

MOISTURE IN CONCRETE SLAB FLOORS

Slab moisture is a significant problem which can be either temporary, caused by the original construction procedures or can be a continuing problem, caused by ground moisture traveling up through the slab on grade.

Flooring manufacturer's recommend that water vapor transmission from below be measured before installing impervious coverings. They commonly specify that it be limited to not more than 3# / 1000 sf / 24 hrs for resilient flooring. Higher rates are thought to cause moisture build up below the flooring, cause mold growth, cause adhesive failure and flooring material damage.

What affects the vapor transmission rate and contributes to flooring problems in industrial facilities?

1. The permeability of the slab and thus the rate at which water vapor passes is influenced by the concrete's original quality. This is primarily measured by the mix design water to cement ratio. The lower the w/c ratio the tighter and less permeable the concrete and the higher the concrete strength. Industrial slabs are usually 4,000 psi and are placed at low w/c ratios to control shrinkage and cracking. Thus they are of low permeability. Slabs which are later saw cut and patched for utilities often do not have adequate quality control and often end up more porous.

2. In new construction the excess water in the concrete needs time and conditions which allow it to dry out before installing floor coverings. We put high solids curing compounds on the slab to hold the water in to cure the concrete. This then prevents the slab from drying preparatory to flooring installation. An untreated slab with no moisture from or to below will take 60 to 90 days to adequately dry at 72 F and 50 % relative humidity. There is usually adequate time to dry in new construction. Curing compounds or cold weather can slow this process. The use of dissipating resin curing compounds can help. Concrete patches usually occur late and don't have time to dry. Covering with polyethylene or wet curing instead of a membrane cure is recommended but adequate drying time is usually a problem.

3. Slab surface treatments, such as chemical surface hardeners and mechanical surface sealers and coatings reduce the permeability and vapor transmission rate. These are frequently used to harden the surface throughout the building as part of the original construction. They can also be added later to reduce permeability. Surface treatments are available to reduce existing vapor transmissions from as much as 20 # / 1000 sf / 24 hrs down to acceptable levels. The cost of treatment varies with the size of the problem.

4. Soil moisture below the slab determines the continuing water available to pass through the slab and potentially cause a long term problem. Slabs on dry, granular soils rarely have long or even short term problems. Slabs on damp fine grained soils, such as silts and clays, with a shallow ground water table often do. Project specific soils reports usually identify soil conditions which might cause moisture problems and when present the report will generally recommend a damp proofing membrane below the slab.

5. Damp proofing membranes or "drain rock" capillary moisture barriers placed below the slab can reduce the transfer of moisture from below. In warehouse projects where office areas are only 5 % to 10 % of the floor area and are of unknown location the decision to use a membrane is costly and compromises the structural floor capacity. However, when long term tests on slabs indicate that more than the recommended moisture vapor is present it is too late to install under slab protection. Surface treatment, slab removal and membrane installation or the use of permeable finishes are the options.

We recommend the following:

1. Review soil moisture before building. Use a moisture barrier below the slab at planned office areas where moisture may be a problem.
2. Allow time in the construction schedule to allow concrete to dry. A dissipating curing compound or a polyethylene membrane can be used at office areas. These allow the membrane to be removed after curing time to allow drying.
3. Measure moisture vapor prior to any flooring operation.
4. Specify joint and crack fillers, floor levelers and floor adhesive that are not moisture sensitive. This can be difficult as solvent based items are becoming less common due to pollution concerns.
5. Use expensive floor surface membranes or remove and replace the slab over a membrane.

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