

Report

BS EN 442 Comparative thermal performance tests on two reflective panels

Report 17787/1 Edition 2

April 2003

This report supersedes Report 17787/1 dated December 2002

Carried out for: Quattro Seal
Shenn Valley
Ballakaighen
Peel
Isle of Man
IM5 2AH

Compiled by: A. Doel

No. of pages: ii of preamble
5 of text

Appendix: A (6 pages)

Quality Approved:



P. Stonard



1053

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PREFACE

This report supersedes Report 17787/1 dated December 2002 and is issued to correct the manufacturer's name shown on page 4 and add a statement of test tolerance. Other information remains unchanged.

SUMMARY

A panel radiator was submitted for testing against the requirements contained in BS EN 442-2 : 1997 with two types of reflective panels fitted on the wall behind it.

The following thermal outputs were determined:

| PRODUCT REFERENCE | MEASURED OUTPUT AT 50ΔT (W) |
|--------------------------------|--------------------------------|
| Sample radiator for panel test | 614 |
| With Quattro panel | 581 |
| With Ecologic panel | 572 |

The reflective panels reduced the total output of the radiator by 5.4% and 6.8% respectively.

The variation between the two results was within the ±1% tolerance band for determination of thermal output in the test facility.

Full details of the test and products can be found in Section 5 of this report.

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1. INTRODUCTION

Thermal performance tests were carried out on a panel radiators in accordance with the procedures contained in BS EN 442-2 : 1997, using low pressure hot water in the BSRIA radiator test room, described within section 3 of this report. The work was requested by Quattro Seal, Shenn Valley, Ballakaighan, Peel, Isle of Man IM5 2AH and was carried out during the period 5th December 2002 to 9th December 2002.

The object of the tests was to determine if the reflective panels gave comparable effects.

All items were received in good condition on 12th November 2002 and 2nd December 2002.

This report refers only to the items tested and no others.

2. DESCRIPTION OF SAMPLES

The test samples consisted of pressed a steel panel radiators and reflective panels from the Quattro Seal and Ecologic range of product.

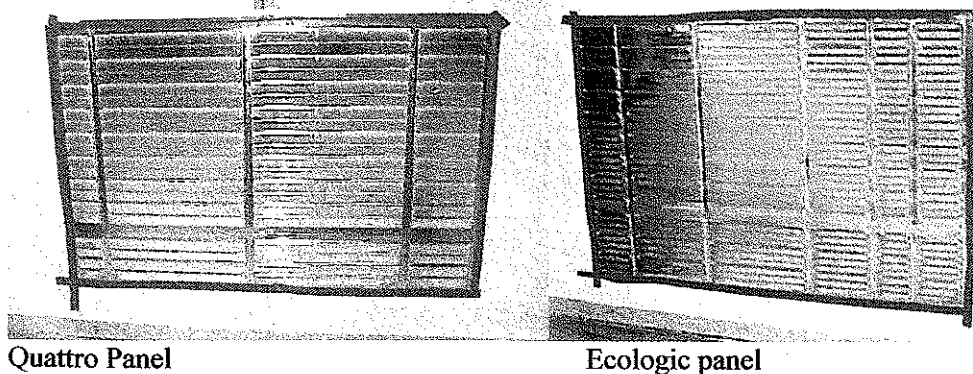
The samples were designated as follows :

Sample radiator for panel test 600mm x 1000mm

Quattro panel 550mm x 800mm

Ecologic panel 550mm x 800mm

The radiator was a four tapping radiators plumbed with top and bottom same end connections (TBSE). The construction was pressed steel plain panels. The reflective panels were metallised plastic with a saw tooth profile and highly reflective face. The Ecologic panel as supplied, was cut and overlapped to give the same face area as the Quattro panel.



Each panel was fixed to the wall using double sided tape behind and single sided tape around the edges.

The panels were mounted with the bottom edge level with the bottom of the radiator and central on the vertical axis.

Further details of the test samples can be found in Appendix A.

3. TEST FACILITY

The test facility consists of a test room 4.0m (l) x 4.0m (w) x 3.0m (h), which is constructed to the requirements contained in BS EN 442-2 : 1997, i.e. five water cooled surfaces and one insulated surface against which the test radiator is installed.

When steady state conditions are achieved the appliance output is determined from measurements of the water flow rate and inlet / outlet water temperature difference.

A standard test consists of three test points. For all appliances a first test is carried out with water supply temperature that produces a mean water temperature of 70°C with the water flow rate such that for radiators the inlet/outlet water temperature difference is 10°C. Two further tests are carried out at the water flow rate established in the first test but with different supply water temperatures.

For all tests the enclosure air temperature is controlled to maintain 20°C at the inner room reference point, which is 0.75m from the floor in the centre of the room.

4. INSTRUMENTATION

TEST RECORD SHEET TP21/7 : TEST EQUIPMENT / INSTRUMENTS

| | |
|------------------|------------|
| Contract Number | FJ17787A |
| Test Engineer(s) | P. Stonard |

| | Instrument No. | Calibration expiry date |
|---|----------------|-------------------------|
| Weigh scales | 333, 334 | 05/02/03 |
| Resistance thermometer (air) reference & radiant shield | 329 | 03/02/03 |
| Resistance thermometers (water) reference | 390-392,394 | 22/08/03 |
| Digital voltmeter 7½ digit (resistance thermometer measurement) | 331 | 18/10/03 |
| Barometer | 334 | 27/11/03 |
| Electronic timer within PC | 588 | 14/10/03 |
| 2.0m Steel rule | 400 | 18/10/05 |
| 1.5m vernier calipers | 359 | 18/09/05 |
| 150mm vernier calipers | 385 | 09/12/03 |
| Spring balance | 386 | 21/11/03 |
| Weigh scales (water content) | 334 | 05/02/03 |
| Water temperature housing | 390/392 | 22/08/03 |

Comments: None

Test Engineer (signature)

5. TEST RESULTS

Date of Test: 05-12-02
 Manufacturer: Stelrad
 Model Reference: Sample Radiator for Panel Test.
 Test Reference Number: 17787A1AD
 Type of Heater: 10
 Pipework Connections: T.B.S.E

HEATER DIMENSIONS

Overall Height: (mm) 600
 Overall Length: (mm) 1000
 Overall Depth: (mm) 14
 Convector Height: (mm) 0
 Convector Depth: (mm) 0
 Height above floor: (mm) 110
 Distance from wall: (mm) 50
 Radiated heat factor (Sk) 0.50
 Barometer exponent (np) 0.50

| MEAN TEST VALUES | TEST 1 | TEST 2 | TEST 3 |
|----------------------------------|--------|--------|--------|
| Room air temperature 0.75m: (°C) | 20.1 | 19.9 | 19.9 |
| Flow rate: (g/s) | 15.4 | 15.4 | 15.4 |
| Flow Enthalpy: (J/g) | 307.9 | 220.8 | 361.8 |
| Return Enthalpy: (J/g) | 268.9 | 199.9 | 310.9 |
| Flow temperature: (°C) | 73.6 | 52.8 | 86.4 |
| Return temperature: (°C) | 64.3 | 47.8 | 74.3 |
| Output: (W) | 598.6 | 322.8 | 783.9 |
| Mean water temperature: (°C) | 68.9 | 50.3 | 80.4 |
| Temperature difference: (°C) | 48.8 | 30.3 | 60.5 |
| Barometric pressure: (mbar) | 1019.0 | 1021.0 | 1022.0 |
| Corrected output: (W) | 597.7 | 322.2 | 782.1 |
| Estimated output: (W) | 595.6 | 322.9 | 783.6 |

PERFORMANCE EQUATION

$$\text{Output (W)} = B(\text{mean water temperature minus room air temperature})^n$$

From test results B = 4.0318

n = 1.2846

VARIATION OF OUTPUT WITH TEMPERATURE DIFFERENCE

| TEMPERATURE DIFFERENCE C | HEAT OUTPUT W |
|-----------------------------|------------------|
| 20 | 189 |
| 30 | 318 |
| 40 | 461 |
| 50 | 614 |
| 60 | 776 |
| 70 | 946 |

5 TEST RESULTS

Date of Test: 06-12-02
 Manufacturer: Quattro Seal
 Model Reference: Quattro Panel
 Test Reference Number: 17787A2AD
 Type of Heater: 10
 Pipework Connections: T.B.S.E

HEATER DIMENSIONS

Overall Height: (mm) 600
 Overall Length: (mm) 1000
 Overall Depth: (mm) 14
 Convactor Height: (mm) 0
 Convactor Depth: (mm) 0
 Height above floor: (mm) 110
 Distance from wall: (mm) 50
 Radiated heat factor (Sk) 0.50
 Barometer exponent (np) 0.50

PANEL DIMENSIONS

550
 800

MEAN TEST VALUES

| | TEST 1 | TEST 2 | TEST 3 |
|----------------------------------|--------|--------|--------|
| Room air temperature 0.75m: (°C) | 20.1 | 20.1 | 20.0 |
| Flow rate: (g/s) | 14.8 | 14.9 | 14.9 |
| Flow Enthalpy: (J/g) | 314.1 | 223.1 | 362.4 |
| Return Enthalpy: (J/g) | 274.6 | 201.9 | 312.5 |
| Flow temperature: (°C) | 75.0 | 53.3 | 86.6 |
| Return temperature: (°C) | 65.6 | 48.2 | 74.7 |
| Output: (W) | 584.9 | 314.5 | 743.9 |
| Mean water temperature: (°C) | 70.3 | 50.8 | 80.6 |
| Temperature difference: (°C) | 50.2 | 30.7 | 60.6 |
| Barometric pressure: (mbar) | 1024.0 | 1023.0 | 1023.0 |
| Corrected output: (W) | 583.3 | 313.8 | 742.1 |
| Estimated output: (W) | 584.4 | 313.5 | 741.4 |

PERFORMANCE EQUATION

Output (W) = B(mean water temperature minus room air temperature)ⁿ

From test results B = 4.1104

n = 1.2658

VARIATION OF OUTPUT WITH TEMPERATURE DIFFERENCE

| TEMPERATURE DIFFERENCE | HEAT OUTPUT |
|------------------------|-------------|
| C | W |
| 20 | 182 |
| 30 | 305 |
| 40 | 438 |
| 50 | 581 |
| 60 | 732 |
| 70 | 890 |

5 TEST RESULTS

Date of Test: 09-12-02
 Manufacturer: Ecologic
 Model Reference: Ecologic Panel
 Test Reference Number: 17787A3AD
 Type of Heater: 10
 Pipework Connections: T.B.S.E

HEATER DIMENSIONS

Overall Height: (mm) 600
 Overall Length: (mm) 1000
 Overall Depth: (mm) 14
 Convactor Height: (mm) 0
 Convactor Depth: (mm) 0
 Height above floor: (mm) 110
 Distance from wall: (mm) 50
 Radiated heat factor (Sk) 0.50
 Barometer exponent (np) 0.50

PANEL DIMENSIONS

550
 800

MEAN TEST VALUES

| | TEST 1 | TEST 2 | TEST 3 |
|----------------------------------|--------|--------|--------|
| Room air temperature 0.75m: (°C) | 19.8 | 19.6 | 19.6 |
| Flow rate: (g/s) | 14.9 | 15.0 | 15.0 |
| Flow Enthalpy: (J/g) | 315.1 | 218.7 | 358.9 |
| Return Enthalpy: (J/g) | 276.0 | 198.5 | 310.4 |
| Flow temperature: (°C) | 75.3 | 52.3 | 85.7 |
| Return temperature: (°C) | 66.0 | 47.4 | 74.2 |
| Output: (W) | 583.7 | 302.5 | 728.1 |
| Mean water temperature: (°C) | 70.6 | 49.8 | 79.9 |
| Temperature difference: (°C) | 50.9 | 30.2 | 60.4 |
| Barometric pressure: (mbar) | 1016.0 | 1016.0 | 1016.0 |
| Corrected output: (W) | 583.2 | 302.3 | 727.6 |
| Estimated output: (W) | 584.5 | 302.0 | 726.7 |

PERFORMANCE EQUATION

Output (W) = B(mean water temperature minus room air temperature)ⁿ

From test results B = 3.9753

n = 1.2701

VARIATION OF OUTPUT WITH TEMPERATURE DIFFERENCE

| TEMPERATURE DIFFERENCE | HEAT OUTPUT |
|------------------------|-------------|
| C | W |
| 20 | 179 |
| 30 | 299 |
| 40 | 431 |
| 50 | 572 |
| 60 | 721 |
| 70 | 877 |

APPENDIX A

Test items and product information

No. of pages : 6

TEST RECORD SHEET TP21/1: TEST ITEMS

Contract number

FJ17787A

Sheet number

1 of 1

Please use additional sheets where necessary

| Date of receipt | Test Engineer initials | Full description of test item | Test item reference number |
|-----------------|------------------------|---|----------------------------|
| 02/12/02 | AD | Sample radiator, Stelrad product style 10, steel plain panel. | 17787A1AD |
| 12/11/02 | AD | Quattro panel - construction plastic reflective panel. | 17787A2AD |
| 12/11/02 | AD | Ecologic panel - construction plastic reflective panel. | 17787A3AD |

Comments:- None

Sheet number of next sheet (if any):

| |
|-----------|
| - |
| <i>AD</i> |

Test Engineer (signature)

TEST RECORD SHEET TP21/2 : PRODUCT INFORMATION

| | |
|-------------------------------|--------------------------------------|
| BSRIA test reference number | 17787A1AD |
| Client | Quattro Seal |
| Manufacturer | Stelrad |
| Product reference number | 10 600 1000 |
| Product style | 10 |
| Material of construction | Steel |
| Date of receipt | 02/12/02 |
| Product or packaging markings | Manufacturer's name, type & Kitemark |
| Test start date | 05/12/02 |
| Weight (dry) (kg) | N/A |
| Water content (kg) | N/A |

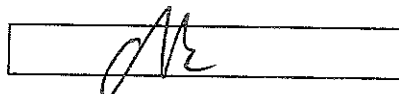
DIMENSIONAL MEASUREMENTS

| Measurement Parameter | Measured value (mm) Radiator | Manufacturer's stated value (mm) | EN 442-2 dimensional tolerance | Pass / Fail |
|-----------------------|---------------------------------|----------------------------------|--------------------------------|-------------|
| Overall height | 600 | | | |
| Overall depth | 14 | | | |
| Overall length | 1000 | | N/A | |
| Convactor height | None | | | |
| Convactor depth | None | | | |

| | |
|---------------------------------------|----------------|
| Number of columns per panel | 30 |
| Distance installed from the wall (mm) | 50 |
| Distance between centres (mm) | 550 |
| Panel thickness (mm) | 14. |
| Convactor overall length (mm) | None |
| Convactor thickness (mm) | None |
| Spot weld horizontal pitch (mm) | 33.3 |
| Additional information | T.B.S.E Audit. |

Comments : Not required for audit tests.

TEST ENGINEER (Signature)



TEST RECORD SHEET TP21/2 : PRODUCT INFORMATION

| | |
|-------------------------------|----------------------|
| BSRIA test reference number | 17787A2AD |
| Client | Quattro Seal |
| Manufacturer | Quattro Seal |
| Product reference number | Quattro Panel |
| Product style | N/A |
| Material of construction | Plastic |
| Date of receipt | 12/11/02 |
| Product or packaging markings | Manufacturer's name* |
| Test start date | 06/12/02 |
| Weight (dry) (kg) | N/A |
| Water content (kg) | N/A |

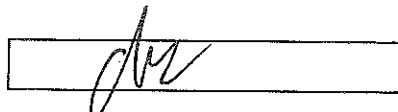
DIMENSIONAL MEASUREMENTS

| Measurement Parameter | Measured value (mm) Radiator | Manufacturer's stated value (mm) | EN 442-2 dimensional tolerance | Pass / Fail |
|-----------------------|------------------------------------|--|--------------------------------------|-------------|
| Overall height | 550 | | | |
| Overall depth | N/A | | | |
| Overall length | 800 | | N/A | |
| Convactor height | None | | | |
| Convactor depth | None | | | |

| | |
|---------------------------------------|------|
| Number of columns per panel | N/A |
| Distance installed from the wall (mm) | 0 |
| Distance between centres (mm) | N/A |
| Panel thickness (mm) | N/A |
| Convactor overall length (mm) | None |
| Convactor thickness (mm) | None |
| Spot weld horizontal pitch (mm) | N/A |
| Additional information | |

Comments : Not required for audit tests.

TEST ENGINEER (Signature)



TEST RECORD SHEET TP21/2 : PRODUCT INFORMATION

| | |
|-------------------------------|----------------------|
| BSRIA test reference number | 17787A3AD |
| Client | Quattro Seal |
| Manufacturer | Ecologic |
| Product reference number | Ecologic Panel |
| Product style | N/A |
| Material of construction | Plastic |
| Date of receipt | 12/11/02 |
| Product or packaging markings | Manufacturer's name* |
| Test start date | 09/12/02 |
| Weight (dry) (kg) | N/A |
| Water content (kg) | N/A |

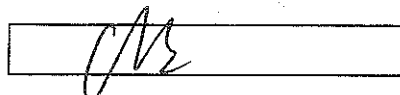
DIMENSIONAL MEASUREMENTS

| Measurement Parameter | Measured value (mm) Radiator | Manufacturer's stated value (mm) | EN 442-2 dimensional tolerance | Pass / Fail |
|-----------------------|---------------------------------|----------------------------------|--------------------------------|-------------|
| Overall height | 550 | | | |
| Overall depth | N/A | | | |
| Overall length | 800 | | N/A | |
| Convactor height | None | | | |
| Convactor depth | None | | | |

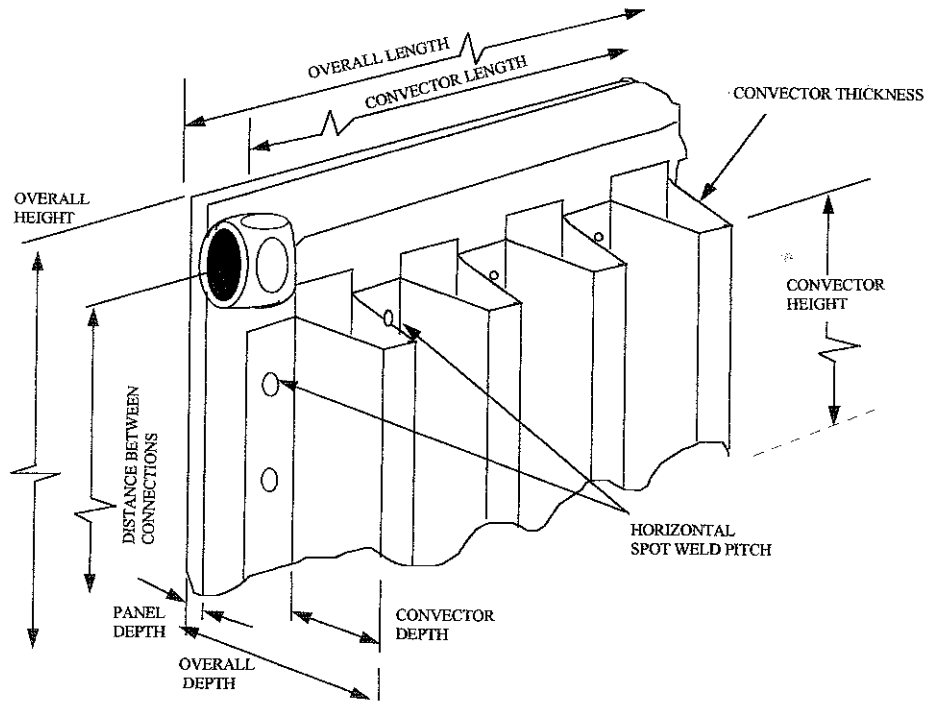
| | |
|---------------------------------------|------|
| Number of columns per panel | N/A |
| Distance installed from the wall (mm) | N/A |
| Distance between centres (mm) | N/A |
| Panel thickness (mm) | N/A |
| Convactor overall length (mm) | None |
| Convactor thickness (mm) | None |
| Spot weld horizontal pitch (mm) | N/A |
| Additional information | |

Comments : Not required for audit tests.

TEST ENGINEER (Signature)



Schematic of radiator dimensions



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