

Summary version of the study
Evaluation of the useful life of EPDM roofing membranes

Commissioned by the Trade Association of the German Rubber Industry, Frankfurt, and performed by SKZ – TeConA GmbH, Würzburg
(Extensive version: Final report SKZ – TeConA N° 37236/99-X of 24 March 2004).

Objective

For the sealing of flat roofs, for about 30 years, amongst others, roofing on the basis of ethylene-propylene-diene rubber (EPDM) has been used. In this application, the roofing is subject to numerous external influences, leading to irreversible changes of application relevant material properties and, hence, capable of harming the use properties. Therefore, the objective of this study was to establish criteria for the evaluation of the foreseeable useful life of EPDM roofing membranes and for assessing on this basis the long-time performance of such roofing.

Procedure

For this purpose, a total of 39 EPDM roofing membrane samples from several manufacturers, already installed for up to thirty years, was checked as to its current state and then aged artificially further in the laboratory, to be able to evaluate the useful life still to be expected for each sample. The essential product data are summarized in the table below. As reference material for the exposed roofing, commercial new product was used, that had not yet been exposed. When comparing the samples taken from the roofs with the new product, we had however to take into account the fact that there is a difference in time of up to 30 years between the production of the various roofing products and that therefore there may have been changes in the raw materials and/or additives.

Results

None of the samples taken from the roofs showed visible indications of material damage. All roofing membranes were still fully performing their task of sealing a roof.

The elongation at break measurements of the aged roofing membranes is the best indication of the influence of the weather conditions and was therefore used as the central measurement parameter. In the initial state, it is situated between 310 and 560% and decreases with increased exposure duration. But for one exception, even after many years of weather exposure, the minimum requirement of the material standard DIN 7864-1 for new product, amounting to 250 % elongation at break, was still met.

From the measured values, by means of two different models (extrapolation and aging temperature models) the residual useful life was evaluated for new product, for the samples taken from the roofs, and for the samples that were artificially aged further in the laboratory. According to this, it amounts to between 10 and clearly over 100 years, using as lower limit value for elongation at break a minimum of 150% residual elongation. However, reaching this value does not automatically lead to an actual failure of the roofing, but means that a very conservative safety limit, based on the material standard DIN 7864-1, has been broken.

Conclusion

On the basis of the results of the study, the useful life of correctly made EPDM roofing membranes may be evaluated as clearly over 50 years under Central European climate conditions. During this period, the membranes conserve an excellent elongation power to be able to resist the mechanical and thermal forces of exposure on flat roofs.

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signatures