TECHNICAL INFORMATION ON BUILDING MATERIALS

FOR USE IN THE DESIGN OF LOW-COST HOUSING

TIBM - 51

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SHINGLES: MINERAL-SURFACED ASPHALT

This is a brief digest of Research Paper RP1002, "Accelerated Weathering Tests of Mineral-Surfaced Asphalt Shingles" (June 1937),[1] by H. R. Snoke and B. E. Gallup, issued by the National Bureau of Standards.

This research paper covers a detailed investigation of mineral-surfaced asphalt type shingles, a comparatively recent development of the roofing industry, having come into general use within the past twenty-five years, and particularly adapted to low-cost housing projects. Federal specifications have been adopted for these shingles and the specification requirements were followed as a basis in this investigation -- notably in the analyses of the weight of the various constituents and the total weight per unit area of the finished product.[2]

Accelerated weathering tests were resorted to because of rapidly changing conditions in the industry. Outdoor weathering tests would be out of date before completion, and, hence of no practical value. Briefly, the accelerated weathering test subjects the samples to continuous light and heat from a carbon-arc lamp (simulating outdoor exposure) with intermittent water spray. Petrographic methods were used to determine the nature of the granules and of the fine mineral fillers, although it was found that failures were largely independent of the granular surfacing material.

Analyses of the thirty-nine samples showed no differences in composition sufficiently great to warrant the prediction of decided differences

[1] May be obtained from Superintendent of Documents, Washington, D. C. (Price 10 cents)

[2] Federal Specification SS-R-521 "Roofing and Shingles: Asphalt, Prepared, Mineral-Surfaced" may be obtained from Superintendent of Documents, Washington, D. C. (Price 5 cents)

in their behavior to weathering, except that the samples containing fine mineral filler in the asphalt coatings appear to be the most resistant to weathering.

A previous report[1] found no significant difference in the resistance to outdoor weathering of asphalt-prepared roofing that could be attributed to the kind of fiber or combination of fibers used.

In general, noncompliance with the requirements of the Federal specifications was not evidenced in the results of these tests, although the samples in Group H failed to meet the test of pliability at 25°C. All roofings developed certain types of failure but retained commendable features peculiar to their particular brand. A brief description of common failures follows:

COLOR CHANGES: The samples surfaced with oil or resin-coated granules were the first to show color changes. The alterations were either a slight fading (for natural slate granules), or an apparent color intensification (notably the ceramic red granules). In all cases the natural slate granules showed the most color changes.

BLISTER: Probably caused by moisture in the sheet. Accelerated blister tests and accelerated weathering tests both produced blisters, although of different types. The former were higher in relation to the diameter at the base while the latter were relatively low and covered a larger area. In many cases several small blisters ran together forming a series of connecting blisters.

PITTING: This is closely related to blistering by a further development in which the thin layer of asphalt surrounding the void is broken. Samples in Groups C and F showed virtually no pits, while those in the other Groups had more and larger pits arranged as follows in increasing order of severity: B, A, E, G, D, and H.

LOSS OF GRANULES: The loss of granules by weight, on weathering, is greater for the natural slate granules than for the artificial granules. The loss is less apparent for the natural slate granules because of their flat shape and scalelike overlapping. The artificial granules, in most cases, are practically equidimensional and consequently do not overlap. Results indicated that initial adhesion of granules, as determined by abrasion methods, is mainly a function of the type of granule rather than of the asphalt coating or of the method of manufacture. Abrasion methods can not be used to predict how well they will adhere on exposure.

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[1] "A Study of the Weathering Quality of Roofing Felts Made from Various Fibers" by O. G. Strieter, RP888; procurable from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price 5 cents

CRACKING: This defect, probably one of the most serious, occurred in relatively few samples.

WARPING: Samples 31 to 39, inclusive, (Groups G and H) were distorted the most. Samples 25 to 30 (Group F) showed only slight distortion. All other samples remained practically flat.

SLIPPAGE: The only slippage occurred in the samples in Group C--approximately 1/4 inch at the end of the test.

The greatest factor in determining the weathering behavior of these shingles is due to the types of asphalt used and the manufacturing process, excluding large variations in the proportions by weight of the several constituents in the finished roofing.

A description of the thirty-nine samples of this type of roofing is given in condensed form in the accompanying table. Under such items as the weight of the felt and the weight of the surfacing material, it will be noted a remarkable uniformity existed between the different groups.

AVERAGE RESULTS OF ANALYTICAL TESTS. ALL WEIGHTS GIVEN ARE ON A BASIS OF LB/108 FT^2.

GROUP	SAMPLE NO.	SIZE OF SAMPLE	WEIGHT	FELT			BITUMINOUS MATTER			MINERAL MATTER		PLIABILITY AT 25°C
				WT.	THICK-NESS	SATU-RATION	TOP WT.	BOTTOM WT.	SATU-RANT WT.	TOP WT.	BOTTOM WT.	
		INCHES			INCHES	PERCENT						
A	1–4	10 x 36	90.4	11.3	0.053	191	15.3	1.0	21.5	38.7	0.6	PASSED
B	5–8	12 1/2 x 36	89.7	11.4	0.057	189	18.0	1.0	21.7	36.1	1.4	"
C	9–12	10 x 36	89.4	11.6	0.055	189	15.7	2.2	22.2	36.9	1.1	"
D	13–17	10 x 36	88.8	11.3	0.052	167	20.1	2.7	19.0	33.9	2.1	"
E	18–24	12 1/2 x 36	91.7	10.7	0.052	191	16.1	4.0	20.7	35.1	1.6	"
F	25–30	12 1/2 x 40	88.0	11.3	0.055	189	13.3	0.7	21.5	39.1	0.8	"
G	31–34	10 x 36	88.8	11.9	0.056	185	16.2	2.2	22.2	34.0	1.0	"
H	35–39	10 x 36	90.7	11.9	0.058	201	27.7	1.0	24.0	24.7	1.4	4 FAILED 1 PASSED