

Certification

Long term investigation of Prelasti EPDM membrane for roofing Inspection no.3 – 37 years of service

Evaluated by Building engineer SBR Jan-Inge Bengtsson Constructech Sweden AB

CONSTRUCTECH Research and development for the construction industry

Constructech Sweden AB Malmbyvägen 4, SE-645 94 Strängnäs, Sweden www.constructech.se



Summary

This durability study was ordered by SealEco from Constructech being an independent inspector with expertise in roofing.

In order to define the durability of Prelasti EPDM membranes on flat roofs, a long term investigation has been performed. Three different roofs with EPDM membranes installed 1976 has been examined three times since then. The first time 1996 after 20 years exposure, the second time 2001 after 25 years exposure and the third time 2013 after 37 years exposure.

The facts from the previous inspections performed1996 and 2001 are showed in reports created by the independent German roofing expert Dipl. Ing. Heinz Götzke.

The result of the visual inspection and the laboratory analysis, performed by certified technical research institutes, shows that the Prelasti EPDM membranes has an outstanding resistance to ageing based on the actual climatic influence and that the material characteristics after 25 years of exposure still fulfills the demands based on the standard for new produced EPDM waterproofing membranes, DIN 7864. During this period no claims what so ever has been reported from the building owners.

The result of the third inspection carried out 2013-07-27, after 37 years exposure, is shown in this report and laboratory test in combination with visual inspections shows that the Prelasti EPDM membrane after 37 years still has satisfying functionality and fulfills the requirement of new produced material.





Description of investigated roofs

<u>Roof 1</u>

Location: (D-64747) Breuberg, Germany

Building type: Reception building, Pirelli industries

Roof area: 360m²

Slope: 0-1%

Installation year: 1976

System: Refurbishment of an old bituminous felt on mineral wool insulation. Unprotected Prelasti EPDM-membrane partly glued to the old substrate, thickness 1.2mm



Picture 1.View of roof. Heavy rain shower.





Picture 2. View of roof. Internal gutter and antenna.

Remarks:

The low slope in combination with deflections in the substructure has caused relatively deep water puddles (6-8cm) with no possibilities to drainage, particularly on the north side of the roof.





Picture 3. Water puddle.

These water accumulations can influence several types of roofing felts or membranes in a negative way:

- Water pressure with changing water levels can lead to shrinkage and expansion of the membrane.
- Mud, algae and leaves can due to contraction cause micro cracks in the membrane.
- In winter time the ice as well as freeze/thaw can cause big tensions in the membrane based on abrasion.

The samples for testing are taken at the same strategic spot as the previous inspection in order to allow comparison.

At this roof the samples are taken from the west oriented perimeter area, not protected by other buildings and most exposed to different weather conditions.





Picture 4. Test spot BR/I Mineral wool insulation

The visual inspection shows that even in spite of the hard outer conditions, the Prelasti EPDM membrane has not been affected in a negative way, during 37 years.

Roof 2

Location: (D64747) Rai-Breitenbach, Germany

Building type: Primary school, two storey building

Roof area: 1100m²

Slope: 0°

Installation year: 1976

System: Ballasted roof with gravel, loose laid Prelasti EPDM membrane without mechanical fixing on cellular plastic (polystyrene) insulation, unprotected membrane at parapets and joints, penetrated with roof lights and ventilation equipment. Thickness 1.0mm.





Picture 5. View of roof

Remarks:

Exposed EPDM membrane in connections with a masonry chimney oriented in south west direction.





Picture 6. Masonry chimney. Note the dirt caused by soot and exhaust gases.

In this case, the membrane is exposed to pollution caused by the exhaust gases in combination with intensive UV-rays. Variations of temperature in the chimney have also caused condensation water with salt content which also has a negative influence on the membrane.

Test samples are taken at the same spots as previous. One sample was taken in connection with the chimney and the other close to an internal gutter where the gravel was removed.



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Picture 7. Test spot RAI/I connected to the chimney



Picture 8. Test spot RAI/II connected to internal gutter without gravel.



The unusually big joints between the insulation slabs are supposed to depend on shrinkage in the cellular plastic. This does not influence the membrane since it is loose laid on the insulation.



Picture 9. Joints of cellular plastic insulation.

The investigation shows that also these types of influence have not caused any problems. The membrane fulfills all demands after 37 years.

Roof 3

Location: (D64720) Michelstadt, Germany

Building type: Technical school

Roof area: 1100m2

Slope: 2%

Installation year: 1976

System: Ballasted roof with gravel, loose laid Prelasti EPDM membrane without mechanical fixing on a bituminous felt, unprotected membrane at parapets and roof light frames. Thickness 1.5mm.





Picture 10. View of roof.



Picture 11. View of roof



Remarks:

Examination was concentrated to certain spots where the membrane was polluted with a thin mud layer, impossible to remove and still remaining after the samples was tested.



Picture 12. Membrane polluted with mud.

The unprotected membrane in connection to roof eaves and roof lights was not thoroughly examined but only overlooked due to the bad weather conditions.

Samples are taken on a spot with polluted membrane in the mid zone of the roof.





Picture 13. Test spot MI/I

The unprotected Prelasti membrane at the roof lights were investigated visually without any remarks. The Prelasti membrane was slightly stretched at the roof lights but without negative influence.



Picture 14. Unprotected Prelasti membrane in connection with roof lights.



In spite of the polluted membrane and unprotected parts, no problem has occurred during 37 years.

Laboratory test

The samples from the roofs has been tested in calibrated and approved equipment according to valid EN-standards which also corresponds to DIN standards at previous inspections. Although DIN 7864 has lost validity we still use it as reference since previous test and evaluation done at the German Institute MPA in Darmstadt was based on that standard for rubber.

The properties of the Prelasti EPDM membrane that has been evaluated is tensile strength, ultimate elongation and tear resistance, and all both in cross and length direction.

Summary

This long term investigation shows that the Prelasti EPDM membrane has an outstanding resistance to ageing under hard outer conditions. Not only water, snow and wind but also the influence of biological and chemical pollution has not changed the characteristics of the material during 37 years.

The best way to determine the ageing resistance is to measure the loss ofproperties and flexibility in a laboratory. Controls of test samples from the three roofs carried out in an independent)laboratory shows that the ultimate elongation measured longitudinal and crosswise on both exposed and protected membranes still are higher that the demands in DIN 7864.

| Measuring | Exposed | Protected | Requirement | |
|--------------|---------|-----------|--------------|--|
| | | | new material | |
| Longitudinal | 398% | 332% | Min. 250%* | |
| Crosswise | 346% | 295% | Min. 250%* | |

Table 1. Ultimate elongation after 37 years, average values.

* The minimum ultimate elongation on new material is 250% according to DIN 7864.

The laboratory tests regarding tensile strength and tear resistance also show values clearly higher that the requirements in DIN 7864.

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| | | Tensile strength N/mm2 | | Ultimate elongation % | | Tear resistance N/mm | |
|---|-------------------------------------|---------------------------|------|-----------------------|------|-------------------------|------|
| Roof | Test sample position | 2002 | 2013 | 2002 | 2013 | 2002 | 2013 |
| 1 | Exposed roof eave | 8.7 | 9.1 | 320 | 330 | 21.9 | 11.0 |
| 2 | Exposed parapet | 8.1 | - | 284 | - | 21.9 | - |
| | Gravel protected mid zone | 9.3 | 9.7 | 384 | 396 | 26.7 | 20.7 |
| | Exposed chimney | 7.4 | 9.9 | 380 | 415 | 27.0 | 18.3 |
| 3 | Protected alu- profile roof eave | 6.5 | - | 206 | - | 19.0 | - |
| | Exposed parapet | 7.0 | - | 266 | - | 19.2 | - |
| | Gravel protected midzone | 6.0 | 8.0 | 316 | 231 | 20.6 | 9.4 |
| Average values | | 7.6 | 9.2 | 308 | 343 | 22.3 | 12.6 |
| Requirement DIN 7864 part 1 new material | | Min 4.0 | | Min 250 | | Min 5.0 | |
| Note: | | | | | | | |

Average values for crosswise and longitudinal measuring regarding tensile strength, elongation and tear resistance.

Tear resistance 2002 has been performed according to DIN 53515 measured crosswise. Tear resistance 2013 according to DIN 53507 longitudinal and crosswise. The difference in tear resistance between 2002 and 2013 can be explained by methods used.

Table 2. Result of analysis from 2013 compared with the result 2002.

Conclusion

The laboratory test in combination with visual inspections shows that the Prelasti EPDM membrane after 37 years still have satisfying functionality and fulfills the requirement of new produced material.