Certified Thermal Details and Products Scheme

Marmox – Thermoblock (100mm, 140mm & 215mm blocks)

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1 Introduction

1.1 Certified Thermal Details and Products Scheme

The Certified Thermal Details and Products Scheme and database allows users to search a range of accurate and independently assessed thermal junction details, products and elements, ensuring accuracy, consistency, credibility and quality throughout the design and specification process.

This scheme provides independent, third party assessment and certification of the ‘as designed’ thermal performance of:

- Building junction details (e.g. SAP Table K1 + some bespoke detail types)
- Opening products (e.g. windows, doors and rooflights)
- Major (plane) building elements (e.g. wall, roof and floor products)

This ensures that the performance, marking and classification requirements of the appropriate standards are met and maintained.

1.2 Marmox – Thermoblock (100mm, 140mm & 215mm blocks)

Marmox have submitted the Thermoblock (100mm, 140mm and 215mm variations) within junction details to BRE. These were assessed, certified and listed on the Certified Thermal Details and Products Scheme database:

www.bre.co.uk/certifiedthermalproducts

Ψ-value (W/m·K) and temperature factor (f) calculations were undertaken for the junction details as follows:

- Cavity wall (100mm and 140mm variations)
  - Slab on ground (insulation above slab)
  - Beam and block

- Timber frame (140mm and 215mm variations)
  - Slab on ground (insulation above slab)
  - Beam and block

The quantity which describes the heat loss associated with a thermal bridge is its linear thermal transmittance, Ψ. This is a property of a thermal bridge and is the rate of heat flow per degree per unit length of the bridge, that is not accounted for in the U-values of the plane building elements containing the thermal bridge.

The temperature factor (f) is used to assess the risk of surface condensation or mould growth and is calculated under steady state conditions. To avoid problems of surface condensation or mould growth, the \( h_u \) should not be less than a critical temperature factor (\( f_{CRsi} \)). A range of appropriate critical temperature factors, as identified in BRE Information Paper IP 1/06, are detailed in Table 1.
<table>
<thead>
<tr>
<th>Type of Building</th>
<th>Critical Temperature Factor ((f_{CRsi}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Buildings</td>
<td>0.30</td>
</tr>
<tr>
<td>Offices, retail premises</td>
<td>0.50</td>
</tr>
<tr>
<td>Dwellings, residential buildings, schools</td>
<td>0.75</td>
</tr>
<tr>
<td>Sports halls, kitchens, canteens</td>
<td>0.80</td>
</tr>
<tr>
<td>Swimming pools, laundries, breweries</td>
<td>0.90</td>
</tr>
</tbody>
</table>

Table 1: Recommended critical temperature factors

In this case, the critical temperature factor selected for assessment is for dwellings / residential buildings (0.75).
2 Assessment

2.1 Thermal assessment
Thermal assessment models of junction details were created for each of the details. These were developed on the basis of information provided by the client, with representative thermal conductivities assumed for each material.

The assessments were undertaken in compliance with:
  - BR 497 Conventions for calculating linear thermal transmittance and temperature factors

2.2 Software
The assessment was undertaken using Physibel TRISCO (v 12.0) thermal modelling software.

2.3 Geometry
Within the models, the detailed geometry of the junction details were taken from drawings provided by the client, as per the detail drawings contained within Appendix B.

2.4 Thermal conductivities
The representative thermal conductivities used in the model were taken from BS EN ISO 10456 and information provided by the client, as detailed in Table 2.

<table>
<thead>
<tr>
<th>Material</th>
<th>Thermal conductivity (W/m·K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XPS Thermoblock</td>
<td>0.047</td>
</tr>
<tr>
<td>Brick</td>
<td>0.77</td>
</tr>
<tr>
<td>Concrete block</td>
<td>1.13</td>
</tr>
<tr>
<td>Lightweight concrete block</td>
<td>0.19</td>
</tr>
<tr>
<td>Screed/ infill concrete</td>
<td>1.15</td>
</tr>
<tr>
<td>Dense concrete</td>
<td>2.30</td>
</tr>
<tr>
<td>Render</td>
<td>1.00</td>
</tr>
<tr>
<td>Plasterboard</td>
<td>0.21</td>
</tr>
<tr>
<td>Timber</td>
<td>0.13</td>
</tr>
<tr>
<td>Mineral wool (wall)</td>
<td>0.032</td>
</tr>
<tr>
<td>Rigid insulation (wall)</td>
<td>0.023</td>
</tr>
<tr>
<td>Mineral wool (floor)</td>
<td>0.035</td>
</tr>
<tr>
<td>Rigid insulation (floor)</td>
<td>0.022</td>
</tr>
</tbody>
</table>

Table 2: Representative thermal conductivities
3 Assessment results

3.1 Assessment results

The results for the assessment of the junction detail variations are given in Table 3.

<table>
<thead>
<tr>
<th>Manufacturer Reference</th>
<th>Description</th>
<th>Calculated Ψ-value (W/m K)</th>
<th>Temperature Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>600376</td>
<td>100 mm XPS Thermoblock Cavity wall-ground floor junction (insulation above slab)</td>
<td>0.032</td>
<td>0.94</td>
</tr>
<tr>
<td>600377</td>
<td>140 mm XPS Thermoblock Cavity wall-ground floor junction (insulation above slab)</td>
<td>0.030</td>
<td>0.94</td>
</tr>
<tr>
<td>600378</td>
<td>100 mm XPS Thermoblock Cavity wall-ground floor junction (beam and block floor)</td>
<td>0.079</td>
<td>0.87</td>
</tr>
<tr>
<td>600379</td>
<td>140 mm XPS Thermoblock Cavity wall-ground floor junction (beam and block floor)</td>
<td>0.087</td>
<td>0.86</td>
</tr>
<tr>
<td>600380</td>
<td>140 mm XPS Thermoblock Timber frame wall-ground floor junction (insulation above slab)</td>
<td>0.042</td>
<td>0.92</td>
</tr>
<tr>
<td>600381</td>
<td>140 mm XPS Thermoblock Timber frame wall-ground floor junction (beam and block floor)</td>
<td>0.075</td>
<td>0.89</td>
</tr>
<tr>
<td>600382</td>
<td>215 mm XPS Thermoblock Timber frame wall-ground floor junction (insulation above slab)</td>
<td>0.039</td>
<td>0.93</td>
</tr>
<tr>
<td>600383</td>
<td>215 mm XPS Thermoblock Timber frame wall-ground floor junction (beam and block floor)</td>
<td>0.065</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Table 3: Assessment results

Graphics from the thermal modelling for each of the variations are given in Appendix A. This includes for:

- Geometry and heat flow (heat flow not available in models with 3D elements, e.g. beam and block floors)
- Temperature distribution profile
## Appendix A  Materials with heat flows and Temperature Distribution Profiles
<table>
<thead>
<tr>
<th>600376 - Cavity wall-ground floor junction (insulation above slab with 100mm Thermoblock)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials and heat flow</strong></td>
</tr>
<tr>
<td><img src="image" alt="Diagram of materials and heat flow" /></td>
</tr>
<tr>
<td><strong>Temperature profile</strong></td>
</tr>
<tr>
<td><img src="image" alt="Diagram of temperature profile" /></td>
</tr>
</tbody>
</table>
600377 - Cavity wall-ground floor junction (insulation above slab with 140mm Thermoblock)

<table>
<thead>
<tr>
<th>Materials and heat flow</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature profile</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image2.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>
600378 - Cavity wall-ground floor junction (beam and block floor with 100mm Thermoblock)

<table>
<thead>
<tr>
<th>Materials</th>
</tr>
</thead>
</table>

| Temperature profile |

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
</table>

Materials diagram:

Temperature profile:

[Images of materials and temperature profile]
600379 - Cavity wall-ground floor junction (beam and block floor with 140mm Thermoblock)

**Materials**

**Temperature profile**
600380 – Timber frame wall-ground floor junction (insulation above slab with 140mm Thermoblock)

Materials and heat flow

Temperature profile
600381 – Timber frame wall-ground floor junction (beam and block floor with 140mm Thermoblock)

<table>
<thead>
<tr>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Temperature profile</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image2" alt="Diagram" /></td>
</tr>
</tbody>
</table>
600382 - Timber frame wall-ground floor junction (insulation above slab with 215mm Thermoblock)

<table>
<thead>
<tr>
<th>Materials and heat flow</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Temperature profile</th>
</tr>
</thead>
</table>
600383 - Timber frame wall-ground floor junction (beam and block floor with 215mm Thermoblock)

<table>
<thead>
<tr>
<th>Materials</th>
</tr>
</thead>
</table>

| Temperature profile |

[Diagram showing materials and temperature profile]
Appendix B  Junction detail drawings
Calculation conditions

Thermal Resistance of insulation used in details:

- Wall (cavity) - 3.26 (m²K)/W
- Wall (inner leaf) - 1.63 (m²K)/W
- Floor - 4.55 (m²K)/W

Product type: 100mm Marmox XPS Thermoblock

Junction type: Wall-ground floor junction (insulation above slab)
Calculation conditions
Thermal Resistance of insulation used in details:
- Wall (cavity) - 3.26 (m²K)/W
- Wall (inner leaf) - 1.63 (m²K)/W
- Floor - 4.55 (m²K)/W

Product type: 140mm Marmox XPS Thermoblock
Junction type: Wall-ground floor junction (insulation above slab)

Ψ-value (W/m·K) = 0.030
Temperature Factor (f) = 0.94
Product type: 100mm Marmox XPS Thermoblock
Junction type: Wall-ground floor junction (beam and block)
Calculation conditions
Thermal Resistance of insulation used in details:
- Wall (cavity) - 3.26 (m²K)/W
- Wall (inner leaf) - 1.63 (m²K)/W
- Floor - 5.00 (m²K)/W

Product type: 140mm Marmox XPS Thermoblock
Junction type: Wall-ground floor junction (beam and block)
Calculation conditions
Thermal Resistance of insulation used in details:
- Wall - 4.38 (m²K)/W
- Wall (inner leaf) - 1.09 (m²K)/W
- Floor - 4.55 (m²K)/W

Product type: 140mm Marmox XPS Thermoblock
Junction type: Wall-ground floor junction (insulation above slab)

$\Psi$-value (W/m·K) = 0.042
Temperature Factor ($f$) = 0.92
**Product type:** 140mm Marmox XPS Thermoblock

**Junction type:** Wall-ground floor junction (beam and block)

**Certified Thermal Details and Products Scheme**
Reference no.: 600381

**Calculation conditions**

Thermal Resistance of insulation used in details:
- Wall: 4.38 (m²K)/W
- Wall (inner leaf): 1.09 (m²K)/W
- Floor: 5.00 (m²K)/W

**Temperature Distribution diagram**
For illustrative purposes only.

**Heat Flow Distribution diagram**
For illustrative purposes only.

Ψ-value (W/m·K) = 0.075
Temperature Factor (f) = 0.89
Heat Flow Distribution diagram
For illustrative purposes only.

Temperature Distribution diagram
For illustrative purposes only.

Product type: 215mm Marmox XPS Thermoblock
Junction type: Wall-ground floor junction (insulation above slab)

Calculation conditions
Thermal Resistance of insulation used in details:
- Wall - 6.72 (m²K)/W
- Wall (inner leaf) - 1.09 (m²K)/W
- Floor - 4.55 (m²K)/W

Ψ-value (W/m·K) = 0.039
Temperature Factor (f) = 0.93
**Calculation conditions**

Thermal Resistance of insulation used in details:
- Wall: 6.72 (m²K)/W
- Wall (inner leaf): 1.09 (m²K)/W
- Floor: 5.00 (m²K)/W

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**Product type:** 215mm Marmox XPS Thermoblock

**Junction type:** Wall-ground floor junction (beam and block)

Ψ-value (W/m·K) = 0.065

Temperature Factor \((f)\) = 0.91