

**Test Report No. 7191271569-MEC21/01-JV**  
dated 26 Nov 2021



PSB Singapore

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**SUBJECT:**

Determination of the gross heat of combustion (calorific value) of Brand: "Lightherm"  
Model: "Lightherm Drymix – Lightweight Thermal Insulation Material" insulation material  
submitted by Eco Building Solutions Pte Ltd on 12 October 2021.

**TESTED FOR:**

Eco Building Solutions Pte Ltd  
1 Sunview Road  
#05-46, Eco Tech @ Sunview  
Singapore 627615

**DATE OF TEST:**

25 & 26 Nov 2021

**PURPOSE OF TEST:**

To determine the gross heat of combustion (calorific value) of products at constant volume in a bomb calorimeter according to the test specified in BS EN ISO 1716 : 2010 "Reaction to fire tests for products – Determination of the gross heat of combustion".

The test was conducted at TÜV SÜD PSB fire test laboratory located at No. 10 Tuas Avenue 10, Singapore 639134.

*Vik Kumar*



LA-2007-0380-A LA-2007-0386-C  
LA-2007-0381-F LA-2010-0464-D  
LA-2007-0382-B LA-2018-0702-B  
LA-2007-0383-G LA-2018-0703-G  
LA-2007-0384-G LA-2020-0747-L  
LA-2007-0385-E

The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council. Inspections/Calibrations/Tests marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our inspection body/laboratory.

Laboratory:  
TÜV SÜD PSB Pte. Ltd.  
15 International Business Park  
TÜV SÜD @ IBP  
Singapore 609937

Phone : +65-6778 7777  
E-mail: info.sg@tuvsud.com  
<https://www.tuvsud.com/sg>  
Co. Reg : 199002667R

Regional Head Office:  
TÜV SÜD Asia Pacific Pte. Ltd.  
15 International Business Park  
TÜV SÜD @ IBP  
Singapore 609937  
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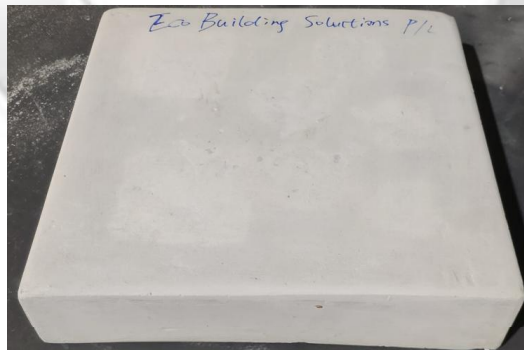
**DESCRIPTION OF SPECIMENS:**

Three pieces of specimen, said to be Brand: "Lightherm" Model: "Lightherm Drymix – Lightweight Thermal Insulation Material" insulation material, each of nominal size of 250mm x 250mm x 52mm (thickness) were received. The area and bulk density of the specimen were measured to be 27.13 kg/m<sup>2</sup> and 522.1 kg/m<sup>3</sup> respectively.

Details of the product, as provided by the sponsor of test, are as follows:

|                      |  |
|----------------------|--|
| Brand                | Lightherm  |
| Model reference      | Lightherm Drymix – Lightweight Thermal Insulation Material |
| Generic product name | Lightweight thermal insulation material                    |
| Material composition | Polystyrene aggregate and cement                           |
| Country of origin    | Malaysia   |
| Manufacturer         | Vodapruuf Pte Ltd  |
| Nominal bulk density | 522.1 kg/m <sup>3</sup>                                    |
| Nominal thickness    | 52mm   |
| Fire retardant       | N.A.   |

Photograph of specimen:



*Vik* *Kan*

## TEST PROCEDURES:

Prior to test, the test specimens were prepared in accordance to clauses 7.2 to 7.5. The test specimens were then conditioned for a minimum of 48 hours at a temperature of  $(23 \pm 2)^{\circ}\text{C}$  and relative humidity of  $(50 \pm 5)\%$  until constant mass is achieved as according to clause 7.6.

The equipment was calibrated according to the method described in clause 8.2 and specimens tested according to clause 8.3 of the standard. A minimum of three tests were conducted for each material type in order for the material to be evaluated.

The gross heat of combustion of the test specimen was calculated in accordance with clause 9.3, 9.4 and Annex D of the standard using the following equation:

$$Q_{PCS} = \frac{E(T_m - T_i + c) - b}{m}$$

The criteria for validity of the test results are shown in Table 1.

Table 1 : Criteria for the validity of test results

| Gross heat of combustion   | Max. and min. of the three replicated tests                                       | Range of validity   |
|--|---|---|
| $Q_{PCS}$ (MJ/kg)  | $\leq 0.2$ MJ/kg<br>Within 5% <sup>b</sup><br>Within 10% <sup>b</sup>             | From any negative value to 3.2 MJ/kg<br>From 3.2 MJ/kg to 20.0 MJ/kg<br>Greater than 20.0 MJ/kg   |
| $Q_{PCS}$ (MJ/m <sup>2</sup> ) <sup>a</sup>  | $\leq 0.1$ MJ/m <sup>2</sup><br>Within 5% <sup>b</sup><br>Within 10% <sup>b</sup> | From any negative value to 4.1 MJ/m <sup>2</sup><br>From 4.1 MJ/m <sup>2</sup> to 20 MJ/m <sup>2</sup><br>Greater than 20 MJ/m <sup>2</sup> |
| <sup>a</sup> for non-substantial components only<br><sup>b</sup> of the average of 3 results |   |   |

*Yik*



**TEST RESULTS:**

|  |   |                          |                       |                                    |
|--|---|--------------------------|-----------------------|------------------------------------|
| Material:  | Lightweight thermal insulation material |                          |                       |                                    |
| Method:  | Crucible                                |                          |                       |                                    |
| Combustion aid:  | Benzoic acid                            |                          |                       |                                    |
| Mass ratio (sample:<br>combustion aid):                          | 1 : 1                                   |                          |                       |                                    |
| Number of test runs:   | 3                                       |                          |                       |                                    |
| Water equivalent, (MJ/K):  | 0.00998                                 |                          |                       |                                    |
|  | Specimen<br>Mass (gm)                   | Temperature<br>Rise (°C) | Gross Heat<br>(MJ/kg) | Gross Heat<br>(MJ/m <sup>2</sup> ) |
| Test run #1:   | 0.4999                                  | 1.3589                   | 0.4391                | 11.9128                            |
| Test run #2:   | 0.5001                                  | 1.3597                   | 0.5307                | 14.3979                            |
| Test run #3:   | 0.5000                                  | 1.3579                   | 0.4850                | 13.1581                            |
| Average Q <sub>PCS</sub> value of<br>three test results (MJ/kg): | 0.48                                    |                          |                       |                                    |
| Maximum Q <sub>PCS</sub> –<br>Minimum Q <sub>PCS</sub> (MJ/kg):  | 0.09                                    |                          |                       |                                    |
| Maximum Q <sub>PCS</sub> –<br>Minimum Q <sub>PCS</sub> (%):      | 18.89                                   |                          |                       |                                    |

**OBSERVATIONS:**

The specimens were fully combusted.


**CONCLUSION:**


The total average gross heat of combustion of the specimen was 0.48 MJ/kg with the Maximum Q<sub>PCS</sub> and Minimum Q<sub>PCS</sub> value difference of 0.09 MJ/kg. This equated to 18.89% of the average Q<sub>PCS</sub> value.

For the validity of test results, the difference between the maximum and minimum gross heat of combustion values meets the criteria of  $\leq 0.2\text{MJ/kg}$  as specified in clause 11 of BS EN ISO 1716: 2010 for the range of any negative value to 3.2 MJ/kg.

**REMARKS:**

The test results relate to the behaviour of the test specimens of a product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

  
Vikneshwaran Jayaraman  
Assistant Manager

  
Chan Lung Toa  
Assistant Vice President  
Fire Testing  
Mechanical Centre

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Effective 26 January 2021

