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ANNEXES 1 to 2

CORRIGENDUM
This document corrects document COM(2018) 284 final of 17.05.2018
Concerns all language versions.
Correction of minor non-substantial errors in the act and its annexes.
The text shall read as follows:

ANNEXES

to the

Proposal for a regulation of the European Parliament and of the Council

setting CO2 emission performance standards for new heavy-duty vehicles

{SEC(2018) 233 final} - {SWD(2018) 185 final} - {SWD(2018) 186 final}

ANNEX I
Calculation of the average specific emissions, the average specific emission target and excess emissions

1. VEHICLE SUB-GROUPS

Each new heavy-duty vehicle shall be attributed to one of the sub-groups defined in Table 1 in accordance with the conditions set out therein.

Table 1 – Vehicle sub-groups (sg)

Heavy-duty vehicles	**Cab type**	**Engine power**	**Vehicle sub-group (sg)**
Rigid lorries with axle configuration 4x2 and technically permissible maximum laden mass > 16 tons	All	<170 kW	**4-UD**
	Day cab	≥170 kW	**4-RD**
	Sleeper cab	≥170 kW and <265 kW	
	Sleeper cab	≥265 kW	**4-LH**
Rigid lorries with axle configuration 6x2	Day cab	All	**9-RD**
	Sleeper cab		**9-LH**
Tractors with axle configuration 4x2 and technically permissible maximum laden mass >16 tons	Day cab	All	**5-RD**
	Sleeper cab	< 265 kW	
	Sleeper cab	≥ 265 kW	**5-LH**
Tractors with axle configuration 6x2	Day cab	All	**10-RD**
	Sleeper cab		**10-LH**

"Sleeper cab" means a type of cab that has a compartment behind the driver's seat intended to be used for sleeping as reported in accordance with Regulation (EU) No …/2018 [HDV M&R].

"Day cab" means a type of cab that is not a sleeper cab.

If a new heavy-duty vehicle cannot be attributed to a vehicle sub-group because information on the cab type or engine power is not available, it shall be attributed to the long-haul (LH) sub-group corresponding to its chassis type (rigid lorry or tractor) and axle configuration (4x2 or 6x2).

Where a new heavy-duty vehicle is attributed to sub-group 4-UD, but data on the CO_2 emissions in g/km are not available for the UDL or UDR mission profiles as defined in Table 2 of point 2.1, the new heavy-duty vehicle shall be attributed to the sub-group 4-RD.

2. CALCULATION OF THE AVERAGE SPECIFIC EMISSIONS OF A MANUFACTURER

2.1. Calculation of the specific CO_2 emissions of a new heavy-duty vehicle

The specific emissions in g/km ($CO2_v$) of a new heavy-duty vehicle *v*, attributed to a sub-group *sg* shall be calculated in accordance with the following formula:

$$CO2_v = \sum_{mp} W_{sg,mp} \times CO2_{v,mp}$$

Where,

$\sum mp$ is the sum is over all mission profiles *mp* listed in Table 2;

sg is the sub-group to which the new heavy-duty vehicle *v* has been attributed according to Section 1 of this Annex;

$W_{sg,mp,}$ is the mission profile weight specified in Table 2;

$CO2_{v,mp}$ is the CO_2 emissions in g/km of a new heavy-duty vehicle *v* determined for a mission profile *mp* and reported in accordance with Regulation (EU) No …/2018 [HDV M&R]

The specific CO_2 emissions of a zero-emission heavy-duty vehicle shall be set to 0 g CO_2/km.

The specific CO_2 emissions of a vocational vehicle shall be the average of the CO_2 emissions in g/km reported in accordance with Regulation (EU) No …/2018 [HDV M&R].

Table 2 - Mission profile weights ($W_{sg,mp}$)

Vehicle sub-group	**Mission profile[1] (*mp*)**						
(sg)	**RDL**	**RDR**	**LHL**	**LHR**	**UDL**	**UDR**	**REL, RER, LEL, LER**
4-UD	0	0	0	0	0,5	0,5	0
4-RD	0,45	0,45	0,05	0,05	0	0	0
4-LH	0,05	0,05	0,45	0,45	0	0	0
9-RD	0,27	0,63	0,03	0,07	0	0	0
9-LH	0,03	0,07	0,27	0,63	0	0	0
5-RD	0,27	0,63	0,03	0,07	0	0	0
5-LH	0,03	0,07	0,27	0,63	0	0	0
10-RD	0,27	0,63	0,03	0,07	0	0	0
10-LH	0,03	0,07	0,27	0,63	0	0	0

[1]**Mission profile definitions**

RDL	Regional delivery payload low
RDR	Regional delivery payload representative
LHL	Long haul payload low
LHR	Long haul payload representative
UDL	Urban delivery payload low
UDR	Urban delivery payload representative
REL	Regional delivery (EMS) payload low
RER	Regional delivery (EMS) payload representative
LEL	Long haul (EMS) payload low
LER	Long haul (EMS) payload representative

2.2. Average specific CO_2 emissions of all new heavy-duty vehicles in a sub-group for a manufacturer

For each manufacturer and each calendar year, the average specific CO_2 emissions in g/tkm ($avgCO2_{sg}$) of all new heavy-duty vehicles in a sub-group *sg* shall be calculated as follows:

$$avgCO2_{sg} = \frac{\sum_v CO2_v}{V_{sg} \times PL_{sg}}$$

Where,

$\sum v$ is the sum over all new heavy-duty vehicles of the manufacturer in the sub-group *sg* excluding all vocational vehicles in accordance with Article 4(a).

$CO2_v$ is the specific CO_2 emissions of a new heavy-duty vehicle *v* determined in accordance with point 2.1;

V_{sg} is the number of new heavy-duty vehicles of the manufacturer in subgroup *sg* excluding all vocational vehicles in accordance with Article 4(a);

PL_{sg} is the average payload of vehicles in the sub-group *sg* as determined in point 2.5.

2.3. Calculation of the zero- and low-emission factor as referred to in Article 5

For each manufacturer and calendar year, the zero- and low-emission factor (ZLEV) referred to in Article 5 shall be calculated as follows:

ZLEV = V / (Vconv + Vzlev) *with a minimum of 0,97*

Where:

V is the number of new heavy-duty vehicles of the manufacturer excluding all vocational vehicles in accordance with Article 4(a).

Vconv is the number of new heavy-duty vehicles of the manufacturer excluding all vocational vehicles in accordance with Article 4(a) and excluding zero- and low-emission heavy-duty vehicles;

Vzlev is the sum of *Vin* and *Vout,*

Where,

$Vin = \sum_v \square\ (1+ (1 - CO2_v/350))$

with $\sum_v \square$ being the sum over all new zero- and low-emission heavy-duty vehicles with the characteristics set out in Article 2(1)(a) to (d);

$CO2_v$ is the specific CO_2 emissions in g/km of a zero- and low-emission heavy-duty vehicle *v* determined in accordance with point 2.1.

Vout is the total number of zero-emission heavy-duty vehicles of the categories referred to in in the second sub-paragraph of Article 2(1), multiplied by 2 , and with a maximum of 1,5% of *Vconv.*

2.4. Calculation of the manufacturer's share of vehicles in a sub-group

For each manufacturer and each calendar year, the share of new heavy-duty vehicles in a sub-group $share_{sg}$ shall be calculated as follows:

$$share_{sg} = \frac{V_{sg}}{V}$$

Where,

V_{sg} is the number of new heavy-duty vehicles of the manufacturer in a subgroup *sg* excluding all vocational vehicles in accordance with Article 4(a);

V is the number of new heavy-duty vehicles of the manufacturer excluding all vocational vehicles in accordance with Article 4(a).

2.5. Calculation of the average payload values of all vehicles in a sub-group

The average payload value PL_{sg} of a vehicle in a sub-group *sg* shall be calculated as follows:

$$PL_{sg} = \sum_{mp} W_{sg,mp} \times PL_{sg,mp}$$

Where,

$\sum_{mp}$ is the sum over all mission profiles *mp*

$W_{sg,mp,}$ is the mission profile weight specified in Table 2 under point 2.1

$PL_{sg,mp}$ is the payload value attributed to the vehicles in the sub-group *sg* for the mission profile *mp, as* specified in Table 3.

Table 3 - Payload values $PL_{sg, mp}$ (in tons)

Vehicle sub-group *sg*	Mission profile[1] *mp*									
	RDL	RDR	LHL	LHR	UDL	UDR	REL	RER	LEL	LER
4-UD	0,9	4,4	1,9	14	0,9	4,4	3,5	17,5	3,5	26,5
4-RD										
4-LH										
5-RD	2,6	12,9	2,6	19,3	2,6	12,9	3,5	17,5	3,5	26,5
5-LH										
9-RD	1,4	7,1	2,6	19,3	1,4	7,1	3,5	17,5	3,5	26,5
9-LH										
10-RD	2,6	12,9	2,6	19,3	2,6	12,9	3,5	17,5	3,5	26,5
10-LH										

[1] See mission profile definitions under Table 2 of point 2.1

2.6. Calculation of the mileage and payload weighting factor

The mileage and payload weighting factor (MPW_{sg}) of a sub-group *sg* is defined as the product of the annual mileage specified in Table 4 and the payload value per sub-group specified in Table 3 of point 2.5, normalised to the respective value for sub-group 5-LH, and shall be calculated as follows:

$$MPW_{sg} = \frac{(AM_{sg} \times PL_{sg})}{(AM_{5-LH} \times PL_{5-LH})}$$

Where,

AM_{sg} is the annual mileage specified in Table 4 for the vehicles in the respective sub-group

$AM_{5\text{-}LH}$ is the annual mileage specified for the sub-group 5-LH in Table 4

PL_{sg} is as determined in point 2.5

$PL_{5\text{-}LH}$ is the average payload value for the sub-group 5-LH as determined in point 2.5.

Table 4 - Annual mileages

Vehicle sub-group *sg*	Annual mileage AM_{sg} (in km)
4-UD	60 000
4-RD	78 000
4-LH	98 000
5-RD	78 000
5-LH	116 000
9-RD	73 000
9-LH	108 000
10-RD	68 000
10-LH	107 000

2.7. Calculation of the average specific CO_2 emissions in g/tkm of a manufacturer referred to in Article 4

For each manufacturer and each calendar year, the average specific CO_2 emissions in g/tkm (*CO2*) shall be calculated as follows:

$$CO2 = ZLEV \times \sum_{sg} share_{sg} \times MPW_{sg} \times avgCO2_{sg}$$

Where,

$\sum_{sg}$	is the sum is over all sub-groups;
$ZLEV$	is as determined in point 2.3
$share_{sg}$	is as determined in point 2.4
MPW_{sg}	is as determined in point 2.6
$avgCO2_{sg}$	is as determined in point 2.2

3. CALCULATION OF THE REFERENCE CO_2 EMISSIONS REFERRED TO IN ARTICLE 1

The reference CO_2 emissions ($rCO2_{sg}$) shall be calculated for each sub-group *sg* on the basis of all new heavy-duty vehicles of all manufacturers of the year 2019 as follows:

$$rCO2_{sg} = \frac{\sum_v CO2_v}{rV_{sg} \; x \; PL_{sg}}$$

Where,

$\sum_v$	is the sum over all new heavy-duty vehicles registered in the year 2019 in the sub-group *sg* excluding all vocational vehicles in accordance with the second sub-paragraph of Article 1;
$CO2_v$	are the specific CO_2 emissions of the vehicle *v* as determined in accordance with point 2.1, if applicable adjusted pursuant to Annex II;
rV_{sg}	is the number of all new heavy-duty vehicles registered in the year 2019 in the sub-group *sg* excluding all vocational vehicles in accordance with the second sub-paragraph of Article 1;
PL_{sg}	is the average payload of vehicles in the sub-group *sg* as determined in point 2.5.

4. CALCULATION OF THE SPECIFIC EMISSION TARGET OF A MANUFACTURER REFERRED TO IN ARTICLE 6

For each manufacturer and each calendar year, from 2025 on, the specific emission target *T* shall be calculated as follows:

$$T = \sum_{sg} share_{sg} \times MPW_{sg} \times (1 - rf) \times rCO2_{sg}$$

Where,

$\sum_{sg}$	is the sum over all sub-groups;
$share_{sg}$	is as determined in point 4 of Section 2;
MPW_{sg}	is as determined point 6 of Section 2;

rf	is the CO_2 reduction target (in %) as specified in Article 1(a) and (b) for the specific calendar year;
$rCO2_{sg}$	is as determined in Section 3.

5. EMISSION CREDITS AND DEBTS REFERRED TO IN ARTICLE 7

5.1. Calculation of the CO_2 reduction trajectory for emission credits

For each manufacturer and each calendar year Y in the period 2019 to 2029, a CO_2 emission trajectory (ET_Y) is defined as follows:

$$ET_{,Y} = \sum_{sg} share_{sg} \times MPW_{sg} \times R\text{-}ET_Y \times rCO2_{sg}$$

Where,

$\sum_{sg}(\ldots)$	is the sum over all sub-groups;
$share_{,sg}$	is as determined in point 4 of Section 2;
MPW_{sg}	is as determined point 6 of Section 2;
$rCO2_{sg}$	is as determined in Section 3;

Where,

for the calendar years Y from 2019 to 2025:

$$R\text{-}ET_{Y,} = (1\text{-}rf_{2025}) + rf_{2025} \times (2025 - Y)/6$$

and, for the calendar years Y from 2026 to 2030:

$$R\text{-}ET_Y = (1\text{-}rf_{2030}) + (rf_{2030} - rf_{2025}) \times (2030 - Y)/5$$

rf_{2025} and rf_{2030} are the CO_2 reduction targets (in %) for 2025 and 2030 as specified in Article 1(a) and (b), respectively.

5.2. Calculation of the emission credits and debts in each calendar year

For each manufacturer and each calendar year Y in the period 2019 to 2029, the emission credits ($cCO2_Y$) and emission debts ($dCO2_Y$) shall be calculated as follows:

If $CO2_Y < ET_Y$:

$$cCO2_Y = (ET_Y - CO2_Y) \times V_y \quad \text{and}$$

$$dCO2_Y = 0$$

If $CO2_Y > T_Y$ *for the years 2025 to 2029:*

$$dCO2_Y = (CO2_Y - T_Y) \times V_Y \quad \text{and}$$

$$cCO2_Y = 0$$

In all other cases $dCO2_Y$ *and* $cCO2_Y$ *are set to 0.*

Where,

ET_Y	is the manufacturer's emission trajectory in the calendar year Y determined in accordance with point 5.1;
$CO2_Y$	is the average specific emissions in the calendar year Y determined in accordance with point 2.7;

T_Y is the manufacturer specific emission target in the calendar year Y determined in accordance with Section 4;

V_Y is the number of new heavy-duty vehicles of the manufacturer in the calendar year Y excluding all vocational vehicles in accordance with Article 4(a).

5.3. Emission debt limit

For each manufacturer the emission debt limit (*limCO2*) is defined as follows:

$$limCO2 = T_{2025} \times 0{,}05 \times V_{2025}$$

Where

T_{2025} is the manufacturer specific emission target for 2025 determined in accordance with Section 4;

V_{2025} is the number of new heavy-duty vehicles of the manufacturer in 2025 excluding all vocational vehicles in accordance with Article 4(a).

5.4. Emission credits acquired before the year 2025

Emission debts acquired in the year 2025 shall be reduced by an amount *(redCO2)* corresponding to the emission credits acquired prior to 2025, which is determined for each manufacturer as follows:

$$redCO2 = min(dCO2_{2025}\,;\, \sum_{Y=2019}^{2024} cCO2_Y)$$

Where,

min is the minimum of the two values mentioned between the brackets;

$\sum_{Y=2019}^{2024}$ is the sum over the calendar years 2019 to 2024;

$dCO2_{2025}$ is the emission debts for 2025 as determined in accordance with point 5.2;

$cCO2_Y$ is the emission credits for the calendar year Y as determined in accordance with point 5.2.

6. DETERMINATION OF A MANUFACTURER'S EXCESS EMISSIONS REFERRED TO IN ARTICLE 8(2)

For each manufacturer and each calendar year from 2025 onwards the value of the excess emissions ($exeCO2_Y$) shall be determined as follows, if the value is positive:

For the year 2025

$$exeCO2_{2025} = dCO2_{2025} - \sum_{Y=2019}^{2025} cCO2_Y - limCO2$$

For the years Y from 2026 to 2028

$$exeCO2_Y = \sum_{I=2025}^{Y} (dCO2_I - cCO2_I) - \sum_{I=2025}^{Y-1} exeCO2_J - redCO2 - limCO2$$

For the year 2029

$$exeCO2_Y = \sum_{I=2025}^{2029} (dCO2_I - cCO2_I) - \sum_{J=2025}^{2028} exeCO2_J - redCO2$$

For the years Y from 2030 onwards

$$exeCO2_y = (CO2_Y - T_Y) \; x \; V_Y$$

Where,

$\sum_{Y=2019}^{2025}$	is the sum over the calendar years 2019 to 2025;
$\sum_{I=2025}^{Y}$	is the sum over the calendar years 2025 to Y;
$\sum_{J=2025}^{Y-1}$	is the sum over the calendar years 2025 to (Y-1);
$\sum_{J=2025}^{2028}$	is the sum over the calendar years 2025 to 2028;
$\sum_{I=2025}^{2029}$	is the sum over the calendar years 2025 to 2029;
$dCO2_Y$	is the emission debts for the calendar year Y as determined in accordance with point 5.2;
$cCO2_Y$	is the emission credits for the calendar year Y as determined in accordance with point 5.2;
limCO2	is the emission debt limit as determined in accordance with point 5.3;
redCO2	is the reduction of emission debts of the year 2025 as determined in accordance with 5.4.

In all other cases the value of the excess emissions $exeCO2_Y$ shall be set to 0.

ANNEX II

Adjustment procedures

1. PAYLOAD ADJUSTMENT FACTORS REFERRED TO IN ARTICLE 12(1)(C)

Subject to the provisions laid down in Article 10(2)(a), for the purposes of calculating the reference CO_2 emissions referred to in Article 1, the CO_2 emissions in g/km of a heavy-duty vehicle *v* determined for a mission profile *mp* referred to in Table 2 in point 2.1 of Annex I shall be adjusted as follows:

$$CO2_{v,mp} = CO2(2019)_{v,mp} \times (1 + PLa_{sg,mp} \times (PL_{sg,mp} - PL(2019)_{sg,mp}))$$

Where

sg	is the sub-group to which the vehicle *v* belongs;
$CO2(2019)_{v,mp}$	is the specific CO_2 emissions of vehicle *v* in g/km, as determined on mission profile *mp* and based on the 2019 monitoring data reported in accordance with Regulation (EU) No …/2018 [HDV M&R] ;
$PL(2019)_{sg,\ mp}$	is the payload value, which was attributed to vehicles in the sub-group *sg* on the mission profile *mp* in the calendar year 2019, in accordance with Table 3 of point 2.5 of Annex I, for the purposes of establishing the 2019 monitoring data reported in accordance with Regulation (EU) No …/2018 [HDV M&R];
$PL_{sg,\ mp}$	is the payload value attributed to vehicles in the sub-group *sg* on the mission profile *mp* in the calendar year when the changes referred to in Article 12(1)(c) take effect for all new heavy-duty vehicles, in accordance with Table 3 of point 2.5 of Annex I;
$PLa_{sg,\ mp}$	is the payload adjustment factor defined in Table 5.

Table 5 - Payload adjustment factors $PLa_{sg,\ mp}$

$PLa_{sg,mp}$ (in 1/tons)		**Mission profiles *mp*[1]**				
		RDL, RDR	REL, RER	LHL, LHR	LEL, LER	UDL, UDR
Vehicle sub-groups *sg*	**4-UD**	0,026	N.A.	0,015	N.A.	0,026
	4-RD					
	4-LH					
	5-RD	0,022	0,022	0,017	0,017	0,022
	5-LH					
	9-RD	0,026	0,025	0,015	0,015	0,026
	9-LH					
	10-RD	0,022	0,021	0,016	0,016	0,022
	10-LH					

[1] see mission profile definitions in point 1 of Section 2 of Annex I.

2. ADJUSTMENT FACTORS REFERRED TO IN ARTICLE 10(2)(B)

Subject to the provisions laid down in Article 10(2)(b), for the purposes of calculating the reference CO_2 emissions referred to in Article 1 the CO_2 emissions in g/km of a heavy-duty vehicle *v* determined for a mission profile *mp* referred to in point 2.1 of Annex I shall be adjusted as follows:

$$CO2_{v,mp} = CO2(2019)_{v,mp} \times (\sum_r s_{r,sg} \times CO2(2019)_{r,mp}) / (\sum_r s_{r,sg} \times CO2_{r,mp})$$

Where

$\sum_r$	is the sum over all representative vehicles *r* for the sub-group *sg*;
sg	is the sub-group to which the vehicle *v* belongs;
$s_{r,sg}$	is the statistical weight of the representative vehicle *r* in the sub-group *sg;*
$CO2(2019)_{v,mp}$	is the specific CO_2 emissions of vehicle *v* in g/km, as determined on mission profile *mp* and based on the 2019 monitoring data reported in accordance with Regulation (EU) No …/2018 [HDV M&R] ;
$CO2(2019)_{r,mp}$	is the specific CO_2 emissions of the representative vehicle *r* in g/km, as determined on mission profile *mp* in accordance with this Regulation in its version applicable in 2019;
$CO2_{r,mp}$	is the specific CO_2 emissions of the representative vehicle *r,* as determined in accordance with this Regulation in the calendar year when the changes referred to in Article 12(2) take effect for all new heavy-duty vehicles.

The representative vehicle shall be defined in accordance with the methodology referred to in Article 12(2)