

Moisture Vapour Emissions Case Study

Flooring failures due to moisture vapour emissions through concrete slabs are at near epidemic proportions everywhere.

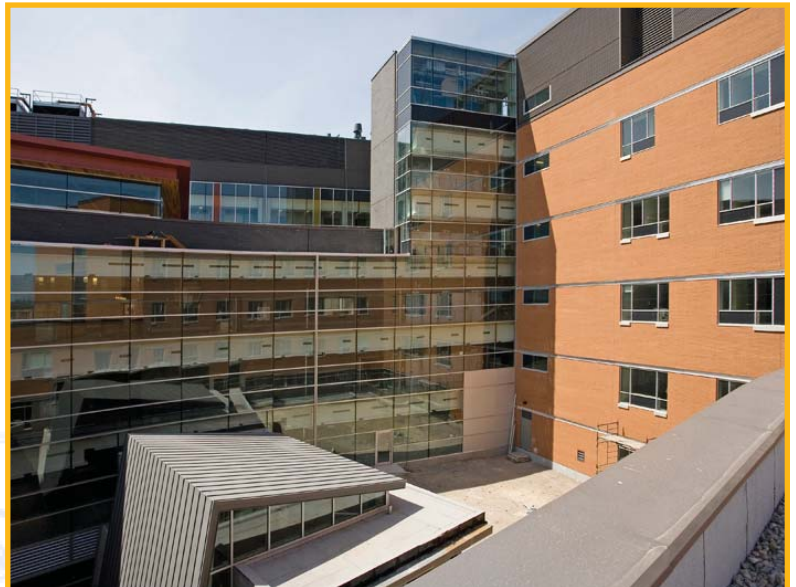
The two biggest obstacles - effectively controlling sub-slab moisture vapour diffusion and accurately assessing the moisture conditions within the concrete

With health and safety on the line, one hospital in Peterborough wasn't going to take chances.

Coatings, carpet, vinyl, rubber, wood, laminates and most floor coverings are affected to one degree or another by pH issues and excess moisture vapour emissions through concrete slab flooring. So what happens when a very large portion of the Peterborough Hospital Centre requires moisture-sensitive flooring to be applied over their base concrete floor?

The project team would need to know the exact moisture conditions within the concrete slab to be able to judge when it was dry enough to receive the flooring. They would also need to control any moisture vapour from the sub-grade that could potentially diffuse through the concrete over time.

To be certain that ground moisture vapour doesn't reach the underside of a finished floor, a vapour retarder is often used under the concrete. In the past, adhesives used for thin-set flooring were solvent based and did not break down in the presence of moisture. But the Peterborough Hospital would be using a more environmentally friendly water based adhesive which can deteriorate in the presence of moisture.



The potential problems the team was facing were disastrous for the hospital if they could not measure the moisture accurately or properly control the ground moisture. They could be facing problems such as the flooring breaking down, debonding, bubbling, oozing, bumps or more. Left uncorrected, these problems can evolve into health and safety issues caused by mould, mildew, poor indoor air quality and floors lifting. Add to that the potential lost time and productivity of the building crew and downtime for repair or replacement.

Troubleshooting moisture problems in the concrete slab

To troubleshoot the moisture problems in the concrete slab the R&D Department at EllisDon worked with the project team and reviewed the concrete specifications. They immediately

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recommended that the vapour retarder be upgraded to a thicker, more durable 10 mil polyethylene to prevent the transmission of the moisture vapour into the concrete. Some time after the slab-on-grade had been poured, they tackled the moisture levels of the concrete to ensure that the concrete slab was adequately dry before the flooring was applied.

Instead of using a calcium chloride test which is highly influenced by the surrounding environment, the team developed a moisture content monitoring program using sensitive digital moisture probes that were installed into the concrete. Using these probes, they regularly measured the concrete's relative humidity in order to determine the optimal moisture levels for receiving the flooring. After substantial drying time and testing, the team concluded that the moisture levels were still too high to apply the moisture sensitive flooring materials.

They came up with two possible solutions and recommendations to keep the project on track;

1. Apply a moisture reduction barrier (MRB) on top of the concrete to prohibit the diffusion of moisture vapour into the underside of the flooring; however this involved huge costs.

2. Allow much more time for the concrete to dry; however this would cause time delays.

Sometimes a little time is the best answer

The Architect fully understood the industry-wide problem of moisture content and agreed that more time was the right option for this project. Supplemental equipment was brought in to increase the drying rate of the slab. To facilitate this “more time” option, the schedule was reconfigured to allow for flooring to be installed in other locations prior to the slab on grade. Using EllisDon's results of the moisture measuring program, the R&D Department was able to project graphically the anticipated period where the moisture conditions would permit the application of the finished flooring. This helped the team plan out the flooring installation for the building as a whole. They decided to start installing

flooring on the upper floors and worked their way down to the slab on grade, providing the slab sufficient time to reach the target relative humidity RH of 75%.

View relative humidity data [[Link to tables](#)] collected from the digital probes showing the increase in temperature within the concrete as well as the decrease of relative humidity.

“During the documents review stage, the R&D Department performed a detailed review of the design documents and advised us about a problem in the construction industry regarding moisture vapour emissions / transmissions relating to finished floors. The R&D dept. worked diligently with our Project Team... (and) provided the right solutions to minimize and hopefully avert any problems in the future (ie. potential repair costs) associated with this issue.”

Ezio Del Fatti

Peterborough Regional Health Centre Project
Manager EllisDon Corporation

The Specifics

Building Specifications

750,000 square feet, 494 beds

Location

Peterborough, Ontario, Canada

Client

Peterborough Regional Health Centre

EllisDon Project Team

Ezio del Fatti, Project Manager
Steve Ferrante, Superintendent
Selvan Thurai, Superintendent

Architect

Anthony Cho, Stantec Architects

Value

\$197 million