EXPERIMENT NO.- 02

EXPERIMENT NAME:

RESISTANCE TO ABRASION OF SMALL SIZE COARSE AGGREGATE BY USING LOS ANGELES MACHINE (ASTM C 131)

INTRODUCTION

- Aggregates used in highway pavements should be hard and resist wear due to the polishing effects of traffic and the internal abrasive effects of repeated loadings.
- Apart from testing aggregate with respect to its strength, testing the aggregate with respect to its resistance to wear or degradation (hardness) is an important test for aggregate to be used for roads, & in floor surfaces subjected to heavy traffic.
- This test method covers a procedure for testing sizes of coarse aggregate smaller than 1.5 inch. (37.5 mm) for resistance to degradation using the Los Angeles testing machine.

INTRODUCTION (Contd..)

- This test has been widely used as an indicator of the relative quality or competence of various sources of aggregate having similar mineral compositions.
- Los Angeles abrasion test is commonly used to evaluate the hardness of aggregates.
- The test has more acceptability because the resistance to abrasion and impact is determined simultaneously.
- Los Angeles abrasion test is suitable for coarse aggregate of different sizes and it is not used for fine aggregate.

INTRODUCTION (Contd..)

- This test is a measure of degradation of mineral aggregates of standard grading resulting from a combination of actions including abrasion or attrition, impact, and grinding in a rotating steel drum containing a specific number of steel spheres, the number depending upon the grading of the test sample.
- As the drum rotates, a shelf plate picks up the sample and the steel spheres, carrying them around until they are dropped to the opposite side of the drum, creating an impact- crushing effect.
- The contents then roll within the drum with an abrading and grinding action until the shelf plate picks up the sample and the steel spheres, and the cycle is repeated.
- After the prescribed number of revolutions, the contents are removed from the drum and the aggregate portion is sieved to measure the degradation as percent loss.

REFERENCED DOCUMENTS

ASTM C 131.

APPARATUS

Los Angeles Machine:

- A Los Angeles Machine, conforming in all essential characteristics to the design shown in Fig. 2.1, shall be used.
- The machine shall consist of a *hollow steel cylinder*, with a wall thickness of not less than 12.4 mm closed at both ends, conforming to the dimensions shown in Fig. 1, having an inside diameter of 711 ± 5 mm (28 ± 0.2 in), and an inside length of 508 ± 5 mm (20 ± 0.2 in).
- The cylinder shall be mounted on *stub shafts* attached to the ends of the cylinder but not entering it, and shall be mounted in such a manner that it rotates with the axis in a horizontal position within a tolerance in slope of 1 in 100.

Los Angeles Machine: (Contd..)

- An *opening* in the *cylinder* shall be provided for the introduction of the test sample.
- A suitable, *dust-tight cover* shall be provided for the opening with means for bolting the cover in place.
- The cover shall be so designed as to maintain the cylindrical contour of the interior surface unless the shelf is so located that the charge will not fall on the cover, or come in contact with it during the test.
- A removable *steel shelf* extending the full length of the cylinder and projecting inward 89 ± 2 mm (3.5 ± 0.1 in) shall be mounted on the interior cylindrical surface of the cylinder, in such a way that a plane centered between the large faces coincides with an axial plane.

Figure 2.1 Los Angeles Abrasion Machine

Los Angeles Machine: (Contd..)

- The shelf shall be of such thickness and so mounted, by bolts or other suitable means, as to be firm and rigid.
- The position of the shelf shall be such that the sample and the steel spheres shall not impact on or near the opening and its cover, and that the distance from the shelf to the opening, measured along the outside circumference of the cylinder in the direction of rotation, shall be not less than 1270 mm (50 in).
- Inspect the shelf periodically to determine that it is not bent either lengthwise or from its normal radial position with respect to the cylinder.
- If either condition is found, repair or replace the shelf before further tests are conducted.

Sieves:

Balance:

Charge:

The charge shall consist of steel spheres averaging approximately 46.8 mm (in) in diameter and each having a mass of between 390 and 445 g. The charge, depending upon the grading of the test sample shall be as follows:

Grading	Number of Spheres	Mass of Charge (gm)
A	12	5000 ± 25
B	11	4584 ± 25
C	8	3330 ± 20
D	6	2500 ± 15

SAMPLING:

Test Sample Preparation

- Wash the reduced sample and oven dry at 110 ± 5°C (230 ± 9°F) to substantially constant mass, separate into individual size fractions, and recombine to the grading of Table 2.1 most nearly corresponding to the range of sizes in the aggregate as furnished for the work.
- Record the mass of the sample prior to test to the nearest 1 g.

PROCEDURE:

- Place the test sample and the charge in the Los Angeles testing machine and rotate the machine at a speed of 30 to 33 r/min for 500 revolutions.
- After the prescribed number of revolutions, discharge the material from the machine and make a preliminary separation of the sample on a sieve coarser than the 1.70-mm (No. 12) sieve.
- Sieve the finer portion on a 1.70-mm sieve in a manner conforming to ASTM C 136 .
- Wash the material coarser than the 1.70 mm (No. 12) sieve and oven-dry at 110 ± 5°C (230 ± 9°F) and determine the mass to the nearest 1 gm.

CALCULATION

- Calculate the loss (difference between the original mass and the final mass of the test sample) as a percentage of the original mass of the test sample.
- Report this value as the percent loss.

REPORT

The Report shall include the following information:

- Identification of the aggregate as to source, type, and nominal maximum size
- Grading designation from Table 1 used for the test
- Loss by abrasion and impact of the sample expressed to the nearest 1 % by mass.

Table 2.1 Gradings of Test Sample

Sieve Size (square openings)		*Mass of indicated Sizes, gm*			
Passing	**Retained on**	**Grading**			
		A	***B***	***C***	***D***
37.5 mm (1.5”)	25.0 mm (1”)	1250 ± 25	----	----	----
25.0 mm (1”)	19.0 mm (0.75”)	1250 ± 25	----	----	----
19.0 mm (0.75”)	12.5 mm (0.5”)	1250 ± 10	2500 ± 10	----	----
12.5 mm (0.5”)	9.5 mm (0.375”)	1250 ± 10	2500 ± 10	----	----
9.5 mm (0.375”)	6.3 mm (0.25”)	----	----	2500 ± 10	----
6.3 mm (0.25”)	4.75 mm (No. 4)	----	----	2500 ± 10	----
4.75 mm (No. 4)	2.36 mm (No. 8)	----	----	----	5000 ± 10
Total		**5000 ± 10**	**5000 ± 10**	**5000 ± 10**	**5000 ± 10**

QUESTIONS:

- What is the significance of Abrasion of Aggregates?
- Why Los Angeles Abrasion Test is most commonly accepted and used?
- How is the abrasive charge selected for Los Angeles Abrasion Test? Write down the no. of spheres & weight of charges for different cases.
- What is the significance of Los Angeles Abrasion Test?
- What is the rotational speed & no. of total revolutions for this test?

EXPERIMENT 02

Data Sheet

Resistance to Abrasion of Small Size Coarse Aggregate by Using Los Angeles Machine

- **Sample Taken = gm**
- **Sample Retained on No. 12 Sieve = gm**
- **Loss of Sample = gm**

LOS ANGELES ABRASION VALUE (LAAV):

$$= \frac{Loss\ of\ sample}{Sample\ Taken} \times 100\ \%$$

$$= \text{————} \times 100\ \%$$

$$= \qquad \%$$

SAMPLE TYPE:

Student No. :

Group :

Date :

Signature of Course Teacher