Special Report

CONCRETE PAVEMENT TECHNOLOGY & RESEARCH

INCLUDES:

Comparison between Diamond Saw Slot Cutting and Carbide Milling

Load Transfer Restoration:
Diamond Saw Slot Cutting vs. Carbide Milling

Load transfer is the ability of a joint or crack in a concrete pavement to transfer load from one slab to the next through shear action. Load Transfer Restoration (LTR) is a rehabilitation technique for increasing the load transfer capability of existing PCC pavement by placement of dowel bars or other mechanical devices across joints or cracks that exhibit poor load transfer.

Dowel bar retrofit (i.e., Load Transfer Restoration) is most often used as part of a comprehensive Concrete Pavement Restoration (CPR) program. The techniques employed in a CPR program usually include a combination of full-depth repair, partial-depth repair, dowel bar retrofit, joint and crack resealing, slab stabilization, cross-stitching of longitudinal cracks, grooving, and diamond grinding. If the application of each technique occurs at the right time, the maximum use and life of the pavement will be achieved.

Recently, some agencies have performed experimental projects (i.e., carbide milling) to try out methods besides saw slot cutting for removing concrete for dowel bar retrofit. **This is not recommended because it requires much greater slot tolerances, damages the joint, and may cause microcracking in the area of the joint.**

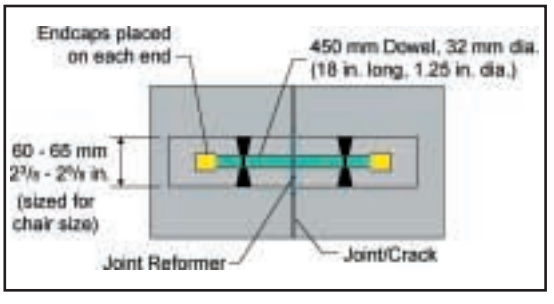
Comparison

The difference between diamond-saw slot cutting and carbide milling is in the way that the concrete is removed. Diamond-saw slot cutting uses two diamond saw blades per slot to cut the edges of the slot, allowing the "fin" of the concrete that is left to be removed with a lightweight jackhammer. In the carbide milling process, a large carbide-tipped wheelsaw (3-4 inches wide) demolishes the concrete, leaving a roughened, variable-width slot that may or may not be within the tolerances required. The strict tolerances are a function of the dowel-bar chair size that is used to align the dowel bars properly in the slot, and if the bars are not aligned properly, the joint may lock up or the patch may fail.

Diamond Saw Slot Cutting

Diamond-sawed slots maintain a constant width throughout the operation. The consistent slot width combined with the specially designed dowel assem-

Diamond-sawed slot with bars in place



Plan view of dowelbar retrofit

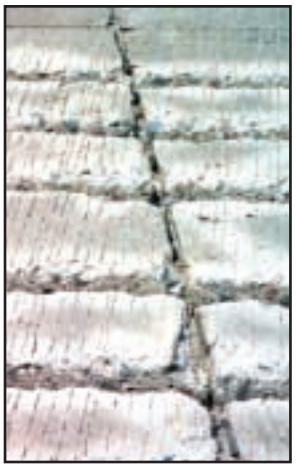
American Concrete Pavement Association

International Grooving & Grinding Association

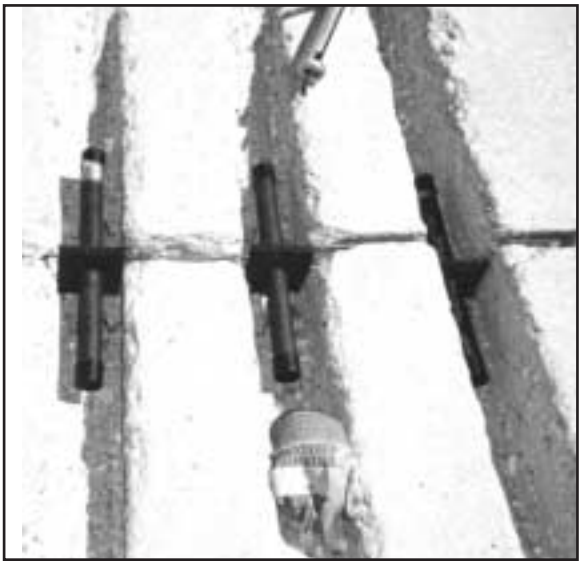
blies restricts unwanted movement of the assembly during the backfill and vibration procedures. This assures that every dowel will be aligned properly.

Carbide Slot Milling

Carbide slot milling (also referred to as rotomilling) is a demolition technique, not a concrete pavement restoration technique. Carbide mills (wheel saws) **should not** be used to form slots for dowel retrofit installations. Although carbide milling of slots may appear to be less expensive than diamond saw slot cutting, most agencies throughout the U.S. have concerns that the milling operation will cause microcracking, which may decrease the long-term durability of the dowel retrofit. Another shortfall of the slot milling technique is the rapid wear-rate of the carbide teeth. Milled slots must be oversized in order to account for this wear. The oversized slots are unable to secure the specially designed dowel assemblies during the backfill and vibrating operations increasing the risk of dowel misalignment. Misaligned retrofit dowels may cause the repair to fail by restricting the natural horizontal movement at the contraction joint.



Milled slots



Bars in milled slots

Additional Information

For more information on dowel bar retrofit, contact your local concrete paving representative, the American Concrete Pavement Association, or the International Grooving and Grinding Association.

References

1. The Concrete Pavement Restoration Guide, TB020P, American Concrete Pavement Association, Skokie, IL, 1998.

2. Concrete Pavement Rehabilitation: Guide for Load Transfer Restoration, Federal Highway Administration, FHWA No. FHWA-SA-97-103, JP001P, American Concrete Pavement Association, Washington DC, 1997.

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