

CFR The Commercial Flooring Report

For the Commercial Floor Covering Industry

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Flooring Adhesives - What They Are and What They Aren't

Flooring adhesives are often thought of as some miraculous material that somehow functions as anything but a material that fastens together two or more solids by the use of a glue, cement or other adhesive. In the case of flooring the two solids would be the flooring material and the substrate. The glue between them makes the bond whether it be permanent, semi-permanent or releasable. The properties of the adhesives used to install flooring materials may vary but the function is universal. That is to stick the flooring to the substrate. What they don't do are control the physical characteristics of the flooring installed on them or control the conditions of the substrate beneath them. I know this issue may piss some people off, but the truth often does. We work with more major commercial flooring failures and consult on more major projects in the US and abroad than anyone in the industry. That allows us to see what works, what doesn't and how products and materials fail. And at some point, any flooring product will fail for some reason. It's like playing Russian Roulette, there's always a bullet waiting to blow your brains out.



Le-Glue for sticking
your blocks together.

Adhesive will not hold flat a flooring material that has an inherent propensity to curl, cup, lift, dome or otherwise change its dimensional or planar characteristics. Anyone who says adhesive should control these material stresses doesn't know what they're talking about. Neither can the adhesive control the conditions of the substrate whether that be moisture, moisture vapor, alkalinity or some other chemical or physical condition of the wood, gypsum or concrete substrate that functions as its own physical and chemical entity. The adhesive may be able to cope with the adverse conditions but it's not going to change them. And to think adhesive can or will overcome the actions of the flooring material or the chemical characteristics of the substrate is to live in fantasy land.



Chemicals make up everything, like the air we breathe, so don't think of chemicals as bad. However, in certain circumstances when flooring is concerned, chemicals, such as water, water vapor, alkalinity or other chemicals in concrete or wood can wreak havoc with other chemicals like adhesive.

We all too often hear questions like these. Shouldn't the adhesive keep the vinyl plank from curling? No. Shouldn't the adhesive prevent the moisture in the substrate from affecting the installation? No. Shouldn't the adhesive keep the – carpet, vinyl, wood, (you pick one) – from shrinking? No. Because the adhesive is only for sticking things together. It may have properties that make it more resistant to deleterious conditions, but it doesn't and won't stop them.

Let's Look Deeper into Flooring Adhesives:

Flooring adhesive is any type of strong, permanent glue for adhering flooring materials to a subfloor or underlayment. Different types of adhesive are recommended for different types of flooring, although some multi-purpose adhesives can be used effectively with multiple materials. Adhesives can also be soft or hard set and may or may not be firm to the touch or transfer to the backing of the flooring material they are being used on.

Listed are categories and types of adhesive used for those flooring materials.

- Carpet – SBR, Multi-purpose, Hybrid Acrylics
- Carpet, Felt backed sheet goods – Multi-purpose
- Cove Base – SBR
- Resilient – acrylic, epoxies, Silane based Urethane (moisture cured)
- Wood – Acrylic, moisture cured Urethane, Silane based urethane
- VCT – Acrylics, Cut back
- Concrete Sealers – Acrylic, epoxies
- Seam Sealer – Latex, acrylic

These adhesives, as we said, can also, depending on the category, be soft set, hard set, transferring or non-transferring. To perform properly all adhesives must be installed on a clean, dry properly prepared substrate that is free of bond breaking and chemically compromising materials, whether in the concrete or topically present. This is a very critical element in the proper performance of adhesives.



Epoxy adhesives, which are often thought to be the best type of adhesive for moisture sensitive situations, are moisture resistant, not waterproof. They are a two part high-strength adhesive for installing a wide range of flooring types, including vinyl composition tile (VCT), felt-backed commercial sheet, linoleum, rubber tile, most recycled rubber, rubber and vinyl stair treads and commercial homogeneous vinyl sheet where wet operating conditions or heavy static or rolling loads are present. Moisture limits may be up to 90% RH and pH to 9. The substrate must be properly prepared so the epoxy can bond to it. Epoxies are also specified for installations of sheet vinyl flooring in hospitals due to the effects of static and rolling loads (think rolling beds) indenting the vinyl. Softer adhesives will not resist heavy point or rolling loads. Epoxy is more resistant to the effects of heavy rolling beds and furniture. If you use a soft adhesive and the vinyl indents, you're getting what you should have expected and anticipated.



THE COMMERCIAL FLOORING REPORT

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Remember this important and legal fact, the act of installation constitutes acceptance. If you install flooring on a substrate you didn't bother to find out might have a compromising component, you can be held liable for the failure of the installation. If you take someone's word for the condition of the substrate or you think the substrate is ok to install on because it looks like it is, and you install the flooring, the risk you take is yours alone. So, ask for information and make sure you have it and don't guess or you may be guessing yourself into a lawsuit.

Why are there so many concerns and flooring installation failures today when we have so much data and adhesive materials that are supposed to thwart the effects of moisture and other installation compromising conditions? Substrates on which flooring is installed have changed significantly. Not just relative to moisture. Moisture has been a component of concrete forever. Adhesives of the past were solvent based and solvent based adhesives are very resistant to moisture. Adhesives that are latex based failed often in the past because of moisture vapor and alkalinity. The alkalinity destroyed the tackifier in the adhesive, leaving the filler and causing the loss of adhesion. We al-



moisture in the slab and adhesive degradation

ways blamed the installer for not using enough adhesive or cheap adhesive when it was the concrete causing most of the problems. And if the adhesive had a high moisture content and a low solids content the act of installation actually caused the failure. The moisture went into the concrete, activated the alkalinity and as the moisture from the adhesive volatilized it brought with it the alkaline salts which in turn destroyed the adhesive tackifier – that's the sticky part of the adhesive. Simple chemistry at work. Changing the adhesive formulation may have presented challenges relative to moisture and alkalinity resistance but it gave us a lot of good adhesives as well. But certainly, the challenges of keeping the flooring material stuck to the substrate aren't just due to the adhesive formulation.

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Concrete make up has changed as well. Concrete can contain chemicals and components that are added to it or applied topically that can affect the bond of the adhesive. Curing compounds, bond breakers, moisture barrier additives, the finish of the concrete, the make – up of it and a host of other chemicals, sometimes including even the water used in the mix, can cause flooring installations to fail. We are constantly involved in large commercial flooring failures over concrete and other surfaces that have hidden components in the concrete that you wouldn't know were there unless you tested for them. We've been involved in consulting on large projects where our concrete specialists have rewritten the concrete specs because they would not sustain a flooring installation, and conversely on projects where installations have failed and the culprit was hidden in the mix design obscured from view or unknown to anyone. When analysis is done, the science reveals what exists in the substrate. Concrete isn't the only culprit in a flooring failure. It can certainly be a wood substrate that causes a failure due to chemicals used in the wood. We had a huge installation at a military base several years ago where the floor leveling material on the wood failed. The failure was due to an insect repellent sprayed on the wood that would not allow anything to bond to it. Further are underlayment materials that will react with adhesive and vinyl flooring materials. A recent failure was with carpet tile. The installers used a tile tab from a product that had a polypropylene backing on a tile that had a PVC backing. Everyplace the tabs were used to hold the tiles there was a black ooze coming to the surface. The adhesive on the tab was SBR based which is chemistry that is not compatible with PVC. The result was plasticizer migration coming from the PVC backing and migrating to the surface. Who would suspect that a simple sticky tab would cause such a problem? The thought was that the tabs had adhesive on them and could be used interchangeably with any carpet tile backing but they found out otherwise. Just look on the bucket of SBR adhesive that says it can't be used with PVC backed flooring. It says that for a reason because the two are incompatible and will react.



Most adhesives are also not moisture mitigators regardless of what anyone may say about the moisture resistance or moisture proof characteristics. Just because you may think you can use one of these adhesives without the fear of a failure or to escalate the resistance to a moisture failure, nature has other ideas. All you have to do is read the warranties on these adhesives to see how restrictive and narrow the application and use of them are. And the slightest deviation from the installation guidelines can put you out of compliance and make you responsible for a failure. Some of the warranties are so ridiculous that they even disclaim the common law warranty.

Adhesive does not stop moisture vapor. The adhesive itself may be moisture resistant or waterproof but it is not moisture vapor proof and, though the adhesive may not be affected by water or moisture vapor, if moisture vapor passes through the adhesive it can affect the flooring installed on it. If you have high moisture you have high alkalinity as they go hand in hand. You can't have 99% moisture reading and a pH of 9, the chemistry doesn't work that way. It's not always the moisture you have to be concerned with but the alkalinity that will do much of the damage. And many adhesives will say they go to some high RH reading but give you a low pH reading limit. Know this, if you have high RH numbers you're also going to have high pH numbers; they go hand in hand.

There are no adhesives on the market today that are 100% fool proof, regardless of how good they are and no matter who says what about them. Have no doubt that someone will find a way to make them fail or they may do that on their own. It's dangerous to think that you can shortcut the system and value engineer a potential problem by using an adhesive you believe will take the place of a more involved mitigation of a compromising condition. There is no magic bullet-period. We've seen failures of every type adhesive out there, every type, and some of them are downright astronomically expensive and have installation guidelines so stringent you have to wonder why anyone would use them. Just

remember that no matter what you use, the substrate has to be prepared to accept the adhesive and also comply with the flooring manufacturers installation guidelines.

If the substrate has been treated with an abatement chemical, whether, citrus, soy or aliphatic solvent based it can affect the new adhesive. If the slab is old, on or below grade, and has no vapor retarder under it, plan on having a failure somewhere in the installation. The abatement chemical will penetrate into the concrete, be driven back up by moisture vapor, compromise the new adhesive, the patch, leveling agent and likely the new flooring. If an abatement chemical was used, you should have core samples taken to determine the depth of the penetration and then grind the concrete down to the level of penetration and start over. This sounds like a lot of fun doesn't it? The abatement guys will never be implicated in a failure caused by their chemicals and the flooring contractor will likely get caught holding the bag. Here's another situation where if you install over this stuff and the installation fails, they're coming after the flooring contractor for the failure. No one ever thinks to go after the abatement guys who started the problem by not getting all the residue out. But, if the slab is old, porous, on or below grade with no vapor retarder, the abatement residues won't ever come out by themselves.

Any new concrete slab on or below grade should have had a vapor retarder installed. Before the installation is begun and you put down one ounce of adhesive, find out if this was done. Most GC's today have pictures of every step of construction and you'll be able to see if and what vapor retarder was used. If no vapor retarder was used you can count on a problem at some point in the future – and it may take years to happen and the right circumstances.



If you try to circumvent science and physics with a membrane on a slab and then glue an installation over it, remember the slab has other ideas. No matter what adhesive you think will solve your problems and what you might put in between it and the underlayment to try and stop the effects of moisture, the moisture will ALWAYS win. We've seen every membrane there is fail at some point where enough moisture is in play. They have their place certainly, but you can't put a bandage on a hemorrhage and expect the bleeding to stop.



How about the method of applying adhesive? Make sure you read what the instructions say about how to apply the adhesive and what to use to do so. Also, what the manufacturer says about the same thing. Follow the directions, take pictures of everything you do and take notes. There may still be failures, but you have to follow the rules to cover your assets when and if they happen. In saying this you also have to understand how the adhesive works. Nothing is more frustrating than to look at installation and flooring problems someone else looked at, and opined on, saying there is no transfer of adhesive to the back of the vinyl tile, plank, carpet tile etc. Most of the adhesives used for those type products are soft set, pressure sensitive and often don't transfer because they aren't supposed to – think sticky note. And they are pliable, so if you touch them, push on them, or run something through them and are aghast that they are soft and sticky it's because that's how they're supposed to be.

Every warranty for flooring adhesive and flooring materials will mandate that all concrete surfaces must be prepared prior to adhesive application per ASTM F710 and be level, firm, smooth, porous and clean.

Free of dust, dirt, wax, cut-back, paint, grease, oil, curing agents, mold, bond breakers, residual alkaline salts, densifiers, hardeners or any other foreign material that would inhibit bond. This would also include any type of silicate moisture barrier added to the concrete mix or topically applied. They don't work, they create problems and yet they continue to be used. They can cause failures. It may take time for them to occur and the blame may be placed on something else, but the true cause may have been forgotten. There is plenty of information on this subject intelligently explaining why silicates don't work that apparently no one is reading, especially General Contractors and Architects who keep specifying this stuff. More and more adhesive and flooring manufacturers will not warrant their products when silicates are used. That should be enough to make you stay away from these products.

Now we come to underlayment's that you glue to the substrate and glue flooring to them or loose lay and then glue flooring to them. NEVER, EVER, use crumb rubber underlayment with a vinyl flooring material. The two products are completely incompatible and will react. This is the reason adhesive buckets for SBR adhesive say it can't be used with vinyl flooring. That should be enough to convince you these two materials are like trying to blend oil and water. If you don't believe that then contact us. We've done more work on this subject than anyone in the industry and we can show you a lot of very scary and convincing pictures to keep you away from these things. Not only are the two incompatible but crumb rubber, from recycled car and truck tires, also contains about 200 other chemicals that can cause problems. Again, the glue won't work between these two materials, the vinyl flooring is going to react, and the flooring contractor is going to get blamed for the failure.



When looking at the installation instructions for moisture proof, resistant or tolerant adhesives, the prep and guidelines can be very stringent and almost insurmountable. The warranties, which you should read before using some adhesives, especially those that are supposed to be waterproof can be absurd. And the cost of some of the specialized adhesives can be astronomical.

This has actually been a short article on a long subject that there's tons more information on. If you have questions, need help with a problem or want to avoid one, call us. We have the answers.



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