

**THE CARPET AND RUG INSTITUTE**

**PILE REVERSAL ("SHADING", "WATER MARKING")**

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## BACKGROUND

After a dense cut pile carpet is placed into service, some areas may start to appear to be lighter or darker in color. If the dyed yarns from these areas are compared with the original color, no change of color will be detected. These areas of perceived change may be in traffic or heavily used areas or in areas which receive only a small amount of use. The areas may be as small as a coin, or they may be very large. Normally, the extremities of the areas are rounded, and the rows of tufts between the two areas stand almost erect.

If two pieces of carpet, either the same or different carpet, abut each other, the line may pass from one onto the next. This line may be seen when the pieces are turned at right angles to each other (as with carpet tiles, which may be laid in four different positions).

If the same carpet is installed in identical hallways of a building, the "shaded" area(s) may develop on one floor but not on the others. If a carpet from one of the other floors is reinstalled in the hallway where the area developed, there is a good chance that a similarly shaped area will develop on the newly installed carpet. However, if two pieces of carpet are exchanged in hallways where the area did not appear, then the chances are very small that the change will be evident on either piece of the newly installed carpet.

If the areas which look like "water marking" are examined, several things will be found. The area will be either lighter or darker than the surrounding area.

If the same area is observed from opposite directions, then the light and dark will reverse. The area which appeared to be darker will now appear to be lighter, and the lighter one is now darker.

If light is reflected from the sides of a yarn, the yarn will appear to be lighter or brighter. However, if light shines into the ends of a yarn, the yarn will appear to be darker because more of the light rays are scattered, and less light is reflected to the eye.

The pile lay can be determined by running a hand in several directions over the carpet pile. When the hand runs with the pile lay, it will move more easily than when running against the pile lay.

On an uncut loop pile carpet, regardless of how the light shines on the yarn, it is always reflected from the sides of the yarn, as there are no ends. Thus, the light and dark areas on a loop pile carpet may be averted.

On a multicolored carpet or one which has some type of design built into the surface, the light and dark areas will not be as apparent since the construction breaks up the plainness of the surface.

If the carpet face yarns of an unused piece of carpet or unaffected section of the carpet are spread apart so that the entire length of the yarn can be seen, it will be observed that the yarn will not be standing erect but will have a slight lean. This is natural lean which is produced when the carpet is made and rolled. If the yarns are spread in a section of the carpet which has developed one of the changed areas, then, normally, the lower section of the yarns will still be leaning in the original direction, but the top one-third to one-half portion of the yarns will now be pointing in a different direction.

What produces this change is not known. It occurs on the very expensive handmade Oriental rugs as well as machine-made carpet. It was as common on earlier carpet and rugs as it is on modern carpet and rugs. It occurs on only a very small percentage of carpet produced, and the same condition may not develop on an entire roll of carpet. The carpet industry has spent countless dollars attempting to determine why it develops and how to prevent it. Over the last twenty years there has been a concerted effort by all segments of the industry to discover the cause and to reduce or eliminate it, but it can no more be prevented today than it could hundreds of years ago when it was first observed on an Oriental rug. A higher, cut pile, denser carpet which will not develop these areas is more than the consumer should expect.

The area may start to appear within several days after installation or may not become apparent for several months.

Once this change takes place, there is little which can be done to correct it or to restore it to its original appearance. The closer the yarns are together or the denser the pile, the more difficult it is to once again change the direction of the pile yarn. In a sparse pile, such as a shag construction, the yarns have very little direction to their lay, and the lay can easily be changed by brushing or vacuuming. Whereas, in a dense pile, it is not possible to permanently change the pile back to its original lay.

Some change may appear to take place by brushing or vacuuming; however, this change will be on the very top portion of the tuft only, and the pile will return to the reversed position after a period of use.

## DEFINITIONS

There is not total agreement in the industry as to what to call these areas or how to define them even though there is agreement regarding the conditions surrounding the phenomena. Therefore, the following International Standards Organization definitions will be used.<sup>7</sup>

**Shading** - A change in the appearance of a textile floor covering due to localized alterations in the orientation of the fibers, tufts, or loops. This is not a real change in hue, but a difference in light reflection which can occur as temporary shading, tracking, or pile reversal defined as follows:

**Temporary Shading** - A reversible, localized change in orientation of the pile of a textile floor covering during use (sometimes described as a normal characteristic of certain cut pile textile floor coverings).

**Tracking** - A gradual change in appearance of a textile floor covering from edge to middle of a narrow band caused by repeated walking over the same area which may result in a localized change in pile orientation and may be irreversible.

## **SUMMARY**

### **Pile Reversal ("Shading", "Water Marking")**

There have been many theories concerning the possible causes of pile reversal. These involve the materials, manufacturing procedures, and/or combinations. However, a thorough search of available literature has not revealed any reason as to why carpet, after it has been installed, may or may not develop pile reversal.

The many theories have been studied, tested, and evaluated by one or more sources. It has been concluded that the theories were not valid. The combined work has resulted in the evaluation of all materials used in the manufacture of carpet and rugs, the manufacturing processes, and combinations of these.

At the present time, the only conclusion which can be drawn is that pile reversal may develop on the surface of some carpet after it is installed, and that pile reversal is not due to the materials which are used to produce the carpet, the manufacturing process, or any combination of these factors.

After the carpet is installed, pile reversal may develop on a carpet made with any fiber(s) or manufacturing process. Once it has developed, it cannot be permanently removed.