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STRUCTURAL LIGHTWEIGHT AGGREGATE

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Impact of Vapor Emission Rate of Lightweight Concrete Slabs on Floor Coverings

At a time when the construction industry is experiencing a boom, the need to build larger buildings faster is becoming more apparent. Commercial and industrial facilities are being built and opened for occupancy at record paces. Contractors continually struggle with meeting fast track schedules while still attempting to achieve quality.

One item that can make or break that fast track schedule is compatibility between floor substrate and floor covering. Special attention needs to be taken from a designer's standpoint on the time frame between placing concrete floor slabs and the application of floor coverings. The most widely used and versatile construction material is concrete. Typical commercial construction, be it concrete frame or steel frame, requires elevated flooring systems using concrete. Most often, steel frame buildings use lightweight concrete on steel decking for constructing all elevated slabs.

The floor covering industry has standards on floor substrate vapor emissions, particularly concrete floor substrates. The Carpet and Rug Institute publishes the "*Standard for Installation of Commercial Carpet*," CRI 104-1996, which provides vapor emission requirements of concrete substrates and testing procedure to determine vapor emissions. CRI 104 gives a general guideline that 3 to 5 lbs./1000 square feet/24 hours vapor emission rate is generally acceptable for carpet with porous backings. However, some carpets that are more sensitive to water vapor must be placed at or below 3 lbs/1000 square feet/24 hours. Always consult individual manufacturers to determine acceptable emission rates on specific materials. All concrete floors should be

tested for vapor emission rate by utilizing an anhydrous calcium chloride moisture test kit, which is available from most flooring suppliers and accessory distributors.

The anhydrous calcium chloride test is a precise quantitative method that is sensitive to operator error. Thus, it is imperative that strict attention be made to the test kit manufacturer's detailed instructions. It requires proper installation and planning, due to its three-day test time period.

When talking about concrete vapor emissions and potential incompatibility of floor coverings there are two items to consider. First, the actual floor covering or backing material may be the factor that restricts placement. Some floor coverings are backed with non-permeable vinyl or latex and are more susceptible to problems from trapped moisture. Secondly, the issue may be the low moisture and alkali tolerance of the adhesive being used.

The time it takes for a concrete slab to reach an acceptable vapor emission level depends on many variables. There is no single answer to "How long does it take for structural lightweight concrete on steel decking under normal conditions to reach the acceptable vapor emission rate?" Researchers have performed studies to attempt to answer that question, but answers still range from one month, to several months, and sometimes up to a year depending on those variables. It is recognized that the lightweight aggregate used in structural lightweight concrete has higher absorbed moisture content than typical normal weight stone and sand. This may or may not add to the length of time it takes to reach the optimum vapor emission rate, but this is just one of many variables.

These other variables consist of, but are not restricted to the following:

1. Concrete's total water content when placed.
2. Porosity / Permeability of the hardened concrete.
3. Effect of different curing compounds and methods used on the concrete
4. Finished surface of the concrete.
5. Ambient relative humidity.
6. Rate of air movement across concrete slab.
7. Temperature of surrounding air.

One thing that is known is, literally thousands of projects are completed successfully each year using various types of structural lightweight concrete systems and floor coverings. So the question now is, "How can we use or optimize those variables to work for us instead of against us?"

1. Use perforated composite decking; it will allow moisture to escape from both sides of the concrete slab.
2. Use water reducers in the concrete in order to reduce w/c ratio and place at the lowest practical slump.
3. Use concrete curing compounds and methods that both cure the concrete properly and minimize the negative impact on flooring adherence.
4. Use adhesives that are the most compatible with concrete and have the best available tolerance for water vapor.

5. Use mechanical air dehumidifiers when needed to increase the evaporation rate.
6. Consider an acid wash of the floor prior to installing flooring if it is needed to insure a good bond.
7. Protect concrete slab from the elements; rain, snow, etc.
8. Do not allow contractor or subcontractor to store materials on plastic sheeting or plywood on the floor during the drying period.
9. Apply an appropriate vapor retarding membrane product on the cured concrete before placing the flooring if needed.

In the times where fast track scheduling becomes an important factor there will continue to be concerns when it comes to timely occupancy. However, when careful forethought is given to floor covering and adhesive compatibility with the concrete substrate and the above variables are optimized, there is a significant decrease in the amount of time required to reach the required vapor emission rate.

Lightweight structural concrete slabs with floor coverings have been placed together successfully for years. As we all learn about our respective products and services, the standards we place on ourselves start to become more inhibitive than productive. If contractors, designers, concrete suppliers, floor covering suppliers, etc. all work together to communicate their individual needs to each other before construction, many of these time restraining problems will simply disappear.

References:

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