

RESULTS OF SURVEY BY KENTUCKY DEPARTMENT OF HIGHWAYS, DIVISION OF MATERIALS
December 27, 2005

SUBJECT: EPOXY COATED DOWEL BARS USED IN PORTLAND CEMENT CONCRETE PAVEMENTS

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All 50 states, the District of Columbia, and Canada were surveyed. There were 33 responses. The following are the results of the questions posed and also the additional comments received.

1. Do you utilize epoxy coated smooth dowels in your concrete pavements? Y 26 N 7
2. Have you excavated smooth dowels from concrete pavements recently? Y 13 N 20
- 2.a). If yes, what condition were they in generally?
 - 7 GOOD
 - 20 NOT APPLICABLE
 - 5 CORRODING
 - 1 DO NOT KNOW
3. Have you experienced rusting problems with epoxy coated smooth dowels? Y 6 N 21
- 3.a) If yes, about how long were they in place and was the rusting cause for pavement joint failure?
SEE BELOW COMMENTS
4. Do you use smooth dowels that are not epoxy coated? Y 10 N 23
- 4.a) If yes, what coatings do you use and what percentage of your smooth dowels are coated with something other than epoxy?
SEE BELOW COMMENTS

COMMENTS RECEIVED FROM DOWEL BAR SURVEY

Alabama AASHTO M 254 for Type A or Type B coating.

California We are aware of other types of dowels as solid stainless steel, stainless steel clad, zinc coated carbon steel and fiberglass reinforced plastic, but currently we do not use them.

Canada/Ontario They were excavated early in the pavement life with little or no deterioration of the bar. Only where the epoxy coating has been damaged or removed.

Connecticut Our experience with dowel bars is that the assemblies (baskets) that hold them in place during concrete placement are never coated. The sheared ends of the dowel bars are also never coated. These factors make it difficult to make a case for the contractor to repair holidays in the dowel bar itself.

Georgia GDOT does allow the use of high density polyethylene coating for dowel bars, however, at this time no HDP coated bars have been used

Idaho We didn't investigate enough to say if we have rusting problem or not. We would like to use smooth dowels made by MMFX steel in future projects.

Iowa Only rust on uncoated ends, no joint failure. It seems problems with rusting are typically due to poorly adhered epoxy coating. Iowa State University has done research on bridge decks with epoxy coating placed in the 1970's and found minimal problems with the epoxy coating

Kentucky Several miles of I-265, south of Louisville KY, were reconstructed recently. The epoxy coated dowels in the excavated load transfer assemblies revealed severe loss of coating and considerable rusting. These dowels may have been in place for 20 years. It is unclear now how much effect this rust had on the transverse joints, but the pavement had been extensively patched over the years.

Louisiana We use Type A, the coating material develops sufficiently low bond strength with concrete that a bond breaker is not required, and the percentage of the smooth dowels which are coated with something other than epoxy is 100%.

Maine Please note that Maine DOT has not built any new concrete pavement since 1975. The responses below are for the rehabilitation project that we are currently doing on the 21 miles (four lane divided highway) and the original construction was done in 1975.

Maryland We do not place a lot of conventional concrete pavement so we do not have a large sample to judge from.

Michigan Zinc coated and microcomposite bars. small %. Pavement constructed in 1997 with 1 1/4" epoxy coated smooth bars in poor condition, section loss at joint. Stainless jacketed dowel bars in a 30 year old pavement with some corrosion along seam, generally in good condition. Patching was done this year on a 1997 JPCP with 15' joint spacing. The failures were mid panel cracks initiated from looseness at the joints. The pavement was warped at the joint edges and the concrete around the bars was crushed. Corrosion probably occurred as a result of movement at the joints damaging the epoxy coating.

Minnesota Some bars have rusted after only a few years in place as part of blow up repairs. Rusted bars are often seen in concrete rehabilitation projects. The concrete below the bars has typically also rotted away, so it is difficult to say that the bars are the sole cause of the joint failure. Minnesota has a high performance concrete pavement specification that includes the use of a high type dowel bar. Since about half of our concrete paving is in the Metro area, nearly one half of our dowels are required to meet this spec. Epoxy bars cost about \$7/bar: high type dowels cost \$14/bar.

New York I was involved in two CPR projects where transverse joints were removed and replaced. In both cases the epoxy coated dowels were in excellent condition. Both repair projects were on PCC pavements that had been in service in excess of 20 years.

Ohio Fiberglass is allowed but no one has placed them yet. Only corrosion at uncoated ends but none installed since design required coated ends.

South Carolina Dowel bar corrosion has not been an issue for us, but it's probably something we need to look at. We don't specifically prohibit epoxy coating, so a recent patching project did use epoxy-coated dowels because the contractor had some leftover material from a project he had recently completed in North Carolina. Otherwise, we've never used them. We allow either a factory-applied wax coating or field-applied layer of grease for bond breaking purposes. We do not use epoxy or other coatings to retard corrosion. Being a wet-non-freeze state, our use of deicing salt is limited. Our oldest doweled pavement, I-95 in southern SC, was constructed in 1974 and, to date, has experienced little or no faulting.

Virginia painted and greased. 80%. On one project with poor sealant and severe faulting up to 1/2 inch, and trapped water leading to softening of soil cement subbase rusty dowel bars were recovered. The dowel diameter was reduced from 1 1/4 inch to 7/8 inch. The area around the dowel was oval shape indicating poor load transfer conditions. These dowel bars were painted and greased not epoxy coated. The dowels were in place for about 10 years. I would like to bring your attention to a report Number 96-128-E1 Titled "A State -of-The-Art- Report Load Transfer Design and Benefits for Portland Cement Concrete Pavements" by ERES consultants, Inc. Table A1. Concrete Construction Features, Transverse Joint Design Features. It lists the practice of 39 State DOT for the type of coating used with smooth dowel bars in pavements. If you have difficulty getting this report please call me at 804-328-3173 for further details. It is my humble opinion that it does not matter whether epoxy coated or paint is used with dowel bars, rusting can result under the similar circumstances as explained in question 2a above, but may be the epoxy will last longer than paint.

Washington Some corrosion prior to placement. No clear failures of PCC joints due to corrosion.

Wyoming We began using the smooth dowel bars approximately 12 years ago, so the few bars that we have excavated are less than 10 years old. Since we are not aware of smooth dowel bar corrosion problems in Wyoming, we have opted not to require coating the end of the bars. We tried coating the ends on a recent project and excess coating at the ends of the bars caused some of the bars to hang up in the dowel bar inserter.