Transmitted by the Expert from OICA

Informal document No. **GRPE-55-11**
(55th GRPE, 15-18 January 2008,
agenda item 6(a).)

OICA PROPOSAL FOR DRAFT AMENDMENT TO REGULATION No. 83

This proposal has been prepared by the experts from OICA in order to amend the requirements of Regulation 83, to make allowance for Stop-Start and Regenerative Braking systems for improved fuel economy.

A. PROPOSAL

Annex 4, Appendix 1,

Insert new paragraph 2.4:

2.4: In the case that the vehicle is equipped with regenerative braking and/or an automatically controlled engine stop-start system, where the vehicle always defaults to the stop-start system being enabled, the conditions for certain operations on the test cycle should be adapted as follows:

2.4.1 Modify the 3 idle periods in operations 1, 6 and 13 on the part one cycle to keep the same time for each operation but to allow an increase of the time with the gearbox in neutral, clutch engaged (shown as PM) and a corresponding decrease in the K1 time (first gear engaged, clutch disengaged).

2.4.2 Modify the decelerations in operations 4, 11 and 23 immediately prior to the deceleration operations (clutch disengaged) where the speed reaches zero to allow earlier clutch disengagement.

2.4.3 The conditions used during type approval should be recorded in the Approval document.

Annex 4, Appendix 1,

Insert new paragraph 3.4:

3.4 In the case that the vehicle is equipped with regenerative braking and/or an automatically controlled engine stop-start system, where the vehicle always defaults to the stop-start system being enabled, the conditions for certain operations on the test cycle should be adapted as follows:

3.4.1 Modify the idle period in operation 1 on the part two cycle to keep the same total time for the operation, but to allow an increase of the time with the gearbox in neutral, clutch engaged (shown as PM) and a corresponding decrease of the K1 time (first gear engaged, clutch disengaged). The total time for the operation remains at 20 seconds.

3.4.2 Modify the decelerations in operation 19 immediately prior to the deceleration operations (clutch disengaged) where the speed reaches zero to allow earlier clutch disengagement.

Annex 4a,

Insert new paragraphs 6.1.1.1. to 6.1.1.3:

6.1.1.1.: In the case that the vehicle is equipped with regenerative braking and/or an automatically controlled engine stop-start system, where the vehicle always defaults to the stop-start system being enabled, the conditions for certain operations on the test cycle should be adapted as follows:

6.1.1.2. Modify the 3 idle periods in operations 1, 6 and 13 on the part one cycle to keep the same time for each operation but to allow an increase of the time with the gearbox in neutral, clutch engaged (shown as PM) and a corresponding decrease in the K1 time (first gear engaged, clutch disengaged).

6.1.1.3. Modify the decelerations in operations 4, 11 and 23 immediately prior to the deceleration operations (clutch disengaged) where the speed reaches zero to allow earlier clutch disengagement.

6.1.1.4. The conditions used during type approval should be recorded in the Approval document.

Annex 4a,

Insert new paragraphs 6.1.2.1. to 6.1.2.3.:

6.1.2.1.: In the case that the vehicle is equipped with regenerative braking and/or an automatically controlled engine stop-start system, where the vehicle always defaults to the stop-start system being enabled, the conditions for certain operations on the test cycle should be adapted as follows:

6.1.2.2.: Modify the idle period in operation 1 on the part two cycle to keep the same total time for the operation, but to allow an increase of the time with the gearbox in neutral, clutch engaged (shown as PM) and a corresponding decrease of the K1 time (first gear engaged, clutch disengaged). The total time for the operation remains at 20 seconds.

6.1.2.3.: Modify the decelerations in operation 19 immediately prior to the deceleration operations (clutch disengaged) where the speed reaches zero to allow earlier clutch disengagement.

Annex 4, Appendix 1, table 1.2, amend as follows

Table 1.2
Elementary Urban Operating Cycle on the Chassis Dynamometer (Part One)

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Elementary urban operating cycle on the chassis dynamometer (Part One)

No. of operation	Operation	Phase	Acceleration (m/s^2)	Speed (km/h)	Duration of each		Cumulative time (s)	Gear to be used in the case of a manual gearbox
					Operation (s)	Phase (s)		
1	Idling	1			11	11	11	6 s PM + 5 s K_1 (*)
2	Acceleration	2	1.04	0-15	4	4	15	1
3	Steady speed	3		15	9	8	23	1
4	Deceleration	4	-0.69	15-10	2	5	25	1
5	Deceleration, clutch disengaged		-0.92	10-0	3		28	K_1 (*)
6	Idling	5			21	21	49	16 s PM + 5 s K_1 (*)
7	Acceleration	6	0.83	0-15	5	12	54	1
8	Gear change				2		56	
9	Acceleration		0.94	15-32	5		61	2
10	Steady speed	7		32	24	24	85	2
11	Deceleration	8	-0.75	32-10	8	11	93	2
12	Deceleration, clutch disengaged		-0.92	10-0	3		96	K_2 (*)
13	Idling	9	0-15	0-15	21		117	16 s PM + 5 s K_1 (*)

No. of operation	Operation	Phase	Acceleration (m/s^2)	Speed (km/h)	Duration of each		Cumulative time (s)	Gear to be used in the case of a manual gearbox
					Operation (s)	Phase (s)		
14	Acceleration	10			5	26	122	1
15	Gear change				2		124	
16	Acceleration		0.62	15-35	9		133	2
17	Gear change				2		135	
18	Acceleration		0.52	35-50	8		143	3
19	Steady speed	11		50	12	12	155	3
20	Deceleration	12	-0.52	50-35	8	8	163	3
21	Steady speed	13		35	13	13	176	3
22	Gear change	14			2	12	178	
23	Deceleration		-0.99	35-10	7		185	2
24	Deceleration, clutch disengaged		-0.92	10-0	3		188	K_2 (*)
25	Idling	15			7	7	195	7 s PM (*)

(*) PM = gearbox in neutral, clutch engaged. K_1, K_2 = first or second gear engaged, clutch disengaged. **The duration of PM and K_x phases may be amended from those in the table according to paragraph 2.4 of this Appendix**

Annex 4, Appendix 1, Table 1.3, amend as follows

Table 1.3
Extra Urban Cycle (Part Two) for the Type I Test

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Extra-urban cycle (Part Two) for the Type I test

No. of operation	Operation	Phase	Acceleration ($m/s^{2)}$	Speed (km/h)	Duration of each		Cumulative time (s)	Gear to be used in the case of a manual gearbox
					Operation (s)	Phase (s)		
1	Idling	1			20	20	20	K_1 (1)
2	Acceleration	12	0.83	0	5	41	25	1
3	Gear change				2		27	-
4	Acceleration		0.62	15-35	9		36	2
5	Gear change				2		38	-
6	Acceleration		0.52	35-30	8		46	3
7	Gear change				2		48	-
8	Acceleration		0.43	50-70	13		61	4
9	Steady speed	3		70	50	50	111	5
10	Deceleration	4	-0.69	70-50	8	8	119	4 s.5 + 4 s.4
11	Steady speed	5		50	69	69	188	4
12	Acceleration	6	0.43	50-70	13	13	201	4
13	Steady speed	7		70	50	50	251	5

No. of operation	Operation	Phase	Acceleration ($m/s^{2)}$	Speed (km/h)	Duration of each		Cumulative time (s)	Gear to be used in the case of a manual gearbox
					Operation (s)	Phase (s)		
14	Acceleration	8	0.24	70-100	35	35	286	5
15	Steady speed (2)	9		100	30	30	316	5 (2)
16	Acceleration (2)	10	0.28	100-120	20	20	336	5 (2)
17	Steady speed (2)	11		120	10	20	346	5 (2)
18	Deceleration (2)	12	-0.69	120-80	16	34	362	5 (2)
19	Deceleration (2)		-1.04	80-50	8		370	5 (2)
20	Deceleration, clutch disengaged		1.39	50-0	10		380	K5 (1)
21	Idle	13			20	20	400	PM (1)

(1) PM = gearbox on neutral, clutch engaged.
K_1,K_5 = first or fifth gear engaged, clutch disengaged
The duration of PM and K_x phases may be amended from those in the table according to paragraph 3.4 of this Appendix

(2) Additional gears can be used according to manufacturer recommendations if the vehicle is equipped with a transmission with more than five gears.

Annex 4a, table 2 amend as follows

Table 2
Elementary Urban Operating Cycle on the Chassis Dynamometer (Part One)

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Elementary urban operating cycle on the chassis dynamometer (Part One)

No. of operation	Operation	Phase	Acceleration (m/s^2)	Speed (km/h)	Duration of each		Cumulative time (s)	Gear to be used in the case of a manual gearbox
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(*) PM = gearbox in neutral, clutch engaged. K_1, K_2 = first or second gear engaged, clutch disengaged. **The duration of PM and K_x phases may be amended from those in the table according to paragraph 6.1.1.1. of this Annex**

Annex 4a, Table 2 amend as follows

Table 2
Extra Urban Cycle (Part Two) for the Type I Test

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(1) PM = gearbox on neutral, clutch engaged.
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The duration of PM and K_x phases may be amended from those in the table according to paragraph 6.1.2.1. of this Annex

(2) Additional gears can be used according to manufacturer recommendations if the vehicle is equipped with a transmission with more than five gears.

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B. JUSTIFICATION

With increasing focus on reduction of fuel consumption, stop-start systems are in development. Without adaptation to technical progress, these systems are artificially constrained by the detailed test schedule clutch and declutch requirements from demonstrating their fuel economy benefit.

A typical Stop-Start System operates using an Integrated Starter-Generator (ISG) unit which has the function of switching off the engine when the vehicle is stationary, or when the vehicle is on a low speed coast-down prior to a stop, and switching the engine back on before the vehicle drives off.

For example, the test cycle instructions require that during an idle period, the clutch is disengaged with the vehicle in 1st gear at 5 seconds before the next acceleration. With some stop-start systems, the disengagement of the clutch and/or the selection of a gear is the signal to restart the engine. This means that the engine is be restarted several seconds earlier on the drive cycle than would be the case in normal driving.

These time conditions for clutch disengagement and selection of gears was developed when vehicles were more difficult to launch without incurring stall issues. It is now appropriate to adapt these requirement to technical progress and allow an increased flexibility for the time for clutch disengagement and gear selection.

It is important to note that there is a certain flexibility regarding the time for gear engagement prior to launch of the vehicle and that this must be maintained. The legislation specifies a 5 sec time-window for gear engagement without defining a restrictions on when (during the 5sec period) the gear engagement should occur. The legislation in this case is as encompassing as possible and it allows this flexibility for practical reasons giving appropriate test tolerances for different vehicles and different drivers.

Revisions which would define a differently specified time window – e.g. clutch disengagement and gear selection at 1 second before the acceleration operation might inadvertently create test problems for certain type of vehicles with complex shift patterns and with difficult gear engagement procedures.

Accordingly the text has been modified to take account of various stop-start control systems. The engine restart conditions for example may be at some point during the clutch pedal travel or with the clutch pedal depressed and using gear engagement as the restart trigger. In this case clutch disengagement and gear selection can be made as late as possible providing that the vehicle can be launched without falling outside the cycle tolerances.

The second part of the amendment concerns the modification to allow an earlier clutch disengagement on the decelerations on the operations prior to where the deceleration operation finishes at zero speed – i.e. at idle. This adaptation would allow more innovative use of regenerative braking systems for energy recovery and encourage development of such systems.

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