

Abstract of the Study to estimate the service life of EPDM roof sheetings

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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 EPDM roof sheetings and review their applicability in practice.**

Procedure

To this end, 39 EPDM roof sheetings which had been in use for up to 30 years were checked for their current condition and then subjected to further artificial aging in the laboratory, in order to be able to estimate the remaining service life in each case. The substantial object data are summarised in the below given table. The comparison material for the exposed sheeting consisted of commercially available new products which are 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 30 years between the corresponding production of the sheeting, so that adjustments at the raw materials and/or the additives could have occurred.



Results

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

The elongation at break measured in the aged roof sheeting gives the clearest indication of weathering and was therefore taken as central measured parameter. The elongation at break was between 310% and 560% in original condition and falls with increasing exposure period. The minimum requirement set by the material standard DIN 7864-1 of 250% for new products was still fulfilled even after many years of exposure to weathering with just one exception.

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 by two different models (extrapolation model and aging temperature model). Accordingly, the residual service life amounts to between 10 and considerably more than 100 years, whereby the limit value for elongation at break which should not fall below is set to 150% residual elongation. However, 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 which was estimated very conservatively on the basis of the material standard DIN 7864-1.

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 properly manufactured EPDM roof sheetings under the climatic conditions prevailing in Central Europe. During this time period, the roof sheetings remain elastic enough to withstand the mechanical and thermal loads resulting from exposure on flat roofs.

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Htz/mo



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Object list with meteorological data (sorted by age)

Sample taking	Year of installation	Duration of sunshine		Global radiation		Fastening	Object	Height [m]	Country	Code
		Annual average [h]	Sum [h]	Annual average [kJ/cm ²]	Sum [kJ/cm ²]					
98-10-21	1968	1,552	46,560	362	10,860	glued	Garage	2.5	NL	III-6
98-10-06	1972	1,627	42,302	366	9,516	loose with load	Residential building	3.5	D	I-9
98-10-22	1974	1,552	37,248	362	8,688	glued	Balcony	22.0	NL	III-2
98-10-22	1978	1,552	31,040	362	7,240	glued	Residential building	8.0	NL	III-5
98-11-17	1978	1,682	33,640	395	7,900	mechanical	Power house	20.0	A	VI-6
98-11-17	1979	1,682	31,958	395	7,505	loose	Multi-storey building	25.0	A	VI-5
98-11-17	1980	1,682	30,276	395	7,110	mechanical	Workshop	5.0	A	VI-7
98-09-14	1981	1,501	25,517	347	5,899	mechanical	Factory building	8.0	D	V-4
98-10-21	1982	1,552	24,832	362	5,792	glued	Factory building	6.0	NL	III-4
98-10-28	1983	1,619	24,285	369	5,535	mechanical	Warehouse	6.0	D	VI-1
98-10-28	1983	1,619	24,285	369	5,535	glued	Indoor swimming pool	7.0	D	VI-4
98-10-19	1984	1,703	23,842	366	5,124	mechanical	Factory building	6.0	NL	IV-2
98-10-28	1984	1,619	22,666	369	5,535	mechanical	Workshop	4.5	D	VI-3
30,09,98	1984	1,855	25,970	371	5,194	loose with load	Hospital	20.0	S	II-6
98-10-02	1985	1,469	19,097	328	4,264	loose with load	Factory building	6.0	S	II-7
98-10-19	1986	1,508	18,096	358	4,296	mechanical	Factory building	15.0	NL	IV-6
98-10-19	1987	1,508	16,588	358	3,938	glued	Sports hall	5.0	NL	IV-1
98-10-01	1987	1,855	20,405	371	4,081	loose with load	Office building	10.0	S	II-5
98-10-21	1988	1,552	15,520	337	3,370	mechanical	Factory building	5.0	NL	III-3
98-09-16	1988	1,504	15,040	364	3,640	mechanical	Warehouse	8.0	D	V-3
98-10-07	1988	1,688	16,880	359	3,590	glued	Factory building	21.0	D	I-8
98-10-19	1989	1,703	15,327	366	3,294	partly glued	Restaurant	3.5	NL	IV-5
98-09-14	1989	1,557	14,013	337	3,033	mechanical	Residential building	12.0	D	V-2
98-10-28	1989	1,619	14,571	369	3,321	mechanical	Workshop	4.5	D	VI-2
98-10-06	1989	1,627	14,643	377	3,393	mechanical	Factory building	10.0	D	I-5
98-10-07	1989	1,661	14,949	368	3,312	glued	Factory building	7.0	D	I-6
98-10-08	1989	1,673	15,057	380	3,420	mechanical	Warehouse	10.0	D	I-7
98-09-30	1989	1,855	16,695	371	3,339	loose with load	Office building	10.0	S	II-3
98-09-30	1989	1,855	16,695	371	3,339	loose with load	Hospital	6.0	S	II-4
98-10-02	1990	1,469	11,752	328	2,624	loose with load	Office building	4.0	S	II-2
98-10-20	1991	1,643	11,501	363	2,541	glued	Entrance hall	3.0	NL	IV-4
98-10-07	1991	1,627	11,389	377	2,639	mechanical	Factory building	10.0	D	I-4
98-09-30	1991	1,855	12,985	371	2,597	loose with load	Residential building	5.0	S	II-1
98-10-20	1992	1,643	9,858	363	2,178	mechanical	Residential building	9.0	NL	IV-3
98-10-06	1993	1,627	8,135	366	1,830	mechanical	Factory building	10.0	D	I-3
98-10-07	1994	1,448	5,792	345	1,380	mechanical	Warehouse	8.0	D	V-1
98-10-07	1994	1,688	6,752	359	1,436	glued	Factory building	21.0	D	I-2
98-10-21	1995	1,552	4,656	362	1,086	mechanical	Factory building	6.0	NL	III-1
98-10-07	1996	1,688	3,376	359	718	mechanical	Factory building	21	D	I-1