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Materialprüfungsamt Nordrhein-Westfalen
[Material Testing Institute North-Rhine Westphalia]
TESTING • INSPECTIONS • CERTIFICATIONS

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2nd Copy

TEST CERTIFICATE

No. 230011089 of 28/09/2017

as Basis for Usability Certification

Client

Hanwha L&C Corporation
7F, Center 1
26, Eulji-Ro
100-210 Jung-Gu
Seoul
South Korea

Date of order: 29/06/2017
Date of sampling: The sample material was submitted by the Client for testing.
Receipt of samples: 29/06/2017 and 05/07/2017
Date of testing: 19/07/2017, 25/07/2017 and 15/08/2017

Order

Testing of flame retardancy (building material class B1) according to Din 4102-1 (May 1998)

Description / designation of the test object

White PVC self-adhesive film “Bodaq Interior Film” for use as interior wall cladding on a metallic substrate with a melting point of ≥ 1000°C

Description of the underlying test method

DIN 4102-1 (May 1998)

This Test Certificate is valid until 27/09/2022.
This Test Certificate is not intended to replace the required General Building Inspection Certificate.
The test results exclusively refer to the above-mentioned test object.

This Test Certificate includes 7 pages and 1 attachment.

DAkkS Deutsche Akkreditierungsstelle D-PL-11142-01-02

egolf

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Test Material

Designation given by the Client: "Bodaq Interior Film"

Description:
White PVC film with single-sided adhesive coating on acrylate basis

Surface weight of PVC film without adhesive coating: 256 g/m²

Surface weight of PVC film with adhesive coating: 276.9 g/m²

(Details provided by Client)

Colour of tested self-adhesive film: white

Table 1: Thickness, surface weight, raw density of tested material

		Lowest measured value	Arithmetic measured value	Highest measured value
Thickness	mm	0.23	0.24	0.26
Surface weight	g/m²	--	301	--
Raw density	kg/m³	--	--	--

Special remarks: None

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Line No.	Results of fire shaft test (Part 1)		Measured values Samples A	B	C	D
1	No. of sample arrangement as per DIN 4102 Part 15, Table 1		--	--	--	--
2	Maximum flame height above upper edge of sample	cm	70	70	80	70
	Time [1]	min : s	1:00	1:30	1:30	1:30
4	Melting-through / burning-through Time [1]	min : s	-- [2]	-- [2]	-- [2]	-- [2]
5	Findings on rear side of sample Blazing / glowing Time [1]	min : s	-- [2]	-- [2]	-- [2]	-- [2]
6	Discolouring Time [1]	min : s	10:00	10:00	10:00	10:00
7	Burning droplets Starting time [1]	min : s	-- [2]	-- [2]	-- [2]	-- [2]
8	Scope Single sample material droplets		-- [2]	-- [2]	-- [2]	-- [2]
9	Continuously dripping sample material		-- [2]	-- [2]	-- [2]	-- [2]
10	Burning pieces falling from sample Starting time [1]	min : s	1:03	-- [2]	-- [2]	-- [2]
11	Single pieces falling from sample		x	-- [2]	-- [2]	-- [2]
12	Continuously falling pieces from sample		-- [2]	-- [2]	-- [2]	-- [2]
13	Duration of continued burning on sieve bottom (max.)	min: s	0:03	-- [2]	-- [2]	-- [2]
14	Impairment of burner flame through dripping / falling material Time [1]	min : s	-- [2]	-- [2]	-- [2]	-- [2]
15	Early end of test End of fire process on sample [1]	min : s	-- [2]	-- [2]	-- [2]	-- [2]
16	If applicable, time of discontinuation of test [1]	min : s	-- [2]	-- [2]	-- [2]	-- [2]

[1] Time from start of test

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Results of fire shaft test (Part 2)

Line No.			Measured values Sample A	B	C	D
	Afterburning after end of test					
17	Duration	min : s	-- [2]	-- [2]	-- [2]	-- [2]
18	Number of samples		-- [2]	-- [2]	-- [2]	-- [2]
19	Front side of sample		-- [2]	-- [2]	-- [2]	-- [2]
20	Rear side of sample		-- [2]	-- [2]	-- [2]	-- [2]
21	Flame length	cm	-- [2]	-- [2]	-- [2]	-- [2]
	Afterglowing after end of test					
22	Duration	min : s	-- [2]	-- [2]	-- [2]	-- [2]
23	Number of samples		-- [2]	-- [2]	-- [2]	-- [2]
	Point of occurrence					
24	Lower sample section		-- [2]	-- [2]	-- [2]	-- [2]
25	Upper sample section		-- [2]	-- [2]	-- [2]	-- [2]
26	Front side of sample		-- [2]	-- [2]	-- [2]	-- [2]
27	Rear side of sample		-- [2]	-- [2]	-- [2]	-- [2]
	Smoke density					
28	≤ 400 % x min		151	139	111	117
29	> 400 % x min		-- [2]	-- [2]	-- [2]	-- [2]
30	Diagram in attachment No.		--	--	1	--
	Remaining lengths		39 44	41 46	34 38	40 38
31	Individual values	cm	46 41	43 39	38 38	39 38
32	Average of individual tests	cm	43	42	37	39
33	Photo of side of test object		--	5	--	--
	Flue gas temperature					
34	Maximum of mean value	°C	115	115	115	114
35	Time [1]	min : s	9:59	9:56	9:29	10:00
36	Diagram in attachment No.		--	--	1	--
37	Notes:					

For the tests, the self-adhesive film was affixed to 0.8 mm thick steel sheet.
Test A: The self-adhesive film was flame-treated crosswise to production direction.
Tests B – D: The self-adhesive film was flame-treated in production direction.

2) has not occurred

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Appearance of the test material samples

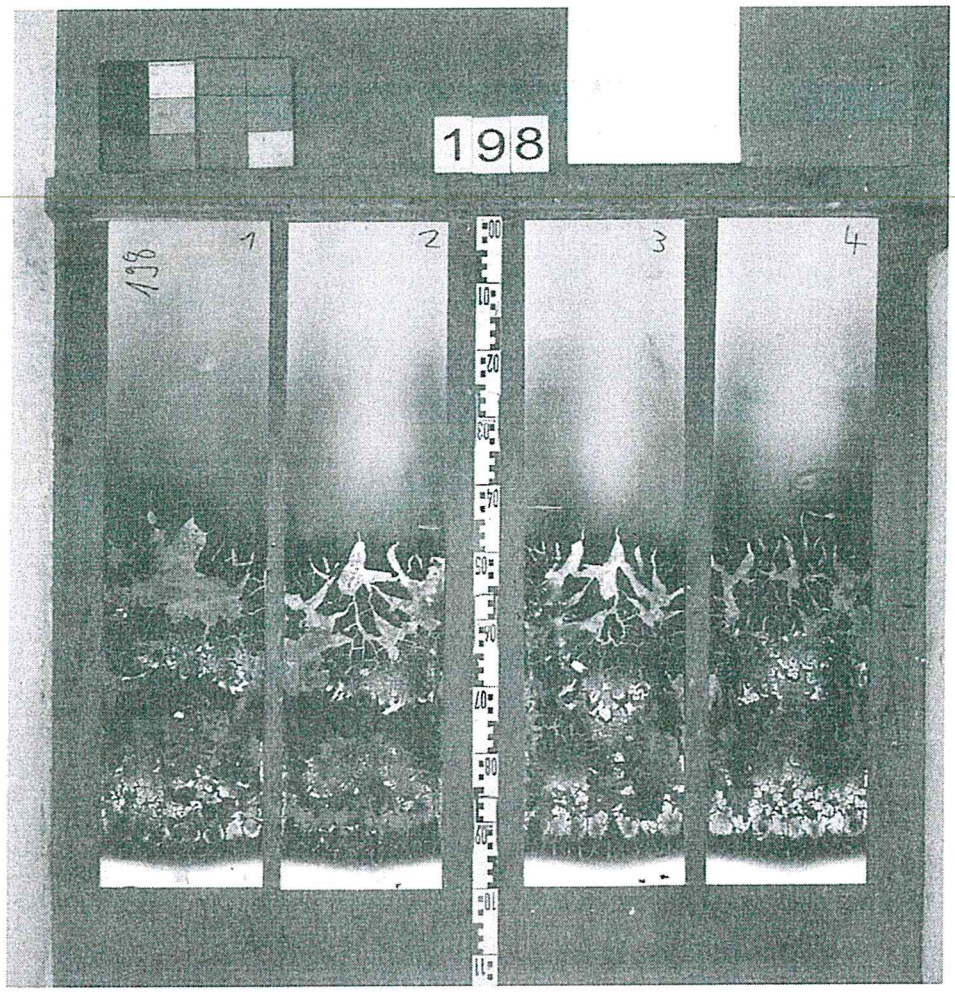

Fig. 1: Appearance of sample B after the fire shaft test

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Test results from normal flammability tests according to DIN 4102-1
(tests with edge ignition)
Edge protection: --
Point of flame attack: lower edge of sample front, flame treatment on self-adhesive film affixed to steel sheet in production direction

Sample No.		1	2	3	4	5
Time from start of test						
Ignition	(s)	1	1	1	1	1
Flames reaching the reference mark	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)
Self-extinguishing of the flames	(s)	15	15	15	15	15
Maximum flame height	(cm)	2	2	2	2	2
End of afterburning	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)
End of afterglowing	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)
Flames were extinguished after	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)
Smoke production				very low		
Burning falling (time)	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)

Note: 1) has not occurred

Point of flame attack: lower edge of sample front, flame treatment on self-adhesive film affixed to steel sheet crosswise to production direction

Sample No.		1	2	3	4	5
Time from start of test						
Ignition	(s)	1	1	1	1	1
Flames reaching the reference mark	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)
Self-extinguishing of the flames	(s)	15	15	15	15	15
Maximum flame height	(cm)	2	2	2	2	2
End of afterburning	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)
End of afterglowing	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)
Flames were extinguished after	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)
Smoke production				very low		
Burning falling (time)	(s)	-- 1)	-- 1)	-- 1)	-- 1)	-- 1)

Note: 1) has not occurred

Due to the low flame heights during edge flame treatment, no failure is to be expected during surface ignition. Consequently, tests including surface ignition were not necessary according to DIN 4102-1 Section 6.2.5.3.

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Result of the test

The material described on Page 2 has met the requirements for class B2 building materials. As shown by the results, the material has likewise met the requirements for class B1 building materials. Consequently, the material can be assigned to building material class B1 (flame retardant) according to DIN 4102 Part 1 (May 1998).

The material is considered **not** burning dripping / falling.

Special notes

The PVC self-adhesive film can be used as interior wall cladding. Coatings or similar covers must not be added to the surface of the film. The self-adhesive film must be affixed to metallic substrates with a raw density of ≥ 5.890 kg/m³, a melting point of ≥ 1.000 °C and a thickness ≥ 0.6 mm. The resistance of fire behaviour to weather influences in the open air has not been verified. For this reason, the material may only be used as flame-retardant product inside buildings or in areas that are otherwise weather-protected.

This Test Certificate is intended as basis for the specified usability certification.

This Test Certificate is not intended to replace the required General Building Inspection Certificate.

Erwitte, 28/09/2017

Authorised signatory

[signature illegible]

Dipl-Ing. Schreiner [Graduated Engineer]
Deputy Head of Testing Authority

[Stamp:
Material Testing Institute
MPA NRW
38
North-Rhine Westphalia]

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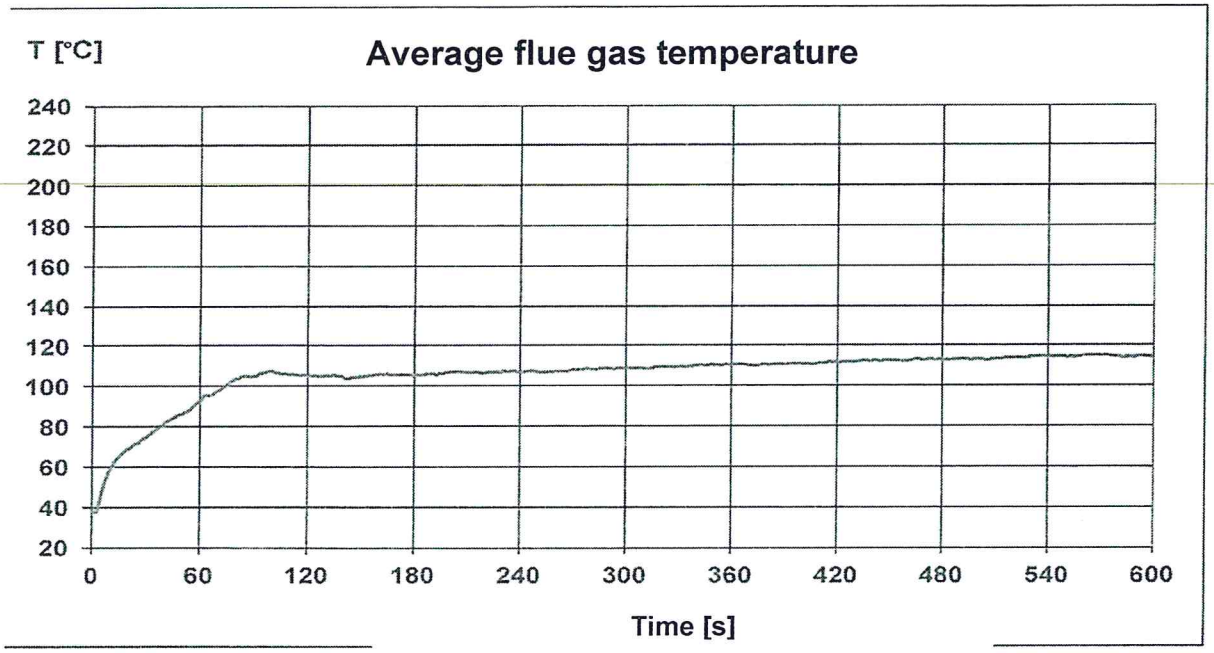
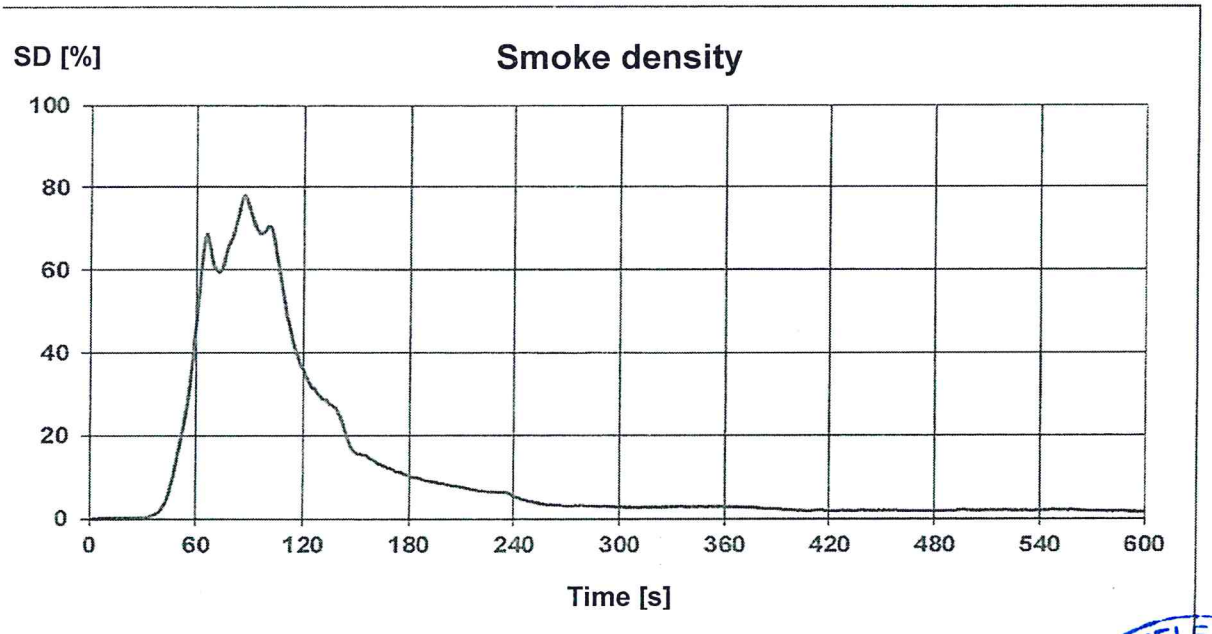
Max. flue gas temperature = 115 °C **at [min : s] 09 : 29** **Smoke release [% x min]: 111**	**Attachment 1 to Test Certificate** **No. 230011089 of 28/09/2017**





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General Building Inspection Certificate

Inspection Certificate No.: **P-MPA-E-17-519**

Subject matter: White PVC self-adhesive film
"Bodaq Interior Film" (DIN 4102-1, 05/98)
as building product of Building Rules List A Part 2 (2015/2), seq. No. 2.10.1.1, taking into account the notification on the changes to Building Rules Lists A and B (2016/1)

Client: Hanwha L&C Corporation
7F, Center 1
26, Eulji-Ro
100-210 Jung-Gu
Seoul
South Korea

Date of issue: 28/09/2017

Valid until: 27/09/2022

Based on this General Building Inspection Certificate, the above product is usable in terms of the German Regional Building Regulations [Landesbauordnung].

This General Building Inspection Certificate includes 5 pages.

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1 Subject matter and scope of application

1.1 Subject matter

The General Building Inspection Certificate shall apply to the production and use of the white PVC self-adhesive film "Bodaq Interior Film" as flame-retardant building material (Building Materials Class DIN 4102-B1) according to DIN 4102-1.
The building material is considered **not** burning dripping / falling.

1.2 Scope of application

1.2.1 The PVC self-adhesive film is to be used as interior wall cladding. No coating or similar cover must be added to the surface of the film. The self-adhesive film must be affixed to metallic substrates of a raw density of $\geq$ 5.890 kg/m³, a melting point of $\geq$ 1.000 °C and a thickness of $\geq$ 0.6 mm. The resistance of fire behaviour to weather influences in the open air has not been verified. For this reason, the material may only be used as flame-retardant product inside buildings or in areas that are otherwise weather-protected.

1.2.2 This General Building Inspection Certificate does not include any statements that requirements for noise and heat protection are met.

1.2.3 The Applicant declared that no products are used in the building product that are subject to the Hazardous Substances Ordinance, the Chemicals Prohibition Ordinance or the Ordinance on Ozone-Depleting Substances, or that he meets the requirements of these orders (especially the labelling requirement).
Furthermore, the Applicant declares that, if precautions regarding hygiene, health protection or environmental protection are to be taken for the trading, putting on the market or use of the product, such precautions have been initiated or announced in the required manner.
Consequently, the Testing Authority did not see a reason to verify the effects of the building product on health and environmental protection.

2 Requirements for the building product

2.1 Properties and composition

2.1.1 The self-adhesive film must consist of PVC and have an adhesive coating on acrylate basis on one side. It must have a thickness of 0.24 mm ($\pm$ 10%) and a surface weight of 276.9 g/m² ($\pm$ 10%). The self-adhesive film must be white.

2.1.2 The composition of the building material must correspond with the data provided to MPA NRW.

2.2 Test procedures to be applied

Affixed to metallic substrates with a raw density of $\geq$ 5.890 kg/m³, a melting point of $\geq$ 1.000 °C and a thickness of $\geq$ 0.6 mm, the self-adhesive film must meet the requirements for flame-retardant building materials (building materials class DIN 4102-B1) according to DIN 4102-1.

2.3 Use, maintenance, service

The building product must not be exposed to weather conditions in the open air.

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3 Certificate of conformity

3.1 General

The compliance of the building product with the provisions of this General Building Inspection Certificate must be confirmed for each manufacturing plant by means of a certificate of conformity on the basis of a factory production control and a regular external inspection including an initial assessment of the building product according to the Building Rules List A Part 2 (2015/2), taking into account the notification on the changes to the Building Rule Lists A and B (2016/1) as well as with the following regulations.

For the execution of the inspection, the "Directives for the Certificate of Conformity for Flame-Retardant Building Materials (Building Materials Class DIN 4102-B1) according to the General Technical Approval" in their applicable version shall be binding.

For granting the certificate of conformity and for the external inspection, including the relevant product tests to be conducted, the building product manufacturer shall involve an accredited certification entity as well as an accredited inspection entity.

The results of the certification and external inspection shall be kept for at least five years. They shall be submitted by the certification entity or the external inspection entity of the competent supreme building authority [oberste Bauaufsichtsbehörde] on request.

3.2 Factory production control

At the manufacturing plant, a factory production control according to DIN 18200:2000-05, Section 3, shall be established which ensures the consistent manufacture and composition of the building product according to Section 2.1. Information about the address of the manufacturing plant may be notified to the inspection entity by MPA NRW.

3.3 External inspection

The factory production control shall be inspected regularly by means of an external inspection at the building product manufacturer's plant, however, at least once per year. As part of the external inspection, an initial inspection of the building product shall be conducted, and samples may be taken for sample inspections. The accredited inspection entity shall be responsible for the sampling and the inspections. Information about the address of the manufacturing plant may be notified to the inspection entity by MPA NRW.

4 Compliance mark

Each building product must be identified by the manufacturer with the compliance mark [Übereinstimmungszeichen] according to Section 7 of the Building Products and Building Methods Ordinance of North-Rhine Westphalia [Bauprodukte- und Bauartenverordnung - BauPAVO NRW]. The compliance mark with the specified information shall be affixed to the building product, an instruction leaflet or the packaging or, if this causes difficulties, the delivery note or an attachment to the delivery note. Such identification may only be provided if the conditions according to Section 3 are satisfied.

[1] The "Directives for the Certificate of Conformity for Flame-Retardant Building Materials (Building Materials Class DIN 4102-B1) according to the General Technical Approval" have been published in the "Notifications" of the German Institute for Structural Engineering of 1 April 1997.

The following information shall be provided on the building material, its packaging or the instruction leaflet:
- Product name
- Compliance mark including:
  - Manufacturer
  - Manufacturing plant
  - Number of the General Building Inspection Certificate
  - Graphic symbol or designation of the certification entity
  - "Only flame-retardant (Class DIN 4102-B1) on metallic substrates with a melting point of ≥ 1.000 °C"

5 Legal basis

This General Building Inspection Certificate is granted on the grounds of Section 22 of the Building Regulations of the German Federal State of North-Rhine Westphalia [Bauordnung - BauO NRW] in the version of their announcement of 15th December 2016 in connection with the Building Rules List A Part 2 (2015/2), taking into account the notification about the changes to the Building Rules Lists A and B (2016/1). The State Building Regulations of the other federal states include a corresponding legal basis.

6 Information on legal remedies

A claim against this General Building Inspection Certificate can be filed in writing or declared for recording to the registrar of the court registry at the Gelsenkirchen Administrative Court [Verwaltungsgericht], Bahnhofsvorplatz 3, 45879 Gelsenkirchen, within one month from its announcement. The statement of claim must designate the Plaintiff, the Defendant and the subject matter of the claim and shall include one certain request. The facts and evidence intended for justification shall be indicated and the contested decision shall be enclosed in its original form or as a copy. Copies for the other parties involved shall be enclosed with the claim.

7 General notes

7.1 The General Building Inspection Certificate is not intended to replace the approvals, consents and certificates that are legally stipulated for the execution of building projects.

7.2 The General Building Inspection Certificate is granted without prejudice to the rights of third parties, especially privacy protection rights.

7.3 Manufacturers or distributors of the building products shall, without prejudice to any further regulations, provide copies of the General Building Inspection Certificate to the user of the building products.

7.4 The General Building Inspection Certificate may only be reproduced in complete form. A publication in extracts is subject to the approval of the NRW Material Testing Institute. Any texts and drawings in advertising brochures must not contradict the General Building Inspection Certificate. Translations of the General Building Inspection Certificate must include the remark "Translation of the German original not verified by the NRW Material Testing Institute".

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7.5 Basis for the preparation of this General Building Inspection Certificate:
- Test Certificate of MPA NRW No. 230011089 of 28/09/2017

Erwitte, 28/09/2017

Head of Testing Authority
Represented by

Dipl.-Ing. Schreiner [Graduated Engineer]

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Diplom-Übersetzerin

This text is a true and exact translation of the attached document from German into English.
Diplom-Übersetzerin [holder of a university degree in translation studies] Gabriele Postberg
Freudenbergstrasse 24 | 69469 Weinheim | Germany | +49 (0) 6201 4 88 35 83
Certified Translator for the English Language, duly appointed and sworn by the President of the Regional Court of Mannheim | 02 November 2017

02/11/2017