Ministry of Land, Infrastructure and Transport

Korea Automobile Testing & Research Institute

Submitted by the Republic of Korea

UNR157-05-13

Minimum Following Distance for ALKS

UN R157 5th SIG on 10&11 May 2021

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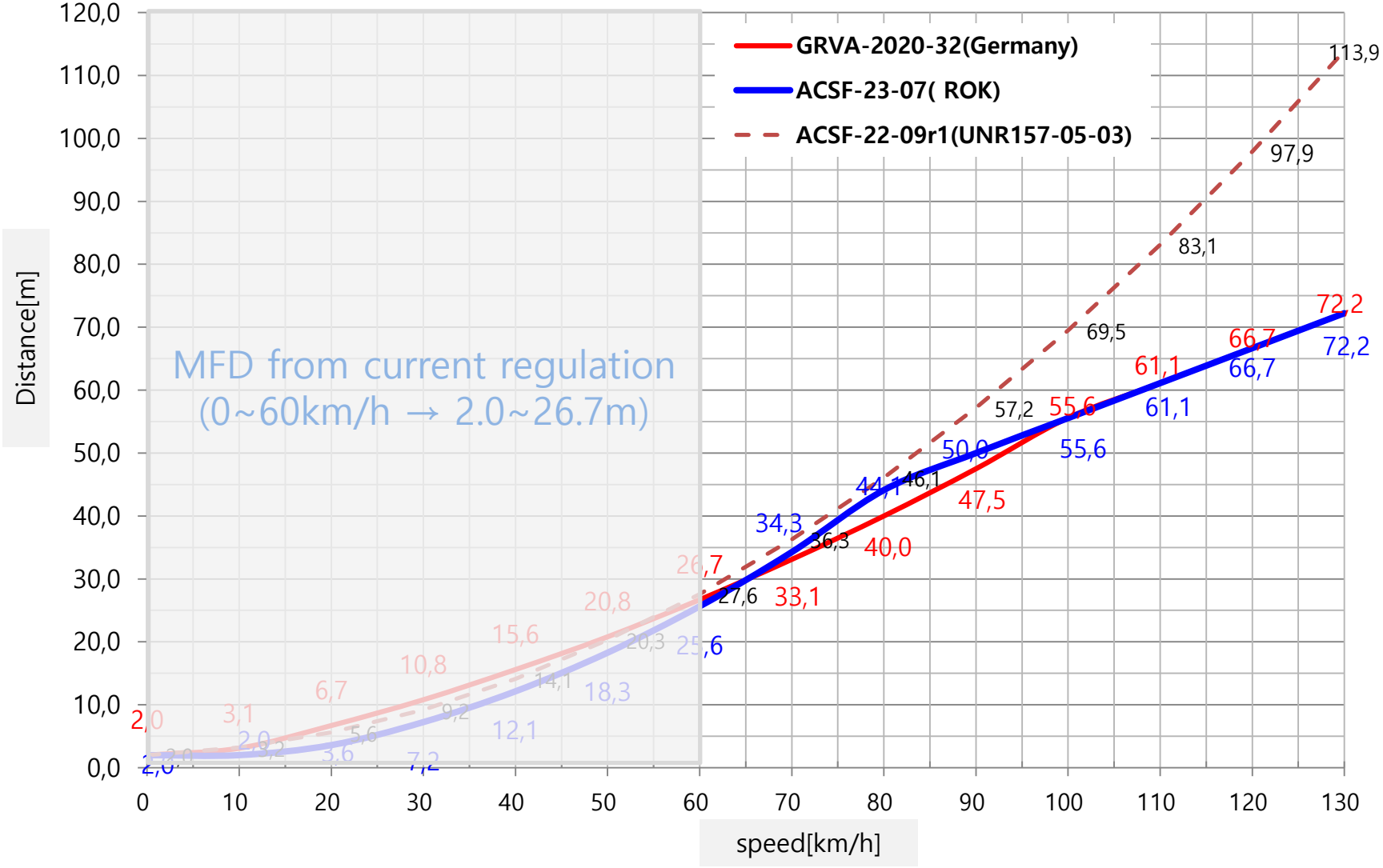
◆ The Korean Comment to Minimum Following Distance discussion

- In **22nd ACSF IWG(ACSF-22-09r1, April 2019),** a formula that considered the margin distance based on the braking distance of the state of art vehicles acquired on the wet road was proposed, but there was an comment from ACSF member that the **Minimum Following Distance proposed was too long in the middle and high speed range**
- Therefore, in **23rd ACSF IWG(ACSF-23-07, July 2019)**, a renew formula that combines and the general time gap of European road traffic law with the braking distance was proposed
- In conclusion, the proposal that the **time gap gradually increase to 2.0 s seems to be reasonable**

Present speed of the ALKS vehicle		ACSF-22-09r1(KOREA) (UNR157-05-03)		ACSF-23-07(KOREA)		GRVA-2020-32(Germany)	
		Minimum time gap	Minimum following distance	Minimum time gap	Minimum following distance	Minimum time gap	Minimum following distance
(km/h)	(m/s)	(s)	(m)	(s)	(m)	(s)	(m)
7.2	2.0	-	2.0	-	2.0	1.0	2.0
10	2.78	-	3.2	-	2.0	1.1	3.1
20	5.56	-	5.6	-	3.6	1.2	6.7
30	8.33	-	9.2	-	7.2	1.3	10.8
40	11.11	-	14.1	-	12.1	1.4	15.6
50	13.89	-	20.3	-	18.3	1.5	20.8
60	16.67	-	27.6	-	25.6	1.6	26.7
70	19.44	**1.9**	**36.3**	**1.8**	**34.3**	**1.7**	**33.1**
80	22.22	**2.1**	**46.1**	**2.0**	**44.1**	**1.8**	**40.0**
90	25.00	**2.3**	**57.2**	**2.0**	**50.0**	**1.9**	**47.5**
100	27.78	**2.5**	**69.5**	**2.0**	**55.6**	**2.0**	**55.6**
110	30.56	**2.7**	**83.1**	**2.0**	**61.1**	**2.0**	**61.1**
120	33.33	**2.9**	**97.9**	**2.0**	**66.7**	**2.0**	**66.7**
130	36.11	**3.2**	**113.9**	**2.0**	**72.2**	**2.0**	**72.2**

MFD from current regulation
(0~60km/h → 2.0~26.7m)

The comparison of 3 doc. plots



Appendix

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Submitted by the Republic of Korea

Informal Document - ACSF-23-07

Minimum Following Distance to the front

ACSF IWG 23rd session on July 2019, Brussels

Korea Automobile Testing & Research Institute

Comment Histroy

● The history and comments on previous session

➢ **19th session proposal(ACSF-19-06) :** $S = V_{ALKS} \times t_{front}$, t_{front} = 2.3sec

- comment : concern for frequent occurrence of cutting-in in low speed range

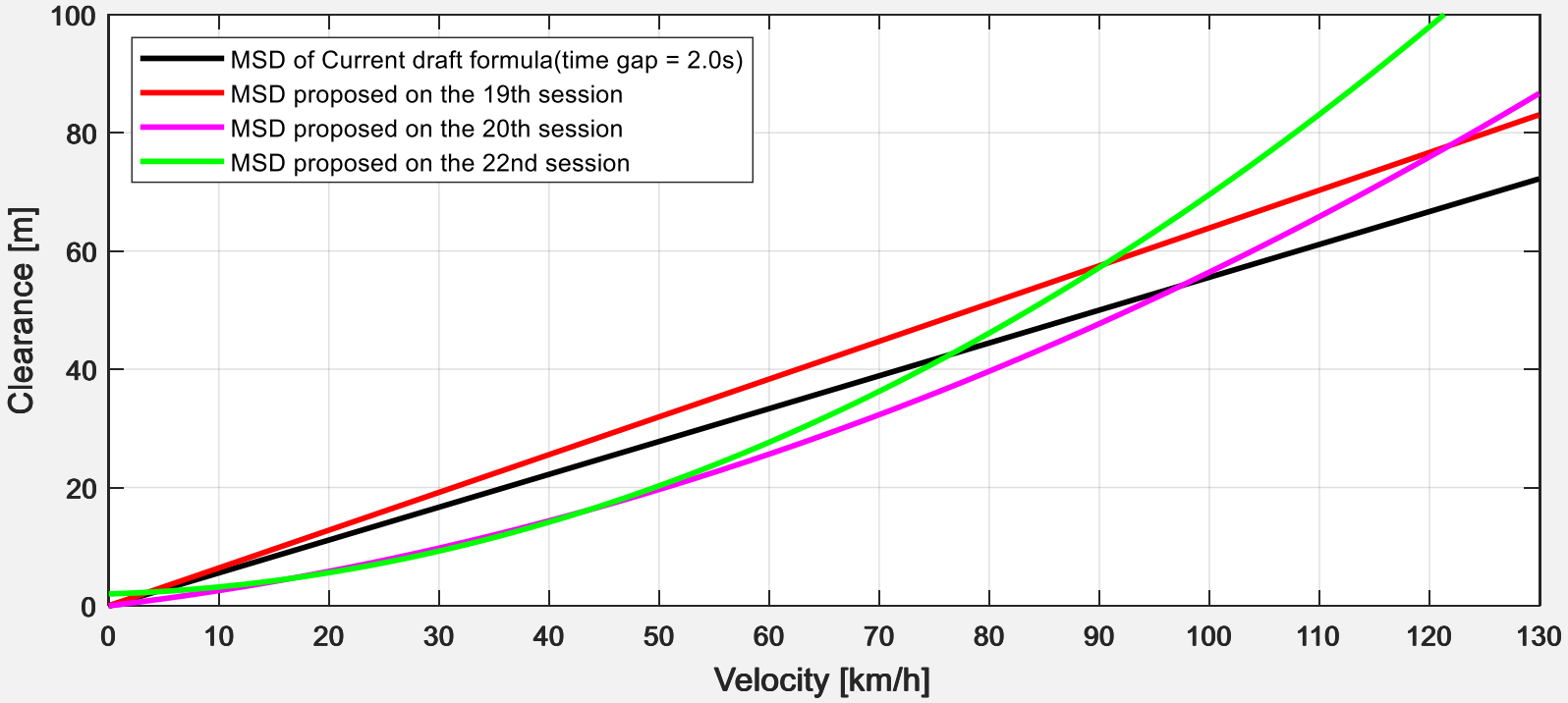
➢ **20th session proposal(ACSF-20-08) :** $S = V_{ALKS} \times t_{front}$, $t_{front} = 0.8 + \frac{1.6 v_{LKLC}}{36.1}$sec

- comment : concern for too high deceleration($9m/s^2$)

➢ **22nd session proposal(ACSF-22-09r1) :** $S = V_{ALKS} \times t_{front} + d_s$, $t_{front} = 0.2 + \frac{2.9 * V_{ALKS}}{36.1}$sec

- comment : concern for too long distance at mid and high speed

Plot for the respective formula



Safe distance between vehicles April 2010

Source : Conference of European Directors of Roads

3 Conclusions

In most countries in Europe, the general rule is that each driver must keep sufficient distance between his/her vehicle and the vehicle in front in order to avoid an accident if the car in front stops suddenly or reduces speed.

This rule does not always come with specific distances that must be observed, such as the required minimum distance or time between the vehicles. In those cases where minimum distances or times are provided, the figures vary greatly from country to country. The 2-second rule or the half-distance rule can be applied. Different, specific rules can be applied to heavy goods vehicles. The 2-second rule is often used as a rule of the thumb and taught at driving schools.

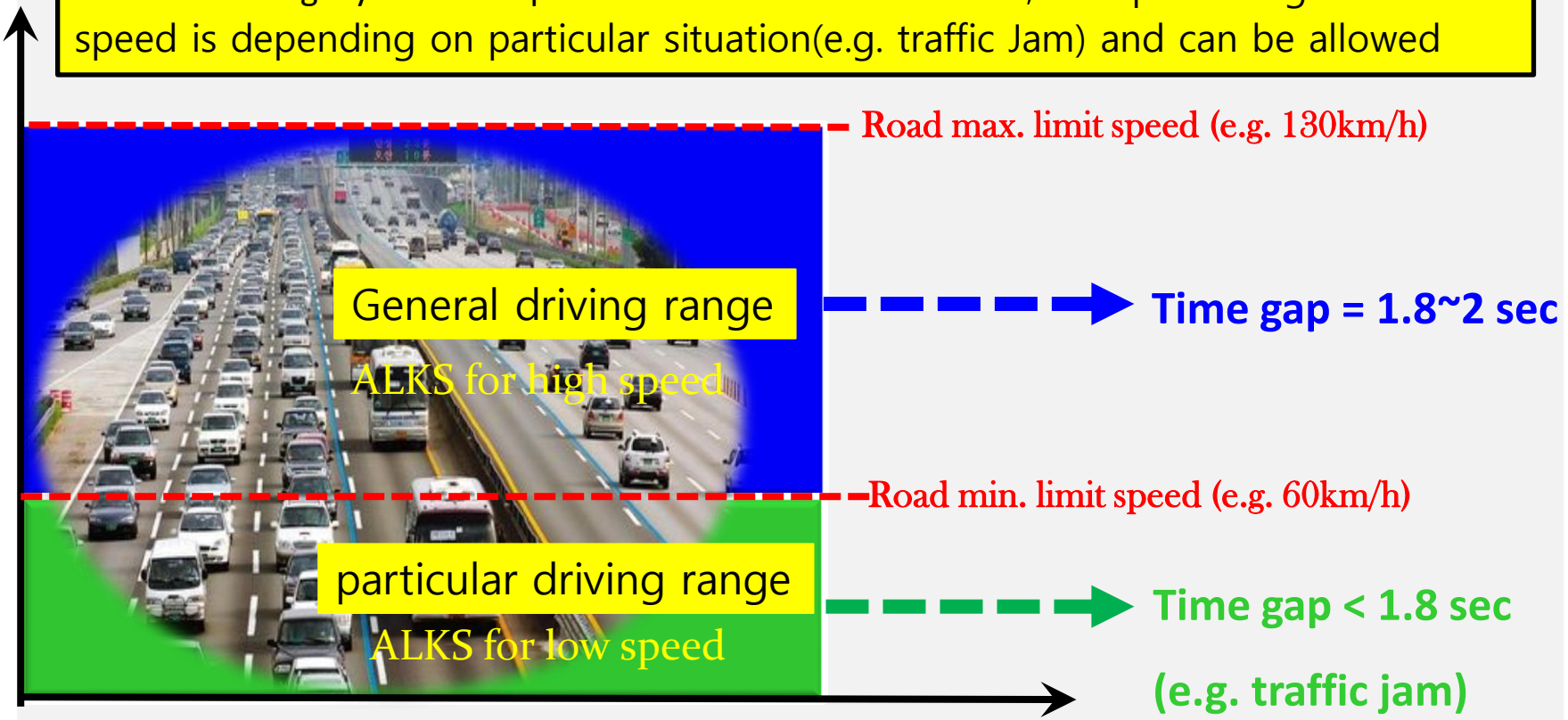
Some devices (e.g. road markings) are used to help drivers obey the rule.

Still, most countries encounter problems with enforcement.

The distance of the 'half-speed rule' corresponds to 1.8 seconds.

Consideration of full range speed for next step (ALKS for high speed)

Road speed limits are used in most countries to **set the max./min. speed** at which road vehicles can legally travel on particular stretches of road. But, the speed range under min. speed is depending on particular situation(e.g. traffic Jam) and can be allowed



New Formula for Minimum Following Distance

$$S = \max(\min(V_{ALKS} \times t_{front1}, V_{ALKS} \times t_{front2}), 2)$$

Low speed application

High speed application

Where :

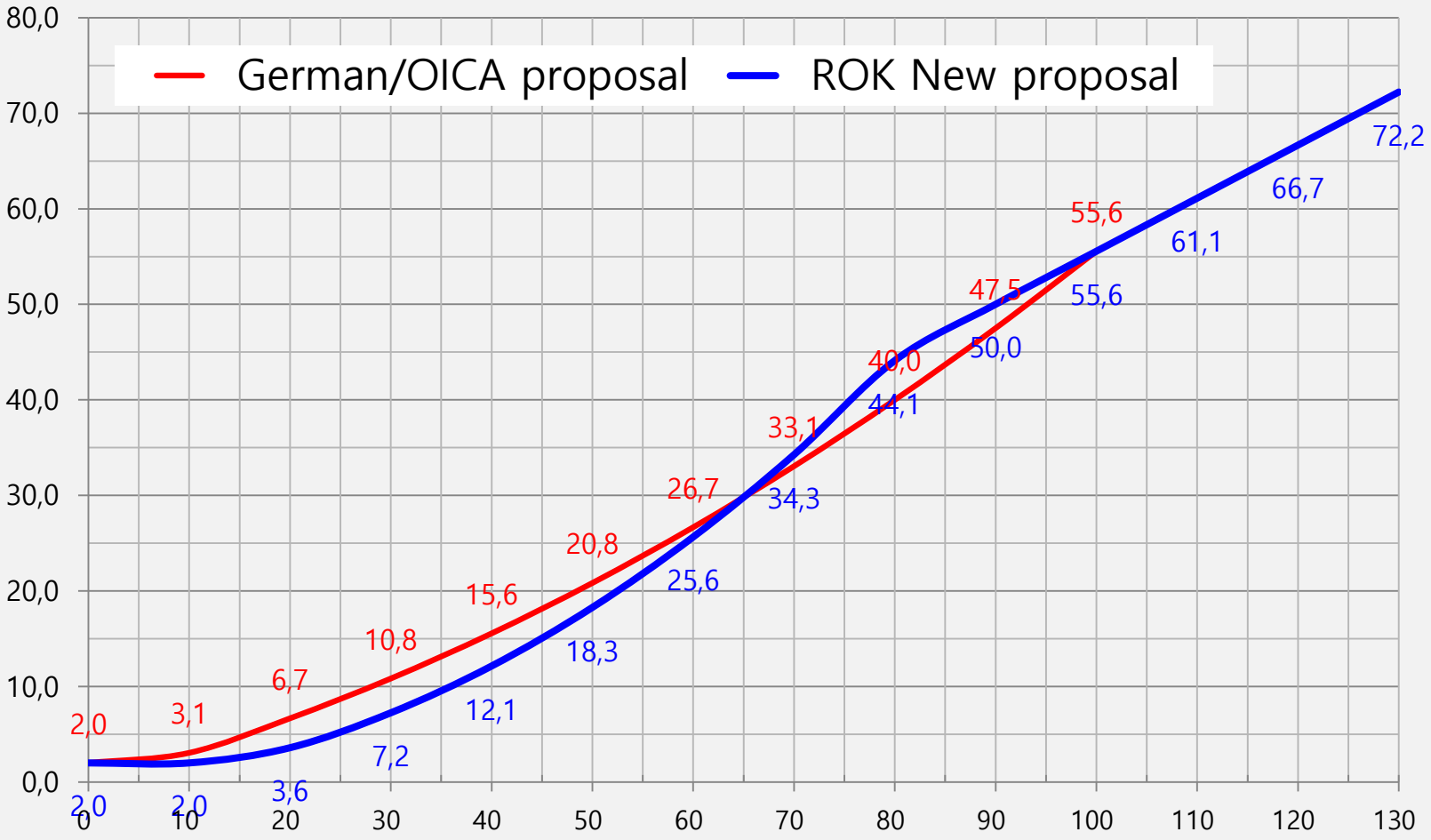
V_{ALKS} : the actual speed of the ALKS vehicle in m/s;

t_{front1} : minimum time gap in second between the ALKS vehicle and a leading vehicle in front $= 0.2 + \frac{2.9 * V_{ALKS}}{36.1}$

t_{front2} : minimum time gap of 2 seconds between the ALKS vehicle and a leading vehicle in front

☞ the result of the formula above for actual speeds below 4 m/s the minimum following distance shall never be less than 2 m.

Plot for G/OICA vs. ROK



Appendix-1

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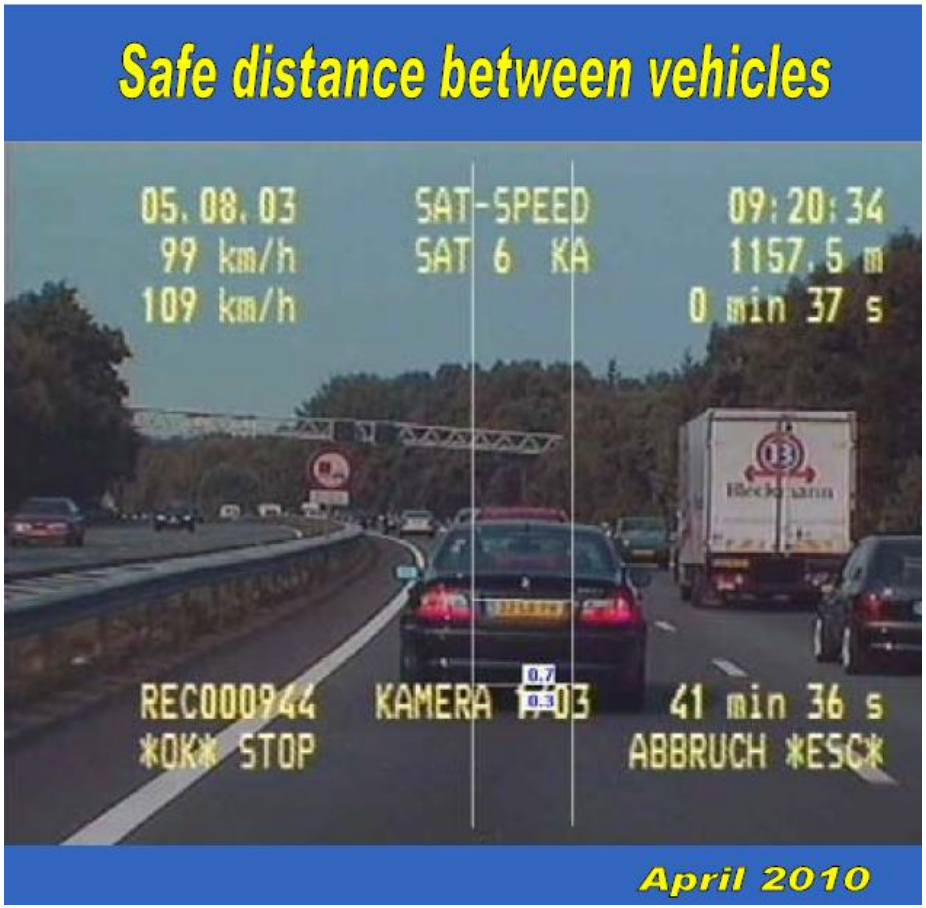
CEDR
Conférence Européenne
des Directeurs des Routes
Conference of European
Directors of Roads

Safe distance between vehicles



Country	Existing law or regulation	Threshold for enforcement set by law or regulation	Comments
Austria	**Yes** (Road Traffic Code) : - Adjust distance to be able to stop if necessary - Sanction based on minimum time or distance	**Yes** - Gap < **0.4 s** - Distance < **50 m** for lorries	The 2-second rule is taught in driving schools and painted on the pavement.
Denmark		**The 2-second rule is used by police.**	The 2-second rule is applied.
Estonia	**Yes** (Traffic Law) : - Keep sufficient distance to avoid collision	**No**	The 2-second rule is used as a rule of thumb.
Finland	**Yes** Traffic Law : - Adjust distance to be able to stop if necessary - Sanction according to the minimum time or distance	**Yes** - Gap < 1 s; distance depends on the speed - Gap < 1.5 s for lorries; distance depends on the speed	The 2-second rule is also used as a rule of thumb.
France	**Yes** (Road Code) : - Sufficient distance to avoid collision if car in front brakes or stops	**Yes** - Gap < **2 s** - Distance < **50 m** for lorries > 3.5 t or < 7 m, in interurban areas at the same speed	For certain infrastructures, higher minimum safe distances can be made compulsory.
Germany	**Yes** (§4 Road Traffic Act) - Drivers must be able to stop in time if the car in front brakes - 50 m for lorries if speed > 50 km/h	**Yes** Quarter-speed rule Fines depend on actual speed and distance and are imposed if drivers break the quarter-speed rule.	Drivers should keep a distance greater than half of the speed in metres or a time gap of two seconds (both are rules of thumb, but have also been confirmed by court decisions).
Iceland	**Yes** (Road Traffic Law) - Sufficient distance to avoid collision		

Ireland	**No** - The law stipulates 'driving with care and attention'	**No**	2-second rule for 'safe stopping distance' in the 'Rules of the Road, however, this is not a legal requirement
Italy	**Yes**: Road Code Art. 149 - Adjust distance to be able to stop if necessary and avoid collision	**No**	Fines and penalties are mainly related to damages resulting from collision or casualties.
Luxembourg	**Yes**: Road Code - Sufficient distance to avoid collision	**Yes** < 100 m between lorries outside urban areas < 100 m (interurban) and 50 m (urban) behind dangerous goods	The 2-second rule is taught as a matter of principle in driving schools.
Netherlands	**Yes** Fine is imposed if distance < 1s	**Yes** Time < **1s**	The 2-second rule is applied.
Norway	**Yes**	- Gap < **0.3 s** (if vehicle < 3.5 t) - Gap < 0.5 s (if vehicle > 3.5 t)	
Portugal	**Yes** (Road Legislation Code) - Sufficient distance to avoid an accident if the car in front stops or reduces speed	**No**	
Sweden	**Yes** Fine is imposed if distance < 1s	If <0.5s, driving licence is revoked.	Enforcement problems exist.
Switzerland	**Yes** (law) - Sufficient distance in case car in front brakes		In practice, the 2-second rule or the half-speed rule is applied.
UK	**No** But 'driving with care and attention' is mentioned in the law	**No**	2-second rule for 'safe stopping distance' in the 'highway code rule', but not a legal requirement
The distance of the 'half-speed rule' corresponds to 1.8 seconds.			

Plot for G/OICA vs. ROK vs. braking dist.