

CHAPTER 12 :

TYPE V TEST : DESCRIPTION OF THE AGEING TEST FOR VERIFYING THE DURABILITY OF ANTI POLLUTION DEVICES FROM 2/3 WHEELERS

Procedure For Durability Testing Of 2 & 3 Wheelers.

- 1 Scope: This standard covers the procedure for establishing the deterioration factor for two and three wheelers.

This procedure shall be followed in case the manufacturer does not desire to use the fixed deterioration factors specified in the corresponding emission notification.

2. Mileage accumulation:
 - 2.1 Mileage accumulation may be done on road/ test track or on chassis dynamometer, at the option of the vehicle manufacturer.
 - 2.2 If the mileage accumulation is carried out on roads, the traffic on the selected road shall be such that the lap speeds can be maintained. The details of routes followed and the trends of the traffic pattern shall be recorded.
 - 2.3 If the mileage accumulation is done on a chassis dynamometer, the chassis dynamometer shall comply with the requirements given in Para 4.1.1.1 (Fixed load type dynamometer or given in Para 4.1.1.2 (Variable load chassis dynamometer) of chapter 3, Part III of the document No. MOST/CMVR/TAP115/116. Suitable robotic controls may be used when the mileage accumulation is being carried out on a chassis dynamometer.
 - 2.4 Mileage accumulation shall be exclusive of the running in period.
- 3.0 Speeds for mileage accumulation:
 - 3.1 Mileage accumulation shall be done in laps of 6km. A trip consisting of eleven laps is counted as one test cycle.

The following test cycles shall be followed for different categories of two and three wheelers:

Vehicle type	Engine cc		Test Cycle classification
	Exceeding	Upto and lower than	
Two wheelers	--	75	A
	75	250	B
	250	--	C
Three wheelers	All		A

The different Lap speeds for each test cycle classification is given in table 1.

Table 1 Lap speeds for different Test cycle classification (See 3.1)

Test cycle classification	Lap speed, km/hr										
	1	2	3	4	5	6	7	8	9	10	11
A	35	30	35	35	30	30	30	40	30	40	40
B	55	35	55	55	45	35	45	60	50	65	70/65*
C	65	45	65	65	55	45	55	70	55	70	70

*Speed of 65km/hr for engine cc below 100.

- 3.2 The break down of time vs. speed for each lap is given in Annex 1. The time versus speed is pictorially shown in Figures 1,2 and 3 for laps 1 to 9, 10 and 11 respectively.
- 3.3 If the lap speed is not achievable because of the speed capability of the vehicle, the vehicle shall be driven at 90% of the actual maximum speed of the vehicle. In such cases, the actual lap speed followed shall be reported.

Figure 1 Pictorial representation of Laps 1 to 9 (A,B & C)

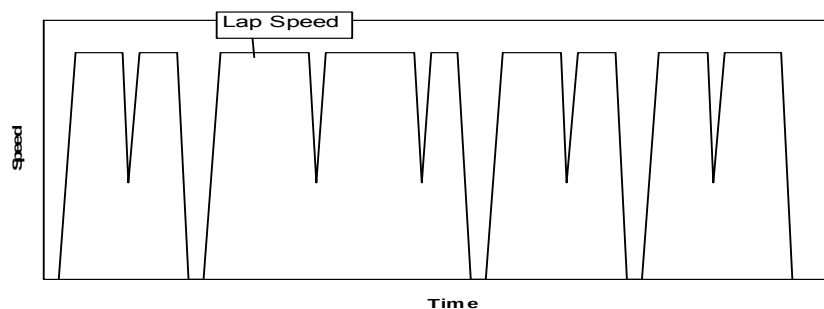


Figure 2 Pictorial representation of Lap 10(A,B & C)

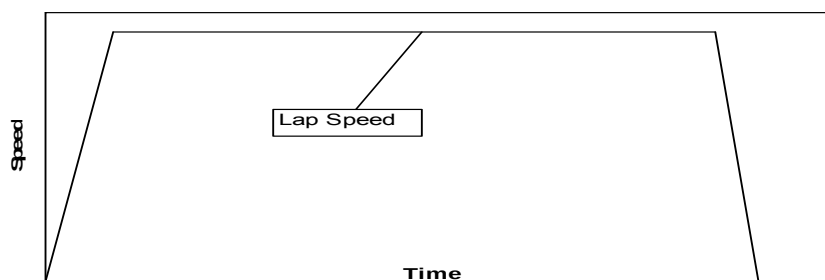


Figure 4 Pictorial representation of Lap 11 (A)

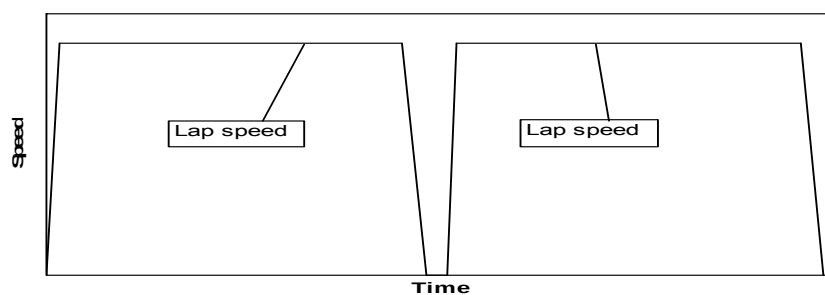
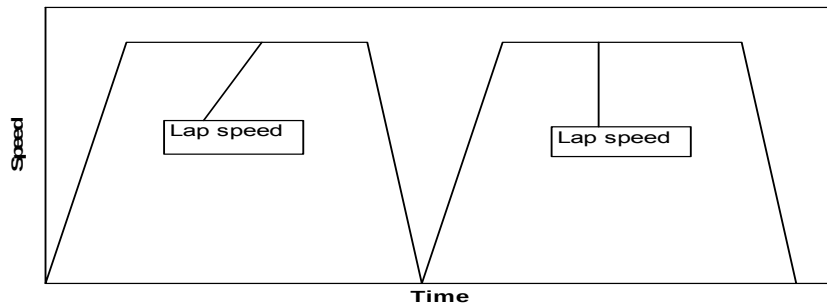


Figure 4 Pictorial representation of Lap 11 (B & C)



4. Gear shifting:

During lap 1 to 10 gear shifting shall be as recommended by the manufacturer. In acceleration phase of lap 11, gearshift shall be done at the maximum safe speed of engine recommended by the manufacturer. The gear shifting pattern actually followed shall be reported for a test cycle.

5. Fuel:

The fuel used shall comply with the requirements for the commercial fuel specified in the applicable emission regulation.

In case the lubricating oil is premixed with petrol, the quantity and quality of the oil shall be as specified by the vehicle manufacturer. The actual quality and quantity used shall be reported.

6. General:

6.1 If the mileage accumulation is done on a road or test track, the vehicle shall be loaded to the reference mass condition, specified in document No. MOST/CMVR/TAP115/116.

6.2 If the mileage accumulation is done on a chassis dynamometer, the load and inertia setting shall be as prescribed for the mass emission test as per document MOST/CMVR/TAP115/116 for the type approval test for specific model.

6.3 Operation of fuel enrichening devices such as choke, lights etc shall be restricted as is required for the actual running of the vehicle.

6.4 The typical test cycle followed during mileage accumulation shall be reported.

7.0 Maintenance of vehicle during mileage accumulation:

7.1 Scheduled maintenance:

A scheduled major engine tune up shall be conducted in a manner consistent with owners manual / service instructions and specifications provided by the manufacturer for use by costumer service personnel. Typical servicing items are listed below:

- a) Contact Breaker points & setting
- b) Ignition timing and setting
- c) Idle speed and Idle air/fuel mixture setting

- d) Tappet clearance
- e) Engine bolt tightening
- f) Spark plugs (Clean, gap setting, replace)
- g) Change of engine and transmission oil, change of elements for oil, air and fuel filters
- h) De-carbonization of engine including silencer in case of two stroke engines.
- j) Adjustment of chains (transmission, valve train)
- k) Adjustment of control cables, clutch etc.
- l) The catalytic converter may be serviced only once during the mileage accumulation, if the failure of the catalytic converter system activates an audible and/ or visual signal which alerts the vehicle operator to the need for catalytic converter system maintenance or if the need for the periodic maintenance of the catalytic converter system is overly signalled to the vehicle operator by appropriate means, e.g., An indicator light or significantly reduced drivability performance.

The catalytic converter may be serviced as recommended by the vehicle manufacturer.

7.2 Other maintenance:

Certain engine components may require maintenance/replacement, which, by its nature can not be scheduled for periodic interval, but which the manufacturer believes will be necessary, shall be permitted. For example, piston and cylinder replacement caused by piston seizure, excessive wear, which results in the vehicle being inoperative.

7.2.1 Any unscheduled engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning or replacement on vehicle shall be performed only in case of significantly reduced driving performance, subject to the following:

- a) part failure or system malfunction or the repairs of such failure or malfunction does not render the vehicle unrepresentative of vehicles in use, and
- b) does not require direct access to the combustion chamber except for:
 - spark plug, fuel injection component, or
 - removal or replacement of the removable pre-chamber, or
 - decarbonising.

7.2.2 Equipment, instruments or tools shall not be used to identify the malfunctioning, mal-adjustment or defective engine components unless the same or equivalent equipment, instrument or tools will be available at the dealerships and other service outlets and are used in conjunction with scheduled maintenance on such components.

7.2.3 Emission measurements shall not be used as a means of determining the need for an unscheduled maintenance.

7.2.4 Repairs/replacement to vehicle components of test vehicle, other than engine, emission control system or fuel system, shall be performed only as a result of part failure, vehicle system malfunction.

7.4 Records of maintenance activities:

All the maintenance work carried out shall be recorded in the test report.

8. Mass emission testing during the mileage accumulation:
- 8.1 During the mileage accumulation the vehicle shall be tested for mass emission. Emission of CO, HC and NO_x shall be measured. The measurements shall be done at the following spots:
- 8.1.1 The first exhaust emission test shall be carried out when the mileage accumulation reaches 1500km.
- 8.1.2 The final exhaust emission test shall be carried out when the mileage accumulation reaches the end.
- 8.1.3 Between the first exhaust emission test and final exhaust emission test regular maintenance shall be done as recommended by the manufacturer. The gap between the maintenance shall not be less than 2000km. At least one maintenance shall be carried out during the durability test. Tests shall be carried out before and after each regular maintenance.
- 8.1.4 Besides the tests specified above, additional tests may be carried out at certain mileage gaps. Such gaps between the tests shall be approximately uniform.
- 8.1.5 The total number of tests carried out, including the first and final test shall be at least 5.
- 8.1.6 If the final test coincides with a scheduled maintenance, only the final test shall be carried out before the maintenance. In this case test after maintenance shall not be carried out.
- 8.2 The difference between the actual mileage accumulation at each test spot and the planned mileage accumulation shall not exceed 200km.
- 8.3 Emission tests shall be carried out as per the procedure used for type approval testing as per document No. MoRTH/CMVR/TAP115/116.
- 8.4 During the emission test, if the test is affected by abnormal behavior of the vehicle, test shall be discarded. In any other case, the test result shall be deemed effective.
- The results which are discarded and the reasons thereof shall be recorded in the test report.
- 8.5 If more than one test is carried out at each spot, the number of effective tests (see 9.1) at each spot shall be same. If so each spot result can be used for regression.
- If the number of effective tests at each spot is not the same, the average of results for each spot shall be used for final calculation.
- The number of effective tests for each spot shall not be more than three.
- 8.6 If two vehicles of one model are selected to take durability test at the same time, the number of tests and mileage accumulation at each test spot shall be same for each vehicle.

9. Calculation of deterioration factor:
- 9.1 The results of tests at all spots as per 8.1.1, 8.1.2, 8.1.3 and 8.1.4, excluding those discarded, as per para 8.4, are the effective test results and shall be considered for calculation of deterioration factor.
- 9.2 Emission test result of any pollutant less than 0.01g/km, shall be deemed to be 0.01g/km.
- 9.3 The emission data before and after maintenance shall not be averaged.
- 9.4 The actual mileage number shall be rounded upto the last digit before decimal point, when expressed in kilometer.
- 9.5 The test result of each pollutant shall be corresponded to the mileage number. Using the least square method, regress out linear function, for each pollutant separately.
- 9.6 Use the linear function to calculate the pollutant value at 2500km and 30,000 kilometer. The value of the pollutant shall be calculated to the fourth digit after the decimal point, when expressed in g/km.
- 9.7 Divide the number at L km by the number at 2500km to work out the D.F. The D.F. shall be calculated to the third digit after the decimal point.
- 9.8 If D.F. is less than 1, it shall be deemed as 1.
- 9.9 D.F. for each applicable pollutant shall be calculated separately.
- 10.0 Extrapolation of the test results:
- 10.1 After accumulating at least half the specified kilometer 30,000 km, given in para 9.6, carry out regression of the results between 2500km and actual kilometre as per para 9.5.
- 11.0 The D.F. established as per this procedure (para 9 and 10) shall be applicable for all models of the same engine family.

Annex 1

Table A1. Mode-wise break up for Laps 1 to 9 of Test cycle classification A

Mode	Driving Mode Lap speed--->	Time for each mode (second)		
		30	35	40
1	Acceleration: Idle - Lap speed	13	15	18
2	Steady state cruise	68	68	52
3	Deceleration: Lap speed - 15km/h	10	11	10
4	Acceleration: 15km/h - Lap speed	10	11	10
5	Steady state cruise	45	45	37
6	Deceleration: Lap speed - idle	10	11	10
7	Idle	15	15	15
8	Acceleration: Idle - Lap speed	13	15	18
9	Steady state cruise	100	100	85
10	Deceleration: Lap speed - 15km/h	10	11	10
11	Acceleration: 15km/h - Lap speed	10	11	10
12	Steady state cruise	100	100	85
13	Deceleration: Lap speed - 15km/h	10	11	10
14	Acceleration: 15km/h - Lap speed	10	11	10
15	Steady state cruise	52	33	29
16	Deceleration: Lap speed - idle	10	11	10
17	Idle	15	15	15
18	Acceleration: Idle - Lap speed	13	15	18
19	Steady state cruise	63	63	52
20	Deceleration: Lap speed - 15km/h	10	11	10
21	Acceleration: 15km/h - Lap speed	10	11	10
22	Steady state cruise	52	11	30
23	Deceleration: Lap speed - idle	10	11	10
24	Idle	15	15	15
25	Acceleration: Idle - Lap speed	13	15	18
26	Steady state cruise	52	52	30
27	Deceleration: Lap speed - 15km/h	10	11	10
28	Acceleration: 15km/h - Lap speed	10	11	10
29	Steady state cruise	59	50	44
30	Deceleration: Lap speed - idle	10	11	10

Table A2. Mode-wise break up for Lap 10 & 11 of Test cycle classification A

Mode	Driving Mode Lap speed--->	Time for each mode (second)	
		For Lap 10	For Lap 11
		40	40
1	Acceleration: Idle - Lap speed	18	10
2	Steady state cruise	515	260
3	Deceleration: Lap speed - idle	18	18
4	Idle	Not applicable	15
5	Acceleration: Idle - Lap speed		10
6	Steady state cruise		260
7	Deceleration: Lap speed - idle		18

Table A3. Mode-wise break up for Laps 1 to 9 of Test cycle classification B & C

Mode	Driving Mode Lap speed--->	Time for each mode (second)						
		35	45	50	55	60	65	70
1	Idle	15	15	15	15	15	15	15
2	Acceleration: Idle - Lap speed	18	23	26	29	31	33	34
3	Steady state cruise	46	29	22	16	11	11	7
4	Deceleration: Lap speed - 15km/h	7	10	12	14	15	16	17
5	Acceleration: 15km/h - Lap speed	10	16	18	21	23	24	25
6	Steady state cruise	38	22	16	10	5	5	5
7	Deceleration: Lap speed - idle	12	15	17	19	20	22	23
8	Idle	15	15	15	15	15	15	15
9	Accelerate from idle to lap speed	18	23	28	29	31	33	34
10	Steady state cruise	89	61	51	42	35	20	11
11	Deceleration: Lap speed - 15km/h	7	10	12	14	15	16	17
12	Acceleration: 15km/h - Lap speed	10	16	18	21	23	24	25
13	Steady state cruise	89	61	51	42	35	20	12
14	Deceleration: Lap speed - 15km/h	7	10	12	14	15	16	17
15	Acceleration: 15km/h - Lap speed	10	16	18	21	23	24	25
16	Steady state cruise	28	14	8	4	1	1	1
17	Deceleration: Lap speed - idle	12	15	17	19	21	22	23
18	Idle	15	15	15	15	15	15	15
19	Accelerate from idle to lap speed	18	23	26	29	31	33	34
20	Steady state cruise	58	37	30	23	17	14	12
21	Deceleration: Lap speed - 15km/h	7	10	12	14	15	16	17
22	Acceleration: 15km/h - Lap speed	10	16	16	21	23	24	25
23	Steady state cruise	38	22	16	10	5	5	5
24	Deceleration: Lap speed - idle	12	15	17	19	21	22	23
25	Idle	15	15	15	15	15	15	15
26	Acceleration: Idle - Lap speed	18	23	26	29	31	33	34
27	Steady state cruise	48	29	22	18	11	7	7
28	Deceleration: Lap speed - 15km/h	7	10	12	14	15	16	17
29	Acceleration: 15km/h - Lap speed	10	16	18	21	23	24	25
30	Steady state cruise	58	37	30	23	17	15	7
31	Deceleration: Lap speed - idle	12	15	17	19	21	22	23
Total time		757	654	628	615	594	578	565

Table A4. Mode-wise break up for Lap 10 & 11 of Test cycle classification B & C

Mode	Driving Mode Lap speed--->	Time for each mode (second)		
		For Lap 10		For Lap 11
		65	70	70
1	Acceleration: Idle - Lap speed	34	36	36
2	Steady state cruise	304	278	106
3	Deceleration: Lap speed - idle	22	24	24
4	Acceleration: Idle - Lap speed	Not applicable		36
5	Steady state cruise			106
6	Deceleration: Lap speed - idle			24