

Extended application report for roofs/roof coverings exposed to external fire No. 21619C

Owner of the extended application report

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Normative references

This extended application (EXAP) report concerns test results obtained in accordance with test method CEN/TS 1187:2012 – test method 4. The extended application process is carried out in conformity with the following extended application document: CEN/TS 16459:2019: External fire exposure of roofs and roof coverings – Extended application of test results from CEN/TS 1187. The extended application process also applies rules (if any) as defined in the following product standard(s) and/or EAD(s): None.

This extended application report consists of 15 pages.

1. DETAILS OF PRODUCT CONCERNED

1.1. Nature


Product Technical Specifications: Inverted roof system with porcelain tiles and pedestals.


Product family: TerraSmart Rail System.

End-use application: For roof terraces, podiums, recessed open balconies

1.2. Description

		Nominal values (1)	Measured values (2)
SUPPORTING DECK			
Material	Oriented Strand Board (OSB)		
Thickness (mm)	18		
Density (kg/m³)	667		
PRIMER			
Material	Bituminous synthetic rubber hotmelt waterproofing		
Trade name	IKO Permatec Ecowrap		
Manufacturer	IKO Group		
Supplier	IKO Group		
Flame retardants	None		
Weight percentage (w%)	(*)		
Surface weight (g/m²)	8000		
Application	Hot Applied		
INSULATING LAYER			
Material	Extruded polystyrene (XPS) insulation board		
Trade name	Danosa Danopren TR40 XPS Insulation		
Manufacturer	Danosa		
Supplier	Build 4 Less		
Thickness (mm)			
	Single layered	40	44
	Multi layered	160	176
Density (kg/m³) of the foam		32	30,4
Flame retardants		None	(3)
Fixing method	Loosely laid. The XPS pieces are interlocked with one another.		
Reaction to fire according to EN 13501-1	E		
VAPOUR CONTROL LAYER			
Material	Felt		
Trade name	Vent 3 Membrane		
Manufacturer / Supplier	Cromer Building Products		
Thickness (mm)		0,43	0,4
Surface weight (g/m²)		115	185
Flame retardants		None	(3)
Fixing method	Loosely laid		
Reaction to fire according to EN 13501-1	E		

ROOF COVERING		
First layer		
A) RPF-1		
Material	Adjustable polypropylene (PP) pedestals, composed of 3 main parts: the support base, the adjustable threaded section and the support head	
Photo of the pedestal		
Manufacturer / Supplier	Ryno Ltd	
Height / thickness (mm)		
<i>Pedestal</i>	35	35 (**)
<i>Support base</i>	22	32,6
<i>Adjustable threaded section</i>	21	29,4
<i>Support head</i>	5	8,4
Diameter (mm)		
<i>Support base</i>	200	198,1
<i>Adjustable threaded section</i>	100	100,1
<i>Support head</i>	120	118,4
Weight of the pedestal (g)	170	202
Flame retardants	None	(3)
Fixing method	Loosely laid	

B) <u>RDA-6C</u>		
Material	Adjustable polypropylene (PP) pedestals, composed of 3 main parts: the support base, the adjustable threaded section and the support head	
Photo of the pedestal		
Manufacturer / Supplier	Ryno Ltd	
Height / thickness (mm)		
<i>Pedestal</i>	200	200 (**)
<i>Support base</i>	87	91,3
<i>Adjustable threaded section</i>	95	89,6
<i>Support head</i>	10	18,3
Diameter (mm)		
<i>Support base</i>	220	217
<i>Adjustable threaded section</i>	100	101,6
<i>Support head</i>	114 x 140	113,8 x 189,8
Weight of the pedestal (g)	885	610
Flame retardants	None	(3)
Fixing method	Loosely laid	

C) <u>RDF-1</u>		
Material	Adjustable polypropylene (PP) pedestals, composed of 3 main parts: the support base, the adjustable threaded section and the support head	
Photo of the pedestal		
Manufacturer / Supplier	Ryno Ltd	
Height / thickness (mm)		
<i>Pedestal</i>	35	35 (**)
<i>Support base</i>	20,25	20,8
<i>Adjustable threaded section</i>	18	16,5
<i>Support head</i>	5 (24,44 with top piece)	8,4 (27,2 with the top piece)
Diameter (mm)		
<i>Support base</i>	200	199,2
<i>Adjustable threaded section</i>	100	100,5
<i>Support head</i>	113	113,1
Weight of the pedestal (g)	170	170
Flame retardants	None	(3)
Fixing method	Loosely laid	
<u>Second layer (OPTIONAL)</u>		
Material	Aluminium joist supports with a rubber gasket	
Trade name	ADS Lower Joist & RST Top Rail	
Manufacturer / Supplier	Ryno Ltd	
Thickness (mm)	52	± 56
Surface weight (g/m²)	5950	8936
Dimensions	845 x 845	845 x 841
Flame retardants	None	(3)
Fixing method	Loosely laid	

<u>Top layer</u>		
Material	Porcelain tiles.	
Trade name	20 mm Porcelain	
Manufacturer / Supplier	Ryno Ltd	
Thickness (mm)	20	20
Dimensions	420 x 420	420 x 422
Surface weight (g/m ²)	41667	20311
Flame retardants	None	
Fixing method	Loosely laid onto RST Top Rail	

(1) Based on the information given by the sponsor

(2) Values verified by the laboratory

(3) Unverifiable by the laboratory

(*) Not communicated by the sponsor

(**) The separate pieces of the pedestal fit into each other, making the total height adjustable. This results in the total height not being the sum of the separate pieces.

Summary of parameters and tested systems:

	A-1	A-2	A-3	A-3
Top coat	20 mm porcelain	20 mm porcelain	20 mm porcelain	20 mm porcelain
Fixing method	Loosely laid	Loosely laid	Loosely laid	Loosely laid
Support	ADS Lower Joist & RST Top Rail	ADS Lower Joist & RST Top Rail	ADS Lower Joist & RST Top Rail	N/A
Fixing method	Loosely laid	Loosely laid	Loosely laid	N/A
Pedestal	RDF-1	RDF-1	RDA-6C	RPF-1
Fixing method	Loosely laid	Loosely laid	Loosely laid	Loosely laid
Vapour control layer	Vent 3 Membrane	Vent 3 Membrane	Vent 3 Membrane	Vent 3 Membrane
Fixing method	Loosely laid	Loosely laid	Loosely laid	Loosely laid
Insulation	XPS (40 mm)	XPS (160 mm)	XPS (40 mm)	XPS (40 mm)
Fixing method	Loosely laid	Loosely laid	Loosely laid	Loosely laid
Primer	IKO Permateg Ecwrap	IKO Permateg Ecwrap	IKO Permateg Ecwrap	IKO Permateg Ecwrap
Support	OSB (18 mm ; 667 kg/m ³)			

2. TEST REPORTS & RESULTS IN SUPPORT OF THIS EXTENDED APPLICATION

2.1. Test reports

Name of the laboratory	Name of the sponsor	Test report ref. No.	Test dates	Test method
WFRGENT N.V. Ghent, Belgium	Ryno Ltd.	21619A	17/11/2021 & 05/01/2022	CEN/TS 1187:2012-test method 4
WFRGENT N.V. Ghent, Belgium	Ryno Ltd.	21619B	05/01/2022 & 12/01/2022	CEN/TS 1187:2012-test method 4

Deviations from test standard: Number of tested samples for report 21619A. Only one preliminary and one penetration test have been carried out instead of the standard one preliminary and three penetration tests.

2.2. Test samples

Test report ref. No.	Sampling procedure	Conditioning	Number of samples tested
21619A	AVCP 3	according to CEN/TS 1187:2012 test 4	4 x 2
21619B	AVCP 3	according to CEN/TS 1187:2012 test 4	4

2.3. Test results

2.3.1. Test results on CEN/TS 1187:2012 – test method 4

Test conditions: 21619A

Specimen No.	A-1(')	A-2(')	A-3(')	A-4(')
Date of test	17/11/2021	17/11/2021	05/01/2022	05/01/2022
Roof pitch	0°	0°	0°	0°
Room temperature at start of test (°C):	17	17	17	17
Substrate	OSB (18 mm (667 kg/m³))			

(') The results of preliminary test correspond with the obtained results of the penetration test.

a) Test results

PRELIMINARY IGNITION TEST WITH BURNING BRANDS (STAGE 1)

Specimen No:	A-1'	A-2'	A-3'	A-4'(*)
Duration of flaming after withdrawal of the test flame (min:sec)	00:00	00:00	00:00	00:00
Maximum flame spread distance (mm)	0	0	0	0
Time to fire penetration (min:sec)	Did not penetrate	Did not penetrate	Did not penetrate	Did not penetrate
Nature of the penetration	N.a.	N.a.	N.a.	N.a.

(*) The results of preliminary test correspond with the obtained results of the penetration test.

(*) Reused in official test 21619B.

PENETRATION TEST WITH BURNING BRANDS, WIND AND SUPPLEMENTARY RADIANT HEAT (STAGE 2)

Specimen No:	A-1	A-2	A-3	A-4(*)	Average
Time to fire penetration (min:sec)	Did not penetrate	Did not penetrate	Did not penetrate	Did not penetrate	Did not penetrate
Nature of the penetration	N.a.	N.a.	N.a.	N.a.	-
Additional observations: None of the specimens ignited.					

(*) Reused in official test 21619B.

Test conditions: 21619B

Specimen No.	1	2	3	4
Date of test	05/01/2022	05/01/2022	12/01/2022	12/01/2022
Roof pitch	0°	0°	0°	0°
Room temperature at start of test (°C):	17	17	17	17
Substrate	OSB (18 mm ; 667 kg/m³)			

Build-up: OSB + IKO Permasec Ecwrap + XPS (40 mm) + Vant 3 Membrane + RPF-1 + 20 mm porcelain

	Specimen number	Time to fire penetration (min:sec)	Duration of flaming after withdrawal of test flame (min:sec)	Maximum flame spread distance (mm)
Stage 1	1	Did not penetrate	00:00	0
Stage 2	2	Did not penetrate	(-)	(-)
	3	Did not penetrate	(-)	(-)
	4	Did not penetrate	(-)	(-)
	Average	Did not penetrate	(-)	(-)

(-) not applicable

2.4. Additional supporting data used in the extended application process

2.4.1. Observations and additional supporting data

- The reaction to fire classification of Vent 3 Membrane is Euroclass E, according to the declaration of performance by the manufacturer.
- The reaction to fire classification of Danosa Danopren TR40 XPS Insulation is Euroclass E, according to the declaration of performance by the manufacturer.

3. RESULTS OF THE EXTENDED APPLICATION

3.1. Principles applied for the extension of the field of application

This extended application procedure is based on:

CEN/TS 16459:2019 §5.1:

Option 1: by use of additional test results which, together with the initial test result, enables consideration of a larger range of one or several product parameters and end-use application parameters.

Option 2: by use of test results in combination with application of calculation methods (§5.3 of CEN/TS 16459:2019) relating the product and end-use application parameters to the fire performance.

Option 3: by use of historical data, see §5.4 of CEN/TS 16459:2019, and other relevant information e.g. data from previous tests.

3.2. Procedure

Under annex D of the above-mentioned standard, extrapolation rules are stated which are relevant to the test method and type of product used for this extrapolation. The paragraphs below are relevant for the extrapolation, performed in this report.

3.2.1 Rules for extrapolation according to §5 and annex D of CEN/TS 16459:2019 – Test method 4 of CEN/TS 1187:2012

Product / End-use parameter for which an extended application is obtained	Extended application based on	Rule or statement
Thickness or Mass per unit area or Density	§ D.2 General rules of CEN/TS 16459:2019	“Following the classification of the roofing systems to EN 13501–5 using the maximum and minimum values of the given parameter for the component layer under investigation, where no change in class occurs, the resulting classification for the roofing system is valid within and including the limits of the component layer.”
Reaction-to-fire classification (EN 13501–1) of any layer in the roofing system	§ D.2 General rules of CEN/TS 16459:2019	Substitution is possible for a component or layer with the same or better reaction-to-fire classification when tested in the same end use application provided that the substitute component or layer is of the same generic product group. Note that this rule excludes the substitution of the external (top) layer.
Surfacing on lower side (backing) of any layer in the roof system.	§ D.2 General rules of CEN/TS 16459:2019	The % of organic content of the surfacing product (by mass) shall not be increased. Note that this rule excludes the substitution of the external (top) layer.
Surfacing on upper side (facing) of any layer in the roof system.	§ D.2 General rules of CEN/TS 16459:2019	The % of organic content of the surfacing product (by mass) shall not be increased. Note that this rule excludes the substitution of the external (top) layer.

To evaluate the product parameter “**Insulation thickness**” tests were performed according to CEN/TS 1187:2012 on:

- A-1: system with 40 mm XPS
- A-2: system with 160 mm XPS

Other parameters of the system were kept the same between the samples.

As a conclusion, there were no significant differences. Based on visual observations the laboratory selected the system with **40 mm XPS** as the worst-case system.

Therefore, this worst-case result can be considered the upper limit for results of the range Insulation thickness. The laboratory continues the EXAP program with the worst-case system.

System/ parameter	A-1	A-2
Parameters of the system: Insulation thickness	40 mm XPS	160 mm XPS
Maximum flame spread distance (in preliminary test) (mm)	0	0
Percentage (%) of maximal flame spread (380 mm)	0,0	0,0
After withdrawal of the test flame, specimens burn for < 5 min (in preliminary test) (min :sec)	00:00	00:00
Penetration (Yes/No)	No	No
Within the Broof(T4) classification	Yes	Yes

For the fire tests, 160 mm (multilayer) was selected as the highest possible thickness (in combination with the pedestal) the test trolley could incorporate to test according to CEN/TS 1187:2012, since results proved to be successful, the range for the insulation thickness is also valid for insulation thicknesses of 40 mm and more, for single and multi-layered insulation, as seen in the extended field of application (§4.1).

To evaluate the product parameter “**Pedestal type and corresponding height**” tests were performed according to CEN/TS 1187:2012 on:

- A-1: system with RDF-1 pedestal at a height of 35 mm
- A-3: system with RDA-6C pedestal at a height of 200 mm
- A-4: system with RPF-1 pedestal at a height of 35 mm

Other parameters of the system were kept the same between the samples.

As a conclusion, there were no significant differences. Based on visual observations the laboratory selected the system with **RPF-1 pedestal at a height of 35 mm** as the worst-case system.

Therefore, this worst-case result can be considered the upper limit for results of the range pedestal type and corresponding type. The laboratory concludes the EXAP program. The worst-case system is officialized in report 21619B.

System/ parameter	A-1	A-3	A-4
Parameters of the system: Pedestal type	RDF-1	RDA-6C	RPF-1
Maximum flame spread distance (in preliminary test) (mm)	0	0	0
Percentage (%) of maximal flame spread (380 mm)	0,0	0,0	0,0
After withdrawal of the test flame, specimens burn for < 5 min (in preliminary test) (min :sec)	00:00	00:00	00:00
Penetration (Yes/No)	No	No	No
Within the Broof(T4) classification	Yes	Yes	Yes

For the fire tests, the RDA-6C pedestal (160 mm) was selected as the highest possible thickness (in combination with insulation thickness) the test trolley could incorporate to test according to CEN/TS 1187:2012, since results proved to be successful, the range for the pedestal height is also valid for 35 mm and more, as seen in the extended field of application (§4.1).

4. **EXTENDED APPLICATION RESULTS**

4.1. Application range – product family

This extended application for the product as described in §1.2, is valid for the following end-use applications:

➤ Range of layer 0: Porcelain tiles

Thickness:	20 mm
Dimensions:	200 x 200 or greater
Surface weight:	41667 g/m ²
Use of fire retardants:	None
Fixing method:	Loosely laid

➤ Range of layer 1: ADS LOWER JOISTS & RST TOP RAIL

Material:	Aluminium joist supports with a rubber gasket
Thickness:	27 mm or more
Dimensions:	200 x 200 or greater
Surface weight:	Varies depending on layout
Use of fire retardants:	None
Fixing method:	Loosely laid

➤ Range of layer 2: Pedestals: RDF-1, RPF-1 or RDA-6C

Material:	Adjustable polypropylene (PP) pedestals, composed of 3 main parts: the support base, the adjustable threaded section and the support head
Pedestal height:	35 mm or more
Use of fire retardants:	None
Fixation method	Loosely laid

➤ Range of layer 3: Vapour control layer

Material:	Felt
Reaction to fire according to EN 13501-5	E or better

➤ Range of layer 4: Insulation: XPS

Thickness:	40 mm or more (single or multi-layered)
Density:	32 kg/m ³
Use of fire retardants:	None
Reaction to fire according to EN 13501-5	E or better
Fixation method	Loosely laid. The XPS pieces are interlocked with one another.

➤ Range of layer 5: Bituminous synthetic rubber primer, as tested and described in §1

➤ Range of layer 6: Supporting deck

Range of supporting deck:	OSB (18 mm or more ; 667 kg/m ³)
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4.2. Fire performance parameters

All products as described in §1.2. and within the field of application as defined in §4.1., can be considered to obtain reaction to fire test results that are better comply with the following:

PRELIMINARY TEST (STAGE 1)

Parameter	Criteria				Compliance			
	Class B _{ROOF} (t4)	Class C _{ROOF} (t4)	Class D _{ROOF} (t4)	Class E _{ROOF} (t4)	Class B _{ROOF} (t4)	Class C _{ROOF} (t4)	Class D _{ROOF} (t4)	Class E _{ROOF} (t4)
Burn time	< 5 min	< 5 min	< 5 min	≥ 5 min	Yes	Yes	Yes	Yes
Flame spread distance	< 0,38 m	< 0,38 m	< 0,38 m	No limit	Yes	Yes	Yes	Yes
Penetration	None	None	None	None	Yes	Yes	Yes	Yes

PENETRATION TEST (STAGE 2)

Parameter	Criteria			
	Class B _{ROOF} (t4)	Class C _{ROOF} (t4)	Class D _{ROOF} (t4)	Class E _{ROOF} (t4)
Penetration	≥ 60 min	< 60 min ≥ 30 min	< 30 min	< 30 min
Parameter	Compliance			
	Class B _{ROOF} (t4)	Class C _{ROOF} (t4)	Class D _{ROOF} (t4)	Class E _{ROOF} (t4)
Penetration	Yes	Yes	Yes	Yes

5. ADDITIONAL STATEMENT

The extended application results relate to the behaviour of a product/product family under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product/product family in use.

Provisions of Regulation (EU) 305/2011, commonly known as the Construction Products Regulation (CPR), prevail over any conflicting provisions in the harmonised standards and technical specifications.

PREPARED BY

APPROVED BY

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