FIW München e.V.
Notified body for testing, surveillance and certification of building materials and components
Consultation, research and development

Durability Project
Mineral wool

Applicant:

EURIMA
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Belgium

FIW München

Report on findings E3.3-2016/01

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FIW Report No. E3.3-2016/01

Durability Project

Mineral wool

EURIMA
Avenue Louise 375 – Box 4
B-1055 Brussels
Belgium

Gräfelfing,
den 26. April 2016

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1 Introduction

Mineral wool insulation mainly consists of the raw materials glass or stone, materials that "stands the test of time (coll.)". Most of the oldest buildings existent are made from stone, a matter of fact, usually nobody is surprised about. Nevertheless, the long-term performance of mineral wool has been questioned throughout the history of the industry without being accurately defined or determined.

The increasing demands of modern building practice and the Life Cycle Assessment of buildings bring greater focus on performance over time. Durability raises its profile in product standards, notably for ETICS, and EOTA is requesting test methods to be inserted into product standards.

Thermal insulation plays a major role in carbon savings of buildings and plants and contributes to Government targets upon climate change. Grant schemes are provided to foster increases in insulation use. Governments become concerned about the security, longevity and cost effectiveness of carbon saving measures. Durability may therefore become a new differentiator between products used for energy efficiency savings

EURIMA wants to provide reliable data on the durability of mineral wool insulation in buildings. Therefore this project is initiated with strict requirements for sampling procedure and testing methods to ensure resilient results. Samplings are done by independent third party laboratories or FIW, and the testing is conducted at FIW, a notified body for testing, surveillance and certification of building materials and components.

The sampling sites are selected by EURIMA without influence of FIW.

2 Scope

For the European Insulation Manufacturer Association (EURIMA) a field study is being conducted to investigate the durability of mineral wool insulation products in building applications (flat roof and façade), that encountered natural ageing under regular conditions for more than 20 years.

The study intends to demonstrate the durability of mineral wool insulation products. Therefore, the applicant sought and selected buildings, available for sampling and suitable to the problem. The constructions should be at least 20 years in service and should not be affected by any structural damages. Information regarding service time and possible retrofit methods are provided by the building owner or the applicant. Third party laboratories or FIW are then taking samples from the insulation material of these buildings. The samples are subject to a test procedure depending on the application type of the mineral wool product.

The results of measurement are used to assess the remaining usability of the aged insulation materials and consequently the durability. The results are eventually compared with product specification sheets of the aged products and the former standard specifications (which were valid at the time of production).

3 Methodology

The following chapter describes the procedures for sampling and testing specified in this project.

3.1 Sampling

Sampling and documentation of sampling are conducted by different third party contractors or FIW itself. EURIMA stated the basic requirements of the sampling procedures in this project. A Third party Laboratory/Institute or FIW shall …

- Take six m² of insulation material for FIW
- Two m² out of the six m² have to be wrapped in plastic bags and sealed for moisture check and testing of thermal conductivity.
- Take pictures of the sampling operation (showing the initial situation and the sampling procedure.
- Write a report for FIW explaining the sampling operation containing
  - Situation on site (weather)
  - Construction details
  - Sketches and descriptions of sampling points
  - Procedures for sampling

If third-parties are involved in the sampling procedure, the samples are sent directly to FIW.

3.2 Test design

To determine durability various tests are conducted, depending on the application of the mineral wool product. The scope of inspection for each application is given below. All listed tests are done for every sampling point of each sampling. Sampling points are chosen to verify the results or to differentiate different areas of stress exposure (thermal, hygric, mechanical).

Measurements of thermal conductivity are conducted on samples, which are sealed water vapour proof during sampling to incorporate the insulations' humidity on site into the measurement. These samples are also used for measurement of moisture content.

Mechanical properties are tested, if the application of the material implies requirements of these properties to maintain usability (e.g. flat roofs - but not for cavity walls or behind ventilated claddings).

For wall insulation samples

The following tests are conducted with all samplings (one test series per sampling position) from applications in wall constructions:

- Thickness (acc. to EN 823)
- Density (acc. to EN 1602)
- Moisture content (acc. to EN ISO 12570)
- Thermal conductivity (acc. to EN 12667) at moisture condition as delivered (The specimens are sealed during measurement to prevent desiccation)
- Compressive strength (acc. to EN 826) (*only non-ventilated constructions e.g. ETICS*)
- Water absorption (acc. to EN 12087 and / or EN 1609)

For roof samples

The following tests are conducted with all samplings (one test series per sampling position) from applications in roof constructions:

- Thickness (acc. to EN 823)
- Density (acc. to EN 1602)
- Moisture content (acc. to EN ISO 12570)
- Thermal conductivity (acc. to EN 12667) at moisture condition as delivered (The specimens are sealed during measurement to prevent desiccation)
- Compressive strength (acc. to EN 826)
- Tensile strength perpendicular to faces (acc. to EN 1607)
- Point load behavior (acc. to EN 12430)
- Water absorption (acc. to EN 12087 and / or EN 1609)

4 Samplings and results of measurement

In this chapter, the results of measurement and general information on the samplings are given in chronological order of sampling and testing starting with the first sampling in Neuburg Germany in 2013.

4.1 Roof insulation – Neuburg a. d. Donau (Germany)

Sampling (Neuburg a. d. Donau)

Sampling date:	20th of June, 2013
Sampling by:	Forschungsinstitut für Wärmeschutz e.V. München
	Munich (GER)
Building:	Factory building
Sampled product:	Rockwool RP XV 140 mm
Service time:	25 years
Construction design:	flat roof construction:
(External to internal)	Bitumen sheeting
	Insulation (no vapour barrier)
	Trapezoidal metal sheeting
Sampling Positions:	1. Center
	2. Peripheral area near rain gutter
	3. Peripheral area near air shaft
Annotations:	The buildings' roof was currently being renovated. Weather conditions at the time of sampling are good (no precipitation). When opening the roofing, no signs of deformation or water damages of the insulation are found. The metal sheeting below the insulation layer was free of water. The sampling procedure was executed according to chapter 3.1.

Results (Neuburg a. d. Donau)

The table below summarizes the results of the test methods (mean values) on roof insulation samples from Neuburg a. d. Donau (Germany).

Table 1: Results – Sampling 1 - Neuburg a. d. Donau

Measurement	Sampling position		
	1	2	3
thickness [mm]	141	141	140
density (oven-dry) [kg/m³]	132.5	132.7	132.6
water content [% by mass]	-	-	-
thermal conductivity* [W/(m·K)]	0.0366*	0.0352*	0.0353*
compressive strength [kPa]	47	42	47
tensile strength [kPa]	6	10	10
point load [N]	254	283	234
water absorption short term [kg/m²]	4.81	5.49	5.67
water absorption long term [kg/m²]	9.9	10.5	9.7

(*thermal conductivity of these samples is tested *after* drying)

4.2 Wall insulation – Roskilde (Denmark)

Sampling (Roskilde)

Sampling date:	04th of February 2014
Sampling by:	Dancert A/S
	Taastrup (SK)
Building:	Viking Ship Museum
Sampled product:	Stone wool insulation "Rockwool A-Batts"
Service time:	20 years
Construction design:	External wall with exterior insulation (ventilated):
(external to internal)	Cladding (cedar wood)
	Gypsum plaster boards
	Insulation layer (150 mm)
	Load-bearing concrete wall
Sampling Positions:	Upper Part of façade (not exposed to flooding)
Annotations:	Water damage in the lower Part due to a flooding in December 2013.
	For further information on the sampling see the sampling report in Annex A.1

Results (Roskilde)

The table below summarizes the results of the test procedures (mean values) on façade insulation samples from Roskilde (Denmark)

Table 2: Results – Sampling 2 - Roskilde (Denmark)

Measurement	
thickness [mm]	151
density (oven-dry) [kg/m³]	29.1
water content [% by mass]	0.6
thermal conductivity [W/(m·K)]	0.0376
compressive strength [kPa]	-
tensile strength [kPa]	-
point load [N]	-
water absorption short term kg/m²]	4.62
water absorption long term [kg/m²]	-

4.3 Roof insulation – Gentofte (Denmark)

Sampling (Gentofte)

Sampling date:	24th of March, 2014
Sampling by:	Danish Technological Institute
	Gregersensvej (DK)
Building:	Hospital
Sampled product:	Stone wool insulation
Service time:	55 years
Construction design:	Concrete roof (slope approx. 15 degrees)
(external to internal)	with exterior insulation:
	Bitumen roofing
	Wooden cladding
	Insulation layer (100 mm, ventilated)
	Concrete
Sampling Positions:	No differentiation
Annotations:	The insulation may have been influenced by leaks in the roofing. Most of the surface of the insulation has marks and small scars.
	For further information on the sampling see the sampling report in Annex A.2

Results (Gentofte)

The table below summarizes the results of the test procedures (mean values) on roof insulation samples from Gentofte (Denmark).

Table 3: Results – Sampling 3 - Gentofte (Denmark)

Measurement	
thickness [mm]	103
density (oven-dry)[kg/m³]	32.4
water content [% by mass]	0.50
thermal conductivity [W/(m·K)]	0.0368*
compressive strength [kPa]	-
tensile strength [kPa]	-
point load N]	-
water absorption short term [kg/m²]	8.9
water absorption long term [kg/m²]	12.3

* mean value of three measurements with values of 0.0367 W/(m*K), 0.0373 W/(m*K) and 0.0365 W/(m*K).

4.4 Wall insulation – Alytus (Lithuania)

Sampling (Alytus)

Sampling date:	10th of September 2014
Sampling by:	Kaunas University of Technology
	Kaunas (LT)
Building:	Exploited multi-storeyed building
Sampled product:	Stone wool insulation with finishing plastic
Service time:	21 years
Construction design:	Wall with exterior insulation:
(external to internal)	Slabs (stone, non-ventilated)
	Insulation layer (100 mm)
	Load-bearing wall
Sampling Positions:	1. Nordeast orientation of the façade
	2. Southwest orientation of the façade
Annotations:	For further information on the sampling see the sampling report in Annex A.3

Results (Alytus)

The table below summarizes the results of the test procedures (mean values)on façade insulation samples from Alytus (Lithuania).

Table 4: Results – Sampling 4- Alytus (Lithuania)

Measurement	Sampling position	
	1	2
thickness [mm]	101	103
density (oven-dry)[kg/m³]	154.5	156.6
water content [% by mass]	0.55	0.41
thermal conductivity [W/(m·K)]	0.0376	0.0380
compressive strength [kPa]	79	75
tensile strength [kPa]	-	-
point load [N]	-	-
water absorption short term [kg/m²]	10.9	10.7
water absorption long term [kg/m²]		21.83

4.5 Flat roof insulation – Germersheim (Germany)

Sampling (Germersheim)

Sampling date:	07th of October 2014
Sampling by:	Forschungsinstitut für Wärmeschutz e.V. München
	Munich (DE)
Building:	Factory building (storage depot)
Sampled product:	Stone wool insulation Rockwool RP-XV 50 mm
Service time:	25 years
Construction design:	Wall with exterior insulation:
(external to internal)	PVC roofing (2 mm)
	Insulation layer (2 x 50 mm)
	Trapezoidal sheet metal
Sampling Positions:	1. Center area
	2. Border area near rain gutter and air shaft
Annotations:	No water damage, no deformations visible.
	The metal sheeting was not impaired by water intrusion.

Results (Germersheim)

The table below summarizes the results of the test procedures (mean values) on flat roof insulation samples from Germersheim (Germany).

Table 5: Results – Sampling 5 - Germersheim (Germany)

Measurement	Sampling position	
	1	2
thickness [mm]	52	54
density (oven-dry)[kg/m³]	153.0	141.3
water content [% by mass]	0.26	0.31
thermal conductivity [W/(m·K)]	0.0384	0.0369
compressive strength [kPa]	60	31
tensile strength [kPa]	12.5	5.7
point load [N]	437	152
water absorption short term [kg/m²]	0.23	0.40
water absorption long term [kg/m²]	2.07	1.33

4.6 Wall insulation – Bern (Switzerland)

Sampling (Bern)

Sampling date:	April 2015
Sampling by:	Saint-Gobain ISOVER G+H AG
Building:	Standstrasse 42, Bern
Sampled product:	Glasswool product from Isover Lucens plant
	(30 kg/m³, 7% binder, 32 mW/mK)
Service time:	> 30 years
Construction design:	Wall with ventilated façade
(external to internal)	Facing with air space
	Aluminium profiles
	Insulation
	Concrete wall
Sampling Position:	No differentiation (unknown position)
Annotations:	No water damage, no deformations visible.
	For these samples, no third party was involved in the sampling procedure or documentation.
	All information on this sample was given by representatives of the applicant (EURIMA).

Results (Bern)

The table below summarizes the results of the test procedures (mean values) on wall insulation samples from Bern (Switzerland).

Table 6: Results – Sampling 6 - Bern (Switzerland)

Measurement	
thickness [mm]	81
density (oven-dry) [kg/m³]	29.4
water content [% by mass]	0.40
thermal conductivity [W/(m·K)]	0.0323
compressive strength [kPa]	-
tensile strength [kPa]	-
point load [N]	-
water absorption short term [kg/m²]	6.96
water absorption long term [kg/m²]	-

4.7 Wall insulation – Ludwigshafen (Germany)

Sampling (Ludwigshafen)

Sampling date:	October 2015
Sampling by:	Eurofins Umwelt West GmbH
Building:	Bürgermeister-Grünzweig-Strasse 1
Sampled product:	Glasswool product from Isover
	"Fassadendämmplatte SPF 80"
	(35 mW/mK)
Service time:	33 years
Construction design:	Wall with ventilated façade
(external to internal)	Facing with air space
	Aluminium profiles
	Insulation
	Brick wall
Sampling Position:	Elevator housing on flat roof of 8-storey building
Annotations:	No water damage, no deformations visible.
	The Sampling report can be found in Annex A.4

Results (Ludwigshafen)

The table below summarizes the results of the test procedures (mean values) on wall insulation samples from Ludwigshafen.

Table 7: Results – Sampling 7 - Ludwigshafen

Measurement	
thickness [mm]	84
density (oven-dry)[kg/m³]	37.5
water content [% by mass]	1.39
thermal conductivity [W/(m·K)]	0.0319
compressive strength [kPa]	-
tensile strength [kPa]	-
point load [N]	-
water absorption short term [kg/m²]	5.92
water absorption long term [kg/m²]	-

5 Summary of Results

For the evaluation of mineral wool durability in buildings, seven samplings are conducted in this project. Four wall insulation samplings in Roskilde, Alytus, Bern and Ludwigshafen and three roof insulation samplings in Neuburg, Gentofte, and Germersheim. The selection covers various types of constructions (ventilated and non-ventilated roofs and façades), applications and products (densities ranging from 30 kg/m³ to 150 kg/m³).

5.1 Thermal conductivity

The measurements of thermal conductivity are performed on undried samples, except for the first sampling in Neuburg a. d. Donau. The results of measurement are summarized below.

The measured values of thermal conductivity are described in Table 8. The thermal conductivity of the mineral wool insulation products sampled ranges between 0,032 and 0,038 W/(m*K), after a service life in building applications of 20 to 55 years.

Table 8: Thermal conductivity – summary of test results

Sampling	Neuburg			Roskilde	Ludwigshafen
Sampling Point No.	1	2	3	-	-
Thermal conductivity [mW/(m*K)]	36.6	35.2	35.3	37.6	31.9

Sampling	Alytus		Bern	Gentofte	Germersheim	
Sampling Point No.	1	2	-	-	1	2
Thermal conductivity [mW/(m*K)]	37.6	38.0	32.3	36.8	38.4	36.9

5.2 Mechanical properties

The results of compressive strength and tensile strength perpendicular to faces are summarized in the table below:

Table 9: Mechanical properties – summary of test results

Sampling	Neuburg			Alytus		Germersheim	
Sampling Point No.	1	2	3	1	2	1	2
Compressive strength [kPa]	47	42	47	79	75	60	31
Tensile strength [kPa]	6	10	10	-	-	13	6
Point Load [N]	254	238	234	- (wall sample)		437	152

The test results of compressive strength are ranging between 42 kPa and 79 kPa. The results of tensile strength vary between 6 kPa and 13 kPa.

The measured thickness of the specimens showed devations from the nominal thickness of the products between -3 mm and +4 mm.
The highest reduction in thickness of -3 mm compared to nominal thickness of 140 mm was detected on the samples from Neuburg. This equates to a change in thickness of -2 %.

Hence, no concerning alteration of the structure, which led to decreases in thickness, was detected. In this regard, the mineral wool samples proved to be dimensionally stable.

5.3 Water content

The water content, averaged by all samples and suitable oddments, are shown in the table below (Except the first sampling in Neuburg where no moisture content was determined).

Except one sample in Roskilde (recently exposed to a flooding before sampling) all samples showed a low moisture content of 0.02 % to 0.05 % by volume.

Table 10: Results of water content measurement (oven-dry-method)

Sampling	Roskilde	Alytus		Bern	Gen-tofte	Germers-heim		Ludwigs-hafen
Sampling Point No.	-	1	2	-	-	1	2	-
water content [% by mass]	0.58	0.35	0.28	0.49	0.53	0.26	0.31	1.39
water content [% by vol.]	0.02	0.05	0.05	0.02	0.02	0.04	0.04	0.05

5.4 Water absorption

The short term water absorption according to EN 1609 varied between 0.23 kg/m² and 10.9 kg/m². The tests of long-term water absorption according to EN 12087 yielded results between 2.1 kg/m² and 25.3 kg/m².

Table 11: Water absorption – summary of test results

Sampling	Neuburg			Roskilde	Ludwigshafen
Sampling Point No.	1	2	3	1	-
Short term water absorption (EN 1609) [kg/m²]	4.81	5.49	5.67	4.62	5.92
Long term water absorption (EN 12087) [kg/m²]	9.9	10.5	9.7	-	-

Sampling	Alytus		Bern	Gentofte	Germersheim	
Sampling Point No.	1	2	-	-	1	2
Short term water absorption (EN 1609) [kg/m²]	10.9	10.7	6.96	8.9	0.23	0.4
Long term water absorption (EN 12087) [kg/m²]	25.3	21.8	-	12.3	2.07	1.33

6 Assessment

The results show that the mineral wool insulation features the expected high durability. The samplings showed fully functional constructions without insulation related defects. The measurements ascertained the steady performance: The thermal conductivity of the samples was not objectionable in any case with values of always below 0.04 W/(m*K).

Figure 2 shows the results of thermal conductivity as a function of service time for each sampling point tested. It shows no evidence of a higher conductivity of older samples and thereby neither indicating a product-specific change of conductivity for older products nor a rise of thermal conductivity due to ageing mechanisms.

Figure 2 shows all measured thermal conductivity values for both applications as a function of the samples' water content. The differences in measured moisture content did not show significant impact on thermal conductivity. This demonstrates that both the water content in the constructions was inconsequential for the thermal properties and the sensitivity of the thermal performance of mineral wool to moisture in the expectable range for faultless constructions is very low.

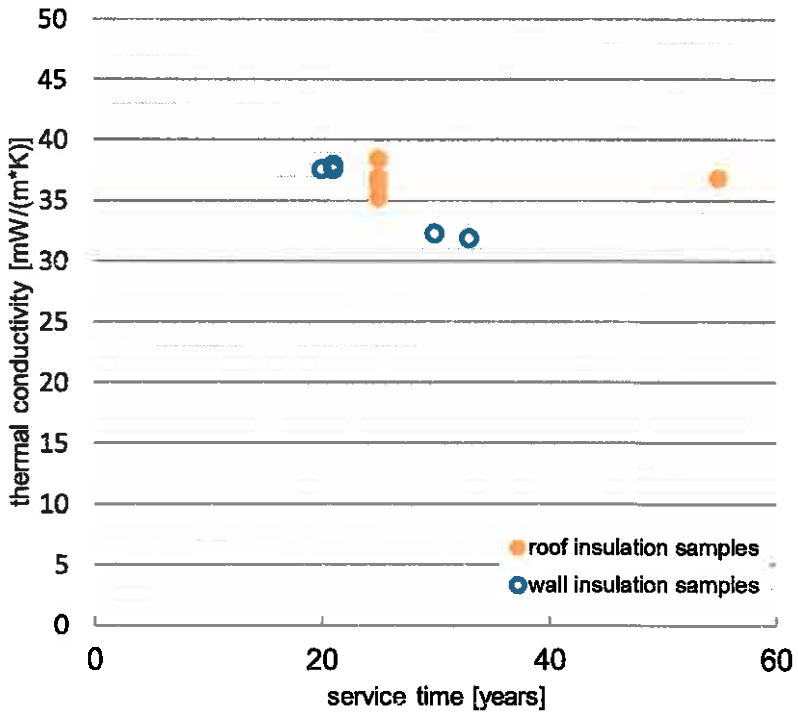

Figure 1: thermal conductivity for all samples tested as a function of service time

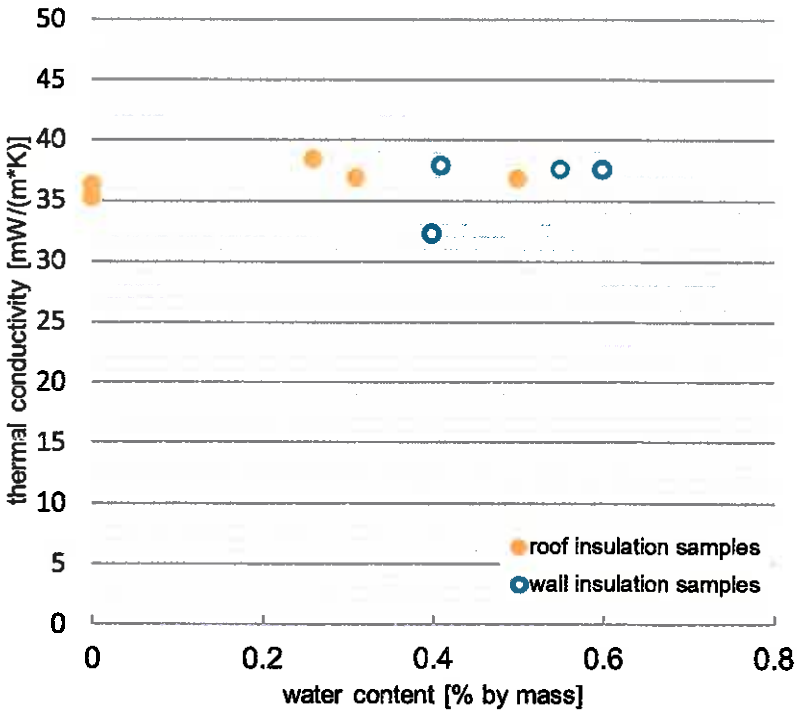

Figure 2: thermal conductivity vs. water content by mass of the thermal conductivity samples at the time of testing.

The moisture content of all samples was within the limits of below 1.0 % by mass. The samplings showed no problems with decay in the roof or wall constructions due to excessive moisture or mold in any case, even though the water repellent characteristics of most samples did not meet today's requirements for brand-new mineral wool insulation products in building applications at time of delivery.

For the samplings in Neuburg, Alytus and Germersheim it could be shown, that the insulation was a product with a design value of thermal conductivity of 0.040 or 0.042 W/(m*K). Assuming that the products used at the time are mainly classified in thermal conductivity group 040 or above and regarding the measured thermal conductivity values of below 0.040 W/(m*K) the energy-saving properties of the sampled insulations are not questionable.

7 Conclusions and Outlook

The insulations in the building constructions examined after a useful life of 20 to 55 years are in every case fully functional and showed excellent thermal performance properties.

The summary of results suggests that the thermal properties of mineral wool in building applications are highly durable considering the life cycle of a building. Especially when assuming the products used in this period mainly have a design value of 0.040 W/(m*K) or above, which is defined to estimate the guaranteed performance over the insulation products useful life. This assumption could be confirmed by reference documentation for part of the samplings after all (Neuburg (design value of 0.040 W/(m*K)), Alytus (design value of 0.042 W/(m*K)), Germersheim (design value of 0.04 W/(m*K))). The measured values of thermal conductivity of those samplings, including effects of the moisture condition on site, still are between 8 % to 10 % below the design values. The oldest samples from Gentofte were in usage for 55 years, and the thermal conductivity with 0.5 % moisture (by mass) was below 0.037 W/(m*K).

The measurements of water absorption showed water-repellent characteristics which are below those measured nowadays on brand-new products at point of delivery. It is indistinguishable which parts of this deviation are due to the ageing process or advancements in the production. But regardless of the water absorption properties, the moisture content of most samples is very low, and likewise, the mechanical properties are still remarkable. In most cases the measured values for mechanical properties of the aged samples meet current requirements for brand-new products.

Further analysis incorporating construction types, product types and application types, regional aspects or similar is difficult, regarding the extent of data generated and the diversity of the sampled constructions. Since the benefit for the project regarding confidence level and possibilities of evaluation could be increased by expanding the project further. It is suggested to systematically cover missing combinations of applications, constructions and building types.

8 Liability

The results are valid only for the listed materials, properties and dimensions.

The analysis above 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 Forschungsinstitut für Wärmeschutz e.V. München is limited to the limitations of claim in § 634a BGB for buildings.

Annex A.1

Dancert

Sent by e-mail koppold@fiw-muenchen.de **to**

Forschungsinstitut für Wärmeschutz e. V. München
Lochhamer Schlag 4
82166 Gräfelfing

Att.: Mr. Stefan Koppold

17 February 2014
Task no. 02040
ASED
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SAMPLING REPORT

Date of sampling	04 February 2014	
Client	The sampling was requested by EURIMA Avenue Louise 375 - Bte 4 B-1050 Brussels Belgium Contact person: Mr. Alain Herssens	
Sampling address	The Viking Ship Museum Vindeboder 12 DK-4000 Roskilde **The location of the building is indicated on a satellite photograph of the area. See Annex A.**	
For Dancert	**Anders Elbek**	**Lead auditor**
For the client	Ms. Marina Mazin 2 craftsmen	**Technical Manager, Rockwool A/S** The Viking Ship Museum
Requisition	Forwarded by e-mail 31 January 2014 by Ms. Caterina **Rocca**	
Subject of sampling	Stone wool insulation material from cavity wall.	
Pre-sampling history	The Viking Ship Museum was partially flooded during a storm in December 2013. Due to the flooding, the museum is presently conducting renewal of the buildings.	
Course of the sampling	In accordance with request from the client, Dancert conducted sampling of insulation material at the above mentioned address.	

Subsidiary of Danish Technological Institute

Dancert A/S
Gregersensvej 4
DK-2630 Taastrup
Telephone +45 7220 2160
E-mail info@dancert.dk

The cavity wall was intact at the start of the sampling (Picture no. 1).

Firstly, the 2 craftsmen removed part of the cladding (cedar wood) Behind the cladding was found gypsum plaster boards used as wind shield (picture no. 2).

The lower part of the gypsum plaster board had a darker colour than the upper parts. A possible explanation of this could be the flooding in December 2013 (Picture no. 3)

Secondly, the gypsum plaster boards were removed to make the insulation material visible (picture no. 4).

The insulation material was found to be stone wool of a texture and visual appearance commonly used in cavity walls in Denmark for decades. No product names were indicated on the material, which had a general appearance similar to *Rockwool A-Batts*.

The linear dimensions of the batts were approximately 0.6 x 0.9 m. and a thickness of approximately 0.1 m.

The slabs were marked with a number, 1 through 11 omitting no. 4. (Picture no. 4).
The lower parts (approximately 0.2 m) of batts nos. 7, 8, and 9 appeared to be wet.

The batts were then removed from the cavity wall.

Batts marked with numbers 1, 2, 6, and 9 were put into separate plastic bags which were sealed with adhesive tape.

The other batts were wrapped in plastic foil, but not sealed.

The batts sampled were then transported to the premises of Rockwool A/S, Hedehusene, for shipment to FIW München.

Dancert confirms that the specimens with the marking described in the annexes are sampled at the place and date under the circumstances described above.

Please do not hesitate to contact Dancert if you have any question or comment

Yours sincerely

Dancert A/S

Anders Elbek

Annexes:
Annex A: Satellite photo (Google Maps)

Annex B:
Photographs nos. 1 through 4.

Annex A

Location indicated on a satellite photo

Dancert

Annex B

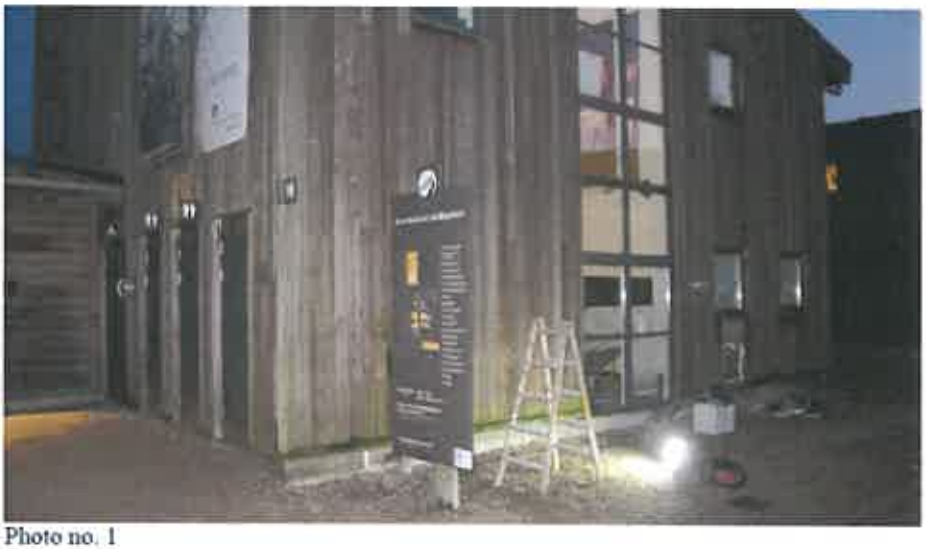

Photo no. 1

Photo no 2

Photo no. 3

Photo no. 4

Annex A.2

DANISH
TECHNOLOGICAL
INSTITUTE

Gregersensvej
DK-2630 Taastrup
Tel. +45 72 20 20 00
Fax +45 72 20 20 19

info@teknologisk.dk
www.teknologisk.dk

Sent by e-mail: koppold@fiw-muenchen.de to

Forschungsinstitut für Wärmeschutz e. V. München
Lochhamer Schlag 4
82166 Gräfelfing

Att.: Mr. Stefan Koppold

March 27, 2014
OTP

SAMPLING REPORT

Date of sampling	24 March 2014
Client	The sampling was requested by EURIMA Avenue Louise 375 - Bte 4 B-1050 Brussels Belgium Contact person: Mr. Alain Herssens
Sampling address	Novo Nordisk a/s Niels Steensensvej 4 Building NSK DK-2820 Gentofte The location of the building is indicated on drawing GE NSO 9900 102 001. See Annex A. The construction year is 1956 or 1957.
For DTI	Otto Paulsen/ Morten Hansen Head of Lab. / Technician
For the client	Ms. Caterina Rocca Rockwool International, Denmark
Requisition	Forwarded by e-mail 20 March 2014 by Ms. Caterina Rocca
Subject of sampling	Stone wool insulation material from concrete roof wall.

1

DANISH TECHNOLOGICAL INSTITUTE

Pre-sampling history	The Building is under refurbishing. The insulation was placed above a concrete roof with a slope at approx. 15 degree. Above the insulation there was a cavity approx. 200 mm, presumable well ventilated. The top of the roof was a wooden construction originally with most probably a bitumen roofing. The condition of the insulation may have been influenced by leaks in the roof. Most of the surface of the insulation has marks and small scars.
Course of the sampling	In accordance with request from the client, DTI conducted sampling of insulation material at the above mentioned address. 10 m^2 of insulation were removed. The linear dimensions of the slabs were approximately 0,6 x 0,9 m, and a thickness of approximately 0,1 m. 4 m^2 were covered tightly by plastic for moisture test, market moisture. 6 m^2 were wrapped in plastic foil, but not sealed. The material sampled was then transported to the DTI for shipment to FIW.

DTI confirms that the specimens sampled at the place and date under the circumstances described above.

Please do not hesitate to contact DTI if you have any question or comment.

Yours sincerely
Danish Technological Institute

Otto Paulsen Ph. D.
Head of Laboratory

Annexes:
Annex A: Situation and original drawing.

Annex B: Photographs nos. 1 through 4.

2

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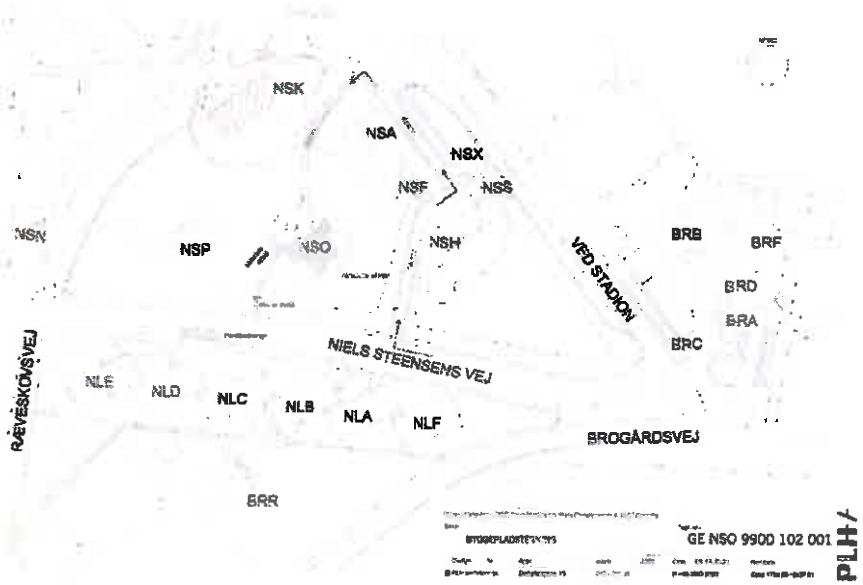
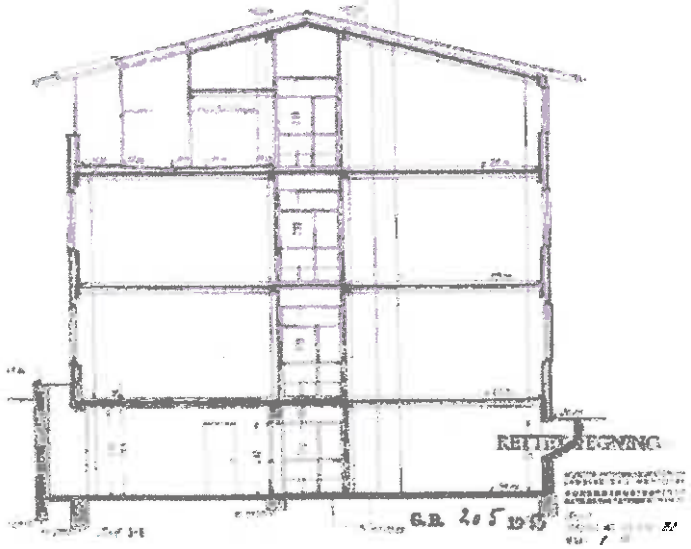
Annex A



Location indicated on the drawing, NSK



Part of the original drawing from 1956

3

Annex B

Photo no. 1, roof

Photo no. 2, sampling

4

Photo no. 3, Removal of samples

Photo no. 4, The construction site

5

Annex A.3

INSTITUTE OF ARCHITECTURE AND CONSTRUCTION OF
KAUNAS UNIVERSITY OF TECHNOLOGY
LABORATORY OF BUILDING PHYSICS

Notified Body number: 2018

LIETUVOS NACIONALINIS AKREDITACIJOS BIURAS
BANDYMAI
ISO/IEC 17025 Nr. LA. 01.031

SAMPLING REPORT No. 1SF/14
Date: 10 of September 2014

Place of sampling: Facades of exploited multistoried building (Figure 1).
Address of building: Naujoji str. 20, Alytus, Lithuania

Specimens: 21 sample of mineral wool covered with a layer of finishing plastic. The average size of the specimens 0,5 m^2 (0,6 × 0,9 m). For most of the sampling selected second from the bottom row of insulation plates (Figure 2). For the sampling selected all four orientations facades: North-east; North-west; south-west and south-east. From the orientation of each façade was taken four – six samples, for the distribution of samples in such a way that each of the samples sent to the laboratory to represent each of the four facades. From the each facade one specimen was prepared for determination of moisture content, adding the samples in polyethylene bags and additionally wrapping polyethylene film (Figure 3).
Samples were taken from the North-east orientation façade of building: No1; No2; No3; No4; No5 (Figure 4). The specimen No2 was prepared for determination of moisture content.
Samples were taken from the south-west orientation façade of building: No6; No7; No8; No9; No10; No11 (Figure 5). The specimen No8 was prepared for determination of moisture content.
Samples were taken from the North-west orientation façade of building: No12; No13; No14; No15; No16; No17 (Figure 6). The specimen No17 was prepared for determination of moisture content.
Samples were taken from the south-east orientation façade of building: No18; No19; No20; No21 (Figure 7). The specimen No18 was prepared for determination of moisture content.
The samples are packed into carton boxes for sending to the laboratories. The boxes (except samples No8; No17 and No18) have signed for representative of accredited laboratory J.Ramanauskas (Figure 8).

Samples No3; No5; No7; No9; No12; No14; No15; No19 and No20 were selected for sending to the laboratory in Denmark (*RI R&D*).
Samples No1; No2; No4; No6; No8; No10; No11; No13; No16; No17; No18 and No21 were selected for sending to the laboratory in Germany (*FIW*).

Sampling time measured air temperature +21°C and relative humidity 51%.

Specimens selected by:

Representative of accredited laboratory. Lithuanian Kaunas University of Technology, Institute of Architecture and Construction, Laboratory of Building Physics, Technical Manager

Dr. assoc. prof. Juozas Ramanauskas signature.....

Representative of producer. UAB ROCKWOOL Technical support manager

Dr. Andrius Buska signature.....

Tunelio g. 60, LT-44405 Kaunas, Lithuania tel. +370 37 453558, +370 37 350799, fax +370 37 451810,
Web site: www.ktu.edu/asi/en/ ; E.mail: statybine.fizika@ktu.lt

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Figure 1. Place of sampling

Figure 2. Place of sampling on facade

Figure 3. Specimen prepared for determination of moisture content

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Figure 4. Samples were taken from the North-east orientation façade of building: No1; No2; No3; No4; No5

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Figure 5. Samples were taken from the south-west orientation façade of building: No6; No7; No8; No9; No10; No11.

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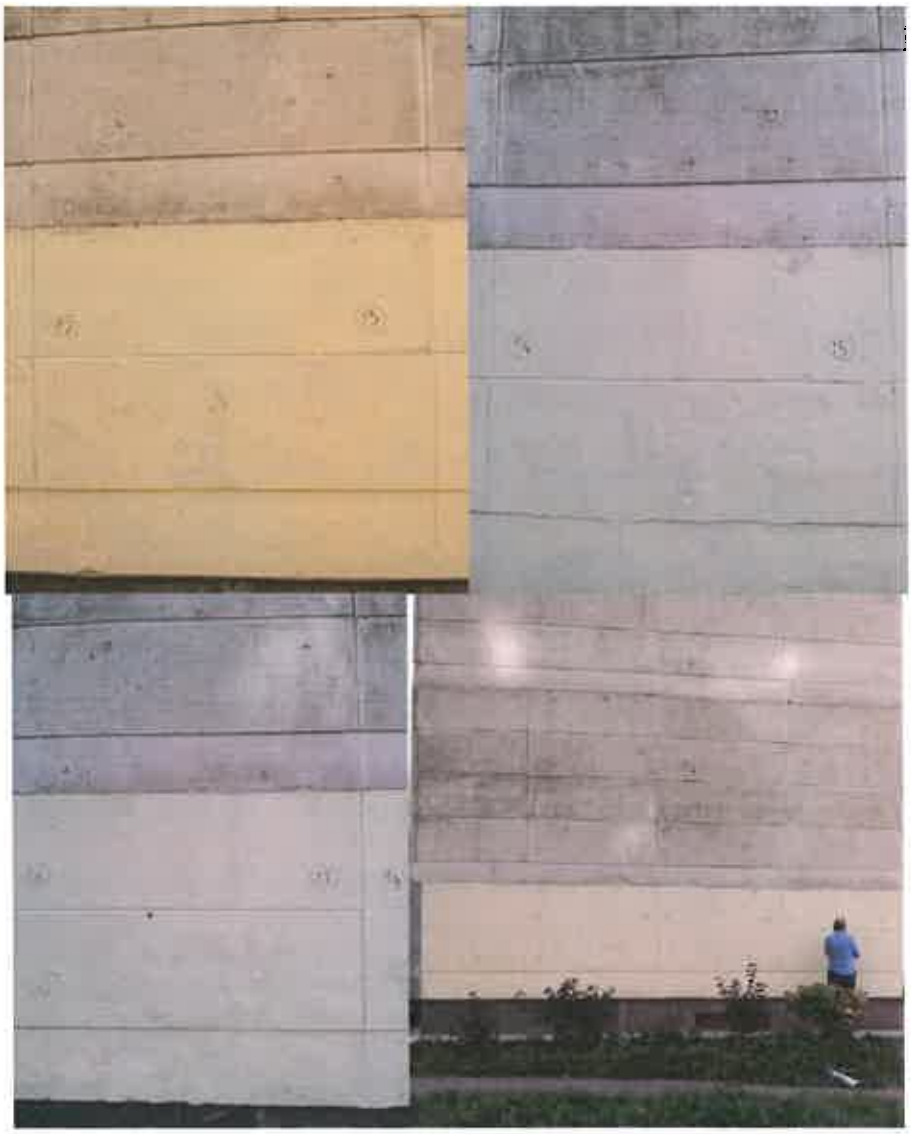

Figure 6. Samples were taken from the North-west orientation façade of building: No12; **No13**; **No14**; **No15**; No16; No17

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INSTITUTE OF ARCHITECTURE AND CONSTRUCTION OF
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LABORATORY OF BUILDING PHYSICS

Notified Body number: 2015

LIETUVOS NACIONALINIS AKREDITACIJOS BIURAS
BANDYMAI
ISO/IEC 17025 Nr. LA. 01.031

SAMPLING REPORT No. 1SF/14
Date: 10 of September 2014

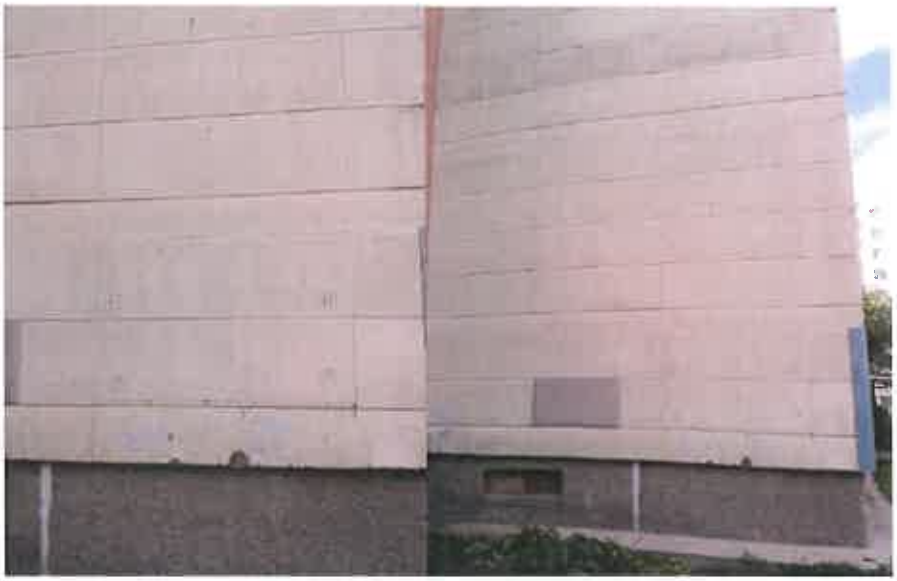

Figure 7. Samples were taken from the south-east orientation façade of building: No18; No19; No20; No21

Figure 8. The samples packed into carton boxes for sending to the laboratories. The boxes signed for representative of laboratory

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Annex A.4

Sampling report

Company:	Saint-Gobain ISOVER G+H AG Bürgermeister-Grünzweig-Strasse 1 67059 Ludwigshafen
Plant:	
Place of sampling	Saint-Gobain ISOVER G+H AG Bürgermeister-Grünzweig-Strasse 1 67059 Ludwigshafen
Date:	14.10.2015
Test Institute:	FIW München Lochhamer Schlag 4 81266 Gräfelfing
Test Parameter:	Lambda, moisture, density, thickness
	EURIMA-Project durability of mineral wool

Stock	Length x Width (mm x mm)	Thickness (mm)	Product / Article nummer	Date of production	Sample	Remarks
> 100 m²	900 x 600	80	ISOVER - Fassadendämm-platte SF	1982	ca. 5 m²	Material entspr. Entnahme vom Frühjahr 2015

Sampler:	Dr. Eva Siedler	Signature Eurofins Umwelt West GmbH Niederlassung Speyer Hasenpfühlerweide 16 67346 Speyer
Company:	Eurofins Umwelt West GmbH Niederlassung Speyer Hasenpfühlerweide 16 D-67346 Speyer	

Present employee of Saint-Gobain ISOVER G+H AG

Name:	Dr. Jens Perner	Signature i.V.
Name:		Signature

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