



Tech Corner

Nothing to Smile About: Avoiding the Misery of Smiley-Face Cracking

An unusual form of early cracking in the shape of a smile has appeared on several concrete paving projects across the country.

Because very little information on this uncontrolled cracking condition and its possible causes exists, alleviating and preventing the problem is a challenge.

However, all the projects share one similarity: the cracks occur starting from a transverse joint, near a longitudinal construction joint (typically starting within 1-3 feet of the slipformed edge). The crack curves inward toward the center the slab on each side of the transverse joint, as shown in Figure 1.

This type of cracking occurs when the transverse joints in the first concrete placement (the pour where the cracking occurs) do not all open up the same amount.



Figure 1: Upside-down smile
... Typical smiley-face cracking is shown at left. Illustration is from the driving lane looking toward shoulder.

Typically, only every third or fourth joint pops, opening up a fair amount to account for drying shrinkage and temperature differentials.

The wide open joints allow for mortar intrusion into the joint, which restricts the joint from closing up when temperature expansion occurs and thus causing the cracking. There are several causes of differential joint opening:

>> High friction bases (or instances where the concrete pavement bonds to a strong base) - lean concrete bases, cement-treated bases, or asphalt-treated bases, without a sufficient bondbreaker.

>> Thick concrete pavements with relatively short joint spacings - 15 feet is the typical maximum transverse joint spacing used for highways; 20-25 feet for airfields.

>> Adjacent pours occurring on different bases - dissimilar bases means different friction and/or bond.

>> Curved roadways which accentuate thermal expansion and contraction effects.

All of the joints eventually open the same amount given a few months to a year. However, construction schedules do not allow enough time for this to occur because adjacent placements or fill-in paving lanes sometimes need to occur within days of the first placement(s).

Inspect previous pours for evidence of differential joint opening before paving adjacent to them. If a project has differential joint openings, be sure to place a piece of duct tape along each joint (and the crack below it) to prevent any mortar from intruding into the wide joint. This simple step will ensure that nothing prevents the joints from closing up in the future, and it will minimize the potential for smiley-face cracking.

More questions about pavement cracks and cracking? Contact [Steve Waalkes](#) at 847-966-2272. To view or download back issues of Tech Corner, visit www.pavement.com.

Tech Corner is seen in ACPA's "On the Grade" and "Concrete Pavement Progress" newsletters.



American Concrete Pavement Association
ON THE GRADE



American Concrete Pavement Association
CONCRETE PAVEMENT PROGRESS