

Laboratory HVAC Engineering
Building 47.

Products submitted by: Studor Ltd, Studor House, 13 Sheridan Terrace, Hove, BN3 5AE, UK.

Product submitted: **STUDOR MAXI-VENT, STUDOR KNITS II, OsmaVent 110.**
DIN CERTCO KEYMARK licence number : 011-7B008

Product Designation: A I

Production facility: Dymotek, USA.


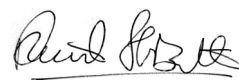
Test Standard: **EN 12380:2002.** Air admittance valves for drainage systems – Requirements, test methods and evaluation of conformity.

The European standard generally incorporates the requirements of AS/NZS 4936: 2002 (Australia / New Zealand standard)

Tests undertaken: Drop test, Air tightness test, Endurance and temperature test, Opening characteristics and airflow capacity test and Test for effectiveness at temperatures below zero.

Test report number: 288614

Test report date: 17th July 2013

| Prepared by | | Approved on behalf of BRE | |
|--------------------|---|----------------------------------|---|
| Name | M Swainson | Name | D Butler |
| Position | Principal Engineer | Position | Group Manager |
| Signature |  | Signature |  |



BRE's Quality Management System is approved to BS EN ISO9001:2008, certificate number LRQ 4001063.

BRE's Environmental Management System is approved to BS EN ISO14001:2004, certificate number LRQ 4001064.

1 Test result summary

The tests carried out were in accordance with BS EN 12380:2002. Air admittance valves for drainage systems – Requirements, test methods and evaluation of conformity.

BS EN 12380:2002. Clause 6.2. Drop test results

| Valve connector size (mm) | Orientation | | | Comments |
|---------------------------|-------------|------|------|----------|
| | 1 | 2 | 3 | |
| 110 | Pass | Pass | Pass | |

BS EN 12380:2002. Clause 6.3. Air tightness test results

| Valve connector size (mm) | Pressure recorded after 5 minutes greater than 90% of initial pressure | Comments |
|---------------------------|--|----------|
| 50 | Pass | |
| 75 | Pass | |
| 90 | Pass | |
| 110 | Pass | |

BS EN 12380:2002. Clause 6.4. Endurance and temperature test results (air tightness test, Clause 6.3). Results after 16 hours at 20°C

| Valve connector size (mm) | Pressure recorded after 5 minutes greater than 90% of initial pressure | Comments |
|---------------------------|--|----------|
| 110 | Pass | |

BS EN 12380:2002. Clause 6.4. Endurance and temperature test results (air tightness test, Clause 6.3). Results after 8 hours at 60°C

| Valve connector size (mm) | Pressure recorded after 5 minutes greater than 90% of initial pressure | Comments |
|---------------------------|--|----------|
| 110 | Pass | |

BS EN 12380:2002. Clause 6.5. Opening characteristics and air flow capacity test results

| Valve connector size (mm) | Opening pressure 0 – 150 Pa | Airflow rate at Static pressure of $-250^{+/-10}$ Pa (l/s) | Measurable airflow rate at -150^{+0}_{-10} Pa |
|---------------------------|-----------------------------|--|---|
| 50 | Pass | 25.0 | Yes |
| 75 | Pass | 35.1 | Yes |
| 90 | Pass | 35.2 | Yes |
| 110 | Pass | 36.0 | Yes |

BS EN 12380:2002. Clause 6.6. Test for effectiveness at temperatures below 0°C test results

| Valve connector size (mm) | Air flow rate greater than 90% of initial air flow rate | 50mm water trap contained more than 25mm water |
|---------------------------|---|--|
| 110 | Pass | Yes |

2 Introduction

Studor approached BRE to undertake the testing of a range of Air Admittance Valves (AAVs) to the current standard BS EN 12380:2002 Air admittance valves for drainage systems – Requirements, test methods and evaluation of conformity. A proposal was prepared and submitted and accepted by Studor.

The AAVs, manufactured by Studor, to be tested were stated as being:

DN90 (DN 50, DN 75, and DN 110 when fitted with rubber connector)

The AAVs were delivered to BRE on 25th January 2013.

BS EN 12380:2002 requires six physical tests to be undertaken on a number of valves in a range. BRE undertook this work during May & June 2013.

Studor advised BRE that all AAVs were to be tested for designation A I. Designation A I allows the valves to be located below flood level of connected appliances and operate at temperatures ranging from -20°C to +60°C.

3 Details of tests carried out

The tests carried out were in accordance with BS EN 12380:2002. *Air admittance valves for drainage systems – Requirements, test methods and evaluation of conformity.*

Studor provided six samples which were numbered BRE01 to BRE06. Three valves were then randomly chosen by Mr C Manescu, Test Engineer, BRE, from those supplied to be tested.

The identification numbers of the AAVs chosen for test are presented in Table 1

| Valve size (mm) | Valves randomly selected for test | | |
|--------------------|-----------------------------------|-------|-------|
| DN 90 | BRE01 | BRE02 | BRE03 |

Table 1 AAVs selected for testing

Studor also provided 8 connectors.

- Four rubber connectors with cones inside for connection to on 50 mm diameter pipe.
- Four standard rubber connectors for connection to 110 mm and 75 mm diameter pipe.

Studor also advised BRE that the valves can be installed solvent welded directly to 90 mm diameter pipe.

All air flow rates are corrected to Standard Temperature and Pressure (STP) 101325 Pa and 20°C.

For designation A I valves, the tests undertaken are detailed in Table 2.

| BS EN 12380:2002 Clause reference | Test description | Number of valves tested |
|--------------------------------------|---|----------------------------|
| 6.2 | Drop test | 3 |
| 6.3 | Air tightness test | 3 |
| 6.4 | Endurance test | 1 |
| 6.3 | Retest air tightness following endurance test | 1 |
| 6.5 | Opening characteristic and airflow capacity test | 3 |
| 6.6 | Test for effectiveness at temperatures below zero | 1 |

Table 2 Tests undertaken for valves designated A I.

For the endurance tests and the test for effectiveness at temperatures below 0°C, Mr C Manescu, Test Engineer, BRE, randomly selected one valve from the three selected to be tested.

Test instruments used during testing of AAVs

| Measurement | Test instrument | Calibration |
|------------------------------------|--|---|
| Air and water temperature readings | PT100 1/10th DIN probes | In-situ 5 point temperature calibration with Hewlett Packard Digital Quartz Thermometer type 2804A BRE Calibration Services (UKAS) |
| Static pressure readings | | |
| 0 - 500Pa | Furness Controls FCO332 | BRE calibration (UKAS) |
| 0 - 10,000Pa | Furness Controls Ltd FCO510 Micromanometer | Furness Controls Ltd (UKAS) |
| Airflow rate readings | Hastings LFE LS-8S Chell Display CCD100 | Chell (UKAS) |

4 Test results

BS EN 12380:2002. Clause 6.2. Drop test results

Test laboratory temperature maintained at 19.8°C.

| Valve number | Valve connector size (mm) | Orientation | | | Comments |
|--------------|---------------------------|-------------|------|------|----------|
| | | 1 | 2 | 3 | |
| BRE01 | 110 | Pass | Pass | Pass | |
| BRE02 | 50 | Pass | Pass | Pass | |
| BRE03 | 75 | Pass | Pass | Pass | |

Table 3 Drop test results (Clause 6.2)

BS EN 12380:2002. Clause 6.3. Air tightness test results

| Valve number | Valve connector size (mm) | Pressure applied (Pa) | Pressure after 5 mins. (Pa) | Laboratory temp (°C) | Comments |
|--------------|---------------------------|-----------------------|-----------------------------|----------------------|----------|
| BRE01 | 110 | 31 | 31 | 20.3 | |
| BRE01 | 110 | 506 | 506 | 20.3 | |
| BRE01 | 110 | 9,984 | 9,949 | 20.3 | |
| BRE02 | 50 | 32 | 32 | 20.2 | |
| BRE02 | 50 | 502 | 498 | 20.2 | |
| BRE02 | 50 | 9,987 | 9,583 | 20.2 | |
| BRE03 | 75 | 31 | 30 | 20.3 | |
| BRE03 | 75 | 502 | 497 | 20.3 | |
| BRE03 | 75 | 9,993 | 9,927 | 20.3 | |

Table 4 Air tightness test results for AAVs (Clause 6.3)

BS EN 12380:2002. Clause 6.4. Endurance and temperature test results

| Valve number | Valve connector size (mm) | Number of cycles in 16 hours | Test rig temperature (°C) | Valve operational at end of test | Comments |
|--------------|---------------------------|------------------------------|---------------------------|----------------------------------|----------|
| BRE01 | 110 | 16299 | 20.5 | Yes | |

Table 5 Endurance and temperature test results at 20°C (Clause 6.4)

| Valve number | Valve connector size (mm) | Pressure applied (Pa) | Pressure after 5 mins. (Pa) | Laboratory temp (°C) | Comments |
|--------------|---------------------------|-----------------------|-----------------------------|----------------------|----------|
| BRE01 | 110 | 32 | 31 | 20.4 | |
| BRE01 | 110 | 502 | 502 | 20.4 | |
| BRE01 | 110 | 9,983 | 9,896 | 20.4 | |

Table 6 Air tightness test results for AAVs following endurance and temperature test at 20°C (Clause 6.3)

| Valve number | Valve connector size (mm) | Number of cycles in 8 hours | Test rig temperature (°C) | Valve operational at end of test | Comments |
|--------------|---------------------------|-----------------------------|---------------------------|----------------------------------|----------|
| BRE01 | 110 | 8143 | 61.1 | Yes | |

Table 7 Endurance and temperature test results at 60°C (Clause 6.4)

| Valve number | Valve connector size (mm) | Pressure applied (Pa) | Pressure after 5 mins. (Pa) | Laboratory temp (°C) | Comments |
|--------------|---------------------------|-----------------------|-----------------------------|----------------------|----------|
| BRE01 | 110 | 31 | 30 | 20.5 | |
| BRE01 | 110 | 501 | 498 | 20.5 | |
| BRE01 | 110 | 9,990 | 9,856 | 20.5 | |

Table 8 Air tightness test results for AAVs following endurance and temperature test at 60°C (Clause 6.3)

BS EN 12380:2002. Clause 6.5. Opening characteristics and air flow capacity test results

Test laboratory during test, Temperature 20.1°C.

| Valve number | Valve connector size (mm) | Opening pressure (Pa) | Static pressure of -250 ⁺ / ₋₁₀ Pa | Airflow rate (l/s) | Static pressure of -150 ⁺ / ₋₁₀ Pa | Airflow rate (l/s) |
|--------------|---------------------------|-----------------------|--|--------------------|--|--------------------|
| BRE01 | 110 | 42 | 251 | 36.0 | 148 | 27.1 |
| | | 44 | | | | |
| | | 44 | | | | |
| BRE02 | 50 | 44 | 253 | 25.0 | 148 | 19.2 |
| | | 46 | | | | |
| | | 43 | | | | |
| BRE03 | 75 | 46 | 251 | 35.1 | 149 | 26.6 |
| | | 45 | | | | |
| | | 43 | | | | |
| BRE03 | 90 | 43 | 253 | 35.2 | 150 | 26.1 |
| | | 46 | | | | |
| | | 47 | | | | |

Table 9 Opening characteristics and air flow capacity test results for AAVs (Clause 6.5)

| Valve number | Valve connector size (mm) | Opening pressure 0 – 150 (Pa) | Static pressure of -250 ⁺ / ₋₁₀ (Pa) | Airflow rate (l/s) | Measurable airflow rate at -150 ⁺ / ₋₁₀ (Pa) |
|--------------|---------------------------|-------------------------------|--|--------------------|--|
| BRE01 | 110 | Pass | 251 | 36.0 | Pass |
| BRE02 | 50 | Pass | 253 | 25.0 | Pass |
| BRE03 | 75 | Pass | 251 | 35.1 | Pass |
| BRE03 | 90 | Pass | 253 | 35.2 | Pass |

Table 10 Summary of test results of opening characteristics and air flow capacity test results for AAVs (Clause 6.5)

BS EN 12380:2002. Clause 6.6. Test for effectiveness at temperatures below 0°C test results

Test laboratory during test, Temperature 20.8°C,

| Valve number | Valve connector size (mm) | Temperature of ambient air (°C) | Temperature of air inside pipe (°C) | Static pressure of -250 ⁺ /.10 (Pa) | Airflow rate (l/s) |
|--------------|---------------------------|---------------------------------|-------------------------------------|--|--------------------|
| BRE01 | 110 | 21.1 | 20.7 | 249 | 34.6 |

Table 11 Test for effectiveness at temperatures below 0°C results for all AAVs ambient air at 20°C (Clause 6.6)

Test laboratory during test, Temperature 20.3°C,

| Valve number | Valve connector size (mm) | Temperature of ambient air (°C) | Temperature of air inside pipe (°C) | Water temperature (°C) | Static pressure of -250 ⁺ /.10 (Pa) | Airflow rate (l/s) | Water in 50mm trap >25mm |
|--------------|---------------------------|---------------------------------|-------------------------------------|------------------------|--|--------------------|--------------------------|
| BRE01 | 110 | -20.8 | -12.9 | 39.7 | 251 | 33.7 | Yes |

Table 12 Test for effectiveness at temperatures below 0°C results for all AAVs ambient air at -20°C (Clause 6.6)

5 BS EN 12380:2002 Marking, labelling and packaging

All the valves tested by BRE were supplied loose with no installation instructions.

The markings on top of the valves are visible in Figure 1 for the Studor Maxi-Vent, Figure 2 for the Studor KNITS II and Figure 3 for the OsmaVent 110.

6 Photographs



Figure 1 STUDOR MAXI-VENT



Figure 2 STUDOR KNITS II



Figure 3 OsmaVent 110



Figure 4 Internal view of STUDOR MAXI-VENT, KNITS II and OsmaVent 110



Figure 5 STUDOR MAXI-VENT, KNITS II and OsmaVent 110 with rubber connector



Figure 6 Standard rubber connector



Figure 7 Rubber connector with cone inside



Figure 8 STUDOR MAXI-VENT, KNITS II and OsmaVent 110 with rubber connector with cone inside

=====REPORT ENDS=====