

Industrial Concrete Floor Joint and Surface Condition Monitoring and Maintenance

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Because your industrial floor is literally the “work surface” upon which your entire operation depends, obtaining and maintaining a durable and serviceable concrete floor is critical to ensure long term productivity. Unlike many building components, an industrial concrete floor is a living, breathing entity. Floors can experience dynamic changes throughout their service life, but especially during the first few years after placement. Changes in temperature, humidity, material handling vehicles/loading and many other factors can all impact the floor and increase the need to perform preventative maintenance to floor joints or surface. This outline is intended to provide a basic overview of the most common floor and floor joint deterioration conditions which should be continually monitored by your operations team.



As with any building component, industrial floor joint filler may require periodic maintenance to ensure optimal performance. Joint edge damage (spalling) can result from lack of attention and proper maintenance.

Industrial Floor Joints

Saw cut and formed joints in an industrial concrete floor create interruptions in an otherwise seamless surface. If not properly treated and maintained, floor joints become impact points along the floor surface and deterioration of joint edges (spalling) will likely occur under even nominal material handling vehicle traffic. In addition to causing potential floor deterioration, open or poorly maintained joints can also present problems for proper sanitation and can harbor bacteria, insects, etc. Add to these factors the potential vibratory and wheel damage to the material handling vehicles crossing deteriorated joints and it's understandable why floor joints are typically reported as the most troublesome floor maintenance issue facility owners face in a majority of the facilities we inspect.

Potential Floor Joint Maintenance/Repair Issues

To follow is a list of the most likely maintenance and repair issues a facility owner is likely to face within the first few years after industrial floor construction.

Most Common Maintenance Issue(s): *Joint Filler Separation*

Issues which typically require repair: *Joint Filler Collapse / Concave Profile*
Slab Edge Curl (elevation differences across joint)
Joint Edge Spalling (multiple causes)

Recommended Monitoring Schedule: *Monthly in unregulated temperature areas*
Quarterly for temperature regulated areas

Most Common Location for Joint Problems: *Near dock areas, doors; at construction joints*

Joint Filler Separation

All concrete shrinks, and your concrete floor will not be the exception. In order to make a concrete mix “workable” it is necessary to add more water than is truly needed to effect the chemical reaction. The excess water later leaves the slab through evaporation, leading to a reduction in slab mass. Slab mass changes affect joint dimension, resulting in contraction (opening) activity at both contraction (saw cut) and construction (formed) joints. Because semi-rigid floor joint fillers used to fill these joints have minimal movement capability (they are structural “fillers” rather than sealants) it’s likely that they will tear either internally or along the edge of the joint, leaving an exposed void. Owners should monitor joint activity periodically, looking for evidence of the following:

- Separation voids opening between joint filler material and joint edge on one or both sides of joint edge.
- Separation voids or “tears” within the joint filler material itself

Separation voids will generally first be seen as dark hairlines within material or along joint edges. Voids are usually not a concern to the structural integrity of the filler and its ability to protect unless they open to a width of 1/32” (credit card width) or greater. Even when voids do occur to this extent, potential exposure to joint edge damage will be dependent largely on the location and pattern of the voids. Internal separation (tears within filler) require less maintenance as they do not lead to joint edge exposure. Separation voids which jump back and forth across the joint or occur dominantly along one edge may require refilling if they exceed credit card or if there is evidence of joint edge deterioration/breakdown occurring at void locations.

If evidence of edge deterioration is present, voids should be cleaned and filled with a semi-rigid polyurea filler. Voids showing no evidence of compromising joint edge integrity should be monitored monthly to determine overall activity over a period of time. If voids remain at consistent width over the period of 6 months, refilling activity can be considered. But it is more likely that void dimension will open and close seasonally to some degree. If no signs of joint edge deterioration are present sanitation issues are not a concern filler separation voids generally will not require maintenance. If either concern is present, refill the voids.



Separation Void at Credit Card Width 1/32” + Maintenance Suggested



Early, Minor Separation Void – No maintenance generally required

Joint Filler Collapse

Sections of joint filler which experience complete adhesion loss in the presence of substantial joint dimension opening can be “punched down” below the joint edge, exposing edges to impact. This would normally only occur in the presence of extreme joint opening (i.e. joint opens wide enough for filler to be driven below base of saw cut) or if there were underlying deficiencies in the original filler installation (i.e. shallow joint filler depth, placement over compressible foam rods or debris, inadequate joint preparation/cleaning, etc). Procedures for repairing depressed filler can be found under Concave/Low Filler Profile in M/M’s Guide to Basic Floor Repair.

Joints exhibiting truly depressed filler should be easily identifiable as joint edge deterioration will likely be noted in any area where the filler has dropped in profile, substantially exposing joint edges to impact/damage. If facility

Joint Filler Collapse (continued)

witnesses this condition occurring it is important to explore joint repair options sooner than later to avoid further deterioration and higher costs.

Typical repair of joints exhibiting filler collapse involves removing existing filler, re-chasing or saw cutting joint to establish clean, structurally sound edges, and refilling the joint with a semi-rigid epoxy (ambient temperatures) or semi-rigid polyurea (freezer/cooler rooms or for faster access). If deteriorated joint width exceeds 1 ½” (38 mm) structural rebuilding of concrete edges may be desirable for optimal long term durability.



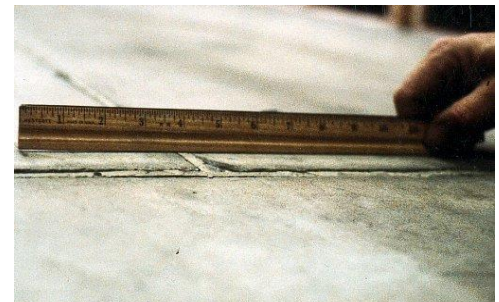
Right: Example of filler collapse in joint experiencing substantial opening...

Slab Edge Curl

Joint edge curling is readily identifiable by a difference in joint edge elevation across any given joint. Slab edge curl is inevitable to some degree on virtually every industrial floor. While the causes of curl are many and still the source of much disagreement within the industry, in very basic terms edge curl occurs as a result of slab panel edges or ends drying faster than the center of the slab panel, leading to a curling or warping effect similar to the behavior exhibited by a wet sponge left to dry out.

Depending upon the degree of curl, it may not present any problem at all or it may be a condition requiring corrective action. Slab edge curl warranting assessment and potential corrective action should be evident as the joint edge will begin to exhibit spalling/deterioration under material handling vehicle traffic (the higher joint edge being impacted and chipped away). In our experience, generally this condition is identified shortly after the floor is placed and is not as likely to occur in areas where it was not previously identified within the first 6 months in the life of the floor. If slab curl condition is present to the degree that it is impacting material handling operations, leading to joint deterioration, or if panels show evidence of “rocking” as vehicles cross the joint, it is important to bring in an engineer, consultant or trusted industrial floor resource to determine potential need for correction and the best long term correction options.

Corrective procedures for this condition would not normally be performed by in-house maintenance staff and vary depending upon conditions and degree of curl and thus will not be addressed within this article.



Right: Example of slab edge curl...

Joint Edge Spalling

Facility owners should always be on the lookout for any sign of floor joint deterioration and should seek outside assistance if the cause of the joint edge deterioration can not be readily identified as resulting from one of the above noted conditions or if unusual conditions are noted. While most joint edge spalling conditions occur as a result of one of the above conditions (with un-maintained separation voids likely the leading cause), spalling can also occur as a result of certain material handling operations behavior (i.e. dragging or pushing of pallets, not lifting forks when crossing joints, dropping pallets or other floor impact behaviors, etc). Spalling resulting from material handling operations can generally be identified by either its randomness (i.e. isolated chip or spall where a fork impacted a joint edge or where a nail or other hard object was dragged under a wheel) or by its consistency in one general location where a problematic operational behavior has been identified or suspected (i.e. Bob drags his pallets and is in charge of loading at door 8...all the joints at door 8 show spalling but joints elsewhere look fine).

It's not possible to comprehensively address every potential joint spalling condition and cause that a facility owner might encounter, but virtually all conditions can be caught and corrected before substantial damage occurs.

Industrial Floor Surface Conditions

There are too many potential surface deterioration conditions to properly address in this outline, and surface deterioration issues are far less likely to occur (at least to the degree in which they require maintenance or adversely affect material handling vehicle operations) than deterioration at joint edges, as the floor surface presents no inherent impact points. Additionally, the floor surface is not normally expected to undergo substantial changes outside of those caused by material handling operations and housekeeping practices.

Most Common Maintenance Issue(s): Gouges, excessive surface wear

Recommended Monitoring Schedule: Monthly throughout facility

Most Common Location for Separation to Occur: Main traffic aisles

Potential surface deterioration issues should be readily identifiable visually, the most likely being scratches, gouges, etc. A vast majority of surface defects result from abuse directly related to material handling vehicles and material handling practices. Scratches and gouges often result from inadequate cleaning of the floor and the subsequent friction resulting from debris, wood slivers from pallets, nails, etc being dragged under the wheel of a material handling vehicle across the floor. Improper driver material handling practices such as pallet dragging, pallet pushing, driving with forks dropped, dropping loads too quickly, etc. are all the most likely contributors and causes to any floor surface defects which might become visible. If signs of substantial or abusive surface wear, our recommended first step is to work with the material handling vehicle operators to identify the practices leading to the deterioration and work to change the practices suspected as the most likely cause.

Some degree of general surface "wear" is inevitable, as no housekeeping or operational practices are perfect. But general surface wear should not negatively impact vehicles.

We recommend that the criteria for identifying surface issues that require correction might be set as follows:

- Signs of spalling, chipping or other deterioration
- Signs or evidence of dusting or gradual erosion of surface
- Any defect/deterioration areas where impact can be felt by MHV operators
- Areas exhibiting wear/damage that appears to be unusual or develops/changes rapidly



Above: Photo to left shows joint spalling and gouges possibly resulting from dragging of hard objects. Photo in middle shows excessive wheel wear, generally a result of poor floor maintenance and cleaning procedures or floor surface defects impacting wheel. Photo at right shows dusting, generally a result of original finishing practices or excessive surface wear.

We hope that these basic guidelines will provide a starting point for identifying potential maintenance and repair issues affecting your facility floor. As with the rest of your facility, effectively monitoring and addressing potential problems on your floor and correcting them early provides the best opportunity for long term cost savings and helps to ensure a productive and trouble-free service life.

For more information and articles on industrial concrete floor maintenance and repair, please call or visit our website: