State of California
Department of Public Works
Division of Highways

MATERIALS AND RESEARCH DEPARTMENT

BACKGROUND ON KELLY BALL AS A DEVICE FOR MEASUREMENT OF SLUMP IN CONCRETE

By

D. L. Spellman
Supervising Materials and Research Engineer

63-04

April, 1963

ClibPDF - www.fastio.com

Supervising Materials and Research Engineer, California
Division of Highways, Materials and Research Department

BACKGROUND ON KELLY BALL AS A DEVICE FOR MEASUREMENT OF SLUMP IN CONCRETE

By

D. L. Spellman*

In a report titled "Use of the Kelly Ball as a Device for Measuring the Consistency of Concrete" by William Grieb and Robert Marr, Jr., made by the Bureau of Public Roads, the following statements were made:

> "The ASTM standard slump test has been used for many years as a measure of the consistency of fresh concrete in the laboratory and on the job. As a laboratory procedure, it is reasonably satisfactory. In the field, especially on paving work, it has several disadvantages and the most serious of these is the time required to make the test. Others are the necessity for careful selection of samples and the close attention to details of the technique required to obtain reasonably accurate results."

The report goes on to describe how the Kelly Ball test was developed and finally adopted as a tentative standard by

*Supervising Materials and Research Engineer, California Division of Highways, Materials and Research Department

ClibPDF - www.fastio.com

ASTM in 1955 (ASTM Tentative Standard C 360-55 T). Since that time, it has been adopted by many highway departments and the Corps of Engineers. Records show that the original test method published in ASTM in 1955 has had only editorial revisions since that time. It is also used by the Bureau of Public Roads as an alternative to the cone method.

Several test series are described in the report covering three field projects and two laboratory series. Results show that the slump as measured by the Kelly Ball was consistently less than that measured by the cone method, both in the field and in the lab. Different mixes were used in the tests and slumps were also varied. Briefly, the results show the following:

Test	Project #1 (Field)			Project #2 (Field)			Project #3 (Field)		
	Slump Range			Slump Range			Slump Range		
	2"	3"	4"	2"	3"	4"	2"	3"	4"
Average Kelly Ball	1.6	2.6	3.7	1.7	2.2	2.9	1.8	2.4	3.3
Avg. Cone	2.5	4.1	4.6	2.5	3.2	4.0	2.5	2.9	4.2
Range:									
Kelly Ball	1.1	0.6	0.9	0.3	0.4	1.0	0.4	0.7	1.0
Cone	2.0	1.0	1.2	0.8	1.2	2.1	1.6	1.3	0.8

The laboratory tests included tests on 6-sack concrete containing 1-1/2-inch maximum size aggregate, both

ClibPDF - www.fastio.com

gravel and crushed stone. The results were the same as those performed in the field, the Kelly Ball method indicating a lower slump than the cone, and the Kelly Ball slump showing less variation.

Advantages listed for the Kelly Ball were:

1. The concrete can be tested in place, eliminating the need for selection or preparation of a sample.
2. Kelly Ball test can be performed in less time and with less effort, and thereby reduces delay to contractor while tests are being made.
3. Since test requires less time and effort, it can be made more often, if more frequent testing is needed to control uniformity.
4. Equipment is easily cleaned.

One other advantage listed was the possibility of using the Kelly Ball with concrete having a maximum size aggregate over 2 inches which cannot be done with the cone. This has little application to California practice.

There is a constant pressure to reduce the number of different tests and to devise more rapid tests, especially for control on the job. The Kelly Ball slump test seems to

ClibPDF - www.fastio.com

meet these demands. Mr. E. L. Howard reported in the Journal of the ACI (June 1950):

> "It is shown too, that the Kelly Ball gives reliable results that can be used for concrete consistency control. Further, the speed and ease of testing with the Kelly Ball is a great advantage over the slump cone method of test. Again, the Contractor is made happy because he is in no way delayed while the test is being made. We have noted that on jobs where the ball is used, contractor-inspector relationships are greatly improved. And not least of all advantages of the Kelly Ball is the ease of cleaning up."

The report described work done on many jobs and slumps were taken in trucks, hoppers, buggies, forms, slabs and on pavements, and Mr. Howard wrote that the Kelly Ball test could be performed almost anywhere "so long as the depth is at least 6 inches and the least horizontal dimension is 12 inches."

The California Division of Highways became interested in the Kelly Ball method and made several tests to evaluate its use. In 1953, a letter was sent to all District

ClibPDF - www.fastio.com

Engineers (Feb. 26, 1953, E. Withycombe) notifying them that Kelly Balls were available from Service and Supply and stated that "except in cases of dispute, the slump of the concrete will be determined by the Kelly Ball instead of the specified Slump Cone." The 1954 Standards listed only the Kelly Ball as the method of making the slump tests, and the 1960 Standards have the same requirements. Since that time, approximately 270 units have been ordered for field testing by State forces representing a value of about $32,000 at current Service & Supply listed prices.

Past experience indicates that the Kelly Ball has been accepted as the method of making "slump" tests, and we are not aware of any pressure or effort on the part of Contractors to return to the cone method. The Kelly Ball has become the accepted standard in California highway work.

ClibPDF - www.fastio.com