Engineering Brief # 33

Subject: INFORMATION: Engineering Brief No. 33,
Steel Fiber Reinforced Concrete Pavements

From: Manager, Engineering and Specification Division, AAS-200
To: All Regions

Attn: Airports Division Managers

Engineering Brief No. 33, Steel Fiber Reinforced Concrete Pavements, discusses some of the problems encountered on pilot projects involving steel fiber reinforced concrete pavements. A discussion of the problems and recommendations for ways to avoid them are given.

We would appreciate any comments you wish to make.

ENGINEERING BRIEF NO. 33
STEEL FIBER REINFORCED CONCRETE PAVEMENTS

Steel fiber reinforced concrete pavements have been constructed at a number of airports over the past 10 years. Fibrous concrete pavements can be useful in instances where slab thickness must be held to a minimum because of grade considerations. Fibrous concrete generally costs about twice as much as conventional concrete but usually requires only about one half the thickness. Valuable information has been acquired from the ten year experience with the in-service projects. The purpose of this engineering brief is to discuss the lessons learned from the installations.

One of the most serious problems encountered with fibrous concrete to date has been corner breaking. Fibrous concrete slabs are usually thinner than slabs of conventional concrete. The fiber reinforcement permits relatively large plan dimensions even with thin slabs. These large thin slabs are prone to warping and curling from temperature and moisture gradients. When traffic is applied to slabs which are warped up, the corners tend to break off. This can occur in either overlay or monolithic slabs. In theory, a bonded overlay would not exhibit excessive warping or curling, however in actual practice complete bond is extremely difficult to achieve and some warping usually occurs.

Loose fibers have also caused some problems in airport applications. Apron area pavements constructed of fibrous concrete have caused complaints from workers of loose fibers sticking their hands, adhering to clothing and shoes and being a general nuisance. At least one installation of fibrous concrete on a military base caused concern about potential foreign object damage for aircraft. Some objections have been raised concerning unsightly stains on pavement surfaces from rusting surface fibers.

Some projects have experienced problems at sawed contraction

joints which have not opened properly. In these instances about every third contraction joint opens while the two intermediate joints do not. This results in excessive movement at the joints which do open. The joint seal material cannot accommodate the movement and fails.

A few fibrous reinforced concrete pavements have developed some shrinkage cracks along the lines where the spud vibrators of the paving machine travel. These cracks are probably due to segregation of materials along the vibrator lines. This segregation causes a rich paste line to develop which tends to shrink and crack upon drying. This problem is considered to be relatively minor.

Experience gained from pilot projects involving fibrous concrete leads us to the following recommendations for any future fibrous concrete applications:

1. Limit slab sizes to minimize warping and curling effects. Plan dimensions shown in AC 150/5320-6C for plain concrete slabs should be used as much as possible.

2. Sawed contraction joints should be made by sawing to a depth of 1/2 the slab thickness.

3. Clean-up operations after placement of fibrous concrete should be meticulous to insure that as many fibers as possible have been picked up.

We still feel that fibrous concrete is a viable construction material for airport pavements when properly used. It can be of considerable value in instances where grade problems preclude the use of conventional concrete.

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