FINISHING OF WOOD FLOORS

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U. S. Department of Agriculture
1953

Years ago floors were commonly finished with repeated applications of hot linseed oil, each application buffed by hand; and when the surface was saturated with oil, it was waxed and maintained by waxing at suitable intervals. Because un-bodied drying oils such as linseed penetrate into wood relatively deep, a good many applications were necessary, making the process rather laborious; but the finish was correspondingly durable, did not show scratches, and was readily patched at places of maximum wear without refinishing the entire floor. The pure linseed-oil finish dried hard enough to be free from any tackiness and made a floor that was very easily kept clean by dry mopping. In time the finish darkened, partly because of the change in color of the wood itself and partly because drying oils and varnishes become discolored with decomposition products as they age. Since the finish saturated a substantial layer of the wood, this darkening effect was more serious than it is with a superficial coating of varnish.

As time passed, the drying-oil finish was increasingly adulterated with nondrying mineral oils until at the present time floor oils have become cheap products often containing no drying oil at all. The mineral oils prevent proper hardening of linseed oil, thereby keeping the finish tacky, so that it clings to dirt and the finish ultimately becomes very dark in color or even black. Largely because of the adulteration of floor oils the old oil finish fell into disrepute and for a long time has been replaced by varnish, shellac, shellac and varnish, or shellac and wax finish. There is, however, a growing trend back to the old oil finish, except that in place of linseed oil, specially designed products known as floor seals are being used because they are obtainable in satisfactory quality and are more economical in labor of application than un-bodied linseed oil.

1Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

2An un-bodied oil is an oil that has not been heated or treated chemically to such an extent as to increase the viscosity substantially. Raw, refined and boiled linseed oils, raw and refined soybean oil, tung oil, and perilla oil are all un-bodied oils.
The varnish and shellac finishes form coatings of substantial thickness over the surface of the wood in contrast to oil and seal finishes, which penetrate into and are embedded in the surface of the wood without forming a definite coating over it. When a coating wears through in a traffic channel, it can rarely be patched without showing the edges of the worn place; and even if the whole floor is recoated there is usually a difference in color between the worn area and the areas where old coating discolored by age remains underneath. For fully satisfactory refinishing, the old coat must be removed completely either by sanding or scraping or by use of suitable liquid removers. The necessity of removal can be avoided by taking care to renew the coatings before traffic channels wear through, but with varnish finishes particularly the color gradually darkens as thicker layers of old varnish accumulate. Shellac has much less tendency to darken with age than varnish but, on the other hand, water causes it to turn white if the water stands on it very long before being wiped off thoroughly.

The modern floor seals may be regarded as thin varnishes or bodied drying oils prepared to penetrate less deeply into the wood than unbodied drying oils. Fewer applications are required, yet they penetrate more deeply than ordinary floor varnishes so that a surface layer of the wood can be saturated and the finish can be embedded in the wood rather than coated over it. Some of the seals contain emulsified water for the purpose of controlling the degree of penetration and the spreading rate at which the seal is applied. The seals are relatively new products on the market; composition and properties vary widely; and inadequate instructions for application are often given. Inasmuch as the seal finish differs fundamentally from the varnish finish in method of application, it is very important that those who use seals for the first time make sure that they learn exactly how the products should be used to obtain the excellent service of which the finishes are capable.

SELECTION OF FINISH

Wood floors can be maintained in good condition by any one of various types of finishing methods, if good materials are properly applied and if maintenance methods appropriate for each type of finish and for the degree of wear to which the floor is subjected are employed. No one type of finish can be said to be superior in all respects and none will long continue to give good service unless it is suitably maintained. The secret of good floors lies in thorough understanding of the nature and limitations of the particular kind of finish chosen and in careful following of the appropriate maintenance program.

Where the owner's chief requirement is a maximum interval of time between refinishing jobs, during which the floors will be merely kept clean by sweeping and dry mopping, or where the highly lustrous appearance obtainable only by using a substantial coating of resinous material is desired, coatings of varnish or shellac are likely to prove most satisfactory. The coatings should be cleaned and renewed when they begin to become thin in the channels of maximum traffic but before they wear through to bare wood at these points. Dissatisfaction with such finishes arises most often where recoating has been too
long postponed; and this is particularly likely to occur, because those who choose such programs do so largely to escape the burden of watching their floors carefully. After three or four renewals of the coating, when it has become dark in color, it should be removed completely by scraping, sanding, or with varnish remover and a new coating applied to the bare wood.

Shellac is used widely for floors chiefly because it dries so rapidly that a floor may be finished or refinished and put back in service within 24 hours. Varnishes, even the quick-drying kinds, require longer intervals between coats and remain tender for some time so that the floor should be kept out of service for several days when varnishing is being done, although they are often used within 24 hours. Painters and landlords are inclined to favor shellac finishes; the owner-occupant is likely to prefer varnish.

Where floors can be kept out of service long enough to apply varnish finishes properly, varnish is commonly chosen instead of shellac because of its better resistance to water that may be spilled upon it. Varnish finishes are also tougher and less easily scratched than shellac.

The shellac and varnish finish, in which shellac is used as the first coat on the bare wood and the varnish put on over it, is a compromise between the shellac and the varnish finish. Like so many compromises, it retains many of the disadvantages of both sides with some new shortcomings of its own. Water may still turn the shellac white under the varnish; the floor still needs to be kept out of service long enough to dry thoroughly; and the finish is usually very easily marred by scratches from shoe nails or scraping chair legs.

The durability of coatings can be improved by keeping them waxed, renewing the wax every 4 to 6 months according to the amount of wear on the floor. Well-waxed floors are also more easily kept clean by dry mopping. Wax over a substantial coating of shellac or varnish, however, tends to make a slippery floor unless the coating of wax is kept very thin. For that reason where wax is to be used, the shellac is often limited to one or two coats and sanded or buffered off so that it acts more as a seal to support the wax than as a coating. Some of the modern floor waxes are made with resinous ingredients in a further effort to make them less slippery. Those who choose coatings to relieve them of the necessity of paying fairly frequent attention to floor maintenance, however, are not generally inclined to renew wax often enough to gain much benefit from it in extension of the intervals between recoatings, and they might therefore do well to consider the newer floor-seal finishes with or without wax.

The modern floor-seal finishes are well suited to the needs of those who wish to keep their floors well waxed at all times, with a minimum of slipperiness, and those who do not like the appearance of the very lustrous coating finishes, or who wish to pay a minimum of attention to floor maintenance except at an annual or semiannual housecleaning time and then want to be able to clean and patch worn spots without the trouble of moving all the furniture out of the room and keeping the room out of service for a day or more.
FINISHING NEW FLOORS

In the house under construction, floor finishing should be the last operation performed after all other interior work has been completed. It is advisable to have the floors protected by a covering of heavy paper from the time they are laid until the finishing is to be done. The first and most important operation of finishing is scraping or sanding. Scraping by hand has been displaced almost entirely by sanding with electrically operated sanding machines. The sanding machine should be well designed, of rugged construction, with its bearings well aligned and kept in good condition. A machine with badly worn bearings may do more harm than good. It is usually advisable to have the sanding done by a man who specializes in floor sanding, not by a carpenter or painter. If part of the work is to be done by relatively unskilled labor or by the owner, let it be the application of the finish rather than the sanding.

In sanding, the floor should be gone over several times, first across the grain and then in the direction of the grain. On the first traverse No. 2 sandpaper is usually used on the machine, graduating down to No. ½, No. 0, and No. 00 on succeeding traverses. On softwood floors, however, No. ½ sandpaper is often the finest grit practicable. After the last sanding, the floor may be buffed with No. 3 steel wool. For working close to walls or corners or in closets, where the large machine cannot be used, there are small, power-operated machines.

After the floor has been sanded, it should be swept clean and carefully inspected, looking at it across the floor toward the light from a window and remembering that any scratches, undulations, or other blemishes will appear greatly accentuated when the finish is applied. The floor should not be walked on until the first coat of finish has been applied and finishing should be done as soon as possible after sanding.

If the floor is to be stained, this should be done with a penetrating oil stain at this time. Where floor seal is to be used, however, the stain may be incorporated in the first coat of seal. Some commercial floor seals are put out in colors as well as in the colorless form. Stained floors require particularly careful maintenance to avoid wearing traffic channels deeply into the wood. No stain penetrates very deeply with uniform color and if a patch becomes light in color through wear, it is very difficult to repair it to match in color the unworn areas of the floor. On the other hand, some stain may penetrate very deeply in the large pores of some hardwoods so that the owner if he subsequently wishes to sand the floor down to get rid of the stain, may have to remove a considerable layer of the board. Stain incorporated in a first coat of floor seal is less likely to result in such deep penetration in local spots.

Floors of oak or other hardwood with large pores may require filling with paste wood filler before proceeding with the subsequent finishing. The filler may be colorless or it may contain pigment if it is desired to bring out the grain of the wood more contrastingly. Paste filler is almost always used on oak floors before applying shellac or varnish coatings, but with floor seals the practice varies. Some manufacturers of seals recommend that filler be used; others recommend its omission. When filler is used, care should be taken to see that the excess is wiped off very thoroughly to avoid an uneven, smeared appearance of the final finish. Any imperfections left by poor sanding make it difficult to do a clean job of filling.
Varnish.—Methods of applying floor varnish are commonly understood and are usually described on the labels of the containers. Only floor varnishes should be used for floor finishing. Varnishes made for other purposes and the so-called all-purpose varnishes are not so durable for floors as varnishes made specifically for the purpose. At least two coats are needed over paste filler or over a first coat of shellac and at least three coats where the varnish is applied directly to the bare wood. The chief precautions to observe are cleanliness and reasonable control of temperature and circulation of air. The floor should be clean when varnish is applied, and the brush must be clean to avoid leaving grains and lumps in the coating. The room should be kept at 70° F. or warmer and plenty of fresh air should be provided, since oxygen is taken from the air when varnish dries. Low temperature and high relative humidity greatly retard the drying of varnish.

Shellac.—Shellac for floors should be purchased in the form of 5-pound cut shellac varnish and should be pure shellac unadulterated with cheaper resins. It should either be freshly manufactured or put up in glass containers. Shellac that has stood long in contact with metal may contain salts of iron that discolor oak and other woods containing tannin. The correct thinner for shellac is 188-proof No. 1 denatured alcohol. For application, 5-pound cut shellac should be thinned with 1 quart of thinner per gallon. It should be applied with a wide brush that will cover three boards of strip flooring at one stroke and should be put on with long, even strokes, taking care to join the laps smoothly. The first coat on bare wood requires 15 to 20 minutes to dry. It should then be rubbed lightly with steel wool or sandpaper and the floor swept clean. A second coat should be applied, allowed to dry 2 or 3 hours, then gone over with steel wool or sandpaper, swept, and a third coat applied. The floor should not be put back in service until next morning if possible but may be walked upon in about 3 hours after finishing, if necessary. If wax is to be used, it should not be applied less than 8 hours after the last coat of shellac and should be a paste wax, not a water-emulsion wax, since water may turn the shellac white.

Floor Seals.—Manufacturers' directions for applying floor seals vary widely and in some cases are very inadequate. In general, floor seals may be brushed on with a wide brush or mopped on with a squeegee or lamb's wool applicator, working first across the grain of the wood and then smoothing out in the direction of the grain. After an interval of 15 minutes to 2 hours, depending upon the characteristics of the seal, the excess is wiped off with clean rags or a rubber squeegee. For best results the floor should then be buffed with No. 2 steel wool although the buffing is omitted by those who are willing to sacrifice something in appearance and service to save the labor of buffing. If possible, the buffing should be done by a rugged power-driven machine designed specifically for buffing with steel wool. The next best procedure is buffing with steel wool pads attached to the bottom of a sanding machine. The buffing may be done by hand if a machine is not available. One application of seal may be sufficient, but a second application is generally recommended for new floors or floors that have just been sanded. The floor should be swept clean before making the second application.
A correct interval of time between application of the seal and buffing is exceedingly important. If the interval is too short, the appearance and durability suffer; while if it is too long, the excess seal "gums" the steel wool badly, is removed from the floor with difficulty, and where not removed becomes blackened with detritus from the steel wool. If the manufacturer of the seal does not specify the correct interval of time clearly, the user should determine it for himself by trial on samples of flooring or in some inconspicuous places where imperfect results will not prove too disappointing. Once the user has learned how to work successfully with one brand of seal he will do well to stick to it, since he might have to learn the technique all over again with another brand.

Floor seals are now offered by a number of manufacturers of floor-finishing materials and equipment, who are usually able to give precise and reliable instructions for the proper application and maintenance of their products. Seals are also sold by most of the larger paint and varnish manufacturers, although the preference of their dealers is usually for floor varnishes.

Waxing of floors is done to best advantage with paste floor wax and an electric polishing machine designed for the purpose. For best appearance and durability there is no satisfactory substitute for the polishing machine; polishing by hand is far too laborious for the modern household and too expensive for the business building. The paste wax is mopped on the floor, allowed to stand until the volatile thinner evaporates, which may take 15 to 30 minutes, and the floor is then polished with the machine. The most modern type of floor-waxing machine applies the wax and polishes in the same operation. For those who wish to get along without a polishing machine and are willing to accept a somewhat less attractive and less durable wax finish, there are water-emulsion floor waxes that are merely mopped on the floor and allowed to dry.

**REFINISHING OLD FLOORS**

Where floors have become badly discolored and worn by neglect or improper maintenance, the most practicable procedure and often the only one that will restore a fine finish is to have the old finish removed and the floor reconditioned by power sanding. Where the floors have been reasonably well maintained but the finish has become dingy with age, refinishing without power sanding may be practicable. The method of removal of the old finish depends upon the kind of finish that was used.

**Floors Originally Finished with Oil**

An old oil finish, since it is embedded in the wood, may cause some difficulties. If a steel-wool buffing machine is available, an attempt should first be made to clean the floor sufficiently merely by buffing with No. 3 steel wool. If this is not feasible or proves ineffective, a chemical treatment will be necessary. Through the action of mild alkalies, the oil is changed to soap. The alkali used may be a water solution of trisodium phosphate, washing soda, or a commercial cleanser. If lye is used, care must be taken not to have the solution too strong because strong alkali swells and softens the wood. (If the
oil contained mineral oil, however, there may be no practicable way of removing it, since alkalies do not saponify mineral oil.)

In applying the alkali, flush a small area of the floor at a time and allow to stand for a few minutes, then scrub with a stiff brush or No. 1 steel wool. Next flush with clean water and scrub to remove the soap that has been formed, and finally remove all the water possible by mopping and let the floor dry thoroughly. If the floor turns gray in color as a result of the action of the alkali and water, it may be necessary to bleach it with a saturated solution of oxalic acid in water (oxalic acid is poisonous and must be handled with great care). Rinse off the oxalic acid thoroughly with clean water, mop, and let the floor dry completely. Any raised grain or roughening of the surface of the boards as a result of the drastic treatments should be smoothed off with sandpaper or steel wool before new finish is applied (p. 22).

Floors originally finished with varnish

Old, discolored varnish finish is usually removed most easily by power sanding; but if desired it can be done with liquid varnish remover. Alkaline solutions in water and removers sold in powder form to be dissolved in water should not be used. The directions for using the liquid remover should be followed carefully. Since some old, discolored varnish remains embedded in the wood, complete restoration of the natural wood color should not be expected. Traffic channels where the old varnish has long been worn through and dirt ground into the wood should be cleaned by sanding.

Floors originally finished with shellac

Old shellac and wax finishes that have merely become soiled by dirt clinging in the coating of wax may be cleaned by going over the floor with steel wool saturated with clean turpentine. Any white spots in the shellac caused by contact with water may be taken out by rubbing lightly with a soft cloth moistened with denatured alcohol diluted half and half with water, but the alcohol must be used with care to avoid cutting the shellac coating. On floors where the dirt is ground into the shellac itself or white spots penetrate all the way through the coating, more drastic treatment is necessary. First, wash the floor with neutral or mildly alkaline soap solution followed by clear water, using as little water as possible in each operation. Then scour the floor with No. 3 steel wool and denatured alcohol diluted half and half with water. If the floor boards are level and are not warped or cupped, the scouring can be done to advantage with a floor-polishing machine fitted with a wire brush to which a pad of the No. 3 steel wool is attached. After the scouring, the floor should be rinsed with a minimum amount of clean water and allowed to dry thoroughly before refinishing with shellac.

Floor maintenance

Wood floors with fine finishes should never be scrubbed with water or unnecessarily brought in contact with water except in connection with refinishing old floors as already described. Sweeping or dry mopping should be all that is necessary for routine cleaning. A soft
cotton floor mop kept barely dampened with a mixture of 3 parts of kerosene and 1 part of paraffin oil is excellent for dry mopping. When the mop becomes dirty it should be washed in hot soap and water, dried, and again dampened with the mixture of kerosene and paraffin oil. Exceptional patches of dirt that cannot be removed in this way may be removed by rubbing lightly with fine steel wool moistened with turpentine. Where the finish is a floor seal, badly soiled spots, such as gray spots where water has been allowed to stand on the floor for a time, can be sanded by hand, patched with seal, and buffed with a pad of steel wool. Varnish finish if kept in good condition offers better protection against water scars; but if it does become stained it is not so easily repaired.