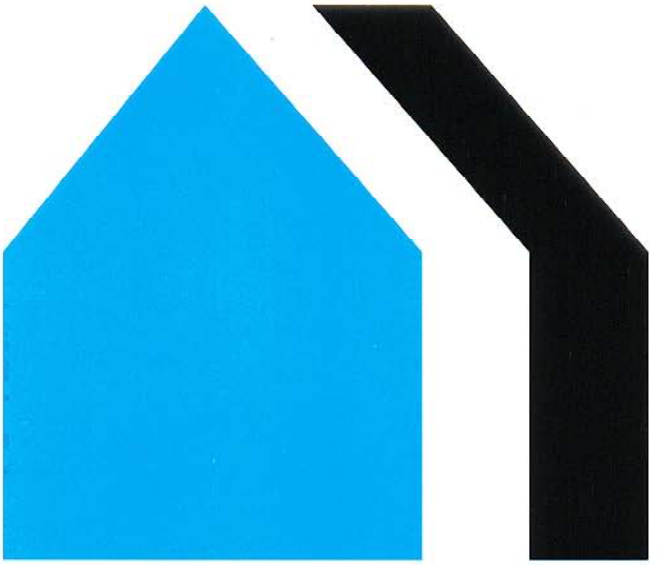

BYGGFORSK

Norwegian Building Research Institute

FIELD INVESTIGATION OF DERBIGUM SP SINGLE-LAYER ROOFING

BYGGFORSK
Norwegian Building Research Institute

Hovedkontor
Forskningsveien 3b
Postboks 123 Blindern
0314 Oslo
Telefon 22 96 55 55
Telefaks 22 69 94 38

Avdelingskontor
Høgskoleringen 7
7491 Trondheim
Telefon 73 59 33 90
Telefaks 73 59 33 80

E-mail firmapost@byggforsk.no
Internett www.byggforsk.no
Foretaksnr. NO 943 813 361 MVA

Client's name:
Performance Roof Systems SA-NV

Client's address:
Parc Industriel
B-1360 PERWEZ
Belgium

Client's reference:
Francis Blake

Project.no:	Date:	Rev.date:	Nber of pages	No. attachments	Graduation	Authors
O-10114	1.February 2001	9.February 2001	8	0	Closed	Trond Bøhlerengen Knut Noreng
Project leader Trond Bøhlerengen		Responsible signature Trine Tveter		Quality assurance Johan Gåsbak		

Assignment Report

Field investigation of Derbigum SP single-layer Roofing

Summary

Brief summary:

A field investigation has been carried out on 18 Norwegian roofs ranging from 5 to 17 years old.
The results show that Derbigum SP subjected to natural ageing has satisfactory properties with regard to mechanical strength and durability.

A visual evaluation of the roofing's execution, with emphasis on detail work, was made in the field investigation. Altogether 72.2% were given the characteristic "Excellent" or "Good," something that is regarded as being generally good. However, some typical faults were registered that can primarily be contributed to execution and the nature of the foundation.

The results of the field investigation show that Derbigum SP is suitable* as single-layer roofing, both for re-roofing and as original roofing for roofs.
It is a precondition however that one follows the supplier's own guidelines.

* with a life expectancy of 25 years or more

Category	Topic	File name
	Roofing; Asphalt, Field investigation	Derbigum-O-10114-Mainereport 1

Contents

1. Commission

The Norwegian Building Research Institute (NBI) has been commissioned by Performance Roof Systems to carry out a field investigation on Derbigum SP single-layer roofing (19-22 June 2000).

The background for this field investigation was the need for

- an after-inspection of the long-term properties of Derbigum SP in connection with the renewal of NBI Technical Approval (nr. 2055/95).
- a follow-up of a corresponding field investigation carried out in 1991-92.

The project comprised the following activities :

- field investigation of 18 roofs in the Oslo, Trondheim and Tromsø areas ranging from 5 to 17 years old.
- laboratory testing of samples taken from 17 of the 18 inspected roofs.

The investigation both encompassed roofs that had been examined earlier (study of 1991-92) as well as some new objects.

Photo 1: Sample taking. The roofing was mechanically fastened to the old roof. Underlayer was old asphalt roofing. The fasteners are placed close to the edge of the roofing (from T9).

2. Studied roofs

Roof nr.	From 1992	Name	Building	Place	Area (m^2)	Year
Roof 1	Ø2	Emma Hjort	Garasje	Oslo/Bærum	365	1988
Roof 2	Ø5	Avantor, Nydalen	Kontor	Oslo	1200	1990
Roof 3		Nycomed, Nycovn. 1	Kontor	Oslo	805	1990
Roof 4		Nycomed, Nycovn. 2	Kontor	Oslo	162	1993
Roof 5		Nycomed, Nycovn. 2	Kontor	Oslo	276	1990
Roof 6	Ø4	Løvenor, Micheletsv.50	Industri	Oslo	1420	1990
Roof 7	T8 *	Norspenn, Fossegrenda	Industri	Trondheim	1400	1986
Roof 8	T9	Norspenn, Fossegrenda	Industri	Trondheim	2000	1985
Roof 9	T3 *	Andreas Riis, Mellomveien	Industri	Trondheim	230	1984
Roof 10	T10 *	Norplasta	Industri	Stjørdal	3000	1983
Roof 11		Norplasta	Industri	Stjørdal	3000	1993
Roof 12	T1 *	Ranheim Papirfabrikk	Industri	Trondheim	742	1983
Roof 13		Ranheim Papirfabrikk	Industri	Trondheim	600	1990
Roof 14		Felleskjøpet, Tromsdalen	Lager	Tromsø	1160	1990
Roof 15		Nova, Tromsdalen	Industri	Tromsø	1100	1995
Roof 16		Tromsdalen brannstasjon	Garasje, kontor	Tromsø	200	1986
Roof 17		Neumann Bygg	Kontor/lager	Tromsø	1800	1986
Roof 18		Heracleum, Midtbyen	Boliger	Tromsø	160	1994

* The second column mentions the roofs that have been studied in 1991-92.

3. Laboratory Testing – Methods and results

The following properties have been examined :

- tensile strength and elongation
- T-peel
- Puncturing by impact
- Cold flex
- Watertightness

The first 4 above-mentioned properties have some individual results that are below NBI's approval criteria based solely on laboratory testing.

But the results show that Derbigum SP subjected to natural ageing has satisfactory properties with regards to mechanical strength and durability.

Table 3.3: Summary of the results

Sample nr Place Year	Tensile strength (N/50 mm) / Elongation (%) long.	 trans.	T-peel of joint (N/50 mm)	Puncturing by impact + 23 °C	 –10 °C	Cold flex (°C) Overside Opp Underside Opp	Watertightness 15 kPa
Sample 1 Oslo 1988	642 N / 40%	570 N / 43%	—	Ø 12 mm 5 of 5 OK	—	OO: – 14 UO: – 10	
Sample 2 Oslo 1990	882 N / 42%	503 N / 32%	—	Ø 12 mm 5 of 5 OK	—	OO: – 14 UO: – 16	
Sample 3 Oslo 1990	744 N / 40%	494 N / 26%	Max: 28 Aver.: 22	Ø 15 mm 5 of 5 OK	waterproof 5 of 5 OK	OO: – 18 UO: – 18	
Sample 4 Oslo 1993	642 N / 51%	608 N / 47%	Max: 81 Aver.: 69	Ø 10 mm 5 of 5 OK	—	OO: – 14 UO: – 16	
Sample 5 Oslo 1990	583 N / 36%	—	—	—	—	OO: — UO: – 16	
Sample 6 Oslo 1990	943 N / 46%	487 N / 32%	Max: 57 Aver.: 37	Ø 12 mm 5 of 5 OK	waterproof 5 of 5 OK	OO: – 18 UO: – 18	
Sample 7 Tr.heim 1990	631 N / 43%	536 N / 41%	Max: 90 Aver.: 59	Ø 12 mm 5 of 5 OK	not waterproof 5 of 5	OO: – 14 UO: – 8	
Sample 8 Tr.heim 1985	Not possible to take any sample from roof nr. 8						
Sample 9 Oslo 1990	699 N / 41%	589 N / 45%	Max: 100 Aver.: 63	Ø 12 mm 4 of 5 OK	waterproof 4 of 5 OK	OO: — UO: – 4	
Sample 10 Oslo 1990	583 N / 21%	—	Max: 86 Aver.: 53	Ø 20 mm 5 of 5 OK	—	OO: — UO: —	*Waterproof*
Sample 11 Tr.heim 1990	850 N / 42%	673 N / 45%	Max: 65 Aver.: 46	Ø 12 mm 5 of 5 OK	waterproof 5 of 5 OK	OO: – 14 UO: – 16	

Sample 12 Tr.heim 1983	454 N / 30%	451 N / 37%	Max: 61 Aver.: 43	—	waterproof 4 av 5 OK	OO: UO:	— – 4
Sample 13 Tr.heim 1990	Roof 13 was roofed by DERBIGUM Totaltekking, and it was difficult to separate the layers			—	—	PO – 20 – 18	PU – 20 – 20
Sample 14 Tromsø 1990	583 N / 36%	560 N / 41%	Max: 67 Aver.: 50	Ø 12 mm 5 of 5 OK	waterproof 4 of 4 OK	OO: UO:	– 18 – 14
Sample 15 Tromsø 1995	756 N / 41%	607 N / 43%	Max: 53 Aver.: 36	Ø 12 mm 4 of 5 OK	waterproof 4 of 4 OK	OO: UO:	– 18 – 18
Sample 16 Tromsø 1986	639 N / 37%	543 N / 33%	Max: 59 Aver.: 42	Ø 15 mm 4 of 5 OK	waterproof 3 of 4 OK	OO: UO:	– 14 – 0
Sample 17 Tromsø 1986	670 N / 48%	566 N / 41%	Max: 64 Aver.: 43	Ø 12 mm 5 of 5 OK	waterproof 2 of 3 OK	OO: UO:	– 16 – 14
Sample 18 Tromsø 1994	869 N / 47%	562 N / 44%	Max: 39 Aver.: 31	Ø 12 mm 5 of 5 OK	waterproof 2 of 2 OK	OO: UO:	– 18 – 18

4. Comments and conclusions

4.1. Comments

A few typical conditions have been found that are of importance to the technical life span of the roof structure and the roofing. Special attention should be paid to them:

1) **Overlap.** There has often been insufficient overlap, and welding widths have often been too narrow, contrary to the supplier's own guide-lines. At the same time it was noted that the full width of the overlap is not always all-welded. In the revised approval, both conditions must be clearly stressed as being execution requirements.
2) **Blisters/bulges.** During re-roofing there have often been blisters/bulges under the old covering, allowing water to collect in gutters and around drains. When re-roofing one must therefore either provide sufficient gradient on both roof surfaces and gutters, with crosswise supplementary insulation, or by cutting out the old blisters/bulges. The requirements for gradient and flatness of the foundation for the roofing are an important pre-condition for the roof's function.
3) **Turn-ups/turn-downs** are often hardly sufficient, especially when re-roofing where existing solutions/edges are retained, and where original fittings/ hardware are often retained. These conditions must be improved upon when re-roofing is undertaken, preferably by renewing all connections and fittings/ hardware and any possible cornice hardware. Poor welding of overlap joints in turn-up/concave moulding against parapets, etc. was also registered.
4) **Bushings.** The roofing-in (sealing) of bushings must, to a greater degree, be carried out in compliance with the supplier's own guide lines.
5) **Fittings/hardware** often lack sufficient anchoring or are insufficiently watertight, especially when re-roofing has been carried out using the old fittings. Whenever re-roofing is carried out, one should ensure that fittings/hardware are replaced and provided with sufficient anchoring.
6) **Flame damage** is a common occurrence and is due to careless application of heat during re-roofing work. Slack procedures should be tightened up.
7) **Lack of inspection** is unfortunately all too common on all Norwegian roofs. Flat roofs are especially prone. Firms carrying out roofing work should ensure that information about the need for regular roof inspection is passed on to the owners.

4.2. Conclusions

A visual evaluation of the roofing's execution, with emphasis on detail work, show that 72.2% were given the characteristic "Excellent" or "Good", something that is regarded as being generally good.

The results of the field investigation show that Derbigum SP is suitable* as single-layer roofing, both for re-roofing and as original roofing for roofs.

It is a precondition however that one follows the supplier's own guidelines.

Ingemar Samuelson (Sveriges Provnings- och Forskningsinstitut, Sweden) and Thomas Bruun (Eta, Denmark) were present during some parts of the field investigation. They have read and approved the partial reports for the respective roofs.

* with a life expectancy of 25 years or more

Oslo; 1. February 2001

Ingemar Samuelson (SP, Sverige)

Thomas Bruun (ETA, Denmark)

Knut Noreng (NBI)

Trond Bøhlerengen (NBI, prosjektleder)

Photo 16: The roofing is welded outside the bushing and is in good shape after 10 years (from T2).

Photo 20: A large roof with a lot of sky-lights. Well done workmanship (from T14).

Photo 30: Example of excellent roofing (from T10).

SEALED ROOFS
DERBIGUM

IMPERBEL GROUP - BERGENSESTEENWEG 32 - B-1651 LOT - TEL : +32 2 334 87 00 - FAX : +32 2 377 01 90
E-MAIL: info@imperbel.be - WWW.DERBIGUM.COM

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