

Abstract of the

Study to estimate the service life of Phoenix EPDM roof sheeting

and of the

Expert report on exposed joint seams and repair capability of exposed Phoenix EPDM roof sheeting

Both carried out by SKZ-TeConA GmbH, Würzburg

Detailed versions: Final report No. 37236/99-V dated 14 August 2003 and
Expert report No. 41544/00 dated 5 December 2003

Objective

For approximately 30 years now, roof sealing sheets made of ethylene propylene diene monomer rubber (EPDM) have been used for sealing flat roofs. In this specific application, the roof sheeting is exposed to numerous external influences resulting in irreversible changes to material properties having a key relevance to the specific application which can therefore impair its characteristics for use. **The objective of this study was therefore to draw up the criteria for appraising the probable service life of Phoenix EPDM roof sheeting and review their applicability in practice. The expert report on the joint seams of Phoenix EPDM roof sheeting was also intended to evaluate the functioning capability of the seams after free exposure to the weather, together with the possibility for making repairs by welding on new sheets.**

Procedure

To this end, 4 Phoenix EPDM roof sheetings which had been in use for up to 20 years were checked for their current condition and then subject to further artificial aging in the laboratory, in order to be able to estimate the remaining service life in each case. The comparison material for the exposed sheeting consisted of commercially available new products not exposed to any loads. In comparing the samples taken from the roofs with the new products, it was however important to consider that there could be a time difference of up to 20 years between the corresponding production of the sheeting, so that adjustments to the recipes must be expected.

Results

The samples taken from the roofs did not reveal any visual signs of material damage. All lengths of roof sheetings still fulfilled their function as roof sheeting to the full.

The elongation at break measured in the aged roof sheeting gives the clearest indication of weathering and was therefore taken as central parameter. It is stated at 560% in original condition and falls with increasing exposure period. However, in all tested lengths of sheeting, the minimum requirement made by the material standard DIN 7864-1 of 250% for new products was still fulfilled even after many years of exposure to the weather.

The measured values taken from the new products, the exposed samples and the samples subject to further artificial aging in the laboratory were used to estimate the residual service life using two different models (extrapolation model and aging temperature model). Accordingly, the residual service life amounts to between 30 and way above 100 years, whereby the limit value for elongation at break which should not be undercut is set at 150% residual elongation. But reaching this value does not necessarily result in actual failure of the sheeting, but only means that the value has fallen below the safety limit estimated on the basis of the material standard DIN 7864-1.

The tested joint seams which had all been produced by hot air welding were also still impervious in spite of long exposure to the weather. On testing the seam strength in the shear and peeling test, the exposed joint seams exceeded the minimum values demanded in standard DIN 7864 Part 1; 1984-4 for new products. By welding new roof sheeting to lengths of Phoenix EPDM roof sheeting which had already been exposed to the elements, it was possible to produce joint seams whose strength once again surpassed the strength of the original sheeting.

Conclusion

On the basis of the obtained results, it is possible to put a figure of far more than 50 years to the service life of Phoenix EPDM roof sheeting (depending on correct recipe, in particular stabilisation) under the climatic conditions prevailing in Central Europe. During this time period, the roof sheeting remains elastic enough to withstand the mechanical and thermal loads resulting from exposure to the weather on flat roofs. Even the joint seams correctly produced on this sheeting proved to be extremely resistant to ageing and can also be expected to provide many years of functioning ability.

Würzburg, 31 March 2004
Htz/Pf/mo

A handwritten signature in blue ink, appearing to read 'M. Bastian'.

Dr.-Ing. Martin Bastian

i. V. 

Dipl.-Ing. Udo Dengel



Fig. 1: Examination of the roof surface of BV „HH-Veddel, Industriegebäude“



Fig. 2: Sample taken from the roof sheeting on the roof of BV „HH-Veddel, Industriegebäude“