List of specific details for the RRT
left as open choices by the CEN CWA 36

Proposition from Proposer for electronic consultation

Secretarial notes
1. highlighted modifications in section A1 made throughout the document
2. This 2nd revision has been called rev3 in order to coincide with the version of the main RRT Agreement

The Round Robin Test procedure shall comply with the requirements of sections 1 to 7 of the CEN WS36 CWA “Thermal insulation – Building roof elements – Evaluation of thin multi-layer reflective insulation products by in situ testing”. The specific requirements detailed in this Annex shall exclusively apply to the Round Robin Test programme detailed in the RRT Agreement.

A1 Design, construction and materials of roofed test cells
(refer to clause 5.1 of the CEN WS 36 CWA agreed as the basis for planning the RRT)

The proposed design of the structure of the test cells to be used for the RRT is as presented in Annex A of the CEN WS 36 CWA.

Rationale:

- The proposed roof structure complies with the requirements of the CEN WS 36 CWA sections 1-7
- The proposed roof structure using rafters and a wooden structure is the most used design in Europe for roof construction in residential buildings
- EMM and multifoil manufacturers have a long experience of in situ testing using such a design and dimensions which are pertinent to reach the objectives of the CEN WS 36 CWA.
- A large number of identical structures are already built all around Europe and can be used for this RTT. This represents an investment of more than 1,5 M€ for EMM and their members

A2 Insulation products
(refer to clause 5.1 of the CEN WS 36 CWA)

A2.1 Reference insulation product:

EMM proposes the following traditional product and conditions of use for the reference material:
- Type: Mineral Wool with integrated vapour barrier
- Thickness: 200 mm and thermal conductivity: $\lambda = 0.040 \text{ W/m.K}$
- Setup in the roofed test cell: between rafters

Rationale:
- Mineral Wool is the most common insulation material used in pitched roofs. It represents more than 60% of the solutions used in this kind of roof design in Europe
- Mineral Wool is a good product, certified with a declared value assumed to be stable for a long service period

Summary of thermal resistance and equivalent thickness of traditional insulation products used in pitched roof insulation in Europe.
(Based on market analysis)

<table>
<thead>
<tr>
<th>Country</th>
<th>Usual thermal resistance $[\text{m}^2\cdot\text{K}/\text{W}]$</th>
<th>Equivalent thickness $[\text{mm}]$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>1.25</td>
<td>50</td>
</tr>
<tr>
<td>Spain</td>
<td>1.55</td>
<td>60</td>
</tr>
<tr>
<td>Belgium</td>
<td>3.15</td>
<td>125</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3.65</td>
<td>145</td>
</tr>
<tr>
<td>Lithuania</td>
<td>4.75</td>
<td>190</td>
</tr>
<tr>
<td>Germany</td>
<td>4.85</td>
<td>195</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>5.10</td>
<td>200</td>
</tr>
<tr>
<td>France</td>
<td>5.25</td>
<td>210</td>
</tr>
<tr>
<td>Finland</td>
<td>6.55</td>
<td>260</td>
</tr>
<tr>
<td>Denmark</td>
<td>6.75</td>
<td>270</td>
</tr>
</tbody>
</table>

- $\lambda = 0.040 \text{ W/m.K}$ is a reference value for thermal conductivity of mineral wool.
  Taking note of the table above, $R=5.00$ for a thickness = 200mm is a good compromise representing a mean value for Europe
- From EMM’s experience, using mineral wool with a thickness = 200mm, thermal conductivity = 0.040, installed between rafters, complies with the requirements of the CEN WS 36 CWA and permits the easy validation of the test cell qualification
- EPS is commonly used in flat roof insulation but it is not common in pitched roofs
- If some laboratories participating in the RRT want to use an additional type of traditional insulation product (as a secondary reference material), a fourth roof test cell is permitted by the CEN WS 36 CWA for this purpose

A2.2 Multifoil insulation product

(product to be evaluated to be determined by the Proposer)

thickness less than 50mm
- more than 5 components (probably more than 15)
- including several low emissive and reflective layers
- fixed under the rafter with an air gap on both sides

A2.3 Other components

Vapour barrier:

A vapour barrier is a requirement for mineral wool. It is usually attached to the insulation product and is positioned interior of the insulation product, i.e. towards the interior of the roof space. IMMR does not need a vapour barrier because of their air-tightness and vapour-tightness characteristics. Thus, for the qualification test and main test, mineral wool will be used with an integrated vapour barrier and IMMR without any additional vapour barrier.

Breather membrane:

A breather membrane shall be used during the qualification test phase in all test cells. For the main test period all of the test cells shall be tested with a breather membrane suitable for the insulation product installed following the recommendations of the insulation product manufacturer. The empty test cell shall retain the breather membrane fitted during the qualification phrase. However, if time permits, a second test may be carried out with the breather membrane removed from the test cells. The insulation and vapour barrier shall not be disturbed by the removal of the breather membrane which may be achieved by removing the roof tiles:

- First stage (first test period): with breather membrane
- Second stage (second test period): without breather membrane

Rationale:

A breather membrane is not a requirement in some parts of Europe and conventional laboratory methods of test consider only the insulation product without any other building components. Having the in situ test in two stages, with and without breather membrane, would permit the following:

- provide a direct link with conventional methods of test which do not consider the effects of the breather membrane
- identify the effect of weather parameters on the insulation systems

A2.4 Condition of Insulation Products prior to installation

All insulation products to be employed in the RRT programme shall be kept prior to their use in the roofed test cells, such that they are not deformed or damaged or kept in an environment that reduces their insulation properties, such as in damp or humid conditions.

All insulation products, including the multifoil insulation, to be employed in the RRT programme shall be evaluated by the RRT participating laboratory, or another accredited laboratory, using traditional methods of test established for traditional insulation products as required by the CEN WS36 CWA.

A3 Internal roof lining materials and jointing (excluding breather membranes or vapour barrier) (refer to clause 5.1.7 of the CEN WS 36 CWA)
EMM proposes to use gypsum plasterboard:

- Board thickness 13mm with adjusted borders (type BA13)
- Directly fixed onto rafter (without metallic support)
- Joint of the lining sealed with plaster skim

**Rationale:**
- *Plasterboard is the most used solution for building finishing*
- *Permits the achievement of good air-tightness level*
- *Good fire protection*

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**A4 Air exchange rate**
*(refer to clause 5.1.5 of the CEN WS 36 CWA)*

EMM proposes to use the $n_{50\text{Pa}}$ value suggested in the *CEN WS 36 CWA*. This value is $n_{50\text{Pa}} = 3.8 \text{ h}^{-1}$ with a surface / volume ratio equal to 0.75 as referred to in clause 5.1.5.

**Rationale:**
- *It corresponds to the official medium level standardized in EN 832*
- *$n_{50\text{Pa}}=0$ is unrealistic, difficult to achieve in reality, not sustainable and not common in real cases for building construction*
- *If a participating laboratory in the RRT wishes to use another $n_{50}$ value, an additional roof test cell shall be used for this purpose*

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**A5 Heating, cooling systems specification**
*(refer to clauses 5.2.3 & 5.2.4 of the CEN WS 36 CWA)*

**A5.1 Heating system**

EMM proposes to use fan heaters as recommended in the *CEN WS 36 CWA*.

- Two fan-heaters with a maximal nominal power rating of 1000W (precise calculation of energy needed to be completed by the RRT WG)
- Positioned on the floor, near the centre of the test cells and pointing outward towards two diagonally opposite corners. In the case of four heaters, these shall be mounted near the centre of the cell with one heater pointing towards each corner
- The regulation is to be zero or nominal power (not progressive) with sufficient running time (> 2 minutes)

**Rationale:**
- *Very simple and less expensive than other heating systems*
- *This system is commonly used in residential buildings*
- *Fan heaters gives a rate equal to 1 between electric energy consumed by the system and thermal energy given to its environment and they do not need pre-treatment of energy consumption before analysis*
- Is in accordance with the requirements of the CEN WS 36 CWA document
- Other systems such as heat pumps and/or systems using generators for hot water (oil, gas, …) have several performance coefficients due to production, distribution, emission and regulation

A5.2 Cooling system

EMM proposes to use a heat pump.

- The RRT WG shall precise the calculation of energy need in order to permit a sufficient running time (> 2 minutes).
- The evaporator shall be fixed on the inside of a gable end wall. The condenser shall be positioned outside near the test cell, protected from the weather conditions preferably on the north side.
- The performance coefficient (COP) of the cooling system shall be measured and recorded continually according the method detailed in Annex XX.B of the CEN WS 36 CWA.

Rationale:
- These requirements are commonly used for cooling systems
- The proposals are in accordance with the requirements of the CEN WS 36 CWA document
- For cooling systems, the determination of the performance coefficient due to production, distribution and emission is an obligatory step

A6 Internal temperature setting
(refer to clause 5.2.2 of the CEN WS 36 CWA)

EMM proposes to use internal temperature settings of 18°C and 23°C as defined in the CEN WS 36 CWA.

- 23°C in winter
- 18°C summer

Rationale:
- These values are representative of temperature settings in residential buildings
- They permit a significant difference of temperature during the test periods in each country where the RRT will be run.

A7 Additional sensors (definition, number, position)
(refer to clauses 5.3 to 5.5 of the CEN WS 36 CWA)

EMM proposes the minimum specification of sensors as defined in the CEN WS 36 CWA

Rationale:
From EMM experience, these are sufficient

The RRT WG can decide on additional sensors if necessary

### A8 Test periods selected
(refer to clause 7.7 of the CEN WS 36 CWA)

EMM proposes a minimum test period of two months within a period of four months, as defined below.

The periods given below include the Qualification test phases, see CEN WS 36 CWA clause 6.4

- Winter period: from the 15th of November 2008 (beginning of RRT) to the 15th of March 2009
- Summer period: from the 1st of June 2009 to the 1st of October 2009 (end of the RRT)

**Rationale:**

- It permits a certain amount of flexibility in the test period depending on the weather conditions encountered in the country where the test is made

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