

Experiment #09

Loss Angeles Abrasion Test (AASHTO T 96 or ASTM C 131)

Los Angeles abrasion test on aggregates is the measure of aggregate toughness and abrasion resistance such as crushing, degradation and disintegration. This test is carried out by AASHTO T 96 or ASTM C 131: Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

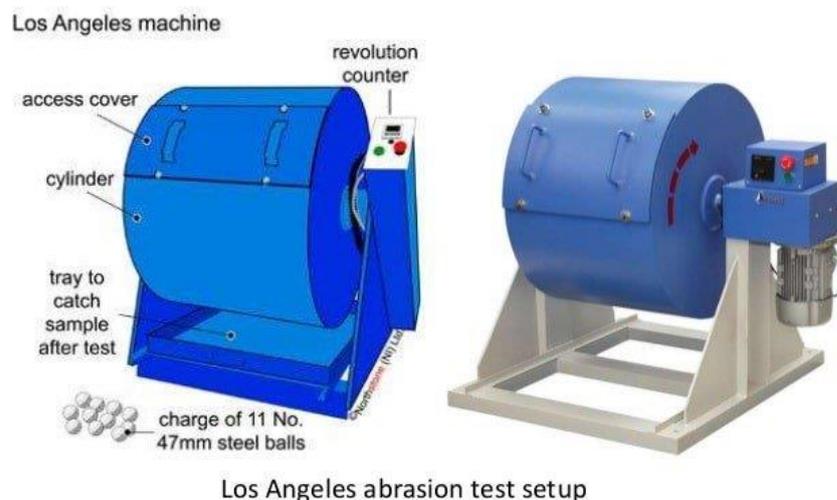
The aggregate used in surface course of the highway pavements are subjected to wearing due to movement of traffic.

When vehicles move on the road, the soil particles present between the pneumatic tyres and road surface cause abrasion of road aggregates. The steel rimmed wheels of animal driven vehicles also cause considerable abrasion of the road surface.

Therefore, the road aggregates should be hard enough to resist abrasion. Resistance to abrasion of aggregate is determined in laboratory by Los Angeles test machine.

The principle of Los Angeles abrasion test is to produce abrasive action by use of standard steel balls which when mixed with aggregates and rotated in a drum for specific number of revolutions also causes impact on aggregates.

The percentage wear of the aggregates due to rubbing with steel balls is determined and is known as Los Angeles Abrasion Value.



Determination of Los Angeles Abrasion Value

The Los Angeles abrasion test on aggregates are done for following purposes:

1. To determine the Los Angeles abrasion value.

2. To find the suitability of aggregates for use in road construction.

Apparatus for Los Angeles Test

The apparatus as per IS: 2386 (Part IV) – 1963 consists of:

1. Los Angeles Machine
2. Abrasive charge: Cast iron or steel balls, approximately 48mm in diameter and each weighing between 390 to 445 g; six to twelve balls are required.
3. Sieve: 1.70, 2.36, 4.75, 6.3, 10, 12.5, 20, 25, 40, 50, 63, 80 mm IS Sieves.
4. Balance of capacity 5 kg or 10 kg
5. Drying oven
6. Miscellaneous like tray

Procedure for Los Angeles Test

The test sample consists of clean aggregates dried in oven at 105° – 110°C. The sample should conform to any of the gradings shown in table 1.

1. Select the grading to be used in the test such that it conforms to the grading to be used in construction, to the maximum extent possible.
2. Take 5 kg of sample for gradings A, B, C & D and 10 kg for gradings E, F & G.
3. Choose the abrasive charge as per Table 2 depending on grading of aggregates.
4. Place the aggregates and abrasive charge on the cylinder and fix the cover.
5. Rotate the machine at a speed of 30 to 33 revolutions per minute. The number of revolutions is 500 for gradings A, B, C & D and 1000 for gradings E, F & G. The machine should be balanced and driven such that there is uniform peripheral speed.
6. The machine is stopped after the desired number of revolutions and material is discharged to a tray.
7. The entire stone dust is sieved on 1.70 mm IS sieve.
8. The material coarser than 1.7mm size is weighed correct to one gram.

Table 1: Grading of Test Samples – *Tolerance of ± 12 percent permitted.

Sieve size (square hole)	Weight of test sample in gm							
Passing (mm)	Retained on (mm)	A	B	C	D	E	F	G
80	63					2500*		
63	50					2500*		
50	40					5000*	5000*	
40	25	1250					5000*	5000*
25	20	1250						5000*
20	12.5	1250	2500					
12.5	10	1250	2500					
10	6.3			2500				
6.3	4.75			2500				
4.75	2.36				5000			

Table 2: Selection of Abrasive Charge

Grading	No of Steel balls	Weight of charge in gm.
A	12	5000 ± 25
B	11	4584 ±25
C	8	3330 ± 20
D	6	2500 ± 15
E	12	5000 ± 25
F	12	5000 ± 25
G	12	5000 ± 25

Observations of Los Angeles Test

Original weight of aggregate sample = W_1 g

Weight of aggregate sample retained = W_2 g

Weight passing 1.7mm IS sieve = $W_1 - W_2$ g

Abrasion Value = $(W_1 - W_2) / W_1 \times 100$

Results

Los Angeles Abrasion Value =

Recommended Los Angeles Test Values for Pavements

Los Angeles 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.

Depending upon the value, the suitability of aggregates for different road constructions can be judged as per IRC specifications as given:

Sl. No.	Type of Pavement	Max. permissible abrasion value in %
1	Water bound macadam sub base course	60
2	WBM base course with bituminous surfacing	50
3	Bituminous bound macadam	50
4	WBM surfacing course	40
5	Bituminous penetration macadam	40
6	Bituminous surface dressing, cement concrete surface course	35
7	Bituminous concrete surface course	30

