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G94-1222 Rug and Carpet Fibers: Selection and Care

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Rug and Carpet Fibers: Selection and Care

This publication discusses structural characteristics to consider when selecting carpet, including fiber and yarn construction.

Adapted by Shirley M. Niemeyer, Extension Specialist, Home Environment

The Fibers

Both natural and manufactured fibers are used in carpeting. Naturals include wool and silk. Cotton tends to crush and soil easily so it is not used for carpeting. Manufactured fibers used in carpeting include nylon, polypropylene/olefin¹, and polyester.

As with all commodities, carpet fiber use changes. Times, availability and cost have an impact on the market. Ninety-nine percent of today's carpet fibers are manufactured. About 68 percent of the carpet market is nylon, 22 percent polypropylene/olefin, over 9 percent polyester, and one percent wool.

Fiber performance in a carpet depends on the construction of both yarn and carpet.

Yarn Construction

A carpet yarn may be a single yarn (ply) or several yarns twisted together, forming a multiple-ply yarn (two-ply yarn, four-ply yarn). Carpet yarns are more durable if they are *heat-set*. Yarn size and weight are referred to as *denier*. Denier is the weight in grams of a piece of yarn 9,000 meters long (about .6 mile). The higher the denier number, the larger the diameter of the yarn.

The amount of fiber (often referred to as face fiber) used per square yard of carpeting is the weight referred to in the manufacturer's specifications. This is sometimes given on the carpet sample. This *weight* is directly related to the durability of the carpeting. A 20- to 24-ounce nylon usually "wears" from eight to 10 years. Commercial-grade carpeting ranges in weight from 22 to 46 ounces or more usually given as per square yard.

HUD (Housing and Urban Development), a division of the Federal Housing Administration, uses the following formula to determine *carpet density*:

$$\frac{\text{pile yarn weight (oz/yd.)} \times 36}{\text{average pile height}} = \text{carpet pile density}$$

The higher the resultant number, the higher the carpet pile density. The denser the carpet, the more durable it will be. Select a density level suitable for the traffic level where the carpet will be used.

Yarns may be made of filament or staple fibers. *Filaments* are long fiber strands measured in miles. They often are referred to as continuous filament fibers. Silk is the only natural filament fiber. A *mono-filament* yarn is made of a single fiber filament. A *multi-filament* yarn is made of multiple fiber filaments. These may or may not be twisted together. When twisted and heat-set, they usually are more durable for floor coverings.

Staple fibers are short fibers measured in inches or fractions thereof. Staple fibers may be natural or manufactured and are spun together to make longer yarns. Because of the short lengths of fibers, staple yarns may be slightly more prone to fuzzing and pilling than filament yarns. A process called parallel spinning produces seven-inch or longer staple yarns that has increased the performance of short staple in carpet construction.

Finishes

Finishes, either internal or external, are methods of modifying fibers. Internal finishes are within the fiber structure; external finishes are applied to the surface of a fiber, yarn or fabric. External finishes may alter the appearance, feel and/or performance of a fabric. Some of the more common finishes used on carpet include:

- **Antistatic finish** -- Different agents are necessary for different fibers. Some are surface applications that are not durable and must be replaced after cleaning the carpet. Some carpet manufacturers incorporate metallic fibers into the yarn, which help some in controlling static, but researchers are still looking for a durable antistatic agent. Besides the electrical shock hazard, static causes carpet to attract soil. Static builds up more in dry, cold climates, so is more prevalent during Nebraska winters. Avoid spraying anti-static finishes that are not specifically approved by the manufacturer. To do so may void the warranty. Using an anti-static spray on some types of carpet can cause the carpet to soil faster.
- **Flame retardants** -- Flame-retardant finishes reduce flaming, charring and/or afterglow. Flammability labeling is not required on residential carpeting, but all carpet must comply with Department of Commerce standards (FF1-70 or FF2-70) designed to protect consumers from small ignition fire sources (matches, cigars, cigarettes, stove or fireplace embers). These do not ensure that a carpet is flame-proof.

The toxic smoke fumes from burning carpet can be more hazardous than the flames. For this reason, look at the manufacturer's information and compare the flame spread and smoke emission factors. The lower these numbers, the safer the carpet. This should be of special interest if you have a wood or coal stove.

- **Mothproofing** -- Protein fibers, especially wool, are highly susceptible to moth damage. Most wool and wool-blend carpets today have been permanently mothproofed and are so labeled. Carpets containing wool that are not permanently mothproofed should be kept clean. Researchers

continuously are looking for new ways of making wool mothproof, including finding a substance sheep might eat to make their wool naturally mothproof. Synthetics do not require mothproofing.

- **Soil resist and stain resist finishes** -- Seventy to ninety percent of carpets sold are treated with a soil resistant finish. A soil resistant finish allows the carpet to remain clean up to three to four times longer than untreated carpets according to the Carpet and Rug Institute. Soil resistance protects the carpet by keeping dirt from sticking so tightly to the fiber, and provides some protection against stains. Loosely held dirt can be removed more easily from the treated carpet with regular vacuuming. Soil resistant finishes may be fluorochemical or silicone (the majority are treated with fluorochemicals). Fluorochemical treatments protect against both water- and oil-borne soils and resists wetting by oily and watery liquids. Silicone treatments protect against water-borne soils and watery liquids only.

Teflon™ and Scotchgard™ (both fluorochemicals) are among the most common factory-applied finishes on carpet, while various companies have their own trade names for similar finishes. Trade names for retail products include, for example, Fiber Shield™ (fluorochemical), Fabri-Coate™ and Total Seal™ (both silicone finishes). DuPont sells its Teflon™ to distributors for application at the retail level also. Scotchgard™ is approved for retail level application only through licensed operators.

Factory-applied finishes can be applied at different stages during the manufacturing of carpet. The chemical finish is applied to individual fibers before they are prepared for carpeting, during the dyeing process, or after a carpet is produced.

The *stain resist* finishes used are complex mixtures -- typically blends of phenolic resins and other copolymers (e.g., acrylics). They are usually applied after the carpet has been dyed to resist dyes found in other products such as spilled foods.

A stain-resistant finish will resist many stains, but it **will not resist all types of stains**. It will resist most food and beverage stains, but will not resist household chemical stains such as acne medication containing benzoyl peroxide, chlorine bleaches and cleaners, plant food containing organophosphate, dandruff shampoos, and pesticides. Stains that may alter or destroy dyes in stain-resistant carpets are red wine, pool chemicals, oven and toilet bowl cleaners, and furniture polish. Many common stains can be removed by blotting with water; water and a non-bleaching, mild detergent solution; or other technique. However, the stain resistant technology may require cleaning procedures different than those used in the past, and consumers are urged to refer to the specific recommendations of the carpet or fiber manufacturer before attempting home or professional cleaning solutions. Using chemicals or procedures not recommended in the manufacturer's cleaning guides may nullify the warranty in the stained area. Manufacturers may also note that there can be slight loss of the stain resistance in high traffic areas and may exclude those areas in their warranty.

If the carpet has one finish, another finish is usually not necessary unless the finish has worn off. *Consult the carpet manufacturer.* When purchasing carpet, it is important to determine if the soil release finish is a fluorochemical or a silicone because applying a silicone treatment over a fluorochemical treatment reduces or eliminates the effectiveness of the original fluorochemical treatment in repelling oil- and water-borne soils. Some manufacturers recommend that a fluorochemical treatment be reapplied after cleaning and "rinsing" (thorough removal of any cleaner residue) the carpet, or every 12 to 18 months depending on the amount of foot traffic. Others state retreatment is not needed on their carpet, that their finish is warranted for five years or that retreatment may nullify the warranty.

Manufacturer's recommendations differ on applying additional finishes or in-home protective

treatments. Some manufacturers specify that certain types of topical treatments added to the carpet in the home may nullify the warranty. Avoid spraying or adding any topical treatments such as bactericides, biocides, fungicides, anti-statics or soil resistors not approved by the manufacturer.

Because carpet fiber manufacturer's recommendations and warranties vary, refer to the specific warranty and recommendations of each manufacturer before adding treatment to the carpet. Some carpet fiber manufacturers offer toll-free numbers as a service to their customers. Examples of these companies and their products are DuPont Stainmaster® (800/438-7668), Monsanto Wear-Dated® Stain Blocker (800/237-8289), Allied Anso V Worry Free® (800/441-8185), and 3M Scotchgard™ (800/433-3296).

It is important to find out from the retailer, home builder or former home owner what type of carpet you have and keep records including the name and address of the manufacturer for proper carpet maintenance. If you sell your home, pass on the information to the new owners.

- **Bacteriostats** -- Antimicrobial, bacteriostatic and antiseptic finishes are applied to control spread of disease or infection, and to control odors and reduce mildew.

Avoid spraying any topical treatment such as biocides, fungicides, anti-statics or soil resistors that are not specifically approved by the warrantor. To do so may void the warranty.

Carpet Fiber Care

Regular vacuuming, quick response to spills and stains, careful selection of tools, products and professional help assure your carpeting a long life. Life length depends also on the construction quality, but even a poorly constructed carpet lasts longer if it's well cared for.

To help you react quickly to stains, a spot and stain removal kit may help. It should contain paper towels to soak up spills, a dull knife to remove hardened soil, and solutions to remove water-based stains, oil-based stains and animal stains. If you are not sure about the origin of a stain, use the oil-based stain remover first (dry-cleaning solvent). If the stain has not come out, use the water-based solution.

Blot stains, don't scrub them. Scrubbing can permanently change the texture of a carpet. Avoid soap, ammonia or too much water.

- **Water-based stains** -- Blot spill immediately. Apply detergent² and vinegar solution: 1 tsp. detergent; 1 tsp. white vinegar; 1 qt. water. Rinse and blot dry. Apply dry cleaning solvent spot cleaner if needed, let dry. Repeat if necessary. Brush pile.
- **Oil-based stains** -- Blot spill immediately. Apply solvent-based spot cleaner available in grocery stores, etc., or use rubbing (isopropyl) alcohol. Blot dry. If necessary, apply suds of detergent solution (from water-based stain removal instruction). Rinse and blot dry. Repeat steps if necessary. Brush pile.
- **Animal stains** -- Blot liquid immediately. Apply several applications of clean, lukewarm water. Apply solutions of warm water and **mild** non-bleach liquid detergent (1 tsp. to 1 qt. water). Blot and allow to dry. Apply clear water solution. Blot dry. Apply vinegar solution of about 1 Tbsp. white vinegar and 1 cup warm water. Rinse, blot and allow to dry.

Consumers are urged to refer to the specific recommendations of the manufacturer before attempting home or professional cleaning. Use of cleaning chemicals or procedures not included in the

manufacturer's cleaning guide may nullify the warranties.

Carpet Fiber Characteristics

Comments	Wool	Nylon	Polypropylene Olefin	Acrylic Modacrylic ³	Polyester
Resiliency -- Determined by fiber structure and modifications.	Excellent	Good to excellent	Good. Avoid high piles.	Good to excellent	Excellent to fair
Abrasion Resistance -- Determined by fiber and density of face fiber -- the more tightly packed the yarns, the more resistant to wear.	Good to excellent	Excellent	Excellent	Fair to excellent	Good to excellent
Soil & Stain Resistance/Cleanability -- Determined by color, texture, dyes, fiber structure and modifications.	Good to excellent	Good to excellent	Good if oil soils and stains are treated promptly.	Good	Good to excellent -- oily stains should be promptly treated.
Resistance to Sunlight -- Determined by fiber structure and modifications.	Poor -- If protected from ultraviolet rays, degradation does not occur as rapidly.	Good -- special dyes may be used to inhibit sun damage.	Loses strength and deteriorates unless chemically modified to resist sunlight damage.	Excellent resistance. Prolonged exposure may cause deterioration in some pieces.	Good -- may weaken with prolonged exposure.
Static -- Determined by fiber structure and modification.	Builds up in low humidity unless modified.	Builds up in low humidity unless modified.	Builds up in low humidity but at a lower level than nylon or polyester	Builds up in low humidity unless modified.	Builds up in low humidity unless modified.
Hand	Warm, soft	Varies from warm and soft to cold and coarse.	Waxy, soft	Warm, soft	Varies -- finer deniers are soft and silky.
Resistance to Mildew -- Determined by fiber structure and modifications	Poor if damp or soiled. Fiber may be modified	Excellent	Excellent	Excellent	Excellent
Flammability -- Determined by fiber	Burns slowly indirect	Burns slowly, melts in	Melts at low temperatures	Acrylic burns readily unless	Burns slowly, melts; some

structure, modification, construction methods, dyes, padding and installation methods	flame; considered self-extinguishing. Burning hair odor.	direct flame; self-extinguishing. Structure may alter what occurs. Celery-like odor.	(170°C); burns and emits heavy, sooty, waxy smoke. Paraffin wax odor. Pulling a heavy object across the carpet surface can cause enough friction to melt the carpet fibers.	modified. Modacrylics are difficult to ignite, will not support combustion, are self-extinguishing and dripless. Acrid odor for both.	are self-extinguishing. Chemical odor.
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Properties listed are influenced by quality of construction, fiber modification, and finishes.

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Other Carpet Selection Information

- *HEG 88-232, Carpet Selection: Construction and Texture*
- *HEG 88-231, Carpet Selection General*
- *HEG 88-237, Rug Selection and Use*
- *NCR 463, A Buyer's Guide to Carpet*

¹Olefin fibers may be polyethylene/olefin or polypropylene/olefin. For accuracy in labeling, some manufacturers use both terms. Others use one or the other.

²Choose a detergent with no additives, such as bleach or brighteners. A hand dishwashing detergent with no lotions or one designed for cleaning wool is suggested.

³Not currently being used in U.S. as carpet fibers.

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