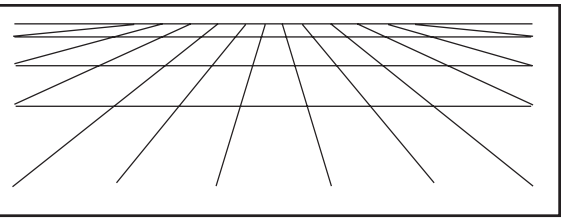
JOINTS...
The Key to Floor Durability



This article was written to help the reader understand the critical function joints play in determining the long-term durability of a conventional industrial floor. To achieve this objective, it is necessary to change your perception of what floors are, what joints are, and why floors and joints should always be considered together.

SLABS + JOINTS = SYSTEM

The floor in a typical industrial building is not "a" floor at all. In actuality, it is "many" floors. Consider a 90,000 square foot floor: construction joints at 30', intermediate joints at 15'; making 15' x 15' grids. Each joint, by formed edge or induced crack, creates a break in the floor. Thus, there are really 400 separate slabs, divided by ***and*** linked by joints. Ideally these 400 slabs will work in unison as if they were one floor. Joint design and construction alone will determine this.

Joints do more than just break a floor into smaller masses. They also create interruptions in the wearing surface. Since a material-handling vehicle cannot cross the slab without crossing over joints, joints are also transition points. You cannot, therefore, treat floors and joints as separate items. Joints must be considered as an integral part of the "floor system".

FUNCTION DETERMINES JOINT DESIGN

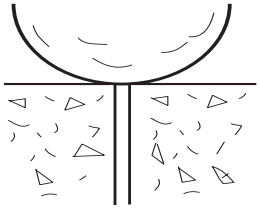
The function of an industrial floor is to serve as a work platform, supporting the movement of material handling vehicles carrying raw materials or merchandise. Floors that are smooth and interruption-free allow optimum movement and productivity. Joints serve several functions within floors: they are the ends of pours; they induce shrinkage cracks to follow straight lines; they allow for seasonal slab expansion/contraction; and they provide the linkage between smaller slab segments. To accommodate all these functions, joint design must incorporate the four following principles:

1. *Narrowness*
2. *Plumbness*
3. *Load Transfer*
4. *Protectability*

Narrowness

Narrowness is a common sense issue. Narrow joints offer less exposure to hard wheels than wider joints. Narrow joints cost less to protect, depending on the joint design. Accordingly, we are advocates of 1/8" diamond blade cuts, or the use of early-cut saws such as the SOFF CUT®. We are strongly against insert plastic channel inserts which create wide joints.

When considering joint width, consider that the joint will never again be as narrow as the day you create it. This is due to concrete shrinkage. As a rule, most concrete shrinks 1/8" in 20'. How wide a joint ends up will depend on its original width, the mix design, and joint spacing.



Joints should be kept as narrow as possible

Plumbness

Any joint created out-of-plumb is a potential problem. If the angle is significant, it creates an overhang condition that will soon be broken off by heavy loads. We oppose the use of insert-type control joints for this reason. All too often the inserts end up angled due to difficulty in the insertion of a thin strip into aggregate-loaded concrete (and displacement during subsequent finishing operations). We advocate saw cutting control joints which results in joints are plumb.

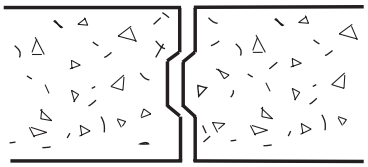
Load Transfer

Earlier we stated that the best floor is one where all the small slab segments work together as if one. We are primarily addressing the effects of heavy loads crossing joints. If one slab segment drops under load, the edge of the opposite segment is exposed to wheel impact. Ideally, adjacent segments should work together and support each other. This support, or linkage, is called load transfer.

CONSTRUCTION JOINTS

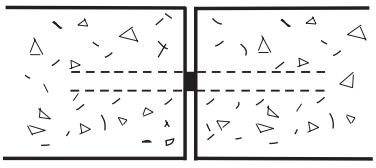
Construction joints create a total separation between slab segments, and thus each segment may move independently unless we provide a form of linkage for load-transfer purposes. For years, the keyed joint was a common means of load transfer. But keys usually prove ineffective once the joint opens (due to normal shrinkage) or the slab edges curl upward. When either of these common phenomena occur, one or both slab panels may deflect under load and shear off the key, eliminating any load-transfer.

The best assurance of positive load transfer at construction joints is the use of dowels.



Keyed Joint

Dowels with proper thickness, length, spacing, alignment, and installation provide the necessary linkage between slab segments. They are best used in conjunction with flat bulkhead forms since alignment is easier.

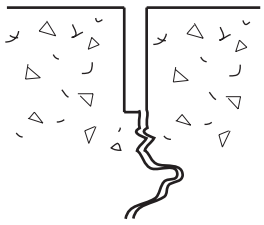


Doweled Butt Joint

JOINTS...The Key to Floor Durability

CONTROL JOINTS

The purpose of a control (contraction) joint is to guide the expected shrinkage crack in a straight line by weakening the slab on that predetermined line. A saw cut is the most common type of control joint. Below the joint a crack will form, winding its way around the large aggregate. This is called *aggregate interlock*, and it is a form of load transfer. Aggregate interlock can be an effective means of load transfer if we take proper precautions. For example, we need to keep the joint from opening too wide. This can be accomplished by using smaller joint spacing (15' centers instead of 20') and minimizing shrinkage with a leaner concrete mix. Larger aggregate also enhances aggregate-interlock capabilities.



Saw Cut
Control Joint

We stated earlier that a rule of thumb is that conventional concrete may shrink at a rate of 1/8" in 20'. Thus, for heavy duty floors, the use of smooth dowels should be considered to ensure posltive load transfer.

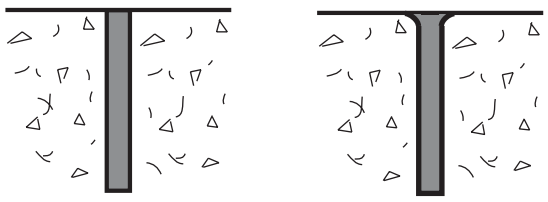
Protectability

A joint is an interruption in the floor surface, and is thus an impact point for hard wheels. Hard wheels will break off the edges of unprotected joints, a process called edge spalling. There is one single best method of preventing edge spalling–fill the joint to restore surface continuity.

To be effective the filler must support loads without deflecting, thus supporting the joint edge. A saw cut provides the most protectable joint since the filler is in full contact with the edge.

In the past tooled joints were common. But the major problem with tooled joints is that they expose the filler to probable deterioration. The filler flares out at the top and tapers to zero thickness at its outer point. When the joint opens, this thin filler web will be broken off by wheeled traffic. Once that occurs, concrete edge damage will quickly follow.

If a joint must be tooled as part of the finishing process, then we recommend coming back later and saw cutting the tooled joint. The cut should be as narrow as possible (1/8") and 1/2" to 1" deep depending on the anticipated traffic loads. Saw cutting creates both a reservoir for the filler and helps remove any weak joint edges.



Avoid tooled edges

JOINT FILLERS-THE CRITICAL EDGE

The joint filler used to fill your control and construction joints is truly the critical edge in providing and maintaining durable, efficient industrial floors. Having discussed proper joint design, one would think that filling is a relatively simple topic. Not so. But, it is a common sense topic. Much of our literature is dedicated to educating designers, owners and contractors on how to select the proper joint filler and how to ensure it is installed properly.

We strongly encourage you to investigate and educate yourself fully on joint filling issues through our literature and contact us anytime you have questions or concerns regarding joint filler selection or installation issues.

Additional Technical Publications Available from Metzger/McGuire

- **Joint Filler Tech Series**

  A series of comprehensive technical sheets covering all aspects of joint filler properties and installation;

  T2 The Concept of Industrial Floor Joint Fillers
  T3 How to Specify Industrial Floor Joint Fillers
  T4 Filling Joints in Treated or Covered Floors
  T5 Joint Filler Separation; Causes, Corrections
  T6 Typical Questions About Floor Joint Fillers
  T7 Preventing / Detecting Deficient Joint Filler Installations
  T8 Freezer and Cooler Joint Filler Installations

- **The Myth of Flexible Fillers**

  Industrial floor joint fillers are sometimes sold on the basis that they can accommodate extreme movement and adequately deflect load. This article examines the balance between movement and load deflection and debunks the myths about products that claim to achieve both.

- **Concrete Floors...Path to Productivity**

  Your concrete floor is your primary work surface. Defects in your floor are costing you big $$$ in lower productivity and greater expenses in vehicle maintenance and repair. See how much a defect really costs.

- **Cracks and Deteriorated Joints**

  Why did your last floor crack so much? Why did your joint edges deteriorate to the point that your vehicles are suffering excessive wear? Here are the causes, and how you can prevent them.

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