Managing Relative Humidity to Prevent Flooring Problems

Water intrusion and moisture related problems are among the most expensive issues for building owners to address. Managing relative humidity is critically important during building construction and throughout the building lifecycle to prevent mold and mildew growth and issues related to floor coverings, specifically adhesive breakdown, covering debondment, blisters, wood flooring buckling, substrate cracks reflecting through bonded floor coverings, and underlayment expansion that ruptures the flooring.

Why do flooring problems occur?

When excessively wet soils are encountered during construction, there are three primary approaches to achieving appropriate soil stability and compaction:

- Excess moisture is trapped in sealed floors or within building walls during construction
- Moisture intrudes into the building envelope causing building materials to take on excess moisture
- Poor site drainage allows water to collect around the base of a building and saturate concrete walls or flow along joints and cracks, leading to mold, mildew, and flooring failures

Prevention begins with pre-construction

Prevention is the best means to avoiding relative humidity problems, and that begins during building design and pre-construction planning.

Build moisture prevention measures into design specifications

To minimize the potential for excessive moisture and alkalinity from reaching the concrete slab surface, design specifications that clearly define moisture protection measures from external sources on the top and bottom of the slab should be incorporated early in the design process. In addition, specifications should address:

- Properties that relate to concrete slab performance as a substrate for flooring, not just compressive strength
- Appropriate weather-specific concrete mixes
- Acceptable concrete drying and curing methods
- Weather protection during the construction phase
- Suitable use and frequency of testing
Determine proper vapor retarder specifications to restrict moisture flow

Vapor retarders are sheet materials used under concrete slabs on ground to restrict the flow of moisture vapor from the subgrade into and through the concrete slab. It’s best if designers specify the likely types of floor covering on concrete slabs so that the appropriate performance-based water vapor retarders can be determined during the design and budgeting phase.

Develop a realistic schedule that allows for adequate concrete drying

Concrete drying can’t be rushed, at least not without tradeoffs that may have undesirable long-term consequences. General contractors can gather input on materials selection, concrete mixes, finishing techniques, environmental protection, and construction processes during the design phase from engineers, testing experts, and trade contractors so that concrete slabs and structural elements are allowed the necessary time to dry while still keeping to the desired schedule.

Relative humidity (RH) testing provides essential concrete moisture knowledge

The amount of moisture within the concrete slab—not just on the surface—typically must not exceed 75%. Unlike traditional surface-based testing methods, relative humidity (RH) testing measures the amount of moisture within the slab. In-situ probes are placed in holes drilled in the hardened concrete. Their purpose is to measure the moisture content at a depth that gives the best indicator of the slab’s moisture level if the surface was sealed at that point.

Section 10.2 of ASTM F2170-02 establishes the RH testing depth requirement at 40% for a slab drying from one side and 20% if from two sides. The hardened concrete’s internal relative humidity at precisely these depths using in-situ probes provides the best indicator of a final relative humidity level if the slab were to be sealed and allowed to equilibrate at that time.

Provide weather protection during construction

If there are no overhangs at building eaves and weather-stripping and sealant joints around openings are not properly installed, rainwater will penetrate the building envelope and re-saturate the concrete.

Turn on HVAC and dehumidifier systems as soon as possible

To make certain that conditions are suitable prior to floor covering installation, turn on HVAC and dehumidifier systems as soon as possible during building construction to provide air movement and help remove excess moisture from the air as the concrete dries. Supplemental dehumidification equipment will likely be necessary during concrete drying in order to remove all the excess moisture that is released. Testing standards require that both a concrete slab and the air space above the slab be at service conditions with HVAC systems operating for at least 48 hours before beginning RH testing.
Concrete alkalinity and moisture can be highly destructive to floor covering adhesives

Because newer, lower-VOC floor covering adhesives are sensitive to both high pH and high moisture conditions (concrete is very alkaline), it is more important than ever to make certain that concrete conditions are suitable for installation and the flooring manufacturer’s specifications are followed.

Concrete can regain moisture – be vigilant about leaks and humidity

Concrete is a hygroscopic material – it gives up and takes on moisture, especially after being covered with flooring or sealants. Like the majority of building materials, temperature and humidity have an impact on the internal moisture levels in concrete even after it has been deemed “dry” and finished with a flooring sealant. Regular monitoring of building systems for water leaks and high humidity conditions can uncover concrete moisture conditions in the early stages when remediation is less costly.

Address exterior drainage problems immediately

After construction is complete, water that collects around the base of a building can cause problems along the interior or perimeter. Water can saturate concrete walls or flow along joints and cracks, leading to mold, mildew, and flooring failures.

Use proper cleaning and maintenance practices

Maintenance of modern floor coverings is critical to ensuring their long-term appearance and function. Floor maintenance staff must use proper chemicals at the correct rate with approved equipment to ensure adequate cleaning without damage from excessive water. Improper maintenance such as inadequate floor polish, frequent stripping, or excessive cleaning may cause water to migrate into concrete at floor covering joints and cause moisture-related problems.

In summary, proper concrete design and specifications, pre-construction planning, proper concrete curing and drying, verification by testing, and appropriate property maintenance practices will help limit the potential for moisture-related flooring problems and failures.

Contact GCI’s Bob Hiles or Glenn McLaughlin at 614.895.1400 for technical details, construction testing services, and specific strategies for your concrete work.

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Alkalinity is the most destructive water problem.
Tests of adhesives commonly used for bonding floor finish to concrete slabs indicate that they lose a large portion of their dry bond strength when the concrete becomes damp. This is possibly due to chemical degradation of the adhesive at the junction of the adhesive and the concrete, and may be caused by a reaction, in the presence of water, between alkali in the cement and the resin in the adhesive.

Poor exterior drainage allows water accumulation at the base of an exterior wall and infiltration of water under the interior floor slab that can saturate floor coverings around the interior perimeter of the building.
GCI Welcomes New Addition to Drill Rig Fleet

The newest addition to GCI’s fleet of drill rigs was recently delivered.

The new CME-45C track-mounted all-terrain vehicle (ATV) drill rig, affectionately nick-named “The Tank,” combines a lower deck height and a shorter vertical mast to only need about 21 to 22 feet of clearance when fully extended.

The shorter mast allows the rig to access areas that couldn’t be drilled before, such as below tree canopies and inside structures. The track-mounted rig can navigate through softer, wetter conditions than the truck-mounted drill rigs.

The Tank is GCI’s second ATV-mounted drill rig, joining “The Beast,” a rubber-tire ATV-mounted drill rig. GCI also operates four truck-mounted drill rigs.

With six active drill rigs and experienced drilling crews, GCI can provide the site assessments necessary to keep your projects on track.