Proposal for correction of document ECE/TRANS/WP.29/GRPE/2009/2

A. PROPOSAL FOR AMENDMENTS

Paragraph 2,
"Equation A13-4" amend to read "Equation A13-3"
"Equation A13-5" amend to read "Equation A13-4"
"Equation A13-6" amend to read "Equation A13-5"

Paragraph 4.1., amend to read: (underlined part)

"An example of input data necessary for the calculation of shift speeds is shown in table ~~A13-1~~ **A13-2**. The upshift speeds for acceleration phases for the first gear and higher gears are calculated using equations **6-1 and 6-2**. The denormalisation of engine speeds can be **performed** by using the equation $n = n\_norm \times (s - n_{idle}) + n_{idle}$."

Paragraph 4.2., amend to read: (underlined part)

"The downshift speeds for deceleration phases can be calculated with equations **6-3 and 6-4**. The ndv values in table ~~A13-1~~ **A13-2** can be used as gear ratios. These values can also be used to calculate the affiliated vehicle speeds (vehicle shift speed in gear i = engine shift speed in gear i / ndv_i). The corresponding results are shown in tables ~~A13-2~~ **A13-3** and ~~A13-3~~ **A13-4**."

The numbering of table A13-3, amend to read: (underlined part)

Table ~~A13-3~~ A13-4: Engine and vehicle shift speeds according to table A13-2

B. JUSTIFICATION

The proposal is simply to correct the typographical errors in the original document ECE/TRANS/WP29/GRPE/2009/2 as shown in the following pages.

JAPAN proposal for correction of working document for gtr No. 2 (WMTC)

Japan has noticed some numbering errors in the document ECE/TRANS/WP.29/GRPE/2009/2 which refers to the gearshift prescription for gtr No.2. (re-issued on 04.11.2008)

Japan would like to point out as following.

Equation A13-1, normalised upshift speed in 1st gear (gear 1).

$$n\_max\_acc(1) = (0.5753 \times e^{(-1.9 \times \frac{P_n}{m_k + 75})} - 0.1) \times (s - n_{idle}) + n_{idle}$$

Equation A13-2, normalised upshift speed in gears > 1

$$n\_max\_acc(i) = (0.5753 \times e^{(-1.9 \times \frac{P_n}{m_k + 75})}) \times (s - n_{idle}) + n_{idle}$$

1.5. In use driving behaviour data from India was added to the WMTC database at a later stage. This resulted in modifications of the part 1 cycles and the part 2, reduced speed cycle. Within this modification work also the gearshift behaviour was checked. Fortunately, it could be proven that the WMTC gearshift prescriptions are also suitable for the Indian gearshift behaviour.

Equation A13-3 is missing.

2. Example

Figure A13-1 shows an example of gearshift use for a small vehicle.
(a) The lines in bold show the gear use for acceleration phases.
(b) The dotted lines show the downshift points for deceleration phases.
(c) The cruising phases the whole speed range between downshift speed and upshift speed may be used.

In case of gradually increase of vehicle speed during cruise phases, upshift speeds ($v_{1 \to 2}$, $v_{2 \to 3}$ and $v_{i \to i+1}$) in km/h may be calculated using the following equations:

Equation A13-4:

$$v_{1 \to 2} = \left[0.03 \times (s - n_{idle}) + n_{idle} \right] \times \frac{1}{ndv_2}$$

Equation A13-5:

$$v_{2 \to 3} = \left[(0.5753 \times e^{(-1.9 \times \frac{P_n}{m_k + 75})} - 0.1) \times (s - n_{idle}) + n_{idle} \right] \times \frac{1}{ndv_1}$$

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4. <u>Calculation example</u>

4.1. An example of input data necessary for the calculation of shift speeds is shown in table A13-1. The upshift speeds for acceleration phases for the first gear and higher gears are calculated using equations **6-1 and 6-2**. The denormalisation of engine speeds can be **performed** by using the equation $n = n\_norm \times (s - n_{idle}) + n_{idle}$.

4.2. The downshift speeds for deceleration phases can be calculated with equations **6-3 and 6-4**. The ndv values in table A13-1 can be used as gear ratios. These values can also be used to calculate the affiliated vehicle speeds (vehicle shift speed in gear i = engine shift speed in gear i / ndv_i). The corresponding results are shown in tables A13-2 and A13-3.

4.3. In a further step the possibility of a simplification of the above-described gearshift algorithms was examined by additional analyses and calculations. It should especially be checked whether engine shift speeds could be replaced by vehicle shift speeds. The analysis showed that vehicle speeds could not be brought in line with the gearshift behaviour of the in-use data.

<u>Table</u> A13-2: Input data for the calculation of engine and vehicle shift speeds

Item	Input Data
Engine capacity in cm^3	600
P_n in kW	72
m_k in kg	199

Table A13-3: Shift speeds for acceleration phases for the first gear and for higher gears (according to table **A13-2**)

Engine Speed	Upshift speeds	
	n_acc_max (1)	n_acc_max (i)
n_norm <u>*/</u> in per cent	**24.9**	**34.9**
n in min^{-1}	3,804	4,869

<u>*/</u>   n_norm means the calculated value by equation A13-1 and equation A13-2.

<u>Table</u> A13-3: Engine and vehicle shift speeds according to table A13-2

Gearshift		Shift speeds		
		v in km/h	n_norm (i) in per cent	n in min^{-1}
	1→2	28.5	**24.9**	3,804

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