Amer Conc Institute, Vol XVII, p 213, 1921 W K Hatt, R B Crepps Tolerance of Coarse Aggregate Passing ¼ inch Sieve as Affecting Specifications for Gravel Aggregates
Amer Conc Institute, Vol XVIII, p 21, 1922 Duff A Abrams Flexural Strength of Plain Concrete

SIGNIFICANCE OF THE TALBOT-JONES RATTLER AS TEST FOR CONCRETE IN ROAD SLABS

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Tests of concrete that have been made to determine its resistance to wear have in the main been made with the Talbot-Jones rattler

The Structural Materials Research Laboratory, Lewis Institute, has published results of several investigations involving the use of this apparatus Their preliminary paper on this subject (See Proc A S T M , 1916, Part II) calls attention among other matters to the fact that (1) the concrete is subjected to a treatment which approximates that of service, (2) several tests may be made at the same time, and (3) test may be made on sections of concrete cut from roads which have been in service In the discussion of this paper, G P Hemstreet of the Hastings Pavement Company, stated that for ten years previously the Hastings Company had been using the Talbot-Jones apparatus for testing asphalt paving blocks Their results show that "material which shows up poorly in the rattler will invariably give poor results on the street"

In Bulletin No 2, Structural Materials Research Laboratory, it is shown that excess of mixing water produces concrete of greatest wear in this test There is, also, a relation between strength of concrete and its wear which may be expressed as follows $S = \frac{C}{W^n}$

where

S = compressive strength in lbs per sq inch,

W= wear in inches, C = a constant, and n = an exponent

In two investigations reported, C=2230 and 1800, and n=1 07 and 1 30 respectively

In Bulletin No 8 of the Structural Materials Research Laboratory, the Talbot-Jones rattler was used in an investigation, the conclusion with respect to wear is as follows "The wear of concrete was not sensibly increased by hydrated lime or other admixtures up to 20 per cent of the volume of the cement"

In Bulletin No 10 of the Structural Materials Research Laboratory, entitled "Wear Tests of Concrete," the conclusions of significance among others are these (1) "The wear on separately moulded concrete blocks tested in the Talbot-Jones rattler was much more severe than any encountered in service, however, the test is believed to give trustworthy information on the wearing resistance of concrete of various proportions,

consistencies, curing conditions, ages, etc , for use in concrete roads and pavements " (2) "In general, the factors which gave concrete of high strength also gave concrete of low wear (a high resistance to wear) " (3) "The quality of the fine or coarse aggregate produced less effect on wear than is commonly supposed "

H S Mattimore, in an article entitled "Wear-Resisting Values of Various Aggregates for Concrete Roads" in Engineering News-Record, May 2, 1918, states that the effect of traffic is to produce some wear due to abrasion, but that this is of secondary importance when compared to the severe impact effect of horsedrawn and motor vehicles He also states that purely abrasion tests were of little comparative value, as the resistance of the specimen as a whole depended entirely upon the hardest aggregate—because a hard coarse aggregate will support a poor matrix, or vice versa A conclusion drawn from this investigation using an impact apparatus is that the resistance depends upon the quality of both the mortar and the coarse aggregate and although a good matrix has a tendency to support a weak coarse aggregate, the use of a good quality of the latter will make a more durable pavement

Similar conclusions were drawn by H Eltinge Breed, in Engineering News-Record, June 5, 1919, from investigations using the same impact-abrasion apparatus

An article on the "Use of Slag as Coarse Aggregate" in Concrete Highway Magazine, February, 1920, by C Gray and F Kellam states that for concretes of this type, higher compressive strengths do not in all cases give greater resistance to wear

A considerable number of tests have been reported in which the apparatus used differed radically from that of the Talbot-Jones rattler It is believed, however, that the latter apparatus is a closer approach to service conditions

The following subjects for investigation are urged by the Committee

1 Is not the test too severe as compared with modern traffic conditions?
2 Is the strength of concrete a proper criterion of its ability to resist wear?
3 What effect, if any, does the quality of coarse aggregate have on the wear of concrete?

In connection with question No 3, the development of a proper test for abrasion of rocks and slags should be made See criticisms of the Standard Deval Abrasion Test by

Scofield and Mattimore, Proc A S T M , 1918, Part II, F H Jackson, Proc A S T M , 1920, Part II, D. A Abrams, Engineering and Contracting, May 3, 1922.

4 Is not the more logical development of wear tests that of perfecting apparatus for measuring actual wear on roads and possibly producing a standard apparatus for wear tests of roads as actually constructed?

With reference to question No 4, a few of the articles published are as follows Apparatus for Measuring the Wear of Concrete Roads, A T Goldbeck, Journal of Agricultural Research, Feb 14, 1916, A Pavement Determinator, Concrete-Cement Age, Dec 1912, A Pavement Testing Machine of the National Physical Laboratory, New York Commissioner of Highways Report, 1913, Vol II

ABSORPTION OF CONCRETE IN WATER AS AFFECTED BY AGGREGATES—ITS ULTIMATE EFFECT IN EXPANSION OF ROAD SLABS

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Published information—There is very little published information on this subject In practically all concrete investigations care has been taken to use only one class of aggregate

University of Minnesota Studies in Engineering by Professor C F Shoop, published in 1915

Tables showing absorption of concrete when same sand and cement was used, but different coarse aggregates, do not show high absorption in concrete to correspond to absorption of stone Tables show higher strengths for concrete made with porous rocks for coarse aggregate

Table 5, page 24, Bulletin No 2, Structural Materials Research Laboratory of Lewis Institute, gives some absorption comparisons between pebbles and limestone

Bulletin 532 of the U S Department of Agriculture is on the expansion and contraction of concrete and concrete roads The possible effect of different aggregates is not investigated

University of Illinois, Bulletin No 126, "A Study of the Effect of Moisture Content upon the Expansion and Contraction of Plain and Reinforced Concrete" In this investigation the same materials were used Curves on pages 9 and 10 of that bulletin show that the expansion and contraction during curing period is greater for mortar than it is for concrete Curves on page 14 of the bulletin indicate that the expansion of mortar due to absorption of moisture is much greater than it is for concrete This curve shows that a 1 2 4 concrete absorbed 5 4 per cent moisture in ten days and showed a unit expansion ranging from 00026 to 0003 The 1 2 mortar showed an absorption of 6 8 per cent in ten days and a unit expansion of 0 00068 On pages 17 and 18 of the bulletin is shown the expansion due to absorption of a sandstone and a limestone The sandstone had high absorption with corresponding expansion, the limestone had high absorption with very little expansion

Bulletin 537 of the U S Department of Agriculture gives the absorption of a great many rocks

The writer was unable to find any information on the expansion of rocks as a result of absorption except for the limestone and sandstone in Bulletin No 126, University of Illinois.