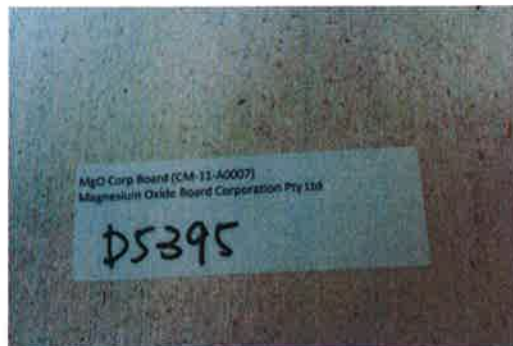




CONFIDENTIAL

DIO290/DU01

**Thermal Resistance of an Insulation
Sample MgO Corp Board CM-11-A0007**



Author: Sheng-Huei Huang
Technician
IANZ Approved Signatory

黃聖惠

Reviewer: Roger Stanford
Senior Technician Materials
IANZ Approved Signatory

All tests reported herein have been undertaken at the BRANZ Ltd laboratories located in Judgeford, Porirua, New Zealand, unless stated otherwise.

Contact: BRANZ Limited
Moonshine Road
Judgeford
Private Bag 50908
Porirua City
New Zealand
Tel: +64 4 237 1170
Fax: +64 4 237 1171
www.branz.co.nz



International Accreditation New Zealand (IANZ) has a Mutual Recognition Agreement (MRA) with the National Association of Testing Authorities, Australia (NATA). Users of test reports are recommended to accept test reports in the name of either accrediting body.



	Project Number: DIO290	Date of Issue: 25 September 2012	Page 1 of 4 Pages
--	------------------------	----------------------------------	-------------------

BRANZ's agreement with its Client in relation to this report contains the following terms and conditions in relation to **Liability and Indemnification**

- a. **Limitation and Liability**
- i. BRANZ undertakes to exercise due care and skill in the performance of the Services and accepts liability to the Client only in cases of proven negligence.
 - ii. Nothing in this Agreement shall exclude or limit BRANZ's liability to a Client for death or personal injury or for fraud or any other matter resulting from BRANZ's negligence for which it would be illegal to exclude or limit its liability.
 - iii. BRANZ is neither an insurer nor a guarantor and disclaims all liability in such capacity. Clients seeking a guarantee against loss or damage should obtain appropriate insurance.
 - iv. Neither BRANZ nor any of its officers, employees, agents or subcontractors shall be liable to the Client nor any third party for any actions taken or not taken on the basis of any Output nor for any incorrect results arising from unclear, erroneous, incomplete, misleading or false information provided to BRANZ.
 - v. BRANZ shall not be liable for any delayed, partial or total non-performance of the Services arising directly or indirectly from any event outside BRANZ's control including failure by the Client to comply with any of its obligations hereunder.
 - vi. The liability of BRANZ in respect of any claim for loss, damage or expense of any nature and howsoever arising shall in no circumstances exceed a total aggregate sum equal to 10 times the amount of the fee paid in respect of the specific service which gives rise to such claim or NZD\$50,000 (or its equivalent in local currency), whichever is the lesser.
 - vii. BRANZ shall have no liability for any indirect or consequential loss (including loss of profits).
 - viii. In the event of any claim the Client must give written notice to BRANZ within 30 days of discovery of the facts alleged to justify such claim and, in any case, BRANZ shall be discharged from all liability for all claims for loss, damage or expense unless legal proceedings are commenced in respect of the claim within one year from:
 - The date of performance by BRANZ of the service which gives rise to the claim; or
 - The date when the service should have been completed in the event of any alleged non-performance.
- b. **Indemnification:** The Client shall guarantee, hold harmless and indemnify BRANZ and its officers, employees, agents or subcontractors against all claims (actual or threatened) by any third party for loss, damage or expense of whatsoever nature including all legal expenses and related costs and howsoever arising relating to the performance, purported performance or non-performance, of any Services.
- c. Without limiting clause b above, the Client shall guarantee, hold harmless and indemnify BRANZ and its officers, employees, agents or subcontractors against all claims (actual or threatened) by any party for loss, damage or expense of whatsoever nature including all legal expenses and related costs arising out of:
- i. any failure by the Client to provide accurate and sufficient information to BRANZ to perform the Services;
 - ii. any misstatement or misrepresentation of the Outputs, including Public Outputs;
 - iii. any defects in the Products the subject of the Services; or
 - iv. any changes, modifications or alterations to the Products the subject of the Services.



CONFIDENTIAL



	Report Number: DI0290/DU01	Date of Issue: 25 September 2012	Page 2 of 4 Pages
---	----------------------------	----------------------------------	-------------------



Thermal Resistance of an Insulation Sample MgO Corp Board CM-11-A0007

1. CLIENT

Leighton Building & Construction Pty Ltd
Factory 5, 59-63 Chapel Street, Glenorchy, TAS 7010, Australia

2. LIMITATION

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

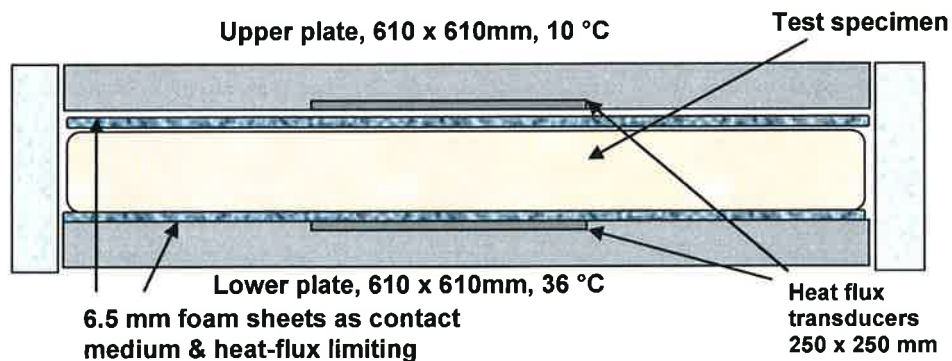
3. DESCRIPTION OF SAMPLE

The specimen was supplied by the client and consisted of three pieces of 12 mm thick magnesium oxide board. The dimensions of the samples were 600 x 600 mm. One sample was randomly selected for the test.

4. DESCRIPTION OF EQUIPMENT

The test equipment used was a LaserComp Fox 600 heat flow meter (HFM). The specimen for testing is placed horizontally in the apparatus, with upward heat flow (figure 1). 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.

Figure 1. Apparatus



5. PROCEDURE

The test setup (figure 1) consisted of the sample sandwiched between sheets of 6.5 mm compressible foam plastic. The foam sheets act as contact media between the apparatus plates and the sample, minimising contact thermal resistance. Since the

SHH
SHH

RSS

	Report Number: DI0290/DU01	Date of Issue: 25 September 2012	Page 3 of 4 Pages
--	----------------------------	----------------------------------	-------------------

CONFIDENTIAL





foam sheets add additional insulation they also serve the purpose of limiting the heat-flux to values that can be measured accurately by the apparatus.

The thermal resistance of the sample is determined by subtracting the thermal resistances of the foam sheets (previously measured) from the total measured thermal resistance of the test specimen (sample plus two foam sheets).

The specimens were tested to the requirements of ASTM C518-10 and the data was recorded as below.

The HFM calibration was checked immediately before testing commenced using the two foam sheets, BRANZ secondary reference sample '2xfoam', and then the samples were tested on 21st of Sep 2012.

6. RESULTS

Sample reference	D5395
HFM plate spacing (mm)	25.0
Thickness of foam sheets (mm)	13.0
Sample thickness (mm)	12.0
Sample weight (kg)	4577
Sample density (kg/m ³)	1059.5
Mean temperature (°C)	23.0
Temperature difference (K)	26.0
Heat flux (W/m ²)	40.39
Difference between heat-flux transducers (%)	0.1
Total thermal resistance(m ² .K/W ± 3%)	0.399
Thermal resistance of foam sheets (m ² .K/W ± 3%)	0.372
Thermal resistance of sample (m².K/W)	0.027
Thermal conductivity of sample (W/mK)	0.44
Estimated uncertainty in results (%)	10

7. REFERENCES

ASTM C518-10 *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, 2010.

SHH

SHH

RSS

	Report Number: D10290/DU01	Date of Issue: 25 September 2012	Page 4 of 4 Pages
---	----------------------------	----------------------------------	-------------------