



LESSONS LEARNED™
Facilities Engineering
OBSERVATIONS AND LESSONS FROM THE SCHOOL OF EXPERIENCE

Concrete Floors and Moisture

MOISTURE SOURCES

Moisture related problems in concrete floors cause significant damage to buildings annually. Moisture can be absorbed into, evaporated from, and transmitted through concrete. Sources of moisture in concrete floors include the following:

- Natural Sources – Weather, drainage, water table, hydrostatic pressure, osmosis, subslab vapor, indoor relative humidity, and dew point
- Artificial Sources – Concrete mix water, curing water, leaking or broken subslab piping, spills, building uses, HVAC operations, and cleaning and maintenance

MOISTURE DAMAGE

In the presence of moisture, chemicals in floor coverings, adhesives, and coatings can react with alkaline concrete. The damage caused by unwanted moisture can include debonding of floor coverings and coatings, trip hazards, poor indoor air quality, damage to adjacent construction materials, and damage to goods stored directly on the floor.

MOISTURE TESTING

The most basic qualitative method of testing is the taping of a piece of polyethylene sheeting to the floor slab for a period of time, then examining the underside of the sheet and the surface of the concrete for the presence of moisture (ASTM D4263). If condensed moisture is present, the concrete is not ready to receive floor coverings that are sensitive to moisture. This test can give false negative results if the slab surface temperature is above the dew point.

Another qualitative method is to bond a sample of the proposed flooring to the concrete utilizing the manufacturer's recommended adhesive and installation procedures. After a period of time, the flooring is pulled up by hand. The effort required to remove the sample is judged and the adhesive is examined for deterioration by moisture.

Various electronic instruments are available to provide qualitative measurements of the moisture content of concrete. These instruments are generally not recognized by standards or flooring manufacturers for the purpose of accepting or rejecting the installation of a floor covering. These instruments can be useful in providing relative moisture conditions across a floor slab.

Two quantitative test methods for moisture include the following:

- Gravimetric Moisture Content – core samples of the concrete are extracted using dry coring methods and the moisture content determined
- Moisture Vapor Emission Rate (MVER) – a container of anhydrous calcium chloride is placed under a sealed plastic dome for a given period of time, then the moisture content is calculated as the amount of moisture emitted from 1,000 sf in 24 hours

The MVER is the most recognized method for moisture testing by most flooring manufacturers and the test procedure is detailed in ASTM F1869. Specified limits for the MVER vary by flooring manufacturer and flooring type. General recommendations are provided by the Carpet and Rug Institute, and the Resilient Floor Covering Institute. The following limits are typical for the MVER and the types of flooring being installed:

5 lb./1,000 sf/24 hours	Vinyl composition tile, felt-backed resilient sheet flooring, porous-backed carpet, and linoleum
3 lb./1,000 sf/24 hours	Solid vinyl sheet flooring, vinyl-backed carpet, nonporous-backed carpet, cork, and direct glue-down wood flooring

In new construction, care must be provided in the design and construction phases to produce a concrete floor slab acceptable for the type of flooring to be installed. The testing of moisture levels is fairly straightforward and inexpensive; however, if unacceptable levels are indicated, determining the source can be quite time consuming and costly.

We hope that this "Lessons Learned" is helpful to you in your next project. ECS is available to provide moisture testing on your next flooring installation project, or assist you in determining the cause of an existing flooring problem.

Respectfully,
ECS Corporate Services, LLC