Eliminating "Expansion" Joints
Joints in Concrete Pavements: Part II of III
By Randall C. Riley, P.E.

Back in the June 2000 issue of HMA News, I wrote about the benefits of using joints in concrete pavements, particularly expansion joints, to control cracking and improve ride quality. It is important to note that expansion joints are not the same as contraction joints, which are used to accommodate thermal movement of the pavement. In this article, we will focus on the proper use of expansion joints.

In 1940, the U.S. Bureau of Public Roads (predecessor to Federal Highway Administration) conducted extensive tests of "expansion" joints. These tests found that "expansion" joints progressively deformed over the years, causing greater opening at joints with adjacent contraction joints. This leads to spalling, loss of aggregate interlock, and settlement failure. The conclusion of that study was that expansion joints are only needed when:

1. the pavement is divided into long panels (60 feet or more) without contraction joints in between.
2. the pavement is constructed while ambient conditions are below 60 degrees F.
3. the contraction joints are allowed to be infilled by large, non-removable materials.
4. the pavement is constructed of materials that are prone to high expansion characteristics. (Ref: Proper Use of Isolation and Expansion Joints in Concrete Pavements, American Concrete Pavement Association, 2000, Dubuque, IA.)

In parking lots and city streets in particular, our goal is to use aggregate interlock as much as possible, thereby eliminating the use and associated expense of joints and other embedded steel. To do so, we must carefully design and construct the pavements.

But there are places in concrete pavements where a joint should be constructed that resembles the classic expansion joint, i.e., it utilizes an expansion material and may or may not include dowels. These locations are where it is necessary to isolate the pavement from fixed structures, light standards, manholes and other items which stick up through the pavement. In this case, the term is "isolation," since they are referred to by pavement engineers as "isolation joints."

Isolating the pavement from these structures is necessary due to the fact that the structure usually penetrates below the frost line. The pavement is built above the frost line, and as the ground freezes, the pavement is raised from the expansion of frozen ground. The fixed structures, with foundations below the frost line, do not move.

For those of you with concrete driveways (you all have them, don't you?) you can see this phenomenon every winter as your driveway slabs move up and down relative to your garage entrance, particularly if you don't have a gravel layer under the concrete. Where the slabs are isolated from the fixed structures, cracking and possible failure of the pavement slab would occur.

More information on joints and jointing can be found in the publication "Guidelines for Joints in Concrete Pavements," which is available from the American Concrete Pavement Association.

Next time, joint spacing and the "reaction zone" concept in parking lot design.

About Randall C. Riley, P.E.
Riley is an Engineering Consultant for the Illinois Chapter - ACRA, Illinois Ready Mixed Concrete Association and the Great Lakes Concrete Promotion Association. He is actively involved in the day to day promotion of longlife quality concrete pavements. He can be reached at 217-773-4933 or...