

TEST REPORT

DI18290-02

THERMAL TESTING OF FIRESTOP DUCT WRAP-25

CLIENT

Firestop Centre Ltd
657 Great South Road
Penrose
Auckland



All tests and procedures reported herein, unless indicated, have been performed in accordance with the laboratory's scope of accreditation



REPORT NUMBER:

DI18290-02

ISSUE DATE:

11 December 2023

PAGE:

1 of 10



TO WHOM IT MAY CONCERN

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Signed:

A handwritten signature in black ink, appearing to read "Jennifer Evans".

Jennifer Evans
NATA CEO

A handwritten signature in blue ink, appearing to read "Dr Llewellyn Richards".

Dr Llewellyn Richards
IANZ CEO

Date: 24 March 2014


Date: 24th March 2014

SIGNATORIES



Author

Sheng-Huei Huang
Senior Technician
Authorised to author this report



Reviewed by

Roger Stanford
Senior Technician
Authorised to review this report



Authorised by

Sheng-Huei Huang
Senior Technician
Authorised to release this report to client

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REPORT NUMBER:

DI18290-02

ISSUE DATE:

11 December 2023

PAGE:

3 of 10

1. TEST SPONSOR

Firestop Centre Ltd
657 Great South Road, Penrose, Auckland

2. LIMITATION

The results reported here relate only to the item/s tested.

3. TERMS AND CONDITIONS

This report is issued in accordance with the Terms and Conditions as detailed and agreed in the BRANZ Services Agreement for this work.

4. TEST SAMPLES

The specimens were supplied by the client and consisted of 15 pieces of ductwrap insulation segment. Ten samples were selected for the test. The nominal thickness of the product is 0.025 m (d_N). The dimensions of the samples were approximately 600 x 300 mm.

Table 1: Sample identification and traceability information

| BRANZ Sample No. | Client Reference | Traceability Information |
|------------------|------------------|--------------------------|
| D7130A | - | - |
| D7130B | | |
| D7130C | | |
| D7130D | | |
| D7130E | | |
| D7130F | | |
| D7130G | | |
| D7130H | | |
| D7130I | | |
| D7130J | | |



5. TEST EQUIPMENT

All tests reported have been undertaken at BRANZ Ltd laboratories located at Judgeford, unless stated otherwise. The ASTM C518 compliant test equipment used was a LaserComp FOX600 heat flow meter and Wintherm software. The specimen for testing is placed horizontally in the apparatus, with upwards heat flow. The hot and cold plates each have a 250 mm x 250 mm heat flux transducer embedded in their surface. The edges of the specimen are insulated from the room ambient temperature.

Table 2: Test condition set-points

| | | |
|-----------------------------------|------|----|
| Nominal Upper Plate Temperature | 10.0 | °C |
| Nominal Lower Plate Temperature | 36.0 | °C |
| Nominal Difference in Temperature | 26.0 | K |
| Nominal Mean Temperature | 23.0 | °C |

6. PROCEDURE

The test was performed in accordance with AS/NZS 4859.1. The thickness was measured to the requirements of ASTM C167 and AS/NZS 4859.1 Appendix B. The specimens were tested at the lesser of nominal thickness and actual measured thickness, to the requirements of ASTM C518.

Because the test specimen is not a homogeneous material the thermal conductivity is described as apparent and is assumed to be dependent on thickness.

Results were adjusted from test temperature of 23°C to declared temperature of 15°C for New Zealand products (according to AS/NZS 4859.2 Clause 5.2).

6.1 Measurement uncertainty

The estimated overall uncertainty of measurement is 2.1%.

7. CONDITIONING

The sample segments were conditioned for at least 24 hours at $23 \pm 3^\circ\text{C}$, prior to the thermal performance measurements. The thickness and the weight of the specimens were recorded after conditioning. Only the relevant results are included in this test report.

8. RESULTS

Table 3: Measured test temperature

| | | | |
|------------------------|------|-----------|----|
| Temperature Difference | 26.0 | ± 0.1 | K |
| Mean Test Temperature | 23.0 | ± 0.1 | °C |

Table 4: Measured results for the test specimens

| | | | | | | |
|---|--------------------|----------|----------|----------|----------|----------|
| Calibration check | 11/12/23 SR12 | | | | | |
| BRANZ reference | | D7130A | D7130B | D7130C | D7130D | D7130E |
| Sample weight | gram | 573 | 527 | 580 | 591 | 639 |
| 'grams per sq. metre' | g/m ² | 3033.2 | 2805.0 | 3024.4 | 3099.4 | 3385.1 |
| Test date | | 11/12/23 | 11/12/23 | 11/12/23 | 12/12/23 | 12/12/23 |
| Measured thickness | mm | 32.3 | 28.6 | 29.8 | 30.0 | 33.1 |
| Test thickness | mm | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 |
| Density | kg/m ³ | 121.3 | 112.2 | 121.0 | 124.0 | 135.4 |
| Heat-flux | W/m ² | 38.49 | 38.02 | 39.47 | 38.50 | 38.99 |
| Thermal resistance | m ² K/W | 0.68 | 0.68 | 0.66 | 0.68 | 0.67 |
| Apparent thermal conductivity | W/mK | 0.0370 | 0.0365 | 0.0379 | 0.0370 | 0.0375 |
| Difference between heat flux transducers | % | 0.3 | 0.6 | 1.8 | 2.6 | 1.3 |
| Results adjusted from test temperature of 23°C to declared temperature of 15°C for New Zealand products (according to AS/NZS 4859.2 Clause 5.2, see note in Section 6 of this report) | | | | | | |
| Thermal resistance | m ² K/W | 0.70 | 0.71 | 0.69 | 0.70 | 0.69 |
| Apparent thermal conductivity | W/mK | 0.0355 | 0.0351 | 0.0364 | 0.0355 | 0.0360 |

* Thermal conductance can be calculated by dividing the thermal conductivity by the thickness of the specimen

* Average temperature gradient in the specimen during test can be calculated by dividing the temperature difference by the thickness of the specimen

* The minimum duration of the measurement portion of the test once steady state (0.2% / 12 mins) is achieved is 6 minutes



REPORT NUMBER:

DI18290-02

ISSUE DATE:

11 December 2023

PAGE:

6 of 10

Table 4: Continued from previous page

| | | | | | | |
|--|--------------------|----------|----------|----------|----------|----------|
| Calibration check | 11/12/23 SR12 | | | | | |
| BRANZ reference | | D7130F | D7130G | D7130H | D7130I | D7130J |
| Sample weight | gram | 582 | 602 | 550 | 550 | 629 |
| 'grams per sq. metre' | g/m ² | 3019.8 | 3175.6 | 2877.0 | 2947.7 | 3309.9 |
| Test date | | 12/12/23 | 12/12/23 | 12/12/23 | 12/12/23 | 12/12/23 |
| Measured thickness | mm | 28.7 | 30.8 | 29.7 | 29.0 | 30.3 |
| Test thickness | mm | 25.0 | 25.0 | 25.0 | 25.0 | 25.0 |
| Density | kg/m ³ | 120.8 | 127.0 | 115.1 | 117.9 | 132.4 |
| Heat-flux | W/m ² | 38.25 | 38.36 | 38.62 | 38.03 | 36.76 |
| Thermal resistance | m ² K/W | 0.68 | 0.68 | 0.67 | 0.68 | 0.71 |
| Apparent thermal conductivity | W/mK | 0.0368 | 0.0369 | 0.0371 | 0.0365 | 0.0353 |
| Difference between heat flux transducers | % | 0.3 | 0.1 | 1.3 | 2.0 | 6.9 |
| Results adjusted from test temperature of 23°C to declared temperature of 15°C for New Zealand products (according to AS/NZS 4859.2 Clause 5.2, see note in Section 6 of the report) | | | | | | |
| Thermal resistance | m ² K/W | 0.71 | 0.71 | 0.70 | 0.71 | 0.74 |
| Apparent thermal conductivity | W/mK | 0.0353 | 0.0354 | 0.0356 | 0.0351 | 0.0340 |

* Thermal conductance can be calculated by dividing the thermal conductivity by the thickness of the specimen

* Average temperature gradient in the specimen during test can be calculated by dividing the temperature difference by the thickness of the specimen

* The minimum duration of the measurement portion of the test once steady state (0.2% / 12 mins) is achieved is 6 minutes



REPORT NUMBER:

DI18290-02

ISSUE DATE:

11 December 2023

PAGE:

7 of 10

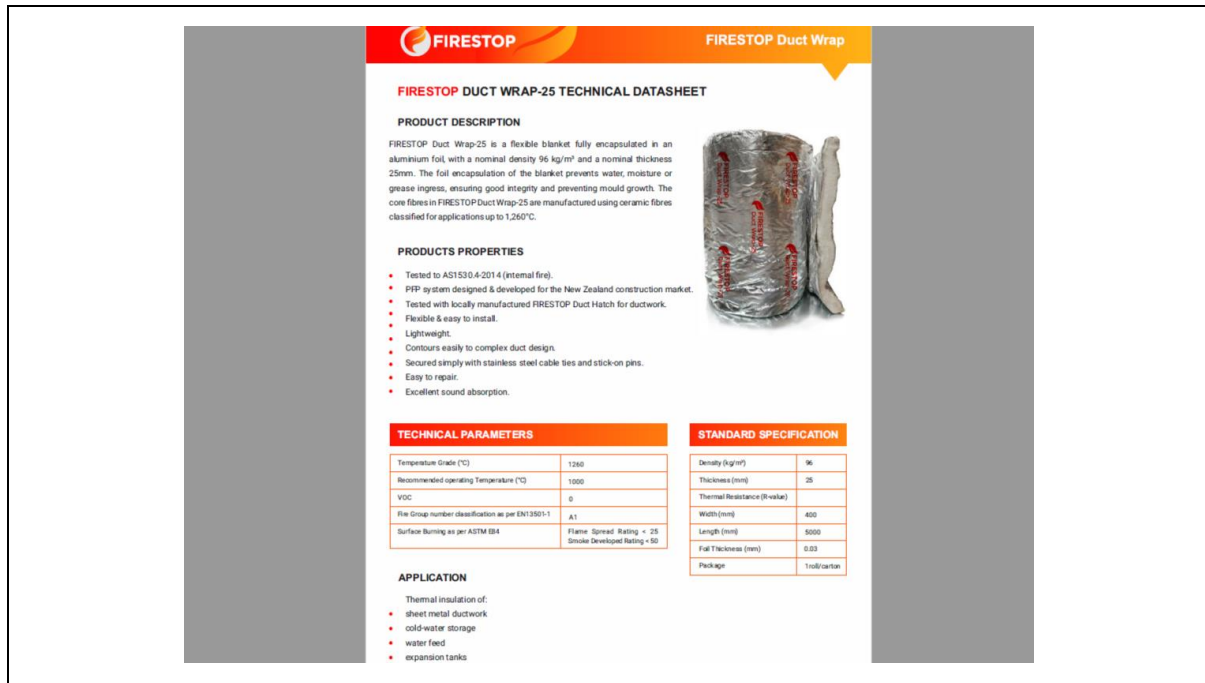
9. REFERENCES

- AS/NZS 4859.1 *Thermal insulation materials for buildings – Part 1: General criteria and technical provisions*
Standards Australia, Sydney, Standards New Zealand, Wellington, 2018.
- AS/NZS 4859.2 *Thermal insulation materials for buildings – Part 2: Design.*
Standards Australia, Sydney, Standards New Zealand, Wellington, 2018.
- ASTM C167 *Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.*
American Society for Testing and Materials, Philadelphia, PA, 2018.
- ASTM C518 *Standard Test Method for Steady-State Heat Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.*
American Society for Testing and Materials, Philadelphia, PA, 2017.

APPENDIX

(A) PRODUCT LABEL DETAILS

Table 5: Label information (AS/NZS 4859.1 Table 3.1)



| | |
|---|--|
| Product name | Firestop Duct Wrap-25 |
| Description of contents | Flexible blanket fully encapsulated in an aluminium foil |
| Name of manufacturer/supplier | Firestop Centre Ltd |
| Address of manufacturer/supplier | 657 Great South Rd Auckland New Zealand |
| Identification of manufacturing plant | - |
| Batch identification or other traceability information | See Table 1 |
| Safety guidance | - |
| A statement of conformance with AS/NZS 4859.1 | - |
| Declared material R-value and the temperature at which it applies | - |
| Number of pieces | 1 roll/carton |
| Nominal total area | - |
| Nominal length, width, and thickness | 5000 mm, 400 mm, 25 mm (foil thickness 0.03 mm) |
| Nominal net weight of contents or supplied quantity | 96 kg/m ³ |

(B) STATISTICAL CALCULATION OF R_{50/90}

The statistical analysis of R_{50/90} is calculated in accordance with AS/NZS 4859.1 Clause 2.3.3.5.

The declared R-value and declared thermal conductivity shall be derived from the statistically adjusted mean values $\lambda_{50/90}$ and R_{50/90}, representing a 50% fractile with 90% confidence, and a one-sided statistical tolerance interval, and which shall be based on thermal measurements on at least 10 individual specimens. $\lambda_{50/90}$ and R_{50/90} shall be calculated using the following equations:

$$R_{50/90} = R_{mean} - k_2 \cdot s$$

$$\lambda_{50/90} = \lambda_{mean} + k_2 \cdot s$$

where

k_2 = coefficient used when the standard deviation is estimated for one-sided tolerance interval

s = sample standard deviation for the 10 or more measured values used to determine the declared value

Note 1: for the particular case of $n = 10$, the value of k_2 in Table C.1, Annex C, ISO 10456:2007 is 0.44.

Note 2: if any sample < nominal thickness then λ_{mean} = mean of the adjusted λ values

Table 6: Summary results from statistical calculation at declared temperature of 23°C for products sold in Australia and 15°C for New Zealand

| Declared temp. | 23 | 15 | °C |
|------------------------------|--------|--------|--------------------|
| R_{mean} | 0.68 | 0.71 | m ² K/W |
| λ_{mean} | 0.0369 | 0.0354 | W/mK |
| Std. dev. of 10 test samples | 1.9 | 1.8 | % |
| $R_{50/90}$ | 0.67 | 0.70 | m ² K/W |
| $\lambda_{50/90}$ | 0.0372 | 0.0357 | W/mK |

This is the end of the report