

FOREST RESEARCH NOTES



NORTHEASTERN FOREST EXPERIMENTAL STATION
Upper Darby, Pennsylvania

NATIONAL FOREST RESEARCH CENTER
Central Reference File
5.21

No.

No. 85
1958

MOISTURE-BARRIER PERFORMANCE OF GROUND COVERS IN BASEMENTLESS HOMES

The use of ground covers in crawl-space under houses is now widely accepted by builders, maintenance men, and home owners. Such covers are practical for reducing decay in subfloor timbers. They also effectively prevent soil moisture from moving upward into the house, and thus aid in preventing swelling and buckling of floors.

Since 1946, the U.S. Forest Service has experimented in the Washington, D.C., area with various covers in home crawl-spaces where winter condensation on sills and joists had been a problem. Tests in 30 basementless homes have proved the effectiveness of some barriers in reducing under-floor moisture. The study has also provided a means of comparing the relative costs of materials, and the installation time required for each cover.

Those moisture barriers tested include: roll roofing (15-, 30-, 45-, 55-, 90-, and 110-pound weights), reinforced asphalt-laminated building paper, asphalt (soap) emulsion applied as a spray over the soil surface, a 2.75-inch layer of slag or pea-size gravel, polyethylene film (0.004-inch), and unmounted aluminum foil (0.00035-, 0.001-, 0.0015-, and 0.002-inch thickness).

Average wood-moisture readings of sills and joists were taken before the ground covers were placed. Subsequent readings were made at 3- to 4-month intervals. An electrical-resistance type meter was used to determine the moisture content at the center and corners of the crawl space.

The relative effectiveness of nine ground covers for nine typical houses is shown in figure 1. With the exception of polyethylene film, tested for only 3 years, all covers have been in place for 9 or 10 years. The graphs in figure 1 are numbered in the order of the material's effectiveness in reducing wood-moisture content below the 20-percent level, and in preventing visible condensation moisture from occurring.

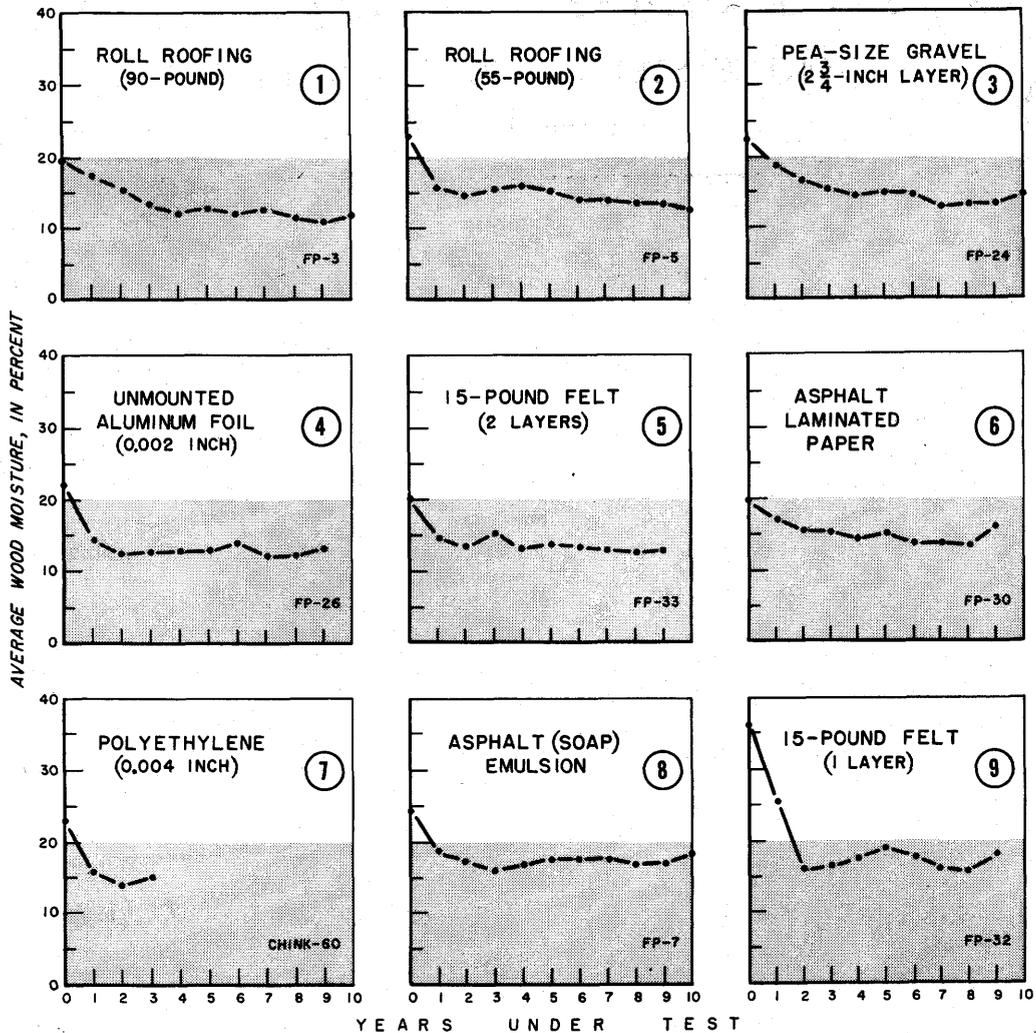


Figure 1.--Relative effectiveness of nine different ground covers in reducing moisture content of wooden sills and joists under basementless buildings. Each point on the graphs represents the average of the readings taken 3 to 4 times yearly. Graphs are arranged in the order of the material's general effectiveness.

Except for the last two covers, all nine shown in the figure effectively prevented visible condensation moisture. Still, the margin of safety decreases in the last four covers. The asphalt laminated paper even deteriorated. This first became apparent during the eighth year, and for the particular house shown (FP-30), the effects of deterioration are apparent.

Table 1 lists the cost (late 1957) of the ground covers, man-hours for installation, and gross installation cost for each of the nine covers. These figures apply to buildings in the vicinity of Washington, D.C., with a crawl-space area of about 1,000 square feet.

On the basis of gross cost and moisture-barrier performance of the nine ground covers for the 9- to 10-year period, the most desirable cover is two layers of asphalt-saturated felt. Installed, this barrier costs only \$24.00, and gives nearly as good protection as the first four covers, which range in cost from \$34.00 to \$61.25 for a coverage of 1,000 square feet of crawl-space area.

Table 1.--Cost and time required to install crawl-space ground covers
in basementless houses in Washington, D.C., 1957

Kind of ground cover	Ground cover cost per 1,000 sq. ft.	Time for installation	Gross cost ¹
	Dollars	Man-hours	Dollars
Roll roofing (90 lbs. wt.)	43.00	4	47.00
Roll roofing (55 lbs. wt.)	36.00	3½	39.50
Pea-size gravel (2-3/4" layer)	41.25	20	61.25
Unmounted aluminum foil (.002")	30.00	4	34.00
Asphalt felt (15 lbs., 2 layers)	20.00	4	24.00
Asphalt-laminated paper	17.90	3½	21.40
Polyethylene film (.004")	22.00	2	24.00
Asphalt (soap) emulsion spray	10.00	3	13.00
Asphalt felt (15 lbs., 1 layer)	10.00	3	13.00

¹The \$1-an-hour wage chosen to represent labor costs is an arbitrary figure, and is low for many areas.

However, for crawl spaces where the ground cover is subjected to physical wear, such as by people or animals crawling over it, durability of the material should also be considered. It might be desirable to make an initial investment for a heavier material, such as 45-pound roll roofing, or a heavier grade of asphalt-saturated felt.

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