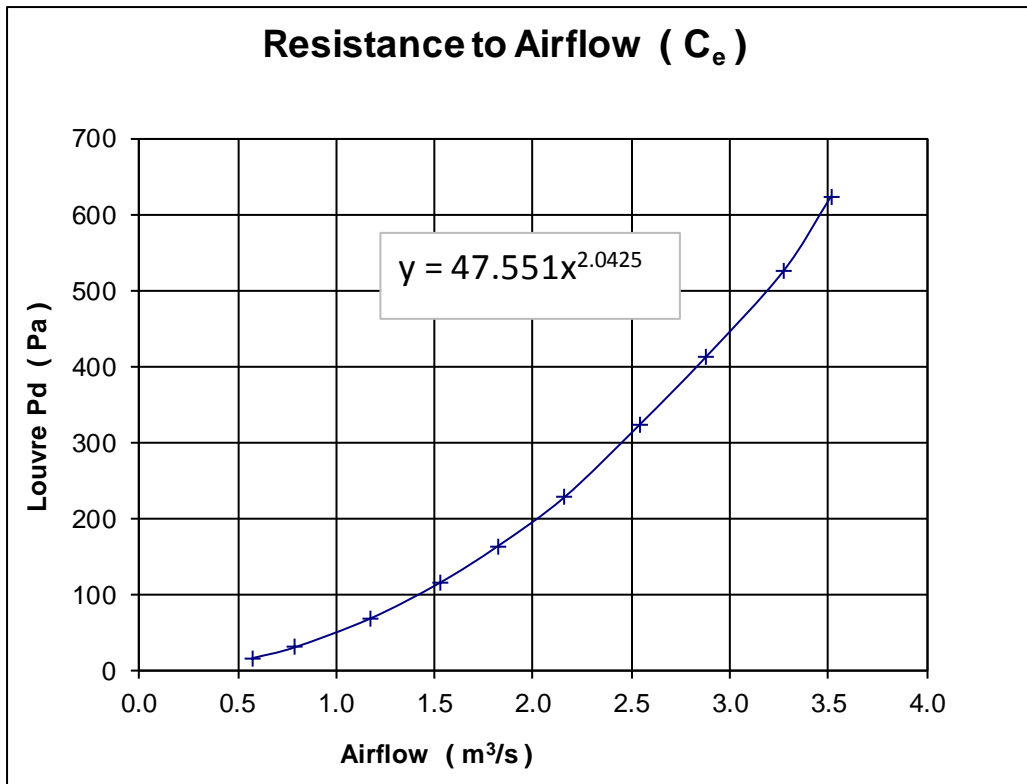


**3.2 COEFFICIENT OF ENTRY**

MANUFACTURER Century Mechanical Systems Factory LLC Date 29/04/2016  
 MODEL STL-A Contract 59314

air temperature 17.3 °C louvre height 1008 mm  
 barometer 1002 mbar louvre width 1008 mm  
 air density 1.197 kg/m³ louvre area 1.016 m²

| louvre pd<br>Pascals | louvre face velocity | air flow rate |                     | coefficient<br>C <sub>e</sub> |
|----------------------|----------------------|---------------|---------------------|-------------------------------|
|                      | m/s                  | test<br>m³/s  | theoretical<br>m³/s |                               |
| 15.2                 | 0.57                 | 0.577         | 5.120               | 0.113                         |
| 29.3                 | 0.78                 | 0.789         | 7.108               | 0.111                         |
| 67.0                 | 1.15                 | 1.172         | 10.749              | 0.109                         |
| 114.0                | 1.50                 | 1.525         | 14.021              | 0.109                         |
| 163.0                | 1.80                 | 1.824         | 16.765              | 0.109                         |
| 227.0                | 2.13                 | 2.160         | 19.785              | 0.109                         |
| 322.0                | 2.50                 | 2.541         | 23.564              | 0.108                         |
| 411.0                | 2.83                 | 2.877         | 26.622              | 0.108                         |
| 524.0                | 3.22                 | 3.271         | 30.060              | 0.109                         |
| 623.0                | 3.46                 | 3.515         | 32.777              | 0.107                         |
| mean C <sub>e</sub>  |                      |               |                     | 0.109                         |
| Class                |                      |               |                     | 4                             |

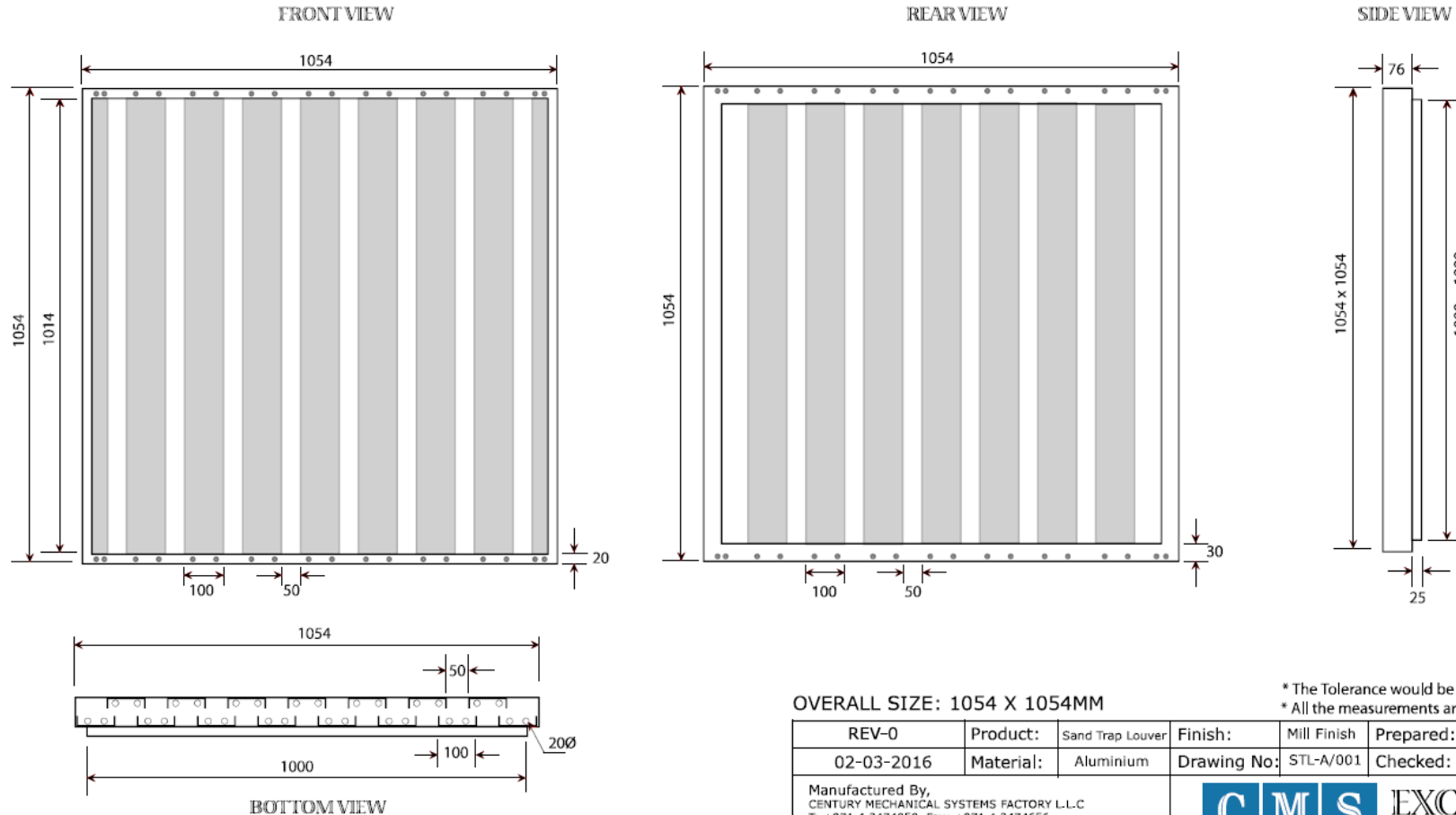


**APPENDIX: A MANUFACTURER’S DRAWING**

**SAND TRAP LOUVER**

Sand Rejection Efficiency Test

Model: STL-A



OVERALL SIZE: 1054 X 1054MM

\* The Tolerance would be ±5mm  
 \* All the measurements are in mm (Inch)

|  |           |                  |             |             |           |         |
|--|-----------|------------------|-------------|-------------|-----------|---------|
| REV-0  | Product:  | Sand Trap Louver | Finish:     | Mill Finish | Prepared: | Kader M |
| 02-03-2016   | Material: | Aluminium        | Drawing No: | STL-A/001   | Checked:  | Prem HS |
| Manufactured By,<br>CENTURY MECHANICAL SYSTEMS FACTORY L.L.C<br>T: +971 4 3474858, Fax: +971 4 3474656<br>P.O. Box: 60270, DUBAI, U.A.E<br>www.cmsglobal.com |           |                  |             |             |           |         |

Note: Pitch of the sand drain hole is variable based on the size.