Maryland Intersection

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This is one of a series of articles by Asphalt Institute Engineers promoting awareness that hot mix asphalt (HMA) can perform successfully in intersections and other high-stress applications.

Preconstruction Trial Run

By now the story of the Maryland Intersection is probably familiar to most readers. But it is still worth repeating. The Maryland Intersection has become the classic case history of how to achieve optimum performance in HMA intersections.

The results of the Maryland Intersection test sites are in, and hot mix asphalt won. Unlike the recent national election, the results were not close. The concrete portion of the intersection failed and was removed and replaced by a Superpave mix.

In 1994, the Maryland State Highway Administration (MDSHA) recognized that many of their major intersections were not performing as expected. They had experienced problems with both asphalt and concrete intersections. The concrete people said that all Maryland intersections would perform well if they were built with concrete, and the asphalt industry said they could produce an intersection that would perform as well or better than any concrete intersection.

Intersection Strategy at work

MDHSA decided to let both groups prove their stuff. They issued a "winner take all" challenge in 1995 to the HMA and Portland cement concrete (PCC) industries to produce a well-performing intersection pavement. They chose US 40 and Maryland Route 213. It was an intersection with a high average daily traffic (ADT) count and a high percentage of heavy truck traffic. MDSHA asked the PCC group to pave one side of the intersection and the asphalt group to pave the other side. The two industry groups were allowed to use the latest technology and were not restricted to current Maryland specifications. The HMA work was done in '94, and the concrete test-site was completed in '95.

Design Strategy

Here's how the HMA group produced the superior pavement. They followed what is now known as the *HMA Intersection Strategy*. It consists of the following points:

- Assessing the existing condition of the intersection or establishing the anticipated loading
- Ensuring structural adequacy

Smoothness Testing

Rut-depth testing

- Selecting materials, then properly designing and controlling mixtures
- Practicing proper construction techniques

If the intersection already exists, the first step in executing the strategy is to access the existing condition. It may be necessary to core or trench the site to determine the depth and degree of movement. Any failed or weakened layers must be removed and replaced. Then, the next step is to provide the structural capacity to meet traffic needs. For new pavements, the thickness design must account for normal factors such as subgrade strength, aggregate base thickness, and traffic volume.

Materials Selection

Careful consideration must be given to the selection of the materials used in an intersection pavement. The Superpave PG grading system lends itself very readily to binder selection. The PG system selects a binder based on its ability to perform in the climate in which it will serve. For slow moving or standing traffic, the PG system recommends increasing, or bumping, the high temperature grade by two levels. For example, if the climate calls for a PG 64-22, for a normal-speed application, then for an intersection pave-

After four years of traffic

Mix Design Process

The goal of the mix design process for intersection mixtures is to select and proportion binder and aggregate components to resist rutting and shoving. Well-designed Superpave or stone matrix asphalt (SMA) mixtures typically possess the type of structure necessary to withstand the forces at work on an intersection pavement. High visibility sites such as intersections are not a good place to experiment or gain experience. Select a mix design type or procedure that has a history of successful performance. If you are not familiar with SMA, don't do your first SMA job as an intersection pavement. Regardless of the design procedure utilized, the laboratory mixture selected should be rut-tested

Cracking in the PCC intersection panels

Continued...

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Removing the PCC portion of the intersection

by some type of performance-testing device.

Preconstruction trial runs of the selected mix to a site other than the intersection are necessary to identify any needed volumetric adjustments. The trial material can also be used to gain insight into the necessary rolling pattern.

Constructing the Intersection

Finally, constructing the intersection pavement by proper construction techniques is critical. The classic good-practices must be followed. These details include:

- Avoid the use of diesel fuel in truckbeds.
- Do not over-heat the mix.
- Thoroughly clean milled areas.
- Avoid segregation during production, transportation, and placement.
- Construct joints properly.
- Achieve target density.

Replacing the PCC portion of the intersection with Superpave

After applying the *Intersection Strategy,* the Maryland HMA intersection has performed extremely well. After six-plus years of service, the rut-depths are 1/16-inch or less. During the spring of 2000, cracking in the PCC panels increased until finally, in July 2000, after about five years of service, the MDSHA decided to remove the PCC portion of the intersection and replace it with Superpave.

Although the Maryland US 40 and MD 213 intersection may be the classic case, it is not unique. Similar performance of both asphalt and concrete is being observed at other sites. The Kentucky asphalt versus concrete intersection test site at US 27 and KY 80 in Somerset is producing a situation similar to the Maryland intersection. The HMA is performing well while the PCC is experiencing cracking and displacement.

No Shortcuts to Success

The secret to the successful performance of HMA intersections is no longer a secret. It is simply a matter of following the four steps in the *HMA Intersection Strategy*. No shortcuts are allowed. The planning, site-testing, structural design, materials selection, mix design, production control, and proper construction techniques must be carefully and completely executed. Each step must be successfully accomplished. It's not magic or rocket science. Constructing a successful HMA intersection is just a matter of following the directions.▲