

Investigation of a Supplementary Device for Determining Plastic Index of Soils and Aggregates¹

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ABRIDGMENT

• MANY PUBLIC agencies in the United States use the plasticity index (P.I.) as one of the principal criteria for the control of quality of subbases, base courses, and mineral aggregates in the construction of their highways and streets. The P.I. has proven to be very valuable for determining the quality of the fines in an aggregate mixture, but it suffers from a severe drawback for direct field control under modern production practices. This drawback consists of the length of time required for a result on the liquid limit and plastic limit tests, from which the P.I. is derived. A quick test is needed as a supplement to the P.I. to give an indication of it, and thereby to determine quickly whether material being produced will meet the specifications. We have developed such a test, called the "P.I. Supplementary Test."

In contemplating this problem, the authors reasoned that the liquid limit and plastic limit tests were basically measures of cohesion as related to the moisture content of the fines. Therefore, it followed that some quick method of measuring the cohesion of the passing No. 40 sieve material should be indicative of the P.I. A suggestion was made to measure the cohesion by using the principle of the plate viscometer. This involved placing a small amount of the wet material to be tested on a plate attached to a calibrated spring. A revolving disc was then lowered onto the plate to the point where the clearance between the plate and the revolving disc was exactly 0.025 in. The resultant torque on the calibrated spring was then read in degrees of arc. This is repeated at varying moisture contents and plotted on a graph, as in Figure 1. Plottings which intersect the area circumscribed by the dashed line shown in Figure 1 indicate plasticity indexes of less than 6.

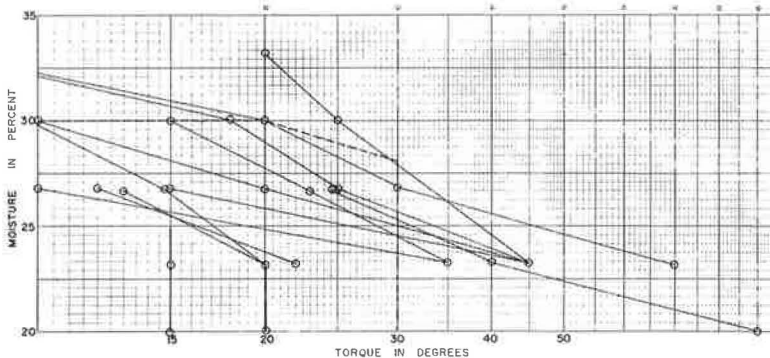


Figure 1. P.I. Supplementary Test, 1 to 3 P.I. group.

¹ A copy of the full text of this paper may be obtained from the authors. Paper sponsored by Committee on Soil and Rock Properties and presented at the 44th Annual Meeting.

The principal attribute of the P. I. Supplementary Test, as finally developed, is the speed with which it can be run. The test seldom requires longer than 10 min from the time of first adding water to the pass No. 40 sieve material until the final answer is obtained, indicating whether or not the material will pass the specifications. The results of the tests do not precisely correlate with individually run P. I.'s, but they fall within group ranges sufficiently accurate for specification control. This is understandable because the P. I. in itself is not exact. Indeed, the liquid limit and plastic limit tests are not exact tests, since they are subject to human variation in manipulative skill.

The original device, described in the paper was of somewhat primitive design. A more sophisticated and compact model, with self-contained motorization, has now been developed.