Testing concrete piles in situ

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SUBJECT TESTING CONCRETE PILES IN SITU

At the Annual Meeting of the American Society of Civil Engineers in New York in the fall of 1961 the writer was asked by Mr. Martin Kapp if he knew of any method of testing the quality of concrete in piles that were actually driven in place. The desirability of having such a method available is obvious as soon as one hears an inquiry such as this, since so much depends on the assumed stability of concrete piles driven into the ground whereas we know well the deterioration of concrete that can take place when it is in contact with water and soil.

Accordingly inquiries were made from those agencies that we thought might have investigated this problem, after a literature search had failed to reveal any useful information about the subject. The following is a summary of the helpful replies that were received, helpful even though they are all of a negative character.

1. "Several years ago we made an attempt to use the Soniscope for determining the condition of concrete piles in place. Our interest at that time was to find some method of determining the extent and location of horizontal cracks in the concrete. The Soniscope was found to be of little value for this purpose. However, we did have some success in evaluating the severity of cracking by applying a strong vibratory force at the top of the pile and observing the mode of vibration of the concrete. As you know the Soniscope uses two

transducers in close contact with the concrete at the point or points below ground where a measure of concrete quality is wanted. Unfortunately, there is no known method of doing this, short of boring an adjacent hole or excavating the pile."

2. "We have had occasional inquiries concerning methods of determining the quality of concrete in piles in place in the ground but we have not attempted to develop a suitable method of test. Very little work has been done here in the last few years on non-destructive testing. It has been suggested that a suitable pile might be subjected to a load test by inserting a jack and load cell between the pile and the structure. This would provide an over-all proof of the adequacy of the pile. Alternatively, a pile might be exposed by excavation and subjected to tests using ultrasonic equipment for measuring the transverse pulse velocity of the Schmidt rebound hammer. Neither of these suggestions is really very helpful but we are not able to see a simple solution to the problem."

3. "The problem of determining the quality of concrete piles, or of detecting cracks in them, has been put to us from time to time. We attempted to use a pulsed-vibration echo-sounding technique in one small investigation where we were looking for cracked piles and the results appeared promising. The pulse was produced by a hammer blow and I doubt whether the pulse produced by the "Soniscope" would be sufficiently powerful to transverse a long reflection path in a pile. M. Dawance of M. L'Hermite's Laboratoire des Travaux Publics in Paris has attempted to use a resonance technique to test concrete piles in situ. Some preliminary results were reported at a recent meeting of the RILEM Non-destructive Testing Group and were encouraging. It is difficult to interpret the results given by resonant and pulsed vibration methods. A high resonant frequency, or a short time of return of a pulsed vibration, may be associated with extremely good quality concrete or a pile shortened by a crack, and the operator will not have the ancillary data necessary to reach a decision. It may be possible to derive useful information by measuring the mechanical damping at resonance. Here again, however, it would be necessary to study the external damping acting on the sides of the pile in order to assess the reliability of the measurements."

It is clear that although the problem is such a "practical" one, it poses great difficulties. The need for such a method of test

suggests that it is a research problem to which we might usefully devote some attention when we have a suitable member of staff with time that can be devoted to the matter.