

# The Commercial Flooring Report

## *The Effects of Temperature and Humidity on Floor Covering*

Volume 31 • Page 1

for the Commercial Floor Covering Industry

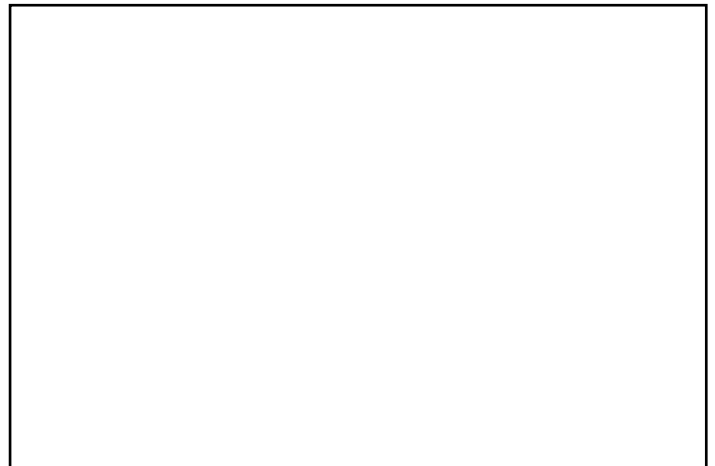
TOTALLY GREEN PUBLICATION

September 2010

This subject may seem absurd to some people, it certainly has garnered responses of “you’re nuts” when being brought up as a cause for flooring material and installation failures, but rest assured, it is a legitimate issue. It becomes a bigger issue when you consider the green movement and it’s implications on start up of HVAC systems in new buildings. We’ve only seen the tip of the iceberg, in my opinion, on this issue.

do the same. Hard surface material, such as sheet vinyl, will also become brittle in extremely cold temperatures and could crack or break. Rolls of carpet when extremely cold can become as unruly to handle as wrestling a bear. On the floor, during swings of temperature and humidity, these flooring materials can contract allowing seams to open up. Suffice it to say that in cold temperature all flooring material is stiff, brittle, unpliable and difficult to work with. In warm or hot temperatures flooring materials are limp, pliable and easier to work with. Going from one extreme to the other during installation, whether from cold to warm or warm to cold, the flooring material will react. It does so by either expanding (growing) or contracting (shrinking). This is why it is so important to insure the space in which flooring material is to be installed, has a temperature and humidity that mirrors one that is comfortable for humans. If a human being would be comfortable in the space so will the flooring material. This temperature and humidity would be what the HVAC system would be set at when occupied as a work space.

So why should varying temperature and humidity affect floor covering materials and how do they? As with all products, regardless of what they are, temperature and humidity have an effect. Carpet is reactive to the effects of heat and cold by expanding and contracting. Hard surface sheet goods and tiles



Humidity is important to flooring material as many flooring materials will absorb moisture. Nylon carpet for example, will absorb about 5% of its weight in moisture; wool about 27%, polypropylene is hydrophobic which means it will not absorb moisture. Since most commercial carpet is nylon, in a high humidity environment it will gain moisture and expand. It will also gain moisture from the adhesive when it is installed. Since all flooring adhesives that come out of a bucket use water as the carrier and because the water has to dissipate, which it does in vapor form, it will be absorbed by nylon or wool fiber. The reaction to humidity or moisture is greater with level loop nylon carpet because the yarn is BCF (Bulked Continuous Filament).

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That is to say, the yarn is made up of continuous filament fiber which you can compare to fishing line; long lengths of unending fiber in the carpet, running from one end to the other. Think of it like this; carpet made with continuous filament level loop yarn is like a chain link fence. When you grab one section of the fence; the entire fence moves.

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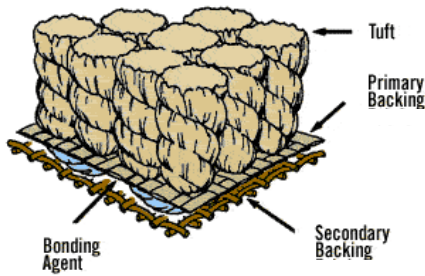
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If the carpet is cut pile the reaction is much less, think of this type of carpet as a picket fence. When you grab it, only one picket is affected as the sections are not connected. That covers simply, the moisture and humidity affect part. Temperature will

### Tufted



affect the backing and on most tufted carpet the primary backing is woven polypropylene and in many cases, so is the secondary backing. As mentioned earlier, polypropylene is

not affected by moisture but it is affected by temperature. So if you have both the moisture in play and temperature you can have a very active and reactive carpet on the floor.

If flooring material is not acclimated in the space prior to installation it can create fits for the installation contractor and the end user.

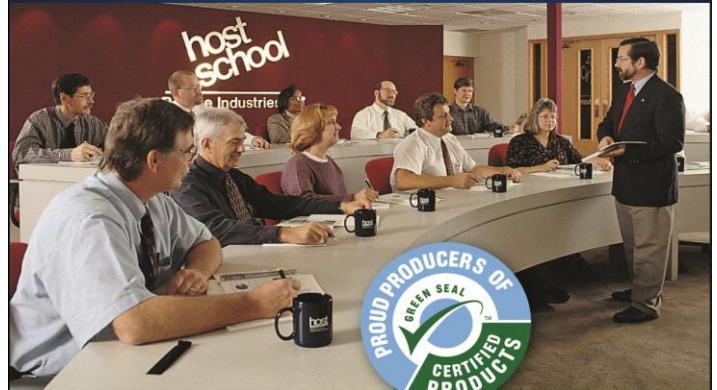
Acclimation, which is a very controversial and



contestable subject, means the flooring material has had an opportunity to relax in the installation space. The space should

be at the temperature and humidity it would be when occupied by human beings. This is a bone of contention in the industry and with end users, general contractors, architects and designers. The issue is going to exist as long as projects are "Fast Tracked" and people conform to and employ "green initiatives." This means the space may not have fully operational HVAC (heat and air) until the C of O (Certificate of Occupancy) is furnished, which can't be done until the space is inhabitable. The space can't be deemed inhabitable until it can accommodate occupants, which puts things in a Catch 22 position. In other words we're trying to put the cart before the horse which creates all kinds of problems and not just for the flooring material but other materials in the space as well.

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The other issue that has a tremendous affect on the flooring material and the installation is moisture in the substrate. This is actually a problem that has reached epidemic proportions of flooring failures and it is very misunderstood and mystifying to the point of being unbelievable. Moisture in concrete, which is always present regardless of how old the concrete is, moves in and out of the concrete. The moisture moves from high pressure to low pressure, so when the HVAC system cycles there is moisture vapor movement in and out of the concrete. As the temperature and humidity vary in a space the movement of moisture does to, this is the law of physics at work. To deny this science is like denying human beings breath. Concrete should be thought of as a living organism. It is affected by changes in the environment. As moisture vapor moves in or out of concrete it affects the flooring material applied to it. If the flooring material is permeable, like broadloom carpet, the moisture vapor can move through the carpet. In this process the moisture vapor brings with it the alkalinity inherently in the concrete. The alkalinity of concrete is at least 12.5 ph. This high alkalinity from the concrete can and will destroy the tackifier, the sticky part, of

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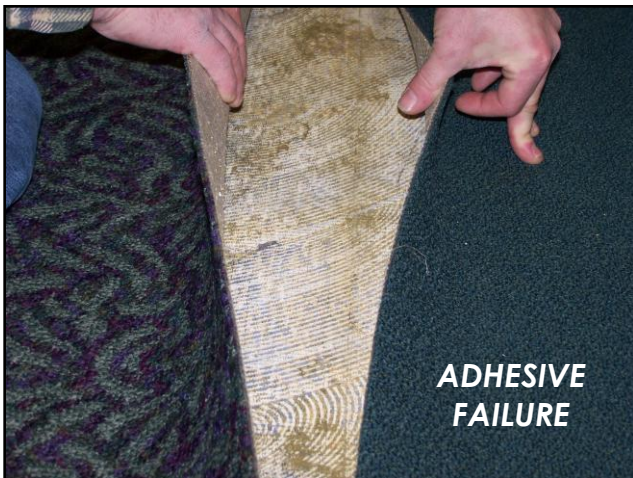
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adhesives causing the adhesive to fail. When this happens the adhesive loses its hold on the flooring material which allows the flooring material to come loose from the substrate. And when the flooring material comes loose from the substrate it can react freely to temperature and humidity fluctuation in the space.

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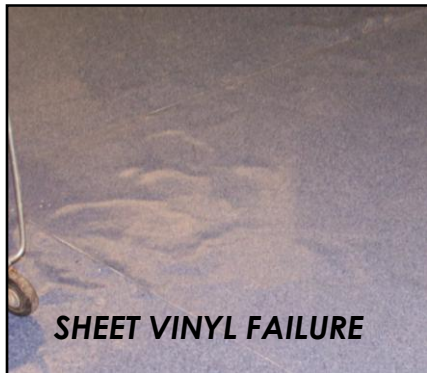
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If moisture is trapped beneath non-permeable flooring material, such as hard backed carpet tile or hard surface sheet goods, it can cause the edges of the tile to curl or the adhesive under the sheet goods to turn to mush. These and similar



**MUSHY ADHESIVE**

conditions, can make one think the flooring material is the problem when the flooring material is only reacting to a condition. The flooring material gets blamed as the problem because it actually physically manifests a change instigating this interpretation. This is not to say the flooring material may not be the problem, especially in the case of carpet tiles but that's



**SHEET VINYL FAILURE**

another story.

Wood flooring is another matter altogether. As more wood is used in commercial installations you can't lose sight of what it is – a tree. To stay out of trouble think of wood flooring as a tree on the floor. Wood reacts to heat and humidity, it does it in the forest and it will do in on the floor. Wood gains and loses moisture which means it will expand and contract, which also means it will grow and shrink on the floor. When it does this it can curl at the edges,



**LIFTED WOOD**

lift at the ends, crack, split, check and lift off the floor. Even if you bolt wood to the floor you can't stop this reaction if the space in which the wood is installed is not controlled.

One of the biggest causes of flooring failures relative to the material coming off the floor and expanding or contracting is the cycling of the HVAC system or not controlling the environment in the space. This is easy enough to do but it also means the cost of operating the space is increased. Cycling the HVAC system lowers expenses and operating costs. When the space is not occupied by humans there's no need to keep it comfortable for them but the flooring material requires the same comfort levels and when it doesn't have that, it can and will react. One of the ways to prevent the flooring material from reacting violently to changes in temperature and humidity is to install it using a system that thwarts the reactions. Systems like EnviroSTIX for hard surface and hard backed flooring materials and FreeLay for carpet are systems that will help prevent the failure of flooring installations. There is more technology coming, most of which we are involved with. We'll keep you informed to help you. In the meantime understand that



temperature and humidity have a profound effect on flooring materials and the integrity of their installation. If you control the temperature and humidity in the space it will maintain the integrity of the floor covering and the installation.



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The new **Velcro Brand Carpet Protector** is ready to go. This product takes the place of clear plastic coverings with pressure sensitive adhesive that have created a host of problems for the industry. The new **Velcro Brand Carpet Protector** is made for use on loop and cut and loop carpet; the vast majority of commercial carpet. Bentley Prince Street is the first carpet manufacturer to offer this unique product. <http://www.velcro.com/>





### Concrete Moisture Testing Technician Certification – Grade I

The International Concrete Repair Institute (ICRI) is pleased to introduce their Concrete Moisture Testing Technician Certification Program. The purpose of this program is to help improve the performance of concrete slab moisture testing in the U.S. to result in more consistent, accurate results that will help flooring manufacturers, architects, and contractors to make better decisions as to when a concrete floor is ready for a floor covering installation.

The certification program has 2 tiers. Tier 1 applicants are those who are not regularly engaged in moisture testing yet have an active interest in learning more about the tests, what the tests mean and how the tests should be performed. Tier 2 applicants are those who have applied for full certification. Both tiers require attendance at a 3 hour educational session followed by a written exam. Tier 2 full certification applicants will also be required to perform each of the 4 tests under the watchful eye of a qualified judge who will not provide any level of coaching. Prequalification for acceptance into full certification Tier 2 will be previous testing experience.

Tier 1 consists of a 3 hour educational session, a written exam and a training session. Those who complete the course and pass the exam will be issued an ICRI Letter of Education. Tier 2 consists of the same 3 hour educational session, the written exam and a field performance exam. By passing both the written and performance exams, an ICRI Concrete Moisture Testing Technician - Grade I certification will be issued to those who successfully demonstrate their knowledge and ability to properly perform and record the results of each of the four field moisture tests on hardened concrete. Those who pass both the written and performance exams will receive a certificate and wallet registration card.

Both the written exam and the field tests will be based on the following four (4) ASTM Standards, including all Annexes and Appendices:

F 710	Preparing Concrete Floors to Receive Resilient Flooring; Section 5.3 pH Testing
F 1869	Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
F2170	Determining Relative Humidity in Concrete Floor Slabs Using <i>in situ</i> Probes
F2420	Determining Relative Humidity on the Surface of Concrete Floor Slabs Using Relative Humidity Probe Measurement and Insulated Hood

ICRI Certification for Slab Moisture Testing Technician– Grade I shall be valid for a period of five [5] years from the date of completion of all applicable certification requirements.

The two day certification program begins on the first day with registration from 8 - 9 am, followed by the 3 hour educational session. There will be a provided lunch and study break from 12 – 1 pm followed by the written exam from 1-2 pm. Following the written exam Tier 1 students will attend a training session where they may receive or observe hands on training on how to properly perform each of the four tests.

For those registered for the Tier 2 Certification, day two begins at 8 am, and each applicant will be required to perform all 4 ASTM tests listed above.

ICRI currently has six Slab Moisture Testing Technician Certification programs scheduled in 2010.

**Atlanta - June 22-23**

**Denver - June 29-30**

**Chicago - September 14-15**

**Baltimore - October 5-6**

**San Diego - November 15-16**

**San Jose - November 18-16**

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