Concrete Floors in Existing Industrial Buildings...

ASSET OR LIABILITY?©

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The decision to purchase or lease an existing industrial building is often motivated by time. The building is needed now, or perhaps yesterday. A check-off list is developed and the clock starts running. A building of the right square footage in the right location is identified. The layout is good, clear height okay, number of dock doors are okay, no sign of roof problems, electric service is adequate, etc., etc. But before you sign those papers, I suggest you take a good hard look at the main thing you are really buying or leasing . . . *the interior concrete floor.*

What is a Floor?

The floor of an industrial building is, in actuality, your company's work surface; and in a sense is not unlike your desk is to you. If the surface of either is smooth and interruption-free, productivity is enhanced. If the surface is rough, weakened, or marred by cracks or joints, productivity suffers. Buying a facility without carefully evaluating the floor is like buying a desk without looking under the desk pad.

Years ago it could be said that "a floor is a floor." This is no longer true. In the past twenty years, material handling vehicles (MHVs) have become more sophisticated, faster, and able to carry heavier loads. Vehicles may be controlled by computer or wire guidance systems. MHVs, SKUs, bar codes, computer designed rack layout, and operator certification are all part of a system. The concrete floor must be viewed as an integral part of that system if optimum productivity, and thus profit, are to be realized.

Floor-Effects

How can a poor quality floor affect normal industrial operations? If we define a poor quality floor as one that has open cracks, broken joint edges, and surface delamination, the effects can include:

- *Vibratory damage to vehicle parts and connections*
- *Accelerated wheel wear and replacement*
- *Downtime to replace worn wheels*
- *Operator slowdowns for defects*
- *Detours to avoid paths with defects*
- *Increased housekeeping costs*
- *Load tipping if defects are severe*
- *Reduced employee morale*
- *USDA/FDA/OSHA citations*
- *Downtime for eventual repairs*

Your company cannot afford a bad floor because a bad floor affects the *bottom line* of your operations. It simply makes sense to purchase or lease a facility that has a better floor. At the very least, it is wise to be aware of the deficiencies in the subject floor; know how much they will cost to correct; and correct them before you take occupancy (or before you renew your lease).

A Case History

Let's take as an example a recent tilt-up project I became involved in on behalf of one of our corporate clients. The building was a new building near Los Angeles, 125,000 square feet in size, and the lease terms were very favorable to our client. The floor looked fine, but this owner had been stung on a previously leased distribution center and asked me to perform an "informal" inspection. From the doorway the floor looked good, but as I walked through I

Deteriorated Floors Drain Productivity from Operations and Increase Material Handling Vehicle Maintenance Costs

noticed the construction joints were averaging 3/8" wide with some occasionally reaching 1/2". I also kept encountering joints where one side of the joint was just slightly higher than the opposite side. That slight difference in height may not mean much to most people but it can mean a lot of trouble to an MHV and its operator. The column diamonds were 1/4" to 1/2" below the floor level, appearing to have settled. I concluded that the slab was suffering severe *"curl"* and excessive shrinkage. The question was how serious were the conditions.

Slab Edge Curl

It can safely be said that all concrete curls and all concrete shrinks. What counts is the degree of each.

Slabs are exposed to the air only on top and, thus, dry out faster on top. As with common mud that dries out, the edges curl upward and slightly backward. If the curl is minor, it will have no effect on the durability of the floor. If the curl is severe, it can mean that one slab segment ends up higher than the adjacent one. It can also result in the bottom of the slab lifting up and off the subgrade, thus being in a cantilevered position. Too much of a load and this suspended section will break off.

Edge curl is most commonly found at pour ends (construction joints) and especially at corners; thus, the apparently settled column diamond had not really settled. The slab end had, in fact, curled and risen. In the case of the subject floor there was also evidence of considerable curl at the intermediate saw-cut control joints. This was not a good sign. Curl is a result of significant early moisture loss and moisture loss is usually not that great at joints between pour ends.

Slab Shrinkage is Normal

Shrinkage of the mass of a slab is always expected since all concrete mixes contain excess water for workability. This water should evaporate slowly over a period of one to two years. Shrinkage occurs as moisture is lost. A general rule for a "reasonable" mix is that a 5" to 6" slab will shrink 1/8" in 20 feet. This means a construction joint that was originally poured tight might reasonably be expected to open to 1/8", perhaps to 3/16".

The construction joints in this slab were 3/8" to 1/2" wide, double what one would normally expect. In addition, the 1/8" diamond blade-cut control joints halfway between the construction joints also opened and now averaged 1/4" plus. My initial guess was that the mix either contained too much water or an additive was overused. It turned out both were good guesses.

Joints and Load-Transfer

One desirable effect of any joint is to have load-transfer. In other words, we want the entire floor to act in unison under traffic despite the fact we pour it in sections and further divide it by cutting or forming control joints. (Control joints direct the expected shrinkage cracks in straight lines.)

Ideally, as an MHV crosses a joint, the two slab segments should work together. If one segment deflects under load while the other stays high, edge damage occurs due to hard-wheel impact. Load transfer is usually accomplished by design (dowels at construction joints) or by aggregate interlock.

The inspected slab had no dowels at the construction joints and the sawn control joints had opened too wide to have any effective aggregate interlock. The result was that each 14' × 14' slab section moved independently. To verify this we borrowed a half-loaded MHV from a company across the street. The vehicle confirmed my fears. Each floor panel deflected as the vehicle crossed the joints.

Cure for Lack of Load-Transfer

There are few cures for slabs with no load transfer, and none of the cures are inexpensive or guaranteed successful. We opted to explore a low-to-middle cost procedure which included:

1. Pressure-grout under each joint to reduce the up-down movement
2. Fill the joints full depth with a non-structural, semi-rigid epoxy
3. Grind the worst curled joints down to an acceptable level
4. Apply a liquid hardener to the edges where grinding was performed.

We solicited bids from two local contractors with whose work I was familiar. The bids came in at $53,000 and $59,000. The owner/developer refused to pay for the corrections and my client wisely backed off from the deal. He promptly found another facility nearby with a durable floor. The facility with the problems? I hope you didn't lease or buy it. If you did, your operations people will soon know they have a big problem on their hands.

All Floors Are Not Equal

All floors are obviously not created equal and it is not at all difficult to get stuck with one that can be a long-term headache. How can you avoid getting stuck? There is no sure, 100% way to avoid problem floors, but you can minimize your risks.

First, learn about floors through books or seminars; bring in your corporate engineers or retain a floor consultant before you structure the deal.

Second, be aware that many existing facilities are built by non-contractors who hire second-rate contractors with only a low bid as their qualifications. I don't mean that to be a slap at developers, but it can be the case, especially with "spec" buildings.

Third, be cautious in areas where floor construction is known to be marginal. Other corporate real estate professionals can prove to be helpful in this subject

Red Flags

There are far too many warning signs to list in this brief article, but the following is a sampling of red flags (along with those cited in my case history):

1. ***Broken corners.***
   When the corners of slab sections have broken off, it can be a sign of severe edge curl.

2. ***Delamination.***
   Be very cautious if you find shallow pieces of the surface coming off. It can mean that the entire surface is weak due to improper finishing.

3. ***Replaced concrete.***
   If various areas have already been replaced, it is probably due to deficiencies that are prevalent throughout the building.

4. ***Metal joints.***
   Construction joints are sometimes formed with left-in-place metal keyways. These joints almost always deteriorate with hard-wheeled traffic and the metal "chews up" wheels.

Conclusion

There is a direct relationship between the quality of an industrial floor and the profit of the operations that function on it. Consider the quality of the floor on all future industrial real estate decisions. Do not forget to evaluate the floors in your presently leased facilities that are up for renewal. (Ask your MHV operators if there are significant floor defects–they'll know.)

Don't let your floors cost you money...let them help your company make money!

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