SINTEF Technical Approval

TG 2594

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Provided listed on
www.sintefcertification.no

SINTEF confirms that

Derbigum GC bituminous membrane

has been found to be fit for use in Norway and to meet the provisions regarding product documentation given in the regulation relating to the marketing of products for construction works (DOK) and regulations on technical requirements for building works (TEK), with the properties, fields of application and conditions for use as stated in this document

1. Holder of the approval

Derbigum Norge AS
Kløvningsten 11
NO-1739 Borgenhaugen
www.derbigum.no

2. Product description

Derbigum GC is a bituminous waterproofing membrane with a double reinforcement felt positioned in the top layer of the membrane. The reinforcement consists of a 250 g/m² polyester felt and a 56 g/m² glass felt with longitudinal glass yarns. Both layers are impregnated with APP polymer bitumen during the manufacturing process, at the same time as the bottom layer is given the specified thickness. Derbigum GC is coated with fine grained talcum on the underside. Measures and tolerances are stated in Table 1. Derbigum GC can also be delivered as a big roll up to about 130 m.

Derbigum GC AR is the anti-root version of Derbigum GC.

Table 1
Measures and tolerances for Derbigum GC according to EN 1848-1 and EN 1849-1

Property	Measure	Unit	Tolerance
Thickness	5.0	mm	± 5 %
Area weight	5.6	kg/m²	± 10 %
Width	1.1	m	± 1 %
Length of roll	7.27	m	+50 / -0 mm
Weight of polyester reinforcement	250	g/m²	± 15 %
Weight of glass felt reinforcement	56	g/m²	± 15 %

Supplementary products for applications other than bridge, and places where there are no horizontal forces:

- Derbiprimer GC primer
- Derbibond S and Derbibond NT adhesive.

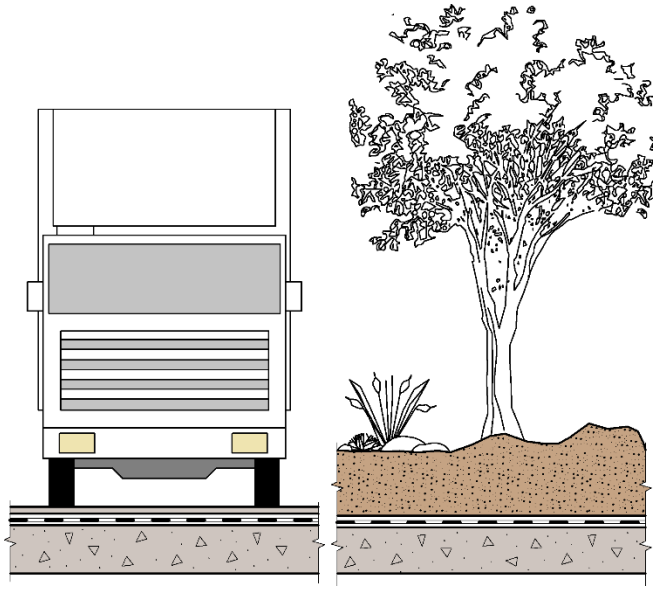

Fig. 1
Example of use of Derbigum GC (AR) as a ballasted membrane

3. Fields of application

Derbigum GC is used as a covered single-layer bituminous waterproofing membrane. The intended use of Derbigum GC is for bridges, tunnel openings, aqueducts, basins, parking decks and roof terraces. For roof gardens, Derbigum GC AR shall be applied instead of Derbigum GC.

Structures such as parking decks and terraces must have adequate slope to drain water from rain and melted snow. The membrane can be laid horizontally when integrally casted wear layers have a slope towards gutter and drain of at least 1:100.

According to Norwegian Public Roads Administration's *Håndbok N100 Veg- og gateutforming*, chapter *2.2 Gater - Generelle utformingskrav* and *3.2 Veger - Generelle utformingskrav*, the driving lanes on streets and roads should have a minimum resultant slope of 2 %.

Table 2
Product properties for fresh material of Derbigum GC bituminous waterproofing membrane

Property		Test method EN	DoP [1]	Control limits [2]	SINTEF's recommended minimum performance [3]	Unit
Dimensional stability		1107-1	-	± 0.2	+0.3 -0.5	%
Flexibility at low temperature - Surface out - Surface in		1109	- ≤ –15	- [7] ≤ –15	≤ --15 / -20 [8]	°C
Flow resistance at elevated temperature < 2 mm at tested temp.		1110	-	≥ 150	≥ 90	°C
Water tightness (10 kPa/24 h)		1928 (A)	Passed	Passed [4]	Passed	-
Water tightness (150 kPa/ 24 h)		1928 (B)	-	Passed [4]	Passed	-
Tensile strength (L/T)		12311-1	1200 ± 20 %	≥ 960	≥ 800	N/50 mm
Elongation at max. load (L/T)		12311-1	50 ± 15	≥ 35	≥ 30	%
Shear resistance of joints Side lap/End lap		12317-1	800 ± 20 %	≥ 640	≥ 600	N/50 mm
Resistance to puncture by	impact at +23 °C	12691 (A)	≥ 1750	≥ 1750	≥ 500	mm
	impact at -10 °C	12691:2001	-	≤ 30 [4]	≤ 30	mm diam.
	static loading	12730 (A)	≥ 20	≥ 20	≥ 20	kg
Bond strength	- Asphalt - to concrete	13596	≥ 0.7 ≥ 0.4	≥ 0.7 [4] ≥ 0.4 [4]	≥ 0.7	N/mm²
Shear strength - to concrete		13653	≥ 0.2	≥ 0.20 [4]	≥ 0.2	N/mm²
Resistance to root penetration (only Derbigum GC AR)		13948	Passed	Passed [4]	Passed [6]	-
Determination of resistance to dynamic water pressure after damage by pre-treatment		14694	-	Passed [4]	[5]	-

[1] The manufacturer's Declaration of performance, DoP.
[2] Control limits show values that the product must satisfy both during internal factory production control and audit testing.
[3] SINTEF's recommended minimum performance in SINTEF Technical Approval for bituminous membranes for bridges (test methods according to EN 13707 and EN 14695)
[4] Result from type testing
[5] SINTEF has not recommended a minimum performance
[6] If the root resistance has not been tested (in soil covered structures) the root resistance must be ensured by a separate root barrier to protect the membrane from plant roots.
[7] In the case of sheets with the same bituminous compound on both sides and where the reinforcement is placed in the cross section visually closer to the upper surface, as with Derbigum GC, the test is performed on the bottom face only
[8] The requirement is maximum -15 ° C when the membrane is used in areas with the lowest air temperature > -30 ° C.
The requirement is maximum -20 ° C if the membrane is to be used in areas with the lowest air temperature -30 ° C or colder.
This is in accordance with the Norwegian Public Roads Administration's *Håndbok N400 Bruprosjektering, Tabell 12.2.2-1 Spesifikasjon for prefabrikkert ettlags asfaltmembran*

L = Longitudinal T = Transversal

Håndbok N400 Bruprosjektering (for bridges) gives no clear requirement for a numerical value for longitudinal slope, but requires that structural parts must be designed to ensure good and appropriate drainage. According to *Håndbok N400*, chapter *3.1 Vannhåndtering* a completely horizontal bridge with edge girders will for instance not meet the requirement. For bridges with edge girders there is no transverse fall (as it is a line without extension in the transverse direction), and it would be too strict to require a 2 % longitudinal fall on the bridge. A longitudinal fall below 2% is therefore acceptable, but the longitudinal fall must be above 0 %.

4. Product performance

Product properties
Characteristics for fresh material are shown in Table 2.

Properties related to fire
Derbigum GC fulfils the requirements of class E according to EN 13501-1 regarding reaction to fire.

For information regarding fire property requirements for the roofing, see TPF Informerer no. 6 *Brannteknikske løsninger for kompakte tak og terrasser* published by Takprodusentenes Forskningsgruppe (TPF), see www.tpf-info.org.

5. Environmental aspects

Substances hazardous to health and environment

Derbigum GC contains no hazardous substances with priority in quantities that pose any increased risk for human health and environment. Chemicals with priority include CMR, PBT or vPvB substances.

Non dry/hardened primer and adhesive is defined as hazardous waste (according to the Norwegian Waste Regulation (Avfallsforskriften)). The product must be sorted as hazardous waste on the construction site, and delivered to an authorized treatment plant for hazardous waste. The dried product is not hazardous waste.

Effect on soil, surface water and ground water

The leaching properties of the product are evaluated to have no negative effects on soil or ground water.

Waste treatment/recycling

The product shall be sorted as residual waste on the building/demolition site. The product shall be delivered to an authorized waste treatment plant for energy recovery.

Environmental declaration

No environmental declaration (EPD) has been worked out for Derbigum GC.

6. Conditions of use

General

Derbigum GC can be torched or hot air welded, and installed in accordance with the manufacturer's installation manual and the principles shown in SINTEF Building Research Design Guide no.

- 544.203 *Asfalttakbelegg. Egenskaper og tekking*
- 544.204 *Tekking med asfalttakbelegg eller takfolie. Detaljløsninger*.
- 525.304 *Terrasse på etasjeskiller av betong for lett eller moderat trafikk*
- 525.306 *Takterrasser med beplantning*
- 525.307 *Tak for biltrafikk og parkering*

Plus, information sheets issued by Takprodusentenes Forskningsgruppe (TPF), see www.tpf-info.org:

- TPF informerer nr. 5 *Innfesting av fleksible takbelegg, dimensjonering og utførelse*
- TPF informerer nr. 6 *Branntekniske løsninger for kompakte tak og terrasser*
- TPF informerer nr. 13 *Tak under oppføring – forholdsregler og tiltak ved bruk*

Design

Where a fire classification is required, the construction in total must be evaluated. Depending on the relevant requirements, either the cover or the substrate must satisfy the fire requirements. Derbigum GC cannot be used as exposed membrane where fire classification is required.

Installation (preparation)

The substrate must be dry and clean and have a smoothness corresponding to float-finished concrete. Concrete elements must be connected to each other, and the joints between the elements must be casted. Gaps larger than 2-3 mm between the elements must be filled in.

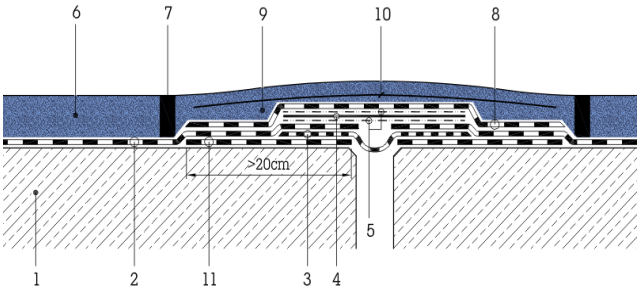

Fig. 2
Principal drawing of performance of movement joint
(This performance does not apply to bridges)

1. Concrete deck primed with Derbiprimer GC
2. Waterproofing Derbigum, welded
3. Derbigum GC with expansion joint
4. Metal plate, thickness 2 mm
5. Separator layer in fibre glass
6. Asphalt layer
7. Rejointing
8. Derbigum GC protection strip, welded with min. 10 cm overlap at each side
9. Asphalt layer above the expansion joint
10. Reinforcement
11. Derbigum GC preparation strip

Installed as contact membrane

On surfaces with heavy traffic like bridges and some parking-decks, Derbigum GC shall be installed fully welded to the substrate.

The substrate must be primed with Derbiprimer GC to prevent blistering (quantity = 150 to 300 g/m^2). The substrate must be dry before priming.

The concrete surface must have a smoothness equivalent to a float-finished and sandblasted surface. Holes and formwork ties must be plugged evenly with the surface. Any burrs and gaps must be ground down before roofing. Any pits must be levelled with concrete/mortar in such a way that a puncture of the fully bonded membrane does not lead to water migrating under the membrane.

Derbigum GC must be laid with 100 mm welded side laps. End laps shall be carried out with 150 mm overlap and the underlying corners shall be cut in an angle.

Installed as bridge membrane

For bridges the membrane shall only be laid on a concrete surface. The membrane is laid out along the bridge deck from the lowest to the highest point in the transverse and longitudinal directions so that overlaps in joints do not prevent water runoff.

Full welding is required on bridges according to Norwegian Public Roads Administration's *Håndbok R762 Prosesskode 2, Standard beskrivelse for bruer og kaier, Hovedprosess 8*, chapter *87.132 Fuktisolering type A3-2 med prefabrikkert membran og beskyttelseslag*.

As a protective layer, on top of the membrane, an asphalt concrete, Ab 4 (AC 4 surf), shall be applied, in accordance with Norwegian Public Roads Administration's *Håndbok R762*, chapter *87.132 Fuktisolering type A3-2 med prefabrikkert membran og beskyttelseslag* and *Håndbok N200 Vegbygging*, chapter *4.8.2 Asfaltbetong (Ab)*. The thickness of the protective layer shall be in accordance with *Håndbok 400 Bruprosjektering*, chapter *12.2.2 Belegningsklasse A3-2 med prefabrikkert membran og beskyttelseslag*.

Derbigum GC shall not be used as waterproofing membrane on bridges in areas with minimum temperature equal to or lower than – 30 °C (local minimum temperature according to existing thirty years norm). Norwegian Public Roads Administration's *Håndbok N200 Vegbygging* chapter *3.2.1 Behov for frostsikring* refers to an online map with temperature data.

Installed as cold applied contact membrane
On surfaces other than those with heavy traffic, Derbigum GC can be installed fully bonded to the substrate with Derbibond S or NT cold adhesive. The substrate can be primed with Derbiprimer GC (quantity= 150 to 300 g/m²) in order to reduce the consumption of cold adhesive.

The roughness of the substrate shall not exceed 2.5 mm.

For roof gardens Derbigum GC AR shall be applied, instead of Derbigum GC, for protection against root penetration. If Derbigum GC is used as a waterproofing membrane on roof gardens, the membrane must be covered with a protective layer to avoid root penetration.

Adequate covering or ballast on roofing membranes that do not fulfil the requirements of class B_{ROOF} (t2) is described in TPF informerer nr. 6 *Branntekniske løsninger for kompakte tak og terrasser.*

There are special requirements and restrictions when using the product under "green roofs", see "TPF informerer nr. 10 *Bygningsmessige aspekter ved prosjektering og bygging av grønne tak*.

Movement in joints in the substrate
Derbigum GC must be installed in such way that movements in the substrate can be absorbed. For contact-membranes this means that the membrane must be laid loosely over the joints in a width sufficient to the extent of the movement in the substrate,
see Fig. 2. The joint shown in Fig. 2 is separated from the general protection layer and is removable to allow repairs without damaging the rest of the roof. The principal drawing in Fig. 2 does not apply to bridges.

Protection and tightness test
The membrane must not be damaged by impacts from sharp objects or by objects that are stepped on during the construction period. The membrane must be protected as soon as it is installed and should be tested for water tightness before it is built into the construction.

Repairs
Repairs of the membrane are performed by brushing the damaged area clean and fully weld a considerably bigger patch over the damaged area, with sufficient overlap in all directions. The patch must cover minimum 10 cm outside the damage in all directions.

Transport and storage
Derbigum GC must be transported in a manner that does not damage the product and stored upright on pallets.

7. Product and factory production control
Derbigum GC is produced by IMPERBEL SA, Chaussée de Wavre 67, B-1360 Perwez, Belgium.

The holder of the approval is responsible for the factory production control in order to ensure that the product is produced in accordance with the preconditions applying to this approval.

The manufacturing of the product(s) and the manufacturer's system for factory production control (FPC) is subject to continuous surveillance in accordance with the contract regarding SINTEF Technical Approval.

The manufacturer IMPERBEL SA has a quality management system in accordance with EN ISO 9001, and an environmental management system in accordance with EN ISO 14001.

8. Basis for the approval
The evaluation of Derbigum GC is based on reports owned by the holder of the approval.

Derbigum GC is by SINTEF considered to be suitable as a prefabricated waterproofing membrane for use on bridges The membrane satisfies the specified material requirements in process *87.132 Fuktisolering type A3-2 med prefabrikkert membran og beskyttelseslag* in *Håndbok R762* ~~(2018)~~ *Prosesskode 2, Standard beskrivelse for bruer og kaier, Hovedprosess 8*. SINTEF's assessment is that Derbigum GC can be used for full moisture insulation regarding class A3-2, provided that the concrete surface is prepared correctly and that the work is carried out correctly.

9. Marking
Derbigum GC are marked on their packaging with the manufacturer, manufacturer's product description and the manufacturing date.

Derbigum GC is CE marked in accordance with EN 13707 and EN 14695.

The approval mark for SINTEF Technical Approval TG 2594 may also be used.

10. Liability
The holder/manufacturer has sole product responsibility according to existing law. Claims resulting from the use of the product cannot be brought against SINTEF beyond the provisions of Norwegian Standard NS 8402.

for SINTEF

Hans Boye Skogstad
Approval Manager