CIP 29 - Vapor Retarders Under Slabs on Grade

WHAT are Vapor Retarders

Vapor retarders are sheet materials that minimize the transmission of moisture or water vapor from the sub-slab support system into a concrete slab. Vapor retarders are typically specified in accordance with ASTM E1745, which requires that the permeance of the material be no greater than 0.1 US perms, when tested by ASTM E96 or ASTM F1249. Low-density polyethylene sheets that were commonly used in the past have been replaced by stronger, less permeable materials that conform to ASTM E1745. A minimum thickness of 10 mils (0.25 mm) is recommended for reduced vapor transmission and for required durability during and after installation. Membrane materials with after-conditioning permeance levels less than 0.01 perms are referred to as vapor barriers rather than retarders.

WHY are Vapor Retarders Used

Vapor retarders are frequently specified for interior concrete slabs on grade where moisture protection is desired. Protection from slab substrate moisture migration is required when floors will be covered with carpet, tile, wood, resilient, and seamless polymeric flooring, or when moisture-sensitive equipment or products will be placed on the floor. Permeation of water vapor through concrete slabs can cause failure of moisture-sensitive adhesives or coatings resulting in delamination, distortion or discoloration of flooring products, trip-and-fall hazards, and possibly fungal growth and odors. See CIP 28.

Low-permeability membranes below floor slabs on grade, in conjunction with sealed joints, also provide a barrier to radon penetration into enclosed spaces when such conditions exist.

WHAT Conditions Require Vapor Retarders

A floor is part of the building envelope and should be constructed to eliminate moisture infiltration through the slab into the occupied building space. It is common to specify the use of vapor retarders for floor slabs intended to receive floor coverings. However, floors intended for use without coatings or coverings, such as warehouses, mechanical rooms, and unfinished expansion areas, are often converted to other uses that may require the installation of moisture-sensitive flooring. Such adaptive re-use cannot be predicted during design and construction of a new building. Therefore, it is sensible planning to include a vapor retarder under every interior floor slab in every building. Vapor retarders are generally not necessary for exterior slabs on grade.

Other sources of moisture that cannot be controlled by the use of vapor retarders need to be separately addressed in contract documents to achieve the moisture emission levels required by flooring manufacturers. Exposure to moisture and re-wetting during construction will take a long time to dry out when the slab is eventually subjected to service ambient conditions with the HVAC system. The same is true for residual moisture within concrete slabs. The concrete slab should be properly cured and allowed to dry out before testing for moisture emissions. (CIP 28) Concrete mixtures with lower moisture emission can be supplied by the concrete producer. These mixtures can include supplementary cementitious materials and specialty chemical admixtures designed to control moisture emission.

HOW Should Vapor Retarders be Installed

ACI Committee 302 recommends that concrete be placed directly on top of a vapor retarder when the concrete slab surface will receive a moisture-sensitive floor covering. A durable and good quality vapor retarder that complies with ASTM E1745 should be used and installed in accordance with ASTM E1643.

When environmental conditions cause a higher rate of evaporation, the possibility of plastic shrinkage cracking increases. Placing concrete directly on the vapor retarder can help alleviate this condition as bleed water will rise to the surface to reduce the chance of this cracking.

Placing concrete directly on the vapor retarder can also create problems. Excess bleeding that does not dissipate from the surface can delay finishing operations. Final finishing of the slab should not begin while bleed water is on the slab surface. Bleed water trapped below a
Concrete in Practice (CIP) Series, National Ready Mixed Concrete Association, Farmington Hills, MI. www.concrete.org

American Concrete Institute, Farmington Hills, MI. www.concrete.org

Guide for Concrete Slabs that Receive Moisture Sensitive Floor Covering, American Concrete Institute, Farmington Hills, MI. www.concrete.org

No Sand, Please

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66 Canal Center Plaza, Ste. 250, Alexandria VA 22314 • www.nrmca.org

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