

OFFICE MEMORANDUM

August 2, 1971



MICHIGAN DEPARTMENT OF STATE HIGHWAYS

LAST COPY
DO NOT REMOVE FROM LIBRARY

To: L. T. Oehler
Engineer of Research

From: C. J. Arnold

Subject: Pull-Out Testing of McCormick Precoated Dowel Bars. Research Project 71 TI-35. Research Report No. R-777.

This report covers pull-out testing of dowel bars removed from a precoated basket supplied by the McCormick Co. The investigation was completed as a cooperative effort by the Research Laboratory's Concrete and Structures Groups.

The dowels were precoated with liquid asphalt, RC-250. Coating thickness was somewhat non-uniform around the perimeter of the bars and difficult to measure accurately in this soft material. It was estimated to be 5 mils or less.

Four concrete test blocks 9 by 9 by 12 in. were cast, each containing one bar. The bars were nominal 1-1/4-in. diameter, 18 in. long, with sawed ends. Embedment depth was 9 in. A special fixture was used to maintain dowel alignment perpendicular to the block face. Figure 1 shows the same fixture as set up for use in another experiment.

Cylinders were cast along with the test blocks for determination of concrete strength. Compressive strength of the concrete was approximately 5,000 psi at the time the bars were pulled.

Pull-out testing was done on a Universal testing machine. A dial gage was used to indicate relative movement between the bar and block (Fig. 2). Bars were pulled out a total of 1/2 in. in each test. No-load machine speed was approximately 0.030 in./min. None of the blocks was damaged during the tests.

The maximum pull-out resistance ranged from 430 to 530 lb. Average pull-out resistance varied from 320 to 460 lb (average of the load values taken at 0.1-in. increments).

Previous pull-out tests, conducted in the same manner as the subject tests, were reported in Research Report No. R-659, and in a letter of December 10, 1968. The previous results indicated maximum pull-out loads of 100 to 250 lb for asphalt-coated saw-cut bars; 380 to 450 lb for plastic-coated bars; 1,250 for asphalt-coated, shear-cut bars; and about 5,000 lb for shop-painted shear-cut bars.

Comparison of the previous results noted above with the results of this experiment shows that the McCormick precoated dowels tested required slightly more pull-out load than similar dowels tested in the previous program. This may be due to longer curing time and differences in consistency of the liquid asphalt used in the different tests. However, the differences in pull-out resistance are not great enough to be significant for the purpose involved.

McCormick precoated dowels are suitable for use in pavement joints, as far as pull-out considerations are concerned. Bulbous projections of the coating caused by gravity flow of the liquid asphalt after dipping, could cause irregularly shaped holes in the concrete. While these irregularities could be small and relatively insignificant if the process of dipping is well controlled, the possibility of larger deviations exists. Also, the softness of this type of coating permits relatively easy damage during shipping and deployment. Both of these items would be subjects for field inspection.

TESTING AND RESEARCH DIVISION



Physical Research Engineer
Research Laboratory Section

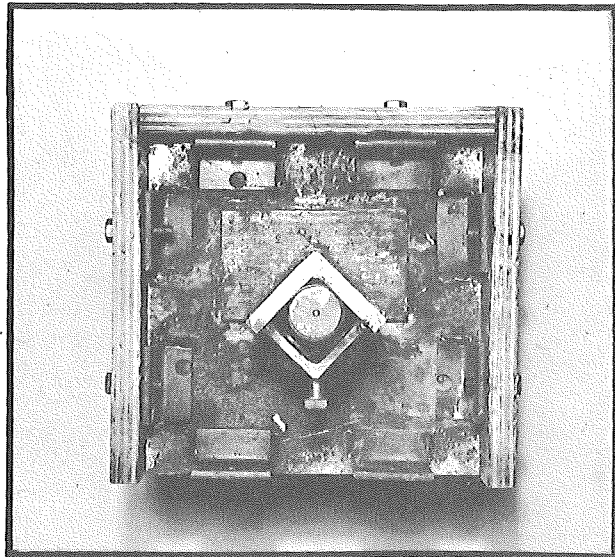
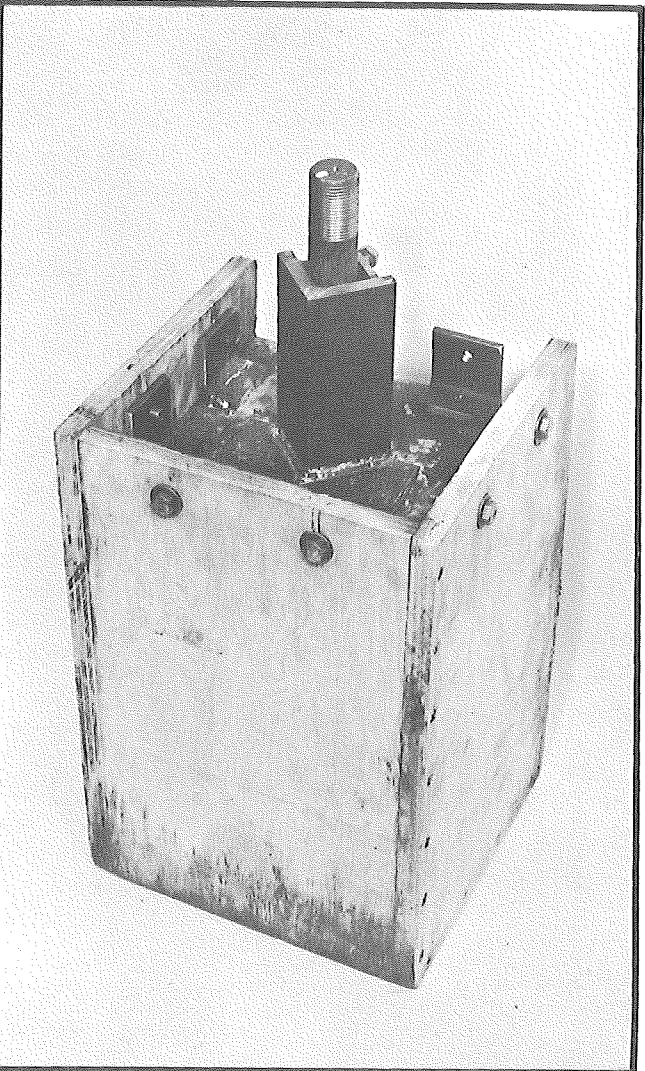
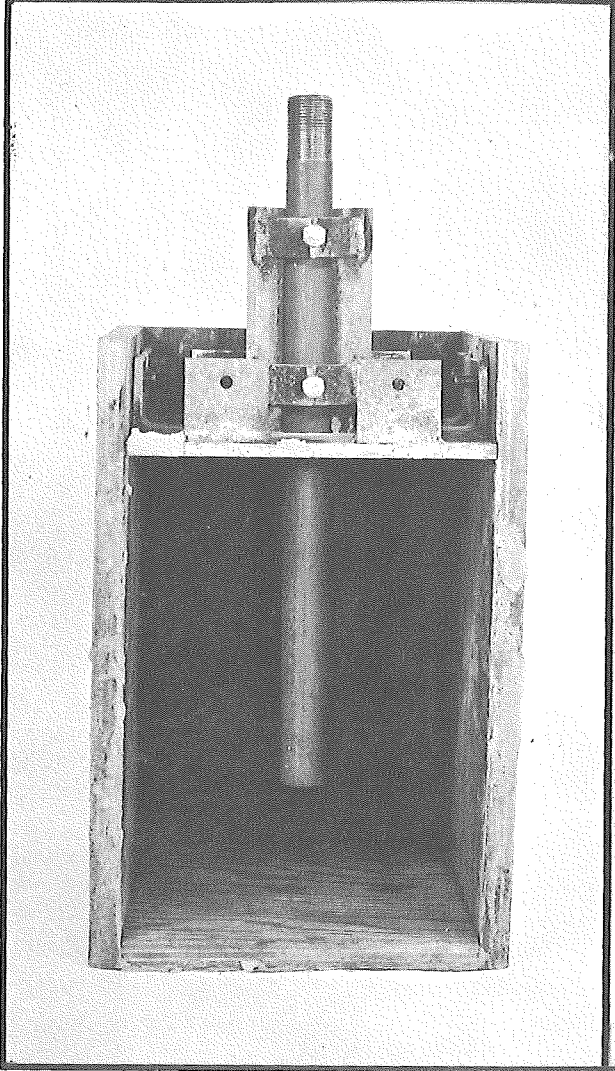


Figure 1. Test block forms showing dowel-locking fixture.



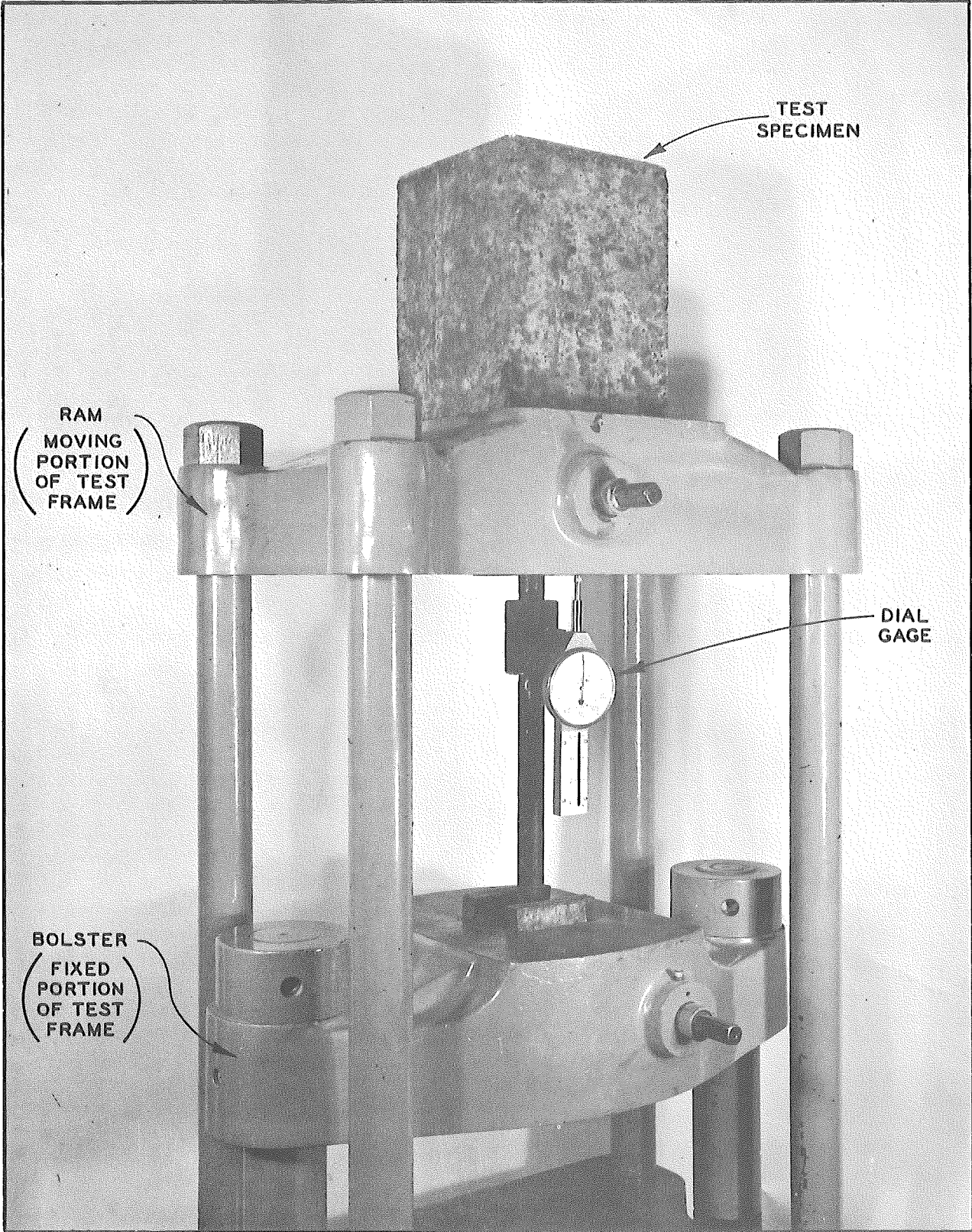


Figure 2. Pull-out test equipment.