TECHNICAL INFORMATION ON BUILDING MATERIALS

FOR USE IN THE DESIGN OF LOW-COST HOUSING

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RESISTANCE OF FLOOR COVERING MATERIALS TO STAINING AND CHEMICALS

Investigations of various types of floor covering materials as to their resistance to stains and chemicals showed that, with the exception of porous limestone and sandstone floorings, all stone types of floor coverings were more resistant to stains and therefore easier and less expensive to clean than fibrous materials.

The results indicated that rubber tile should not be specified for use where grease, oils, gasoline, or turpentine are liable to be spilled. Cleaning compounds containing these solvents should be avoided.

The continued use of strong soap solutions containing excess alkali will darken oak floors and cause linoleum to dry out, harden, and crack. Excessive scrubbing with soap solutions caused color to "run" in some of the samples of rubber tile.

Alcohol, gasoline, turpentine, oil, and grease have a solvent action upon asphalt, causing the surface to become softened and more easily indented.

Acids exert a solvent action upon marble, limestone, terrazzo, and concrete.

There are many different types of flooring materials of different compositions ranging from stone to fibrous. Each type is represented by a variety of grades depending upon the source of raw material and method of manufacture. There are also different surface treatments such as polishing, painting, waxing, varnishing, and lacquering. The materials used for these treatments and the methods of application also vary. The problem is further complicated in that there is an unlimited number of stains which cause discoloration of flooring surfaces.

In these tests use was made of two types of stains and ten different chemicals for removing stains.

Resistance to Staining

Believing that some flooring surfaces might have a greater resistance to staining than others, efforts were directed toward a study of the relative ease of removing stains. The principles of stain removing are covered in Farmers' Bulletin No. 1474 "Stain Removal from Fabrics--Home Methods".[1] In addition, methods for the removal of a variety of stains from interior marbles are described in Bureau of Standards Technologic Paper T350, "A Study of Problems Relating to the Maintenance of Interior Marble", by D. W. Kessler.[2] Rather than follow the routine of removing known stains by known methods, a special procedure was adopted to differentiate between the behavior of various samples toward staining.

Procedure: Two stains, tincture of iodine and a water suspension of hydrated ferric oxide, were selected to measure the resistance of the flooring surfaces to staining. Approximately one milliliter of each stain was applied to three separate portions of each sample. Efforts to remove the stains were made at intervals of five minutes, twenty-four hours, and thirty days. If the stain could be removed by means of a dry cloth, wet cloth, or soap solution, the surface was classified as "easy to clean". If the stain resisted all of these methods, the surface was classified as "difficult to clean", and treatments provided in the references cited were applied to determine whether the stain could be removed. The demarcation between "easy to clean" and "difficult to clean" was based upon the assumption that cloths, water, and soap would be obtainable in the average household, whereas a supply of chemical reagents might not be available.

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[1] May be obtained from Superintendent of Documents, Washington, D. C. Price 5 cents.

[2] Out of print but may be consulted in Government Depository libraries.

Conclusions: Two flooring samples, quarry tile and slate, were classified as "easy to clean" with respect to both iodine and iron stains for all of the time periods. The sample of sandstone flooring proved "difficult to clean" under all conditions of tests.

Iodine volatilizes, which accounts for the fact that iodine stain had completely disappeared from some surfaces. This was generally true in the case of stone samples having dense or polished surfaces.

Iron stain was easy to remove from sample of waxed linoleum, but difficult to remove from unwaxed surface.

Lacquered cork sample showed a greater resistance to iron staining than untreated sample.

None of the waxed surfaces showed greater resistance to iodine staining than untreated surfaces.

Lacquer was ineffective in protecting cork surface from iodine stain.

Iron stain was difficult to remove from untreated surfaces of linoleum and cork at five-minute and twenty-four-hour periods. Yet it was found easy to remove from both surfaces at thirty-day period. The intensity of stains had been reduced considerably on each of these surfaces at thirty-day period, probably due to absorption. In addition, the mottled brown background of each of these surfaces was sufficient to conceal traces of stain which might have remained after soap treatment.

Unwaxed surfaces of rubber tile, asphalt tile, and Permex tile were as resistant to stains as waxed surfaces.

Cleaning unwaxed rubber tile surface with soap caused color to run. Waxing prevented this action.

Alcohol caused color to run from rubber, asphalt, and Permex tiles. Waxing these surfaces did not prevent this condition.

Resistance to Chemicals

The flooring surfaces were exposed to the action of chemicals which are liable to be spilled upon floors, those used as ingredients in compounds for general cleaning, or those used as special solvents for removal of stains. The tests were conducted to determine the surface action of the chemicals upon the samples.

Procedure: In preliminary experiments, the chemicals were applied in the form of talc poultices. They were removed after 30 days, and the resistance to abrasion and indentation measured. The results were fallacious, since they did not check with visual observations.

Abrasion and indentation tests, as a means for measuring the surface action of chemicals upon samples of flooring, were discontinued, as more reliable information could be obtained by inspection. The procedure adopted was as follows: Approximately one milliliter of chemical was applied to surface of sample and allowed to remain for five minutes. It was then wiped vigorously with a cloth, and the latter examined as to whether discolored or clean. When surface had dried, spotting, if any, was noted. If cloth remained clean, surface was characterized as "fast" with respect to the chemical. If cloth was discolored the word "runs" was used to signify that fact. If discoloration of surface was observed after the chemical had dried, a notation of "spots" was used. In an individual test it was possible to have a combination of "fast" and "spots", or "runs" and "spots", but never of "fast" and "runs". A notation of "fast" and "spots" indicates that the color of the sample did not rub off upon the cloth, but that a spot was left upon the surface of the sample after drying.

Conclusions: Under the conditions of the tests the stone group of flooring materials proved to be more resistant to the action of chemicals than the samples typical of the fibrous group. Acid was the only chemical which showed a deleterious effect upon the surfaces of any of the stone floorings tested. The acid had a solvent action upon the surfaces of the marble, limestone, and terrazzo samples. None of the fibrous samples was resistant to all of the chemicals.

RESISTANCE TO CHEMICALS

FLOORING MATERIAL	SURFACE FINISH	CHEMICAL TREATMENT									
		GREASE (LARD)	OIL (LUBRICATING)	ACID 5% HCL	ALKALI 5% NAOH	BLEACH 5% NAOCL	SALT 5% NACL	ALCOHOL (DENATURED)	GASOLINE	TURPENTINE	TAP WATER
BROWN LINOLEUM	FACTORY FINISH	FAST SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST	FAST	FAST
BUFF CORK CARPET	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST	FAST	FAST
BLACK RUBBER TILE	FACTORY FINISH	FAST SPOTS	RUNS SPOTS	RUNS SPOTS	RUNS SPOTS	FAST SPOTS	FAST	RUNS SPOTS	RUNS SPOTS	RUNS SPOTS	FAST
GREEN ASPHALT TILE	UNTREATED	RUNS SPOTS	RUNS SPOTS	RUNS SPOTS	SPOTS	FAST SPOTS	FAST	RUNS SPOTS	RUNS SPOTS	RUNS SPOTS	FAST
QUARTERED OAK	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST SPOTS	FAST
ORDINARY OAK	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST SPOTS	FAST
MAPLE STRIP	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST SPOTS	FAST
PINE (BLOCK ON END)	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST SPOTS	FAST
WALNUT STRIP	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST SPOTS	FAST
MASONITE	FACTORY FINISH	FAST SPOTS	FAST SPOTS	FAST	RUNS SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST SPOTS	FAST
GRANITE	POLISHED	FAST SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST	FAST	FAST	FAST	FAST
TERRAZO	UNTREATED	FAST SPOTS	FAST SPOTS	(—)[1]	FAST	FAST	FAST	FAST	FAST	FAST	FAST
WHITE MARBLE	POLISHED	FAST SPOTS	FAST SPOTS	(—)[1]	FAST	FAST	FAST	FAST	FAST	FAST	FAST
LIMESTONE	UNTREATED	FAST SPOTS	FAST SPOTS	(—)[1]	FAST	FAST	FAST	FAST	FAST	FAST	FAST
SANDSTONE	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST	FAST	FAST	FAST	FAST
SLATE	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST	FAST	FAST	FAST	FAST
QUARRY TILE	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST	FAST	FAST	FAST	FAST
CERAMIC TILE	UNTREATED	FAST SPOTS	FAST SPOTS	FAST	FAST	FAST	FAST	FAST	FAST	FAST	FAST

[1] ACID ATTACKS THE SURFACE.