TECHNICAL BULLETIN CP-14

JOINT FILLER ELONGATION, SEPARATION, AND REPAIR

EUCLID CHEMICAL

The ultimate tensile elongation of a material is the percentage increase in length that occurs before the material breaks under tension. Very rigid materials such as epoxy adhesives often exhibit elongation values under 5%, whereas a flexible polyurethane sealant has an elongation at break of over 300%.

The tensile elongation of semi-rigid joint fillers is a frequently specified property. Many engineers believe that the use of a high elongation filler will allow for early filling of joints in a new floor, and that the filler will "stretch" along with the joint as it opens due to slab shrinkage. This logic is incorrect. The tensile test illustrated at left measures the ability of the joint filler material to stretch along the length of the test specimen, but control joints in concrete floors do not elongate lengthwise, they widen laterally (side-to-side). The tensile elongation test does not represent actual control joint movement and the ability of the joint filler to move along with it. A typical polyurea joint filler with tensile elongation of 300% can expand laterally about 10% before it splits cohesively (within the filler itself) or adhesively (along the joint filler/concrete bond line). Similarly, an epoxy joint filler with 50% elongation will usually tolerate about 5-8% lateral expansion before splitting. Since shrinkage-related joint opening is often greater than what the joint filler can handle, early installation of joint fillers will almost certainly result in splitting or loss of adhesion.

ACI 302.1R, Concrete Floor and Slab Construction, states:

"Concrete slabs on ground continue to shrink for years; most shrinkage takes place within the first 4 years. The most significant shrinkage takes place within the first year, especially the first 90 days. It is advisable to defer joint filling and sealing as long as possible to minimize the effects of shrinkage-related joint opening on the filler or sealant. This is especially important where semi-rigid fillers are used in traffic-bearing joints; such fillers have minimal ability to elongate in the narrow direction. If the joint is filled before most of the shrinkage has occurred, separation should be expected between the joint edge and the joint filler or within the joint filler itself. These slight openings can subsequently be filled with a low viscosity filler recommended by the same manufacturer as the original filler. If construction traffic dictates that joints be filled early, provisions should be made that require the contractor to return at a pre-established date to complete the necessary work using the same manufacturer's products. Earlier filling will result in greater separation and will lead to the need for more substantial correction; this separation does not indicate a failure of the filler."

When floor joints open beyond the joint filler's capability to expand, they will separate adhesively along the bond line with the concrete, or cohesively within the joint filler itself. Semi-rigid epoxies will most often separate adhesively, and typically the separation alternates from side to side of the joint. Polyurea joint filler

also tend to separate adhesively, but usually on only one side of the joint in a continuous split. Minor joint filler separation (less than a credit card thickness) does not affect the filler's ability to transfer load and protect joint edges under traffic. However, if cracks in the filler are wide, or if joint edges show signs of spalling, in facilities where seamless floors and sanitary conditions are critical, or where the separation is aesthetically objectionable, the separation is often repaired at the discretion of the facility manager or owner. There are two methods for correcting joint filler separation voids. The easier option is to clean debris from all voids and fill voids with the same joint filler used initially or a low-viscosity epoxy adhesive. For a more durable repair, saw out the top ½ inch (12 mm) of joint filler with a concrete saw or crack chaser and refill with the same joint filler installed initially.