



# THE COMMERCIAL FLOORING REPORT

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## Pooling, Watermarking, Pile Reversal and Shading - AGAIN

### CFR Extra!

We've included the latest issue "Installation Expertise" with Tim McAdoo, Installation Expert for J.J.Haines & Co Distributors with their permission. I wanted to share this with our many residential/builder flooring contractors because it is so relevant to the challenges they face in the new home/multi-family market.

I've written about this subject several times over the years but it is still an important issue especially where high end woven Axminster carpet is used. Much of this product is installed in five star properties around the world and despite the technology available for preventing pooling, watermarking, pile reversal and shading, the conditions persist. These issues, and the terms are somewhat synonymous in their meaning, continue to plague carpet manufacturers who produce high end cut pile carpet.

Pooling, Watermarking, Pile Reversal and Shading are manifested in different ways but primarily give the appearance of water having been spilled on a carpet causing irregularly shaped light and dark areas in or out of the traffic lanes of carpet. Shading is more a highlighting or a light and dark mottled appearance in a carpet, much like shading on suede material. Shading is normal for a cut pile carpet as the face yarn directions are altered by normal foot traffic and vacuum cleaner movement. More expensive woven wool or wool blend carpets are the most severely affected but the conditions can occur on nylon, polyester and polypropylene cut pile carpets as well. These conditions also don't discriminate against the type of manufacture of a carpet, be it woven, tufted or fusion bonded, nor whether it is broadloom or carpet tile. All of these terms refer to the shading or perceived color change and textural change effect that occurs when the pile in random or concentrated areas of the installed carpet undergoes a vertical re-orientation of the face yarns. This in turn causes light to be reflected off the ends or sides of the pile in different directions, thus creating the "shading" effect. This condition is much like the shading that can occur in suede or velvet upholstery fabric. No dense, high quality cut pile carpet or rug is immune to this condition whether it is hand or machine made and the condition appears almost exclusively in cut pile carpets.



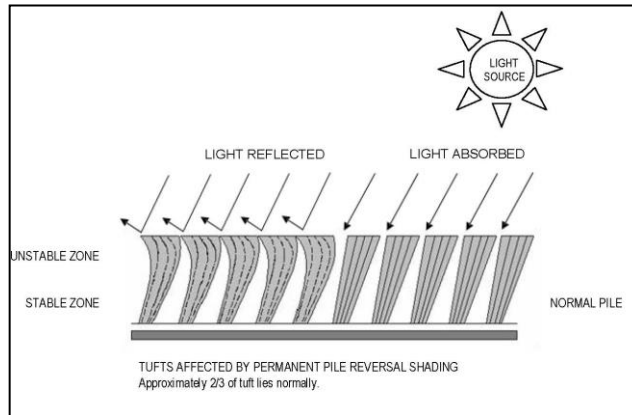
Pile Reversal / Watermarking

**What is it and what causes it?**

No one knows why this phenomenon occurs. We know what it is - the vertical reorientation of the face yarns of the carpet which lie down and reverse and in the process change the light reflectance value on the carpet surface but not why it happens. This condition can manifest itself in and out of traffic areas. Pile reversal, pooling, watermarking and shading has existed for centuries and has been seen in woven rugs that are hundreds of years old. Carpet manufacturers all over the world have tried desperately to determine the cause without success and despite all efforts, there continues to be no scientific explanation for its cause. There have been many theories as to what happens but none have been proven. It was theorized that the movement of air currents or changes in positive and negative charges had something to do with the condition but that is not the case. Sometimes the substrate, with normal undulations, can influence a change in the carpet if it is glued direct because of the force of foot traffic on the carpet pushing on the face yarns.

However, much of that is actually shading and alteration of the surface which may be interpreted as pooling, watermarking and pile reversal. This is not to discount the fact that the substrate may create conditions which would instigate pile reversal.

Shading, highlighting, matting and crushing are not pooling, watermarking and pile reversal. Shading and highlighting are inherent characteristics of all cut pile carpet caused by the face yarns being moved in one direction or the other which in turn alters the light reflectance of the carpets surface and thus makes the color look lighter or darker or more or less shimmering.



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Matting and crushing occurs primarily in traffic lanes and is caused by the forces of compression from foot traffic and rolling traffic on the carpet; flattening the surface of the carpet. This can and will occur in concentrated, unalterable and pivotal traffic areas. There are some conditions which we know can cause pile reversal, watermarking and pooling. Rolling a carpet up warm, allowing moisture to form inside plastic wrappings and letting the carpet sit for a period of time, in transit or in a warehouse, can instigate a form of pile reversal. This can particularly affect woven wool or wool/nylon blend carpets during long range shipping on the high seas but it has affected cut pile nylon carpets as well. This condition, if and when it occurs, will be seen when the carpet is unrolled during installation. Typically watermarking, pooling and pile reversal will not occur immediately and can take, in some cases, a year or more to appear.

Covering a woven wool or wool/nylon blend carpet with plastic – especially plastic that has pressure sensitive adhesive on it - immediately after it has been glued to the floor or to a cushion in a double stick installation, will alter the face of the carpet creating a type of pile reversal, distortion or mottling effect. This distortion will not come out. Besides, the pressure sensitive adhesive will adhere to the face fibers and stick them together and also attract soil onto the surface of the carpet; this creates even more problems. The carpet should only be covered with Kraft paper and Masonite sheets, never with any type of plastic.



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## ***What does not cause it?***

The type of fiber, the manufacturing type or process, the yarn construction especially if there is very little twist. The more twist in the yarn the less likely a face fiber distortion is like to occur; the less twist the more likely. High twist levels in the yarn actually allow the yarn to fight distorting influences. The backing type, the method of installation and atmospheric conditions, positive or negative charges in the air, the weather do not cause pooling, watermarking and pile reversal.

## ***Is It a Manufacturing Defect?***

Watermarking, pooling, pile reversal and shading are not a manufacturing defect. They follow none of the lineal directions in which carpet is manufactured and it can occur in or out of traffic areas. The condition will cross over colors, seams, patterns, yarn blends and subfloor surfaces. It can occur inside, outside, high in a building and on or below grade. Substrate conditions such as moisture do not cause it. Once it occurs it typically cannot be corrected or reversed. It occurs in carpets made of all kinds of fibers without discrimination. The severity of the change will depend on the color, pattern and luster of the carpet surface. In appearance it may look as if water was actually spilled on the carpet, thus the term water marking and pooling. If a carpet is replaced that has been afflicted with this condition the replacement, in greater than two out of three cases, will also experience the same conditions. If an affected carpet is removed and replaced with another carpet from a different area, the condition is likely to occur again. Most of all no one knows why or if it will occur in any roll of carpet – it cannot be predicted. The condition can occur within a short period of time after installation, sometimes as soon as 6 to 8 weeks or as long as two to three years after. If the carpet is a solid color with a lustrous yarn it will exacerbate the condition. There are also cases where a woven 80/20 wool/nylon blend Axminster carpet was installed for years with no surface changes and then a new carpet of the same kind and quality was installed where the condition occurred.



The Carpet and Rug Institute, in their technical bulletin on shading specifically states that “pile reversal is not a manufacturing defect and does not affect the durability of the carpet. Pile reversal is not due to the materials used to produce the carpet, the manufacturing process, or any combination of these factors”. It then goes on to state that “It is not possible to assume that pile reversal will not develop in any carpet”. The bulletin further notes that “although brushing or vacuuming may create some degree of temporary appearance changes...the pile will return to the reversed position after it is again subjected to foot traffic”

Chances are all of you have seen this condition somewhere; we’ve included some great photos if you haven’t seen it. If you sell carpet in the hospitality market you have undoubtedly seen pooling, watermarking and pile reversal and had complaints on it numerous times. It is almost always interpreted as a defect or problem with the carpet and it’s just as frustrating for manufacturers as it is for end users, architects, designers and specifiers.

## ***Some Tips for Avoidance:***

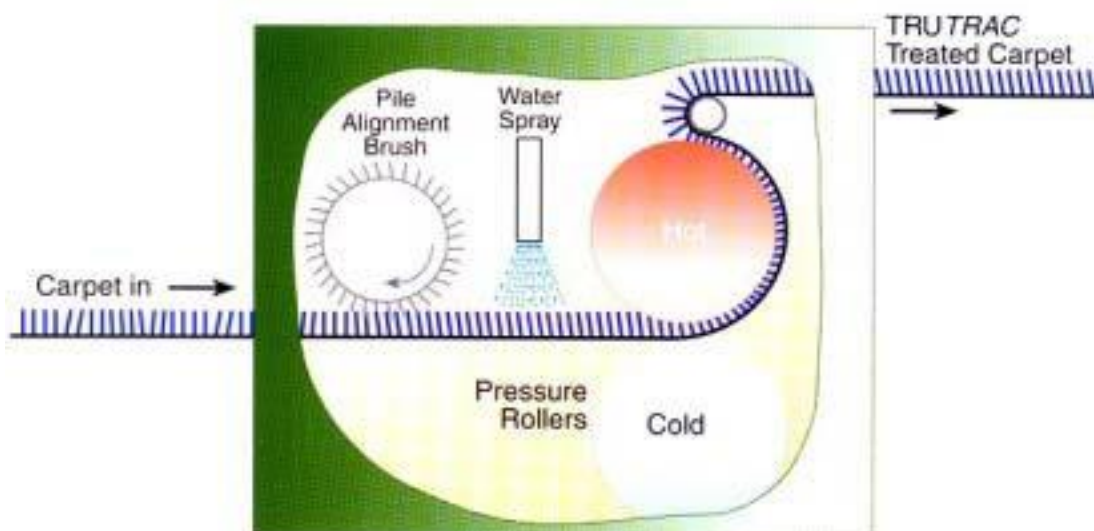
There are several things you should know to avoid the pain of pooling, watermarking and pile reversal. The more texture and twist a cut pile carpet has the less likely it is to experience these conditions or shade. Texture and twist give the yarn more stability and resiliency keeping it from bending and thus preventing any vertical re-orientation. For cut pile woven goods you can busy the pattern with style and colors. The busier the pattern the less visible the conditions will be. If you have a carpet that is experiencing pooling, watermarking, pile reversal or shading already and replacement is being thrust upon

you, do not replace the carpet with the same thing – that would be suicidal. Busy up the pattern. Chances are the new carpet will be afflicted with the same condition so avoid giving it the opportunity to make your life miserable. By making the pattern so busy it won't be blatantly obvious when it does occur, the condition will be masked. Replacement may not have to be everywhere, just the areas that get seen the most that are causing concern for the visible discomfort. Don't use or allow to be used, plastic covering or plastic covering with pressure sensitive adhesive on it. If this plastic is used you can count on a problem with the surface of the carpet. It is forbidden from use by manufacturers. Whoever puts plastic on the carpet and ruins the carpet owns the carpet. In fact the architects spec should state that no plastic be used to cover the carpet. You can also pull that information off CRI's website from CRI – 104. Here is the link: <https://www.carpet-rug.org/About-CRI/CRI-Blog/February-2013/Pile-Reversal,-Watermarking,-Shading-Technical-Bul.aspx>.

### **Now the Good News:**

If you've ever installed cut pile commercial carpet with an attached cushion back on it you've never experienced pile reversal, watermarking or pooling and the reason for that is the way the carpet is prepared to accept the cushion. The carpet is heated and passes over a large drum and the surface yarn is set in one direction with a roller – this is called "setting the nap" or orienting the pile lay. Once the pile surface is set in one direction it is literally bent into that shape and it cannot reorient or change. Kind of like giving the carpet face yarns a permanent. This simple technology has been used in the tufted carpet industry for years without anyone really realizing what it accomplishes relative to pooling, watermarking and pile reversal. There are a few cushion backing finishers in Dalton, Georgia such as Universal Textile Technologies (UTT) who apply this technology when attached polyurethane cushion with precoat and foam eliminating the chance for any carpet they finish to experience pooling, watermarking and pile reversal. They have done this by setting the nap on all cut pile carpet and any carpet going through this process. What this proves is that the system works and it successfully prevents pooling, watermarking and pile reversal from occurring. A benefit in this process is the addition of an attached cushion backing to a woven product which prevents another feared failure of a double stick installation because the carpet and cushion are actually one. You get two birds with one stone. Watermarking, pooling and pile reversal is an aesthetic or appearance change that does not affect the performance of the carpet in any way.

Every manufacturer could do this if they wanted to and prevent pooling, watermarking and pile reversal. In the late 1990's the Wool Research Organization of New Zealand (WRONZ) developed a system called TruTrac to prevent pooling, watermarking, pile reversal and shading from occurring in cut pile wool carpets. This equipment was designed to be installed in a woven carpet finishing line.



Unfortunately no woven manufacturer employed the equipment. One of the reasons for not using the system was that the finished carpet provided would not look like the samples and thus would cause more problems. When I saw the TruTrac system in operation in New Zealand in 1997 it was actually performing the same function the equipment on a polyurethane backing line was performing but in a different manner. The carpet industry has the ability to prevent these surface distortion issues. The equipment that can do the job has been in existence, for tufted carpet, for over 30 years.

### ***In Summary:***

The chances of experiencing pile reversal, watermarking, pooling and shading on a high end cut pile tufted or woven carpet are pretty high. It is not a manufacturing defect. Solid colors will show the condition more; busy patterns much less. It can occur in and out of traffic lanes. Replacing the carpet with new carpet is no guarantee it won't happen again – in fact it will in 2 out of 3 cases. Putting plastic covering on the carpet can cause distortion that can lead to the condition manifesting itself in some form. There is really no need to know why it happens since that will likely never be known, as long as we know that it can happen with certain carpets and that it can be prevented if simple, currently existing technology is employed.

Remember that if you have questions, need help of any kind with any type of flooring material or flooring issue or you just want to stay out of trouble and avoid having problems, LGM has the experts to make that happen. We are at your service anywhere in the world.

## **Now for the article from Tim McAdoo, Installation Expert for J.J.Haines & Co Distributors**

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#### **About Tim McAdoo:**

Tim is a certified instructor for Armstrong, Avaire, and Metroflor products and has been a member of the Armstrong Installation Training Team since 1984. Tim has highly developed installation skills and qualifications that have been combined over his 32 years in the floor covering industry. Tim is privy to all the latest innovations and techniques used in the installation of their products.

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# Installation Expertise with Tim McAdoo

## Dealing with that Builder B S

In my many travels, I have done a lot of training in the Builder Market and always come home wondering why our good customers want in this business. It seems as though it is nothing more than one headache after another when dealing with these builders.

New homes are now turning over in less than 60 days compared to 90 days several years ago. The housing builders continue to push the flooring contractors to install sensitive flooring products well outside the flooring manufacturer's guidelines and then stand behind the products. The issues I see are;

1. **Flooring is too early in the building schedule.** I feel flooring is way up to far in the building schedule. This presents a number of issues from not having the recommended job site conditions to having other trades tear the flooring apart before the homeowner even sees it. Flooring should be the last item installed in the home and when all other trades have completed their work. Drywall dust with handscraped hardwood has recently presented issues in new home construction. Drywall is being sanded after the handscraped hardwood is installed and not completely covered up. The drywall dust gets into the rough handscraped edges and will not come out. Trade damage from other trades working on top of installed flooring damages the recently installed flooring.
2. **No HVAC.** Resilient flooring is a sensitive product and reacts to fluctuations in temperature and humidity. Hardwood requires a temperature of 60°F to 80°F. Vinyl flooring and Luxury Vinyl Tile and Plank recommends; The area to receive resilient flooring and the flooring materials and adhesives should be maintained at a minimum of 65°F for 48 hours before installation, during installation, and 48 hours after completion. Maintain a minimum temperature of 55°F thereafter. Patching compounds and adhesives require the same conditions. Not having these conditions retards the drying and curing process of the flooring installation which can result in a failure. I have heard instances where the hardwood flooring has been installed and the home does not sell and is closed up for months. They come back in the home months later and the hardwood flooring is cupped, cabinet doors are swelled shut, the ceiling fan blades are sagging and the builder wants to know why the flooring is failing. Last winter in Raleigh, NC an installer was wet setting an installation of LVT. When asked why he was wet setting, he replied he had to because the adhesive was freezing on him if he let it open to long. Now that's a problem!
3. **Homes today are very air tight and do not breathe.** Minimizing air movement in and out of a house is key to building an energy-efficient home. Many of the materials used in a house as structural and finish components also act as air barriers. Sealing all the holes and seams will reduce air leakage. The most common air barrier material is house wrap, which is wrapped around the exterior of a house during construction. Sealing house wrap joints with tape improves the wrap's performance by about 20%. During construction, the new home is saturated with moisture from weather elements to other trades like painting and drywall spackling. The efficiency of the home and the loss of air exchange helps keep this a very wet environment and will not allow the

# Installation Expertise with Tim McAdoo

environment to dry out. This is also related to having no HVAC. For the environment to dry out you need to dry the air first and having HVAC running can make a huge difference.

4. **Wet subfloors.** A concrete floor under good drying conditions (60°F to 80°F) and low humidity on average takes 1 month per inch of concrete to dry. So a 4" slab of concrete under good drying conditions will take 4 months to dry. The problem is, the houses are being turned over in 60 days or less and these slabs have not seen ideal drying conditions. The "All In One Hardwood Adhesives" has really helped the wood flooring in builder work. Now, Luxury Vinyl Tile and Plank is becoming hot. The problem is, the adhesives for LVT are not quite as moisture resistant as the All In One Hardwood Adhesives and have presented some problems on these wet subfloors. Wood subfloors are saturated and do not have the time or the capability to dry out because of not having proper HVAC up and running. Complaints about underlayment show through are on the rise in the builder market. Staple down hardwood flooring squeaking complaints are also on the rise. This all comes back to having wet subfloors. Vinyl and adhesive manufacturers are now starting to give a wood subfloor moisture guideline limit of 13% for their products. A wood subfloor at 14% at the time of installation and it goes through one full heating season, that original 14% subfloor moisture can drop as low to 6% moisture. That is a lot of shrinkage/movement in a short amount of time. Add this to cheaper OSB subflooring and we wonder why we have underlayment fasteners and hardwood fasteners coming loose. As stated above, drying the air out with HVAC up and running will help dry out these subfloors.
5. **Value flooring.** We used to have Good/Better/Best. Now just for the builder market, every manufacturer has added a value flooring product. The builder market is all about hitting a price point, not the value or quality of a product. The flooring keeps getting thinner and thinner and the wearlayers follow the same trend. I believe this is also a contributing factor to underlayment show through as well. A thinner vinyl product glued to an underlayment installed over a wet subfloor is a recipe for underlayment show through. The homeowner thinks they have picked out this wonderful floor only to be disappointed in the long run. Ever wonder why first time new home buyers have a bad taste for vinyl flooring. Bottom line is, we are putting the cheapest flooring possible in the absolute worst conditions and expecting it to perform.
6. **Trade Damage.** Trade damage falls right in with #1, Flooring being too early in the building process. The flooring is installed first then having some sort of protective barrier put on top of it. Problem is, the protective barrier gets ripped and damaged from other trades. Then you have trades dragging equipment and appliances over the unprotected flooring, drywall being sanded with no cover underneath them. The flooring is being beaten to death. There are so many repair areas/board replacements done prior to the homeowner ever setting foot on the flooring itself.
7. **Maintenance.** You have completed the punch list and repaired all items. The house is sold, the cleaning crew comes in and you get a call that all the hardwood flooring is cupped. The cleaning crew comes in with big mops and buckets of water and starts wet mopping the hardwood. The



# Installation Expertise with Tim McAdoo

hardwood flooring, which has made it through everything else, is at the mercy of the cleaning crew whom cleans hardwood flooring like they clean ceramic tile by wet mopping it. The hardwood flooring cups. Even though there are still puddles of water on the hardwood and those big wet mops are being shoved in the minivan, everyone denies they use water on the flooring. Now, you are asked “what’s wrong with your hardwood” and you are expected to fix this problem.

Unfortunately, the builders hold all the cards. Builders continue to ignore what the flooring industry requires and have no intentions of changing and still, they get special pricing from suppliers. I was once asked by a builder, since when did flooring require temperature control. I replied “since a little before 1940.” They have beaten every trade and supplier down in price and still expect an absolute perfect product and installation without having to change any of their practices, which fails to meet the flooring requirements. Fast Track construction is killing the flooring business.

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