

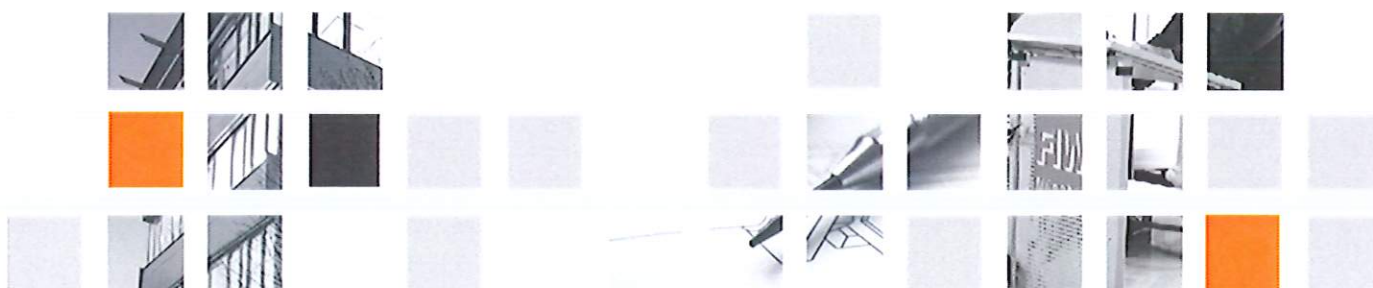
## **Case study: Durability of cellular glass in building applications – Testing of Foamglas® insulation**

### **Sampling: Care Home in Burcot, England (UK) (flat roof built in 1989)**

Max Engelhardt

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Responsibility for the content of the report lies with the authors.



# **FIW München**

**Report: E3.3-2017/10a**



Notified body for testing, surveillance and certification of building materials and components  
Research and development in the field of heat and moisture protection



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This report includes

10 pages  
4 figures  
2 tables

Gräfelfing, 21 December 2017

Director

Head of Department

Author

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## 1 Introduction

This summary gives a short review on one of many sampling and testing operations conducted in 2017 which is part of an ongoing study on durability of cellular glass for Pittsburgh Corning Europe. General aim of the study is to increase the knowledge about the long-term behaviour of cellular glass insulation in different types of building applications and determining factors influencing the stability and expected useful life. The project focuses on specific applications for building insulation materials e.g. external wall and flat roof insulation.

The building site of the herein described sampling operation was selected by the applicant. The sampling procedure was conducted by local personnel of Pittsburgh Corning supervised by a third party commissioner.



Figure 1: View of the building / probed flat roof construction

## 2 Sampling operation

FOAMGLAS® insulation material was sampled under third party supervision by the applicant from the flat roof of the a care home building "John Masfield House (Leonard Cheshire)" in Burcot, Oxfordshire, England on 22<sup>th</sup> of September, 2017.



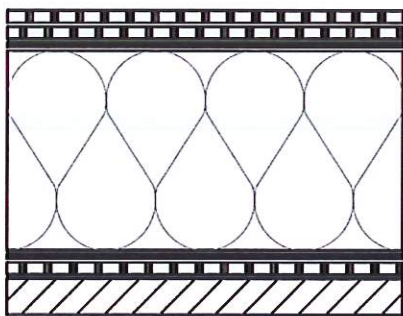
Figure 2: During the sampling operation on site

The sampling operation was conducted following a comprehensive sampling guideline issued by FIW. This guideline defines the standards of operation within the project for third parties, assigned by Pittsburgh Corning to supervise and document a sampling operation of cellular glass specimens. It includes instructions for the inspections of buildings and FOAMGLAS® cellular glass products, the documentation, sampling, and shipping.

The guideline provides instructions and templates for the assigned sampling commissioners to meet the project's specifications and to harmonize the procedures for all inspections/samplings. Necessary data, which has to be gathered on site and manners of documentation for a proper evaluation within the framework of the ongoing durability study, is specified.

Important sampling documentation information on the building, the product, and construction gathered by the sampling commissioner is summarized below.

**Table 1: Sampling operation in Burcot, England (based on sampling protocol)**

Building	John Masfield House (Leonard Cheshire)
Location	Linnet Close OX14 3DP Burcot England, UK
Year of construction	1989
Product	FOAMGLAS® T2 (90 mm) Cellular glass slabs 600 mm x 450 mm
Service Life	Since 1989 (28 years)
Sampling point	Flat roof over residential rooms (normally heated). Central point, close to water evacuation-drain (gutter) Roof area is strongly exposed to sun, only in the morning shaded by nearby roof edges, techniques and skylights. .
Construction build-up	<p>Flat roof build-up with bitumen membranes and wooden substructure.</p>  <p>Roof slope 1:60</p>
Condition	Construction in good condition, membrane fully adhered to FOAMGLAS®. Aging symptoms of upper bitumen membrane visible ("crocodile skin"). No water accumulations / dry, no blisters.



### 3 Measurements

The samples were delivered in water- and vapor proof packaging to FIW München on 4<sup>th</sup> October 2017 by the applicant. The laboratories at FIW performed several measurements on the specimens.

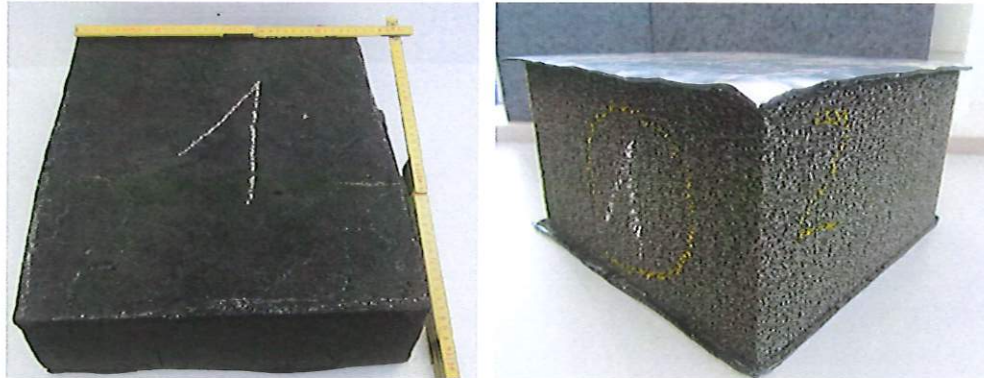


Figure 3: Sample (1 of 4) as arrived in the FIW laboratories (left), prepared specimens for measurement of compressive strength (right).

The thermal performance was determined in “as-is” condition as well as oven-dry condition in a “heat flow meter apparatus” according to ISO 8301.

The structural durability was assessed by measurement of compressive strength by means of a universal materials testing machine. The measurements were conducted according to the special requirements for cellular glass as stated in Annex A of DIN EN 826:2013.

Additionally moisture content and dry density of the sample were measured.

### 4 Results

The specimens from the flat roof of the Care Home in Burcot, England show the following quality characteristics:

Table 2: Results of measurement for FOAMGLAS® insulation installed 1989 in Burcot

<b>Thermal conductivity</b> (DIN EN 12667:2001-05)	0.048 W/(m·K) (condition as sampled) 0.048 W/(m·K) (dry condition)
<b>Compressive strength</b> (DIN EN 826:2013-05)	1018 kPa (dry condition)
<b>Moisture content</b> (DIN EN ISO 12570:2013-09)	0.4 % by mass / 0.06 % by volume
<b>Density (oven-dry)</b> (EN 1602:2013-05)	129 kg/m <sup>3</sup>

## 5 Conclusion

For the time and location of the product installation – England in 1989 – there is no technical approval or similar document for the insulation material available. Therefore the sampled product was assessed according to the approval in the country of manufacture (Belgium). The approval was issued by the Belgian Union for technical approval in construction (BUtgb), see technical approval ATG/H 539 of November 1983.

It states a thermal conductivity for FOAMGLAS® T 2 for new FOAMGLAS® insulation material of 0.045 W/(m·K) and a compressive strength of 500 kPa (according to the then valid standard ASTM C 240-72).

<p><b>BUtgb</b> N.I.H.-SECO-W.T.C.B.</p> <p>Belgische Unie voor de technische goedkeuring in de bouw</p> <p>c/o N.I.H. St. Lazaruslaan 10, 1030 Brussel Tel. : 02 / 218.45.70</p> <p>Lid van de Europese Unie voor de technische goedkeuring in de bouw (EUtgb)</p>	<p>Technische goedkeuring Agrément technique</p> <p>Doorlopende homologatie Homologation suivie</p> <p><b>Cellulair glas FOAMGLAS® en FOAMGLAS®-BOARD</b></p> <p>PITTSBURG CORNING EUROPE N.V. Tervurenlaan 32-38, 1040 Brussel Tel. (02) 735 90 36 - Telex 22277</p>	<p>ATG/H 539</p> <p>Geldig van 17-11-1983 tot 17-11-1986</p> <p>U.D.C. : 69.025</p> <p>THERMISCHE ISOLATIE ISOLATION THERMIQUE WÄRMEDÄMMUNG THERMAL INSULATION</p>
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Figure 4: Header of Belgian technical approval for FOAMGLAS T2

Considering the stated period of use (28 years) the tested samples showed good mechanical properties still easily meeting the requirements for new manufactured products of 1989 with over 1000 kPa compressive strength.

The thermal conductivity in sampled condition of 0.048 W/(m·K) is indicating a high thermal insulation performance.



## 6 Liability

Measurements results are valid only for the described materials, properties and dimensions. The report is based on the current knowledge from research in thermal transport. Liability can only be accepted within the scope of this knowledge.

Warranty for analysis results and expert opinions of FIW München e.V. is limited to the limitations of claim in § 634a BGB for buildings.



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