

Device Soothes Aching Floor Joints

Pep Boys uses mechanical cylinders to stabilize loose floor joints and extend the life of material handling equipment.

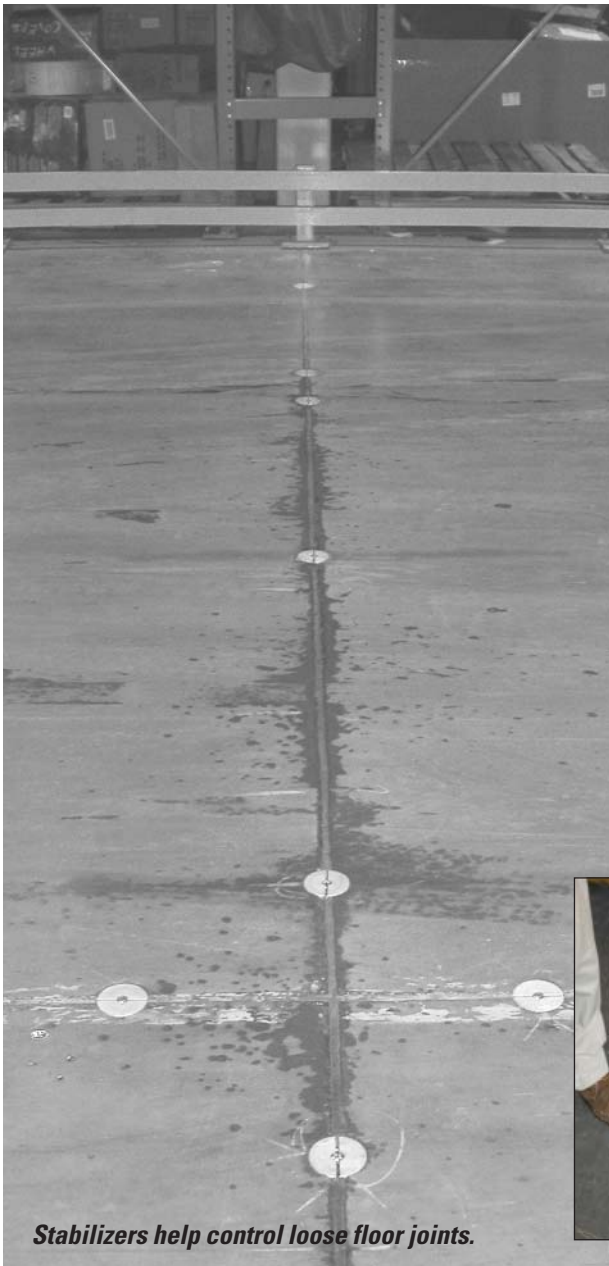
Industrial concrete floors develop many problems, from cracks to excessive wear. Most of these problems have been around for decades, and the remedies for them are well established. However, one defect is becoming more common—loose joints that shift when vehicles cross them. No standard way of dealing with this problem has been developed.

Loose joints lack the ability to transfer vertical loads. As a vehicle approaches the joint, the joint's near side deflects. Meanwhile, the far side deflects less or not at all. When the vehicle actually crosses the joint, the near side bounces back, and the far side deflects. This differential movement lies at the root of the problem, causing noise, joint edge deterioration, damage to tires and vehicles and failure of joint fillers.

Issues with loose joints are not new, but problems associated with them have worsened since the late 1980s. Before then, almost all industrial floors contained reinforcing steel that helped stabilize joints and cracks. Since then, many slabs have been built with no steel at all, except dowels at construction joints. These unreinforced slabs rely on aggregate interlock to transfer load across sawcut joints and cracks. It's a cheap, fast way to build a floor, but it carries a risk. You bet that aggregate interlock will keep working as the concrete shrinks and the joint widens. Sometimes you win that bet, and sometimes you don't.

Pep Boys, a Philadelphia-based retailer of car parts and supplies with more than 600 stores across the U.S., learned about the risk of loose joints in 1997. The floor was big, and so was the problem.

Measuring joint stability next to a newly installed stabilizer



Stabilizers help control loose floor joints.



The company had just moved into a new, 400,000-square foot distribution center in Chester, N.Y. The floor slabs were seven inches thick, with joints spaced 18 feet to eight inches by 20 feet to zero inches. The concrete—a normal, 4,000-psi mix—contained no reinforcement, except dowels at widely spaced construction joints. Most joints were sawcuts, relying on aggregate interlock to transfer load.

The problem appeared soon after Pep Boys began to use the building. First, lift truck drivers noticed bumps and knocking sounds as they crossed the joints. Then, joint edges began to chip, requiring patches that didn't last. Pep Boys looked for a solution.

Here, the plot thickens, because in 1999, no one had a reliable, affordable fix for loose joints. There were, of course, plenty of ideas. A consultant recommended filling the joints with semi-rigid material, but that didn't work. Other options included sub-slab grouting and retrofit dowels, but both came with severe drawbacks. Grouting would have been costly and might not have provided a lasting repair, especially with the big temperature swings the floor would experience. Retrofit dowels could have handled the thermal changes, having been proven in highway slabs. But, they were costly. And, either grouting or doweling would have disrupted operations, since both relied on chemical reactions that take hours.

Faced with those unattractive options, Pep Boys waited.

In 2004, Robert Costa approached Pep Boys with something new. Costa's invention, called a joint

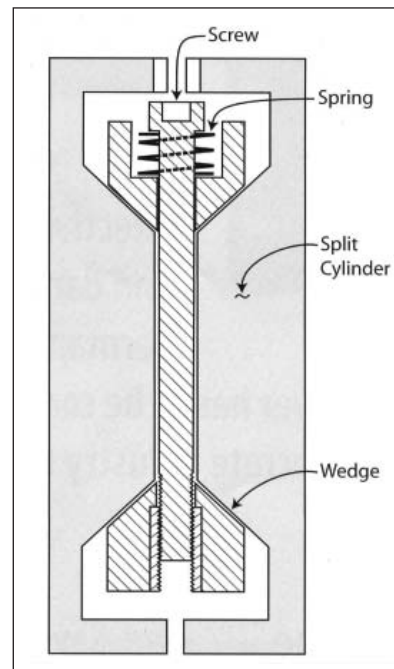
stabilizer, consisted of a seven-inch-long, three-inch-diameter aluminum cylinder, split lengthwise. The device fit into a drilled hole centered on the joint. A screw pushed the two halves apart, locking them into the hole with about 8,000 pounds of force. Springs maintained the clamping force if the joint opened wider, which could be caused by drying shrinkage or thermal contraction. Unlike grouting and doweling, Costa's stabilizer was purely mechanical, relying on no chemical reactions. That meant the floor could accept traffic right after repair.

In February 2005, Pep Boys agreed to try stabilizers at 10 loose joints. Archdale, N.C.-based Somero Matson Group, the U.S. distributor of Costa's stabilizers, supplied 120 devices. Four stabilizers were installed at every joint intersection and one every four feet between intersections, with a few more at cracks.

Costa used an inclinometer to measure movement under load, before and after repair. The before readings ranged from 0.003 of an inch to 0.050 of an inch, with a mean of 0.021 of an inch. The after readings were either 0.001 of an inch or 0.002 of an inch.

That was good news, but it did not prove the repairs would last. To check long-term performance, Costa monitored the repairs for two and a half years. Though the joints widened, the stabilizers remained tight, and the movement under load stayed small.

Heartened by the success of the trial but still facing a big problem with the rest of the floor, Pep Boys decided to repair all high-traffic lanes. Starting in February 2008, S&S Concrete Specialties, based in New Ipswich, N.H., installed 1,542



Schematic of joint stabilizer

additional stabilizers. The work was completed without a serious hitch, stabilizing all loose joints in the areas of greatest traffic.

Lee Williams, Pep Boys' facilities manager, reports the joint stabilizers "have significantly reduced the amount...we have to lay out for wheels and bearings on our lifts."

There is still no standard way to stabilize loose joints. But, thanks to Pep Boys' willingness to try a new device, facility managers faced with the problem now have another option. **MMH**

George Garber is a partner at Face Consultants, a firm specializing in the design, construction and operation of warehouse and industrial floors. For more information, call Somero Matson Group at 800-584-5553 or visit www.someromatsongroup.com.