When Good Floors Go Bad

White Paper Series



PRIME RESINS

Developed by:
Michael Vargo
Prime Resins, Inc.
2291 Plunkett Road
Conyers, GA 30012-3433
www.primeresins.com

When Good Floors Go Bad

All buildings have them and we rely heavily on them, yet most floors are neglected. Your company could be paying the price for it.

There are two types of floors — those that are conducive to productivity and profitability and those that are productivity black holes. The first type helps make you money, while the second steals from you in ways you may have never considered.

Impact on Productivity and Liability

Warehouse floors come in many shapes and sizes: Large, small, heavy duty or regular, polished or coated, super flat or sloped to drain. No matter the type of floor, they all can have the same common problems.

Random cracks, bad joints, curled edges (thumping joints), spalls (missing concrete), delaminations (overlays), and moisture problems can and do occur on older floors as well as many that have been newly constructed.

All these problems cost you valuable time and money. Many people never consider what bad floors are costing them in lost productivity and related costs. It is those "related costs" that are often overlooked and under-valued. Those costs could include major liability if floors present trip and fall hazards for employees or customers.

Most warehouse facilities run a fleet of electric, hard wheeled forklifts. These lifts do not have a suspension system to absorb the shaking, rattling, jarring, thumping, and other forms of abuse that bad floors can deliver to them. All have expensive electronic components and batteries that can cost thousands of dollars to replace. Main drive and outrigger tires are replaced long before they wear out due to damage. Forklift batteries are expensive; constant jarring knocks the paste off the plates, causing them to short out prematurely. Forklift operator fatigue also becomes an issue when the jarring and bouncing begins to affect a driver's productivity. In one facility, a worker on a double pallet electric walkie/rider pallet jack was thrown coming around a corner and broke her wrist because of a bad floor joint. This incident resulted in a worker's compensation claim and a reduction in productivity due to this reportable lost time injury.

Figuring out whether or not a floor problem exists can be easily done by analyzing forklift maintenance expenses. How many batteries and tires were purchased last year? What was the average age of any replaced parts? Were parts replaced due to wear or damage? Often a piece of equipment will be off the floor for days while being repaired, awaiting the arrival of parts and leading to more lost productivity.

While these increased maintenance costs may affect different departmental budgets, the impact is reflected on the company's bottom line. The solution is to fix the problem at its source, allowing everybody to win. Fleet and maintenance costs, operator fatigue, longer cycle times, injury claims, and reduced building value can all impact a company's productivity and bottom line. Prime Resins can help facilities increase productivity and reduce liability by providing the materials, tools, and expertise needed to fix the problem at its source – the floors.

Common Issues

Slab Curl: As concrete cures, moisture is lost from the concrete mix. The surface can cure faster than the middle and bottom of the slab. As the water dissipates, the concrete on the top of the slab contracts, creating surface tension. This tension causes the ends of the slab section at the joint to pull up or curl, creating a void between the concrete slab and the soil below. As the forklift drives across the floor, the weight causes the slab to deflect, allowing the tire to hit the joint face of the adjacent slab panel. Over time the joint edges deteriorate. Slab curl must be addressed first before repairing the joints. This step is often overlooked and just more joint sealant is placed in the joint. This will fail because joint sealants are designed for movement in expansion and contraction (joints opening and closing) not in shear (up and down movement). If you have rocking slabs, they must be stabilized first or you are just wasting time and money.

Solution – The first step is inspection and sounding to locate and map voids. Once done, the map can be used as a guide for areas to be treated. A scale of one to three can be used to prioritize different areas based on budget limitations.

Injection of a high strength, high density polyurethane foam (Prime Flex 985 LX10 or LX20) is used to stabilize the slabs and prevent rocking. This process can be done even when the facility is in operation or after hours. Typically holes are drilled through the floor to inject the resin. The resin reacts to create a dense foam to fill the void and support the slab. The floor can be opened to traffic as soon as 45 minutes after the injection process is done. This eliminates long-term aisle closures waiting for the repair to cure. Once the slabs are stabilized the top of the slabs may need to be ground flush with each other so the slabs are the same elevation across the joint to provide a smooth transition from one slab to the other. This is not due to the stabilization process but the difference in the amount of curl from slab to slab surface.

If joint edge deterioration (spalling) has occurred, then rebuilding/repairing of joint nosing must be done prior to filling the joints with a semi rigid epoxy or polyurea joint filler. The repair of joint nosing should be done with an epoxy or polyurea material for long-term durability.

Control Joints: In order to control the location of cracks in the slab due to curing, control joints are used. Control joints are cut in the slab at predetermined locations to weaken the slab, allowing the concrete to crack from the bottom of the control cut to the bottom of the slab. Control joints need to be cut at the right time and to the right depth. Generally they are cut one-fourth the slab thickness. In most new facilities the joints are not filled right away. It is best to wait as long as possible to allow concrete shrinkage to occur. Concrete can shrink as much a 1/8” in 20 feet during cure and into the first year. Waiting as long in the first year as you can will reduce joint material stress.

Solution: Joints should be filled with a polyurea joint filler (Joint Shield 5500). For new construction an epoxy filler will perform better in green floors—new slabs less than one year old. After a year, epoxy or polyurea will perform well. Polyurea-based resins are affected by moisture during installation, and in green concrete can cause bonding issues. Polyureas are faster to set up and are used when minimal down time is required. They are also used for cooler and freezer applications due to the temperatures.

Joint fillers typically have relatively low bond strength. This is by design so as not to weld the joint together. If too much joint movement is encountered, the filler will lose bond before causing the concrete to crack. All joints should be saw cut and cleaned prior to filling to ensure a clean, bondable concrete sidewall surface.
Joints should be free of any dust, dirt, and debris when filling. Joints should also be over filled and then shaved or ground flush with concrete. The goal is to have a totally smooth transition from one slab to the next.

Random Cracks: Random cracks in a floor can occur for a variety of reasons: control joints not cut soon or deep enough, excess shrinkage, overloading, or sub-base problems allowing slab deflection.

Solution: Typically these random cracks are filled by a rout and seal method or filled by gravity feeding with epoxy resin (Prime Rez 1100 or 1200) for structural bonding. The material can be the same semi rigid material used in the control joint.

Spalls: Spalls, pop outs, voids, and chips are common in older floors due to abuse, normal wear and tear, equipment movement, or machinery anchor bolt removal. Unprotected joint edges can also be spalled back.

Solution: These can be repaired using an epoxy or polyurethane-based resin. For small repairs (1 inch x 1 inch), filling with a neat epoxy (Prime Bond 3000 series) or a fast setting polyurethane (Floor Fix) resin will be okay. For larger areas use a mortar made from any of these resins mixed with an oven dried sand. The amount of sand to add can vary, but is generally from two to five parts sand by volume to mixed resin. When using a mortar, make sure to "prime" the area to receive the mortar first with just the mixed resin (no sand). For spall repair it is important to have a vertical edge along the perimeter of the spall—do not featheredge the repair material—and surrounding concrete should be in good shape. Saw cutting or grinding may be necessary to accomplish this step. There are several manufacturers offering dry dustless equipment for these applications. The spall must be clean and free of any dust, debris, and water. Fill the spall with mortar and allow to cure. Unlike concrete the repair mortar does not need to be worked after placing: Mix, fill, level, and leave it alone to harden. Consult product data sheet for cure times of the product you are using.

Delaminations: Some floors have an overlay applied to them. These can vary in makeup and thickness, but are generally one and a half to three inches thick. Sometimes these overlays will become unbonded (delaminated) and sound hollow and begin to crack.

Solution: Removal and replacement is very expensive, time consuming, and disruptive to the facility. Most commonly these can be repaired by epoxy injection (Prime Rez 1100 or Prime Rez 1200). In extreme cases or highly abused floors, pinning is done in conjunction with epoxy injection. Holes are drilled through the overlay and into the slab and a high strength, low viscosity resin is injected into the delaminated area to rebond the overlay back in place. When pinning is done, the process will include drilling deeper into the existing slab and inserting steel or composite pins in to help hold and provide additional shear capacity.

Chemical spill protection – Primary and secondary containment: In many manufacturing and warehousing facilities chemicals are used or stored. At times these chemicals spill on to the floor thus damaging the concrete or potentially leaching thru the slab, cracks, or joints in to the subsoil. Another common area needing protection are the forklift battery charging areas. (charging station and battery storage areas.
A high chemical resistance coating such as Prime Coat 4300 Novolac (in conjunction with HydroLock Primer) can be used to protect the area. The Prime Coat 4300 can be used for primary and secondary applications. A list of chemical and concentrations will need to be supplied to check for resistance levels / exposure limitations and follow proper surface preparation especially if slab is contaminated from previous spills.

Conclusion: Improving Productivity and Liability: When looking for productivity improvements and reductions in liability, the answer may be right under your feet. Prime Resins, Inc. is a leading manufacturer of polyurethane grouts and epoxies used for infrastructure repair and restoration. For nearly 40 years, Prime Resins has helped contractors, municipalities, facility owners, and utility companies achieve the best long-term repair value. Our superior product performance and the industry's best technical support—available 24/7—provide unparalleled value. For more information about floor repair techniques, visit www.primeresins.com or call 800-321-7212.