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and types of construction

Bautechnisches Prüfamt

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European Technical Assessment

ETA-17/0451
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General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

FIRE MIX

Product family
to which the construction product belongs

Renderings and rendering kits intended for fire resisting
applications

Manufacturer

Premix Sp. z o.o.
ul. Wyzwolenia 12
28-230 POLANIEC
POLEN

Manufacturing plant

Premix Sp. z o.o.
ul. Wyzwolenia 12
28-230 Polaniec
POLEN

This European Technical Assessment
contains

20 pages including 1 annex, which forms an integral part
of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

ETAG 018 Part 3: "Renderings and Rendering Kits
Intended for Fire Resisting Applications", edition January
2006, amended May 2012,
used as EAD according to Article 66 Paragraph 3 of
Regulation (EU) No 305/2011.

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Specific Part

1 Technical description of the product

Object of this European Technical Assessment (ETA) is the rendering kit for creating the fire protective rendering "FIRE MIX".

The final product will be assessed according to option 2 of EAD ETAG 018 part 3¹.

The rendering kit consists of the dry mix "FIRE-MIX", the galvanized lathwork of steel wire, the primer "PRIMER 500" and, if necessary e.g. for outdoor application, the top-coat (surface coating) "PREM PE".

The dry mix "FIRE-MIX" is a factory-made, homogenous coarse powder of grey colour, which essentially consists of cement as the binder, the lightweight aggregates Vermiculite and Perlite, mineral filler and additives.²

The bonding agent "PRIMER 500" is a polymeric emulsion supplied by PREMIX Sp. z o.o. The chemical composition of "PRIMER 500" is deposited². The primer is delivered in containers or pails. The fresh application rate (spray application) on concrete substrates should be 250 g/m² to 300 g/m². The primer is not obligatory on steel substrates treated with a corrosion protection in good order.

For the lathwork a fence wire web of hexagonal meshes of 25 mm made of galvanized steel wire, 0,8 mm thick shall be used. The lathwork shall be fixed with welded steel pins on steel elements; on concrete elements the steel pins may be shot with a compressed air pistol. The lathwork shall be fixed with self-sticking clamps on the steel pins ca. 3 mm to 15 mm (depending on the thickness of the intended rendering layer) above the surface to protect. The lathwork will be delivered in rolls of fence wire together with the steel pins for fixing and the self-sticking clamps.

The layer, effective for fire protection, arises from mixing mechanically the dry mix with a defined amount of clean water in an appropriate mixing unit. The application of the fresh mortar shall be carried out by means of a spray equipment for wet application e.g. Putzmeister S 5 EVTm. The applied mortar hardens and forms the final layer, which sticks completely on the substrate (steel, concrete, masonry) and delays the heat introduction effectively this way.

The thickness of the rendering applied depends on the intended period of fire resistance and on the type of element to protect. The thickness of the applied rendering ranges from ca. 10 mm to ca. 75 mm.

When the application of the fire resistant rendering is intended outside or under the conditions of high air humidity (areas of constantly more than 85 % RF, the top-coat "Prem PE" (a one-component Polymer-Acryl-coating²) shall be applied additionally as surface protection. The top-coat "Prem PE" will be delivered ready for use in pails or containers and may be sprayed as the finish or applied by brush.

2 Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

The rendering kit "FIRE-MIX" is assessed on the basis of EAD/ETAG 018, part 3, edition May 2012 concerning the fire protective performance.

The fire protective product "FIRE-MIX" is intended to protect horizontal areas (Type 1), vertical areas (Type 2), load-bearing elements made from concrete, reinforced concrete or prestressed concrete (Type 3) and load-bearing elements made of steel (Type 4).

¹ ETAG 018 part 3: "Renderings and rendering kits intended for fire resisting applications", edition January 2006/amended May 2012, used as European assessment document (EAD) in according to Article 66, Paragraph 3 of the Regulation (EU) N° 305/2011.

² Composition dated of 15/04/2017 is deposited with DIBt

The performance given in section 3 is only valid, if the construction product rendering kit "FIRE-MIX" in use considers the instructions and the conditions stated in section 3.3.

The test and assessment methods on which this European Technical Assessment (ETA) is based, lead to the assumption of working life of the fire protective rendering "FIRE-MIX" of at least 25 years in final use.

The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for this assessment

Safety in case of fire (BWR 2)

3.1 Reaction to fire

Essential characteristic	Performance
Reaction to fire	Class E in accordance with EN 13501-1

The final construction product "FIRE MIX" with and without top-coat meets the reaction to fire requirements of class A1 in accordance with EN 13501-1³.

3.2 Resistance to fire

3.2.1 Resistance to fire and necessary thickness of the rendering on steel elements for classification

The tests and the numerical assessment of the results for resistance to fire of the rendering "FIRE-MIX" on steel elements grade S (excluding S185) were carried out according to ENV 13381-4:2004.

The assessment of the test results and the determination of the minimum thicknesses keeps into consideration:

- fire resistance periods of 15 minutes up to 240 minutes
- (surface extent/surface area) section factors of $\leq 80 \text{ m}^{-1}$ up to 395 m^{-1}
- steel beams and steel columns with open cross section (H- and I-profiles)
- steel beams and steel columns with hollow sections of rectangular cross sections.

3.2.1.1 Design steel substrates; open cross section profiles

Tab. 1 Resistance to fire class R 15 (beams and columns H- and I-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m^{-1}]	necessary minimum thickness, dry [mm]								
≤ 80	14	13	13	13	0	0	0	0	0
81-100	14	13	13	13	13	0	0	0	0
101-120	14	13	13	13	13	13	0	0	0
121-140	14	13	13	13	13	13	13	0	0
141-395	14	13	13	13	13	13	13	13	13

³ EN 13501-1

Fire classification of construction products and building elements, Part 1 Classification using test data from reaction to fire tests and A1:2009

Tab. 2 Resistance to fire class R 20 (beams and columns H- and I-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	15	13	13	13	13	13	13	13	13
81-395	15	14	13	13	13	13	13	13	13

Tab. 3 Resistance to fire class R 30 (beams and columns H- and I-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	17	15	14	13	13	13	13	13	13
81-120	17	16	15	13	13	13	13	13	13
121-160	17	16	15	14	13	13	13	13	13
161-200	17	16	15	14	13	13	13	13	13
201-240	17	16	15	14	14	13	13	13	13
241-395	18	17	16	15	14	13	13	13	13

Tab. 4 Resistance to fire class R 45 (beams and columns H- and I-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	21	19	17	15	14	13	13	13	13
81-120	21	19	18	17	15	14	13	13	13
121-160	21	20	18	17	16	15	14	13	13
161-200	21	20	19	18	17	16	15	14	13
201-240	21	20	19	18	17	16	15	14	13
241-280	21	20	19	18	17	16	15	15	14
281-320	21	20	19	18	17	17	16	15	14
321-360	21	20	19	19	18	17	16	15	14
361-395	21	20	20	19	18	17	16	15	15

Tab. 5 Resistance to fire class R 60 (beams and columns H- and I-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	24	22	20	18	17	15	14	13	13
81-120	25	23	21	20	18	17	16	15	14
121-160	25	23	22	21	19	18	17	16	15
161-200	25	24	22	21	20	19	18	17	16
201-240	25	24	23	22	20	19	18	17	17
241-280	25	24	23	22	21	20	19	18	17
281-320	25	24	23	22	21	20	19	18	17
321-360	25	24	23	22	21	20	19	19	18
361-395	25	24	23	22	21	20	20	19	18

Tab. 6 Resistance to fire class R 90 (beams and columns H- and I-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	32	29	27	24	23	21	19	18	17
81-120	32	30	28	26	25	23	22	20	19
121-160	32	31	29	27	26	25	23	22	21
161-200	32	31	29	28	27	25	24	23	22
201-240	33	31	30	29	27	26	25	24	23
241-280	33	31	30	29	28	27	26	25	24
281-320	33	31	30	29	28	27	26	25	24
321-360	33	32	30	29	28	27	26	25	24
361-395	33	32	31	30	29	28	27	26	25

Tab. 7 Resistance to fire class R 120 (beams and columns H- and I-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	39	36	33	30	28	26	24	23	21
81-120	39	37	35	33	31	29	28	26	25
121-160	40	38	36	34	32	31	29	28	27
161-200	40	38	37	35	33	32	31	29	28
201-240	40	39	37	36	34	33	32	30	29
241-280	40	39	37	36	35	33	32	31	30
281-320	40	39	38	36	35	34	33	32	31
321-360	40	39	38	37	35	34	33	32	31
361-395	40	39	38	37	36	35	34	33	32

Tab. 8 Resistance to fire class R 180 (beams and columns H- and I-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	53	49	46	42	40	37	35	33	31
81-120	54	51	48	46	43	41	39	37	35
121-160	55	52	50	48	46	44	42	40	38
161-200	55	53	51	49	47	45	44	42	40
201-240	55	53	51	50	48	46	45	43	42
241-280	55	54	52	50	49	47	46	44	43
281-320	55	54	52	51	49	48	46	45	44
321-360	56	54	53	51	50	48	47	46	45
361-395	56	54	53	51	50	49	48	46	45

Tab. 9 Resistance to fire class R 240 (beams and columns H- and I-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	67	63	58	54	51	48	45	42	40
81-120	69	65	62	59	56	53	51	48	46
121-160	70	67	64	61	59	56	54	52	50
161-200	70	67	65	63	60	58	56	54	53
201-240	70	68	66	64	62	60	58	56	55
241-280	71	68	66	65	63	61	59	58	56
281-320	71	69	67	65	63	62	60	59	57
321-360	71	69	67	66	64	62	61	59	58
361-395	71	69	68	66	64	63	61	60	59

3.2.1.2 Design steel substrates, hollow sections

Tab. 10 Resistance to fire class R 15 (□-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 395	13	13	13	13	13	13	13	13	13

Tab. 11 Resistance to fire class R 20 (□-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 395	15	14	13	13	13	13	13	13	13

Tab. 12 Resistance to fire class R 30 (□-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	17	16	15	14	13	13	13	13	13
81-120	17	16	15	15	14	13	13	13	13
121-160	17	16	15	15	14	14	13	13	13
161-200	17	16	16	15	14	14	13	13	13
201-240	17	16	16	15	15	14	14	13	13
241-280	17	16	16	15	15	14	14	14	13
281-320	17	16	16	15	15	14	14	14	13
321-360	17	16	16	15	15	15	14	14	13
361-395	17	16	16	15	15	15	14	14	14

Tab. 13 Resistance to fire class R 45 (□-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	21	20	18	17	16	15	14	13	13
81-120	21	20	19	18	17	16	16	15	14
121-160	21	20	19	18	18	17	16	16	15
161-200	21	20	19	19	18	17	17	16	16
201-240	21	20	20	19	18	18	17	17	16
241-280	21	20	20	19	18	18	17	17	16
281-320	21	20	20	19	19	18	18	17	17
321-360	21	20	20	19	19	18	18	17	17
361-395	21	20	20	19	19	18	18	17	17

Tab. 14 Resistance to fire class R 60 (□-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	25	23	22	21	20	18	17	16	16
81-120	25	24	23	22	21	20	19	18	17
121-160	25	24	23	22	21	21	20	19	18
161-200	25	24	23	22	22	21	20	20	19
201-240	25	24	23	23	22	21	21	20	20
241-280	25	24	23	23	22	22	21	20	20
281-320	25	24	24	23	22	22	21	21	20
321-360	25	24	24	23	22	22	21	21	20
361-395	25	24	24	23	22	22	21	21	20

Tab. 15 Resistance to fire class R 90 (□-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	32	30	29	27	26	25	24	23	21
81-120	32	31	30	29	28	27	26	25	24
121-160	33	32	30	29	28	27	27	26	25
161-200	33	32	31	30	29	28	27	26	26
201-240	33	32	31	30	29	28	28	27	26
241-280	33	32	31	30	30	29	28	27	27
281-320	33	32	31	31	30	29	28	28	27
321-360	33	32	31	31	30	29	28	28	27
361-395	33	32	32	31	30	29	29	28	27

Tab. 16 Resistance to fire class R 120 (□-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	39	37	36	34	33	31	30	29	27
81-120	40	39	37	36	35	33	32	31	30
121-160	41	39	38	37	36	34	33	32	31
161-200	41	40	38	37	36	35	34	33	32
201-240	41	40	39	38	37	36	35	34	33
241-280	41	40	39	38	37	36	35	34	33
281-320	41	40	39	38	37	36	35	34	34
321-360	41	40	39	38	37	36	36	35	34
361-395	42	40	39	38	37	37	36	35	34

Tab. 17 Resistance to fire class R 180 (□-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	54	52	50	48	46	44	42	41	39
81-120	56	54	52	50	48	47	44	45	42
121-160	56	55	53	51	50	48	47	46	44
161-200	57	55	54	52	51	49	48	47	45
201-240	57	56	54	53	51	50	49	47	46
241-280	58	56	54	53	52	50	49	48	47
281-320	58	56	55	53	52	51	49	48	47
321-360	58	56	55	54	52	51	50	49	47
361-395	58	57	55	54	52	51	50	49	48

Tab. 18 Resistance to fire class R 240 (□-profiles)

design temp [°C]	350	400	450	500	550	600	650	700	750
section factor [m ⁻¹]	necessary minimum thickness, dry [mm]								
≤ 80	69	66	63	61	59	57	55	53	51
81-120	71	69	66	64	62	60	58	57	55
121-160	72	70	68	66	64	62	60	59	57
161-200	73	71	69	67	65	63	62	60	58
201-240	74	71	69	68	66	64	62	61	59
241-280	74	72	70	68	66	65	63	62	60
281-320	74	72	70	69	67	65	64	62	61
321-360	74	73	71	69	67	65	64	62	61
361-395	75	73	71	69	67	66	64	63	61

English translation prepared by DIBt

3.2.2 Resistance to fire and necessary thickness of the rendering on concrete elements for classification

The tests and the numerical assessment of the test results for resistance to fire of the rendering "FIRE-MIX" on elements made of concrete, reinforced concrete or pre-stressed concrete were carried out according to ENV 13381-4:2004.

The determination of the minimum thicknesses kept into consideration:

- normal concrete with a density between 2000 kg/m³ up to 2600 kg/m³
- fire resistance periods of 30 minutes up to 240 minutes
- application on ceilings/slabs, walls, beams, columns

According to EN 1992:2008 (EUROCODE 2), the necessary minimum thickness of the rendering " FIRE-MIX" on reinforced concrete elements and on pre-stressed concrete elements takes into consideration the axial distance between the reinforcement bars a and the critical temperature T_{kr} of the reinforcement in the element to be protected. Here 10 mm of the final rendering may substitute ca. 25 mm normal concrete.

3.2.2.1 Reinforced concrete walls and ceilings

Tab. 19 Resistance to fire class R 30 (reinforced concrete; walls and ceilings/slabs)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
10-14	10	10	10	10	10	0	0	0	0	0
15-19	10	10	10	0	0	0	0	0	0	0
20-24	10	0	0	0	0	0	0	0	0	0
≥ 25	0	0	0	0	0	0	0	0	0	0

Tab. 20 Resistance to fire class R 60 (reinforced concrete; walls and ceilings/slabs)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
10-14	10	10	10	10	10	10	10	10	0	0
15-19	10	10	10	10	10	10	0	0	0	0
20-24	10	10	10	10	10	0	0	0	0	0
25-29	10	10	10	0	0	0	0	0	0	0
30-34	10	10	0	0	0	0	0	0	0	0
≥ 35	0	0	0	0	0	0	0	0	0	0

Tab. 21 Resistance to fire class R 90 (reinforced concrete; walls and ceilings/slabs)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
10-14	10	10	10	10	10	10	10	10	10	10
15-19	10	10	10	10	10	10	10	10	10	0
20-24	10	10	10	10	10	10	10	0	0	0
25-29	10	10	10	10	10	0	0	0	0	0
30-34	10	10	10	10	0	0	0	0	0	0
35-39	10	10	10	0	0	0	0	0	0	0
40-44	10	10	0	0	0	0	0	0	0	0

Continuation tab. 21										
45-49	10	10	0	0	0	0	0	0	0	0
50-54	10	0	0	0	0	0	0	0	0	0
≥ 55	0	0	0	0	0	0	0	0	0	0

Tab. 22 Resistance to fire class R 120 (reinforced concrete; walls and ceilings/slabs)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
10-14	10	10	10	10	10	10	10	10	10	10
15-19	10	10	10	10	10	10	10	10	10	10
20-24	10	10	10	10	10	10	10	10	0	0
25-29	10	10	10	10	10	10	10	0	0	0
30-34	10	10	10	10	10	10	0	0	0	0
35-39	10	10	10	10	10	0	0	0	0	0
40-44	10	10	10	10	0	0	0	0	0	0
45-49	10	10	10	0	0	0	0	0	0	0
50-54	10	10	0	0	0	0	0	0	0	0
55-59	10	0	0	0	0	0	0	0	0	0
60-64	10	0	0	0	0	0	0	0	0	0
≥ 65	0	0	0	0	0	0	0	0	0	0

Tab. 23 Resistance to fire class R 180 (reinforced concrete; walls and ceilings/slabs)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
10-14			10	10	10	10	10	10	10	10
15-19			10	10	10	10	10	10	10	10
20-24		10	10	10	10	10	10	10	10	10
25-29		10	10	10	10	10	10	10	10	0
30-34	10	10	10	10	10	10	10	10	0	0
35-39	10	10	10	10	10	10	10	0	0	0
40-44	10	10	10	10	10	10	0	0	0	0
45-49	10	10	10	10	10	0	0	0	0	0
50-54	10	10	10	10	0	0	0	0	0	0
55-59	10	10	10	0	0	0	0	0	0	0
60-64	10	10	10	0	0	0	0	0	0	0
65-69	10	10	0	0	0	0	0	0	0	0
70-74	10	0	0	0	0	0	0	0	0	0
75-79	10	0	0	0	0	0	0	0	0	0
≥ 80	0	0	0	0	0	0	0	0	0	0

Tab. 24 Resistance to fire class R 240 (reinforced concrete; walls and ceilings/slabs)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
10-14					10	10	10	10	10	10
15-19				10	10	10	10	10	10	10
20-24				10	10	10	10	10	10	10
25-29			10	10	10	10	10	10	10	10
30-34			10	10	10	10	10	10	10	0
35-39		10	10	10	10	10	10	10	0	0
40-44		10	10	10	10	10	10	0	0	0
45-49	10	10	10	10	10	10	0	0	0	0
50-54	10	10	10	10	10	10	0	0	0	0
55-59	10	10	10	10	10	0	0	0	0	0
60-64	10	10	10	10	0	0	0	0	0	0
65-69	10	10	10	10	0	0	0	0	0	0
70-74	10	10	10	0	0	0	0	0	0	0
75-79	10	10	0	0	0	0	0	0	0	0
80-84	10	10	0	0	0	0	0	0	0	0
85-89	10	0	0	0	0	0	0	0	0	0
90-94	10	0	0	0	0	0	0	0	0	0
≥ 95	0	0	0	0	0	0	0	0	0	0

Tab. 25 Resistance to fire class R 360 (reinforced concrete; walls and ceilings/slabs)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
10-14								10	10	10
15-19							10	10	10	10
20-24							10	10	10	10
25-29						10	10	10	10	10
30-34						10	10	10	10	10
35-39					10	10	10	10	10	10
40-44					10	10	10	10	10	10
45-49				10	10	10	10	10	10	0
50-54				10	10	10	10	10	0	0
55-59			10	10	10	10	10	0	0	0
60-64			10	10	10	10	0	0	0	0
65-69		10	10	10	10	10	0	0	0	0
70-74		10	10	10	10	0	0	0	0	0
75-79		10	10	10	10	0	0	0	0	0

Continuation tab. 25										
80-84		10	10	10	0	0	0	0	0	0
85-89	10	10	10	10	0	0	0	0	0	0
90-94	10	10	10	0	0	0	0	0	0	0
95-99	10	10	10	0	0	0	0	0	0	0
≥ 100	0	0	0	0	0	0	0	0	0	0

3.2.2.2 Reinforced concrete beams and columns

Tab. 26 Resistance to fire class R 30 (reinforced concrete; beams and columns)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
5-9	12	12	12	12	12	12	12	12	12	0
10-14	12	12	12	12	12	12	12	12	0	0
15-19	12	12	12	12	12	12	12	0	0	0
20-24	12	12	12	12	12	0	0	0	0	0
25-29	12	12	12	0	0	0	0	0	0	0
30-34	12	12	0	0	0	0	0	0	0	0
≥ 35	0	0	0	0	0	0	0	0	0	0

Tab. 27 Resistance to fire class R 60 (reinforced concrete; beams and columns)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
5-9	22	18	16	12	12	12	12	12	12	12
10-14	18	16	12	12	12	12	12	12	12	12
15-19	16	12	12	12	12	12	12	12	12	12
20-24	12	12	12	12	12	12	12	12	12	0
25-29	12	12	12	12	12	12	12	12	0	0
30-34	12	12	12	12	12	12	0	0	0	0
35-39	12	12	12	12	12	0	0	0	0	0
40-44	12	12	12	12	0	0	0	0	0	0
45-49	12	12	12	0	0	0	0	0	0	0
50-54	12	12	0	0	0	0	0	0	0	0
55-59	12	0	0	0	0	0	0	0	0	0
≥ 60	0	0	0	0	0	0	0	0	0	0

Tab. 28 Resistance to fire class R 90 (reinforced concrete; beams and columns)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
5-9	28	22	18	16	12	12	12	12	12	12
10-14	24	18	16	12	12	12	12	12	12	12
15-19	22	16	12	12	12	12	12	12	12	12
20-24	18	12	12	12	12	12	12	12	12	12
25-29	16	12	12	12	12	12	12	12	12	12
30-34	12	12	12	12	12	12	12	12	12	0
35-39	12	12	12	12	12	12	12	12	0	0
40-44	12	12	12	12	12	12	12	0	0	0
45-49	12	12	12	12	12	12	0	0	0	0
50-54	12	12	12	12	12	0	0	0	0	0
55-59	12	12	12	12	0	0	0	0	0	0
60-64	12	12	12	0	0	0	0	0	0	0
65-69	12	12	0	0	0	0	0	0	0	0
70-74	12	0	0	0	0	0	0	0	0	0
75-79	12	0	0	0	0	0	0	0	0	0
≥ 80	0	0	0	0	0	0	0	0	0	0

Tab. 29 Resistance to fire class R 120 (reinforced concrete; beams and columns)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
5-9	32	28	24	20	18	16	12	12	12	12
10-14	28	26	20	18	16	12	12	12	12	12
15-19	26	24	18	16	12	12	12	12	12	12
20-24	24	20	16	12	12	12	12	12	12	12
25-29	20	18	12	12	12	12	12	12	12	12
30-34	18	16	12	12	12	12	12	12	12	12
35-39	16	12	12	12	12	12	12	12	12	12
40-44	12	12	12	12	12	12	12	12	12	0
45-49	12	12	12	12	12	12	12	12	0	0
50-54	12	12	12	12	12	12	12	0	0	0
55-59	12	12	12	12	12	12	0	0	0	0
60-64	12	12	12	12	12	0	0	0	0	0
65-69	12	12	12	12	0	0	0	0	0	0
70-74	12	12	12	0	0	0	0	0	0	0
74-79	12	12	0	0	0	0	0	0	0	0

Continuation tab. 29										
80-84	12	12	0	0	0	0	0	0	0	0
85-89	12	0	0	0	0	0	0	0	0	0
≥ 90	0	0	0	0	0	0	0	0	0	0

Tab. 30 Resistance to fire class R 180 (reinforced concrete; beams and columns)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
5-9	42	42	38	36	34	32	30	30	28	26
10-14	40	38	36	34	32	30	30	28	26	26
15-19	38	38	34	34	30	30	28	26	26	24
20-24	38	36	34	32	30	28	26	26	24	22
25-29	36	34	32	30	28	26	26	24	22	22
30-34	34	34	30	30	26	26	24	22	22	20
35-39	34	32	30	28	26	24	22	22	20	18
40-44	32	30	28	26	24	22	22	20	18	18
45-49	30	30	26	26	22	22	20	18	18	16
50-54	30	28	26	24	22	20	18	18	16	14
55-59	28	26	24	22	20	18	18	16	14	0
60-64	26	26	22	22	18	18	16	14	0	0
65-69	26	24	22	20	18	16	14	0	0	0
70-74	24	22	20	18	16	14	0	0	0	0
75-79	22	22	18	18	14	0	0	0	0	0
80-84	22	18	18	16	0	0	0	0	0	0
85-89	20	18	16	14	0	0	0	0	0	0
90-94	18	18	14	0	0	0	0	0	0	0
95-99	18	16	0	0	0	0	0	0	0	0
100-104	16	14	0	0	0	0	0	0	0	0
105-109	14	0	0	0	0	0	0	0	0	0
≥ 110	0	0	0	0	0	0	0	0	0	0

Tab. 31 Resistance to fire class R 240 (reinforced concrete; beams and columns)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
10-14			42	40	36	36	32	32	30	28
15-19		42	42	38	36	34	32	30	28	26
20-24	42	42	40	36	34	32	30	28	26	26
25-29	42	42	38	36	32	32	28	26	26	24
30-34	42	40	36	34	32	30	26	26	24	22
35-39	40	38	36	32	30	28	26	24	22	22

Continuation tab. 31										
40-44	38	36	34	32	28	26	24	22	22	20
45-49	36	36	32	30	26	26	22	22	20	18
50-54	36	34	32	28	26	24	22	20	18	18
55-59	34	32	30	26	24	22	20	18	18	16
60-64	32	32	28	26	22	22	18	18	16	14
65-69	32	30	26	24	22	20	18	16	14	0
70-74	30	28	26	22	20	18	16	14	0	0
75-79	28	26	24	22	18	18	14	0	0	0
80-84	26	26	22	20	18	16	0	0	0	0
85-89	26	24	22	18	16	14	0	0	0	0
90-94	24	22	20	18	14	0	0	0	0	0
95-99	22	22	18	16	0	0	0	0	0	0
100-104	22	20	18	14	0	0	0	0	0	0
105-109	20	18	16	0	0	0	0	0	0	0
110-114	18	18	14	0	0	0	0	0	0	0
115-119	18	16	0	0	0	0	0	0	0	0
120-124	16	14	0	0	0	0	0	0	0	0
125-129	14	0	0	0	0	0	0	0	0	0
≥ 130	0	0	0	0	0	0	0	0	0	0

Tab. 32 Resistance to fire class R 360 (reinforced concrete; beams and columns)

Design temp. [°C]	300	350	400	450	500	550	600	650	700	750
a [mm]	necessary minimum thickness, dry [mm]									
10-14							42	40	38	38
15-19						42	40	38	38	36
20-24					42	42	38	38	36	34
25-29				42	42	40	38	36	34	32
30-34			42	42	40	38	36	34	32	32
35-39			42	40	38	38	34	32	32	30
40-44		42	40	38	38	36	32	32	30	28
45-49	42	42	38	38	36	34	32	30	28	26
50-54	42	40	38	36	34	32	30	28	26	26
55-59	40	38	36	34	32	32	28	26	26	24
60-64	38	38	34	32	32	30	26	26	24	22
65-69	38	36	32	32	30	28	26	24	22	20
70-74	36	34	32	30	28	26	24	22	20	20
75-79	34	32	30	28	26	26	22	20	20	18
80-84	32	32	28	26	26	24	20	20	18	16
85-89	32	30	26	26	24	22	20	18	16	14

Continuation tab. 32										
90-94	30	28	26	24	22	20	18	16	14	0
95-99	28	26	24	22	20	20	16	14	0	0
100-104	26	26	22	20	20	18	14	0	0	0
105-109	26	24	20	20	18	16	0	0	0	0
110-119	24	22	20	18	16	14	0	0	0	0
120-129	22	20	18	16	14	0	0	0	0	0
130-139	20	20	16	14	0	0	0	0	0	0
140-149	20	18	14	0	0	0	0	0	0	0
150-159	18	16	0	0	0	0	0	0	0	0
160-169	16	14	0	0	0	0	0	0	0	0
170-179	14	0	0	0	0	0	0	0	0	0
≥ 180	0	0	0	0	0	0	0	0	0	0

3.3 Hygiene, health and the environment (BWR 3)

Essential characteristic	Performance
Content and release of dangerous substances	No dangerous substances

The manufacturer's detailed declaration concerning the chemical composition⁴ of all components of the rendering kit "FIRE-MIX" was assessed by DIBt and is deposited with DIBt.

3.4 General aspects of durability

Durability testing shall be an integral part of assessing the basic works and performance requirements. The following specific provisions for use shall be complied with to ensure the durability of the performance.

The final rendering "FIRE-MIX" without a top-coat can be used as a rendering for fire protective application on load-bearing steel elements or on elements of concrete, reinforced concrete or pre-stressed concrete for improvement or maintenance of fire resistance under use conditions of type Z₂ – frost protected indoor use at relative humidity up to 85 % RF.

The final rendering "FIRE-MIX" with the top-coat "Prem PE" on steel elements pre-treated with the primer "PRIMER 500" can be used for fire protective application on load-bearing steel elements for improvement or maintenance of fire resistance under use conditions of type X – outdoor use, free weathering (rain, UV, frost)⁵.

⁴ In accordance with the Regulation (EC) No 1272/2008 of the European parliament and the council of 16/12/2008 (published in the OJ of the EG N° L 353 of 31.12.2008, p. 1)

⁵ The manufacturer's recommendations for this use shall be considered obligatory

3.5 General aspects for installation and execution

For the execution of the rendering "FIRE-MIX" only those components shall be used as described in this ETA, the primer "PRIMER 500", the dry mix "FIRE-MIX", the described lathwork and optionally the top-coat "Prem PE".

The execution of the rendering "FIRE MIX" shall follow the manufacturer's instructions.

It is in the responsibility of the manufacturer to ensure that all necessary information is communicated completely and correctly to the applicator. The full fire protective performance of the rendering can only be assumed, if the execution on site is carried out by trained workers, who have some experience with the product.

Depending on the steel grade and the real intended environmental conditions, it is recommended to protect the steel substrate against corrosion. Appropriate anti-corrosion coatings are for instance "Intergard[®] 251" by Akzo Nobel or a two-component-coating on the basis of epoxy resin by PREMIX Sp. z.o.o.

When executing the rendering "FIRE MIX", at least some samples should be prepared in parallel for determining the density, to demonstrate the conformity of the executed rendering with the requirements of his ETA.

Furthermore it is necessary to control the layer thickness of the applied rendering after execution. The measurement should be done by a depth gauge on a marked "control area" of at least 0,5 m² for each 1000 m² and at least 6 points administered evenly across that area. The results shall be recorded. The determined thickness of the protective layer shall never fall below the required minimum thickness.

If the final rendering "FIRE MIX" is intended to be used out-door under conditions of free weathering, the integrity of the top-coat shall be conserved for the whole period of use. The user of the works should be instructed to take care for an appropriate arrangement.

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with the European Assessment Document ETAG 018, part 3 the Decision of the commission N° 1999/454/EC of 22 June 1999 (OJ of the EU L 178 of 14 July 1999, p 42), amended by EC Decision 2001/596/EC of 8 January 2001(OJ of the EU L 209 of 2 August 2001, p 33) is the legal basis for AVCP.

So system 1 applies for the assessment and verification of constancy of performance (AVCP). See Annex V in conjunction with Article 65 (2) of the Regulation (EU) N° 305/2011 and the following table:

Product	Intended use	performance	System
"FIRE MIX"	fire protective application on load-bearing steel elements, elements of concrete, reinforced concrete and pre-stressed concrete for improvement or maintenance of fire resistance	reaction to fire, resistance to fire relevant characteristics	1

5 Technical details necessary for the implementation of the procedure for assessment and verification of constancy of performance (AVCP) system 1, as provided for in the applicable European Assessment Document

The technical details necessary for the implementation of the system for assessment and verification of constancy of performance are laid down in the control plan (confidential part of this ETA) deposited with Deutsches Institut für Bautechnik.

The CE-marking for the kit shall be affixed on every component (stick-on label or directly on the packing unit) and the commercially accompanying documents.

The letters "CE" shall be followed by the identification number of the notified certification body and where relevant the following information:

- Name and address of the producer,
- Name and Generic type of the product,
- Number of this European Technical Assessment (ETA).

Issued in Berlin on 4 September 2017 by Deutsches Institut für Bautechnik

Prof. Gunter Hoppe
Head of Department

beglaubigt:
Dr.-Ing. Dierke

**TECHNICAL CHARACTERISTICS OF THE FIRE PROTECTIVE RENDERING
"FIRE-MIX"**

Characteristic	Test method ⁶	Determined values and tolerances
Dry mix		
Bulk density	EN 1097-3:2000	410 kg/m ³ ±10 %
Hardened rendering		
Density, dry	EN 1015-10:2001/A1:2007	640 kg/m ³ ±10 %
Flexural strength,	EN 1015-11:2001/A1:2007	≥ 1,5 N/mm ²
Compressive strength	EN 1015-11:2001/A1:2007	≥ 3,0 N/mm ²
Linear shrinkage after 28 d	EN 12617-4	≤ 0,5 %
Adhesion on steel substrate primed with "Intergard [®] 251"-coating (see cl. 3.5)	EN 1015-12:2002	≥ 0,20 N/mm ²
Adhesion on concrete substrate		≥ 0,20 N/mm ²

⁶ Details of test method are deposited with DIBt.