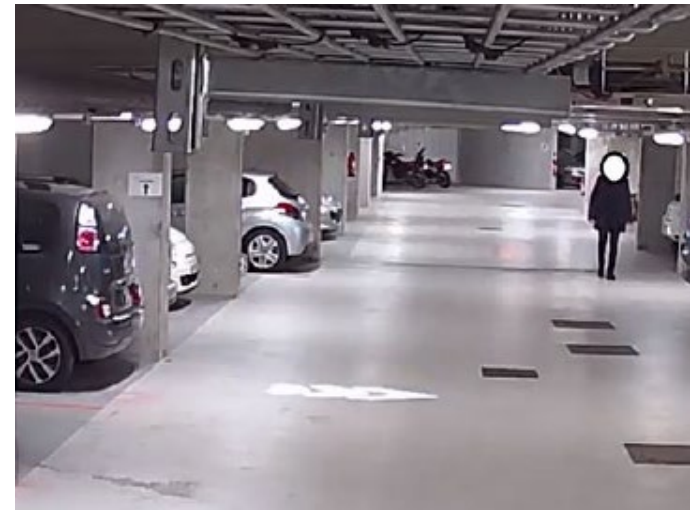


“Signal Road Projector” (SRP) Main aspects of the proposal

88th GRE session

25-28 April 2023



Signal Road Projector (SRP) Definition

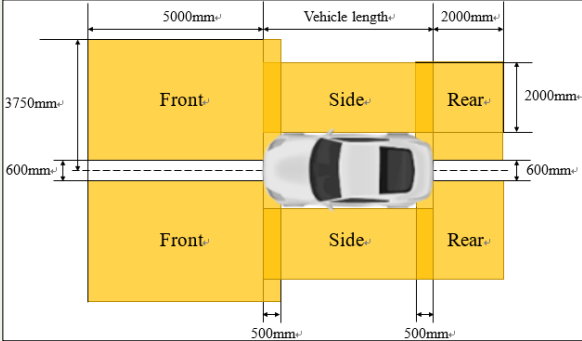
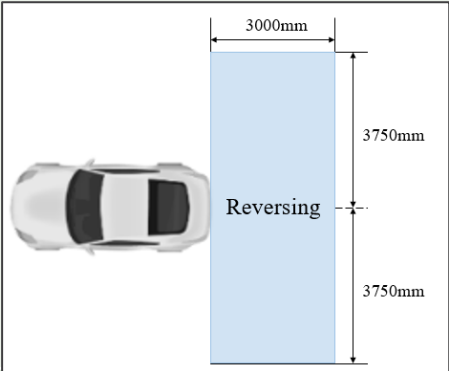
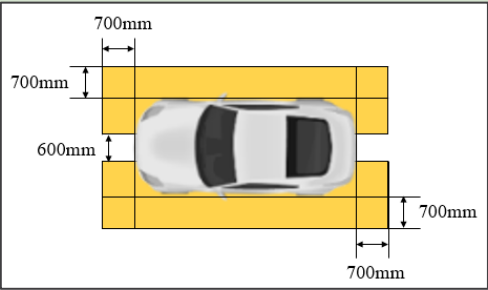
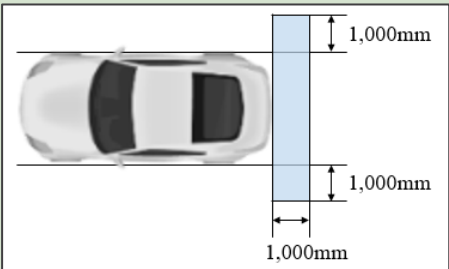
We propose “**Direction indicator projector**” and “**Reversing projector**”, as a new independent light-signalling function.

“**Direction indicator projector**” means a lamp to provide enhanced recognition of direction indication to other road users by illumination of the ground surface. It is operated in conjunction with Direction Indicator Lamp.

“**Reversing projector**” means a lamp to provide enhanced recognition of reversing indication to other road users by illumination of the ground surface. It is operated in conjunction with Reversing Lamp.













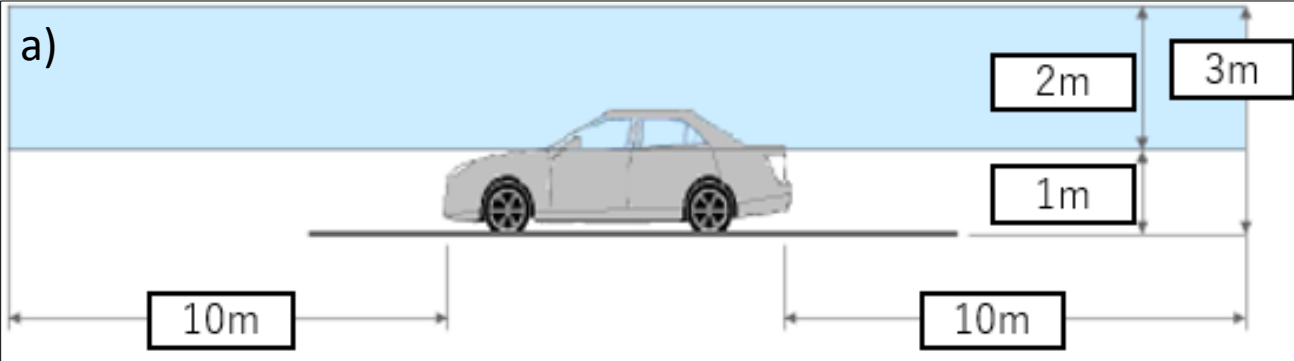
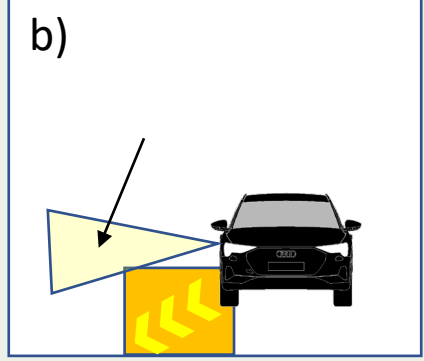
Signal Road Projector (SRP)

Main aspects – UN R48

	Direction Indicator Projector	Reversing Projector
Presence	Optional	Optional
Number	2 front DI projectors, 2 rear DI projectors, side DI projectors quantity depending on vehicle length	1 or 2
Color	Amber	White
Projection area	 <p>The diagram shows a top-down view of a vehicle with yellow projection areas. The front projection area is 5000mm wide and 3750mm high. The side projection area is 2000mm high. The rear projection area is 2000mm high. The vehicle length is indicated. The projection area is 600mm wide on both sides of the vehicle. The distance from the front of the projection area to the front of the vehicle is 500mm, and from the rear of the projection area to the rear of the vehicle is 500mm.</p>	 <p>The diagram shows a top-down view of a vehicle with a blue rectangular projection area labeled 'Reversing'. The projection area is 3000mm wide and 7500mm high (3750mm on each side of the vehicle).</p>
Maximum distance between projection start and vehicle	 <p>The diagram shows a top-down view of a vehicle with yellow projection areas. The maximum distance between the projection start and the vehicle is 700mm. The projection area is 700mm wide and 700mm high. The distance from the front of the projection area to the front of the vehicle is 600mm, and from the rear of the projection area to the rear of the vehicle is 700mm.</p>	 <p>The diagram shows a top-down view of a vehicle with a blue rectangular projection area labeled 'Reversing'. The maximum distance between the projection start and the vehicle is 1,000mm. The projection area is 1,000mm wide and 1,000mm high.</p>

Signal Road Projector (SRP)

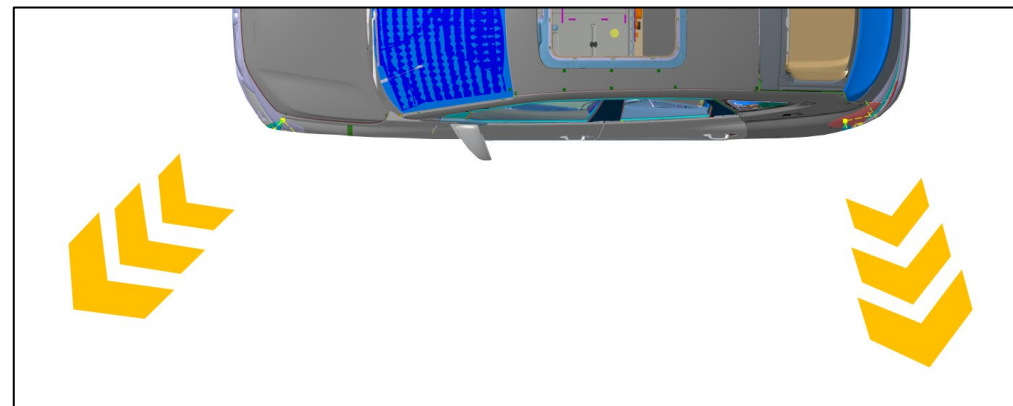
Main aspects – UN R48

Direction Indicator Projector and Reversing Projector									
Examples of Elements of Projection Pattern	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th style="width: 25%;">Rectangle/Line</th> <th style="width: 25%;">Triangle</th> <th style="width: 25%;">Chevron</th> <th style="width: 25%;">Circle</th> </tr> </thead> <tbody> <tr> <td>  </td> <td>  </td> <td>  </td> <td>  </td> </tr> </tbody> </table>	Rectangle/Line	Triangle	Chevron	Circle				
Rectangle/Line	Triangle	Chevron	Circle						
									
Non-visibility/non glare	<p>- Apparent surface of separate projector shall not be visible in the area, as shown figure a) below. (Same requirement as Manoeuvring lamp in UNR48)</p> <p>- For combined projectors, the intensity is limited outside the projection area, as shown in figure b) below measured in the component approval acc. to UN148.</p> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px;"> <p>a)</p>  </div> <div style="border: 1px solid black; padding: 5px;"> <p>b)</p>  </div> </div>								

Signal Road Projector (SRP)

Main aspects – UN R48

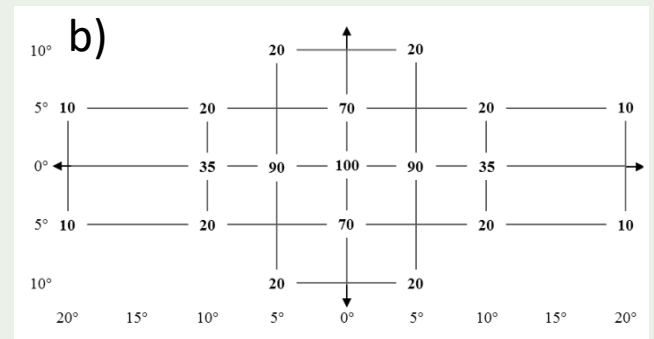
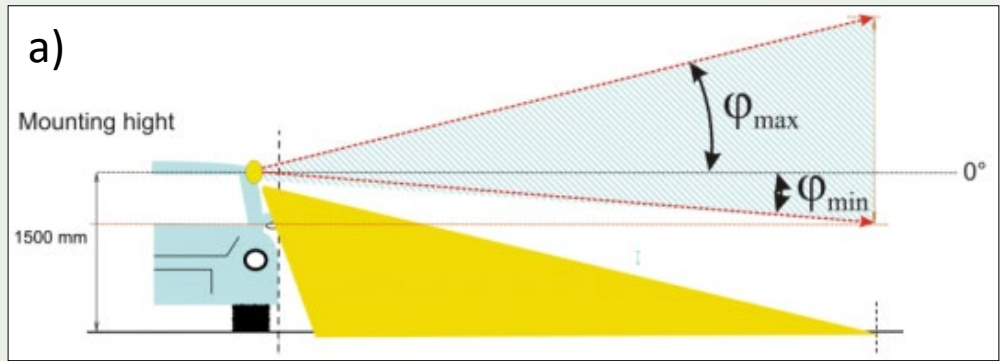
	Direction Indicator Projector	Reversing Projector
Operating condition	- May be operated only when DI lamp is operated.	- May be operated only when Reversing lamp is operated.
	- Flashing is allowed.	- Flashing is allowed.
	- Sequential activation is allowed.	- Sequential activation is not allowed.
	- Pattern of projection is not allowed to vary.	- Pattern of projection is allowed to vary.



Signal Road Projector (SRP)

Main aspects – UN R148

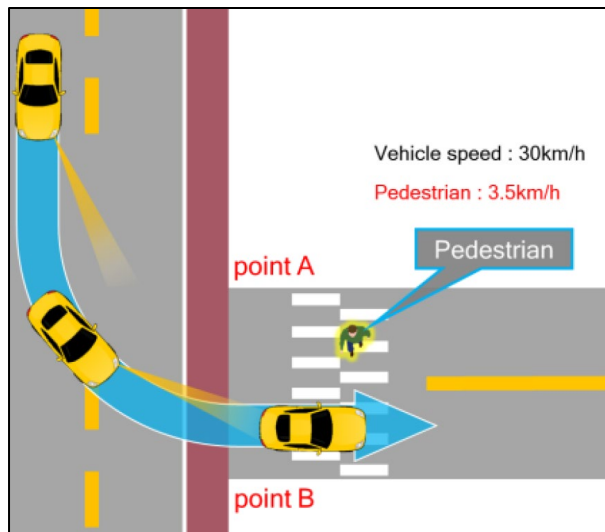
	Direction Indicator Projector	Reversing Projector
Photometry (1)	- 12,000 cd max within the defined projection area	- 12,000 cd max within the defined projection area
Photometry (2)	<p>- 0.5 cd max in the area, as shown in the figure a) below. (Same requirement as Manoeuvring lamp in UNR148)</p> <p>However, if the distance between the apparent surface of DI projector and DI lamp respectively Reversing projector and Reversing lamp does not exceed 75 mm they may be visible, but intensity limits outside the projection area are defined by parameters of the corresponding signal lamp acc. to UN148, as shown in figure b) below as example.</p>	



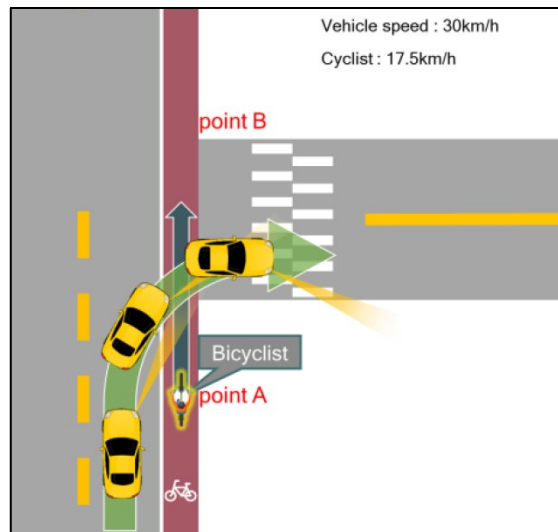
GTB Signal Road Projector (SRP) Study_1 - Overview

Research Institute :	Yeung-Nam University (South Korea)
Research Method :	VR-based study, Simulator-based study, Field study with mock-up sample
Research content:	Multiple scenarios of direction indicator projection including Driver, Cyclist and Pedestrian related tests.

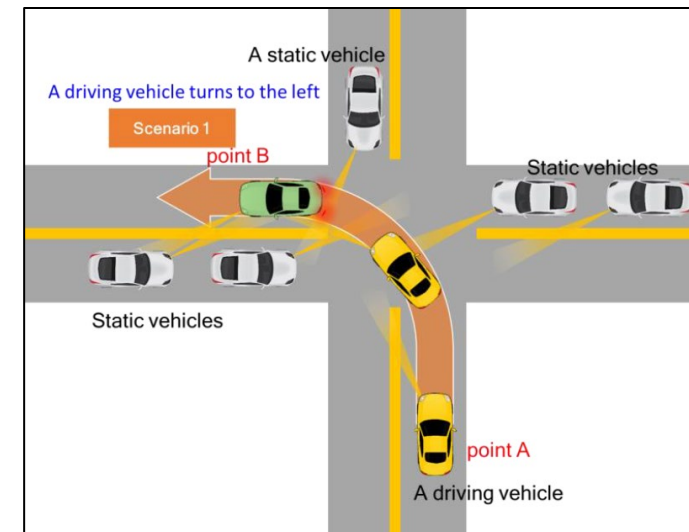
Example Vehicle to pedestrian scenario



Example Vehicle to bicycle scenario



Example Vehicle to vehicle scenario



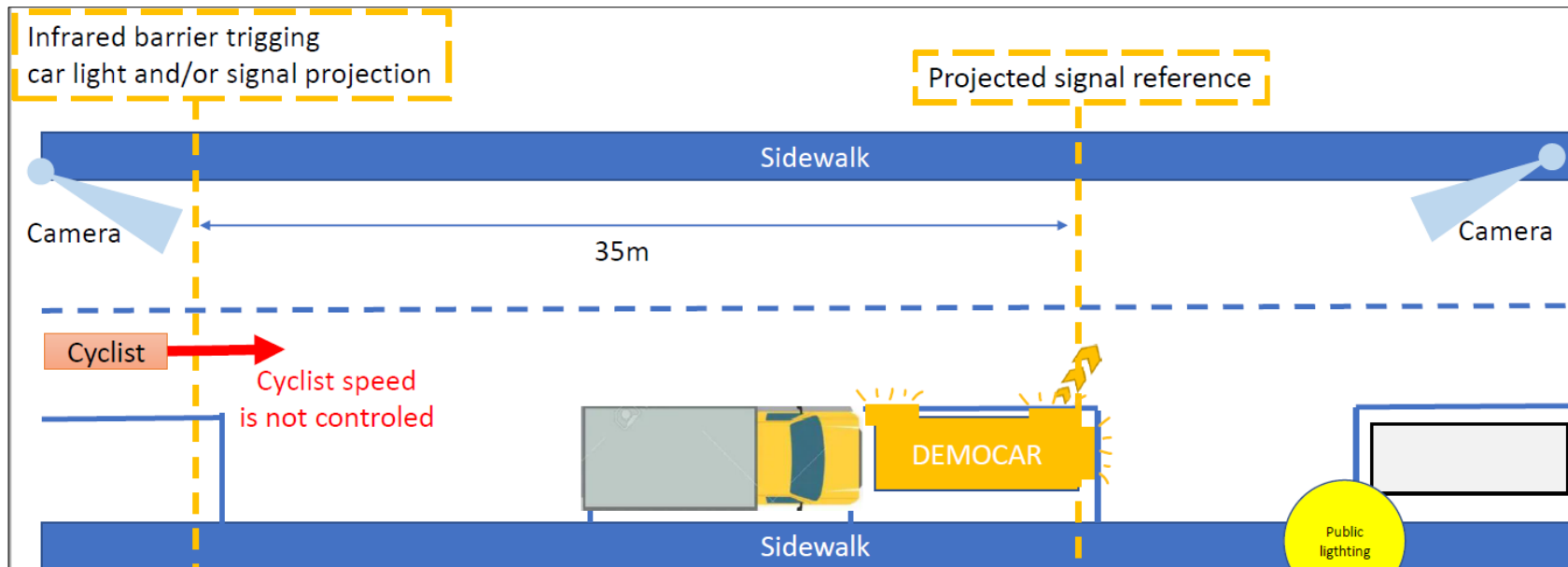
GTB Signal Road Projector (SRP) Study_1 – Summary of Results

- 1) Signal projection by approaching/turning vehicles provides better visibility to other road users (especially for Cyclist).**
- 2) The reaction time to the behavior of other road vehicles is not compromised by signal projection (brake reaction time of following vehicles was even reduced).**
- 3) Questionnaire survey shows positive response of participants to signal projection.**

The study is available upon request to the GTB Secretariat (secretary@gtb-lighting.org)

GTB Signal Road Projector (SRP) Study_2 - Overview

Research Institute :	Embedded Lighting Systems (France)
Research Method :	Field study with mock-up sample
Research content:	Cyclists exposed to a vehicle departing from a parallel parking place in a street at night time



GTB Signal Road Projector (SRP) Study_2 – Summary of Results

1) The projector provides information about forward situation to cyclists.

Through the information, the cyclists stopped pedaling, slowed down or moved away from the projecting vehicle better than the situation the vehicle without the projector.

2) Qualitative results (questionnaire survey) shows that the majority of the cyclists stated that:

- the projected light signal is visible and is not dangerous**
- the situation is fully understandable**
- the projected light signal is very useful**
- they would feel safer with such equipment**

The study is available upon request to the GTB Secretariat (secretary@gtb-lighting.org)

Signal Road Projector (SRP) GRE Delegates Guidance Request

Based on impressions from the live presentation we would like to ask for guidance about the view of the delegates on **three** topics:

- 1) number of simultaneously activated projections
- 2) limitations for the projection activation
- 3) activation of projection related to the vehicle direction

Signal Road Projector (SRP) GRE Delegates Guidance Request

1) Limitation to the number of projections

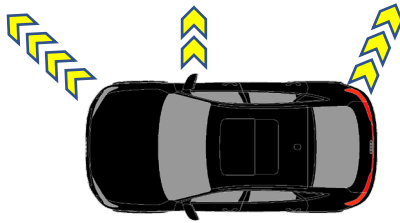
- GTB identifies that projections are voluntary and that the maximum number of projections could be aligned to the number of signal lamps, which includes an increase of the maximum number of projections for long vehicles.
- The updated draft Chinese standard for light signalling devices does not limit the number of projections.

GTB seeks confirmation from GRE about the number of projections.

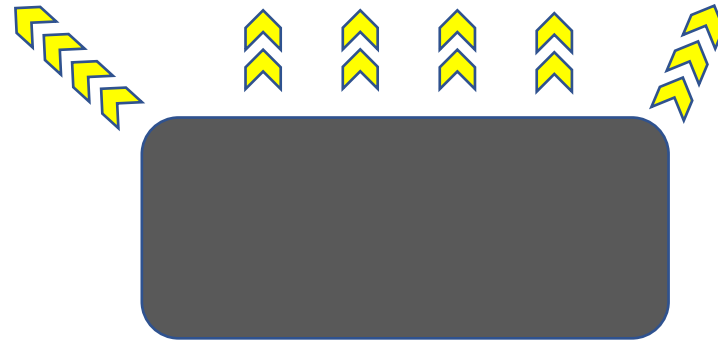
Signal Road Projector (SRP) GRE Delegates Guidance Request

Examples of maximum number of direction indicators allowed acc. to R48:

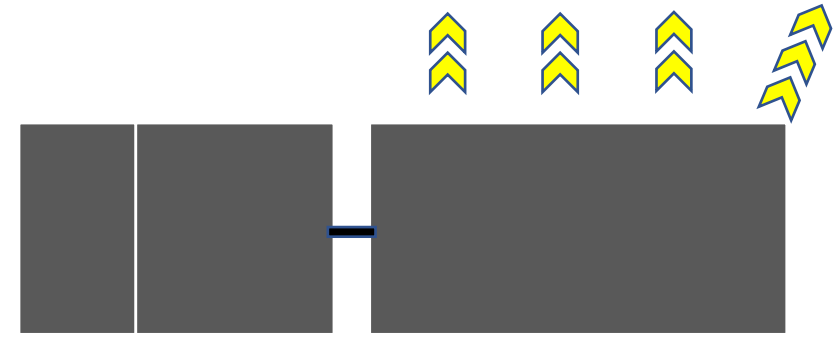
$M_1, N_1 < 9m$
3 per side



$M_3 > 9m$
6 per side



$O_4 > 9m$
4 per side



GTB request for confirmation:

The maximum number of direction indicator projections may be aligned up to the number of installed direction indicators

Signal Road Projector (SRP) GRE Delegates Guidance Request

2) Limitations to traffic condition

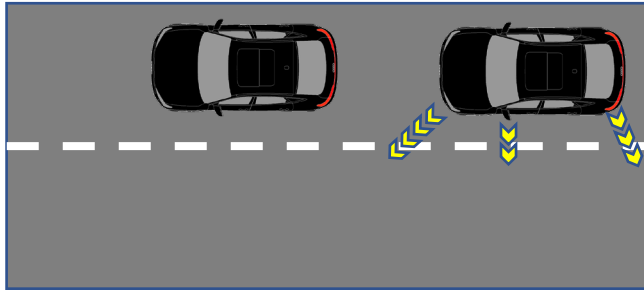
- The areas for the signal projection defined by GTB makes the projection suitable for urban traffic.
- GTB is convinced that signal projection is beneficial in all other traffic conditions as well.
- GTB does not identify any reason to introduce a restriction by speed or urban condition, even if the updated draft Chinese standard restricts the activation of the projection to a certain speed limit.

GTB seeks guidance from GRE that there is no need for restrictions on projections for any traffic conditions or speed limits.

Signal Road Projector (SRP) GRE Delegates Guidance Request

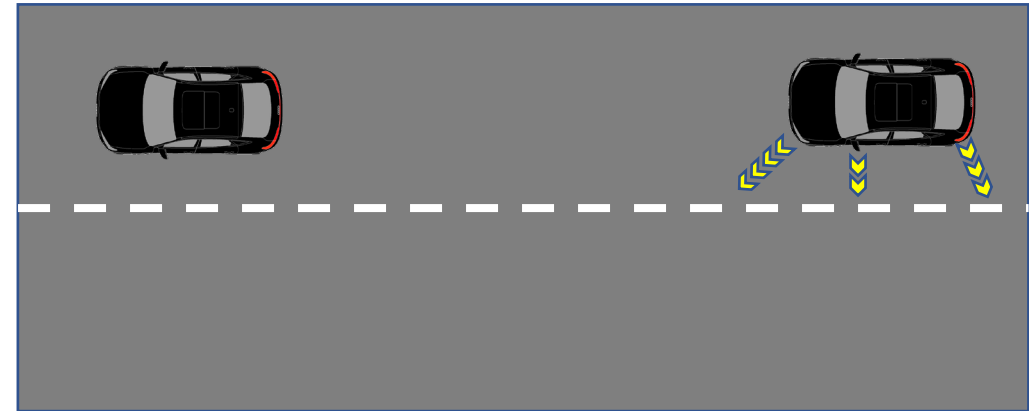
(a)

Narrow lanes, short distances, slow speed



(b)

Wide lanes, long distances, high speed



GTB request for guidance between the following options:

I) Signal projection may be used in all traffic conditions: (a) & (b).

OR

II) Signal projection may only be used in specific driving conditions with similar characteristics as urban conditions and below a certain speed (a)

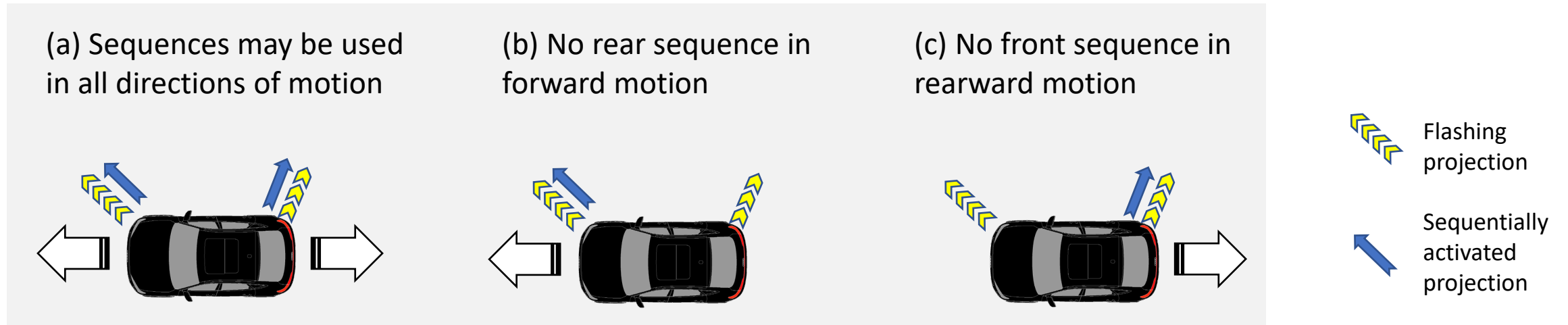
Signal Road Projector (SRP) GRE Delegates Guidance Request

3) Limitations for projection activation

- GTB identifies that direction indicator projections are not likely to interfere with the recognition of the vehicle direction of motion, due to the colour standardisation for lamp functions.
- The updated draft Chinese standard restricts the direction of sequential activation to the direction of vehicle movement.

GTB seeks guidance from GRE whether restrictions on the sequential activation in relation to the travel direction are necessary.

Signal Road Projector (SRP) GRE Delegates Guidance Request



GTB request for guidance between the following options:

- I) Sequences of direction indicator projection may be used regardless of the direction of vehicle motion: (a) & (b) & (c)
- OR**
- II) Sequences of direction indicator projection must be aligned to the direction of vehicle motion: (b) & (c)