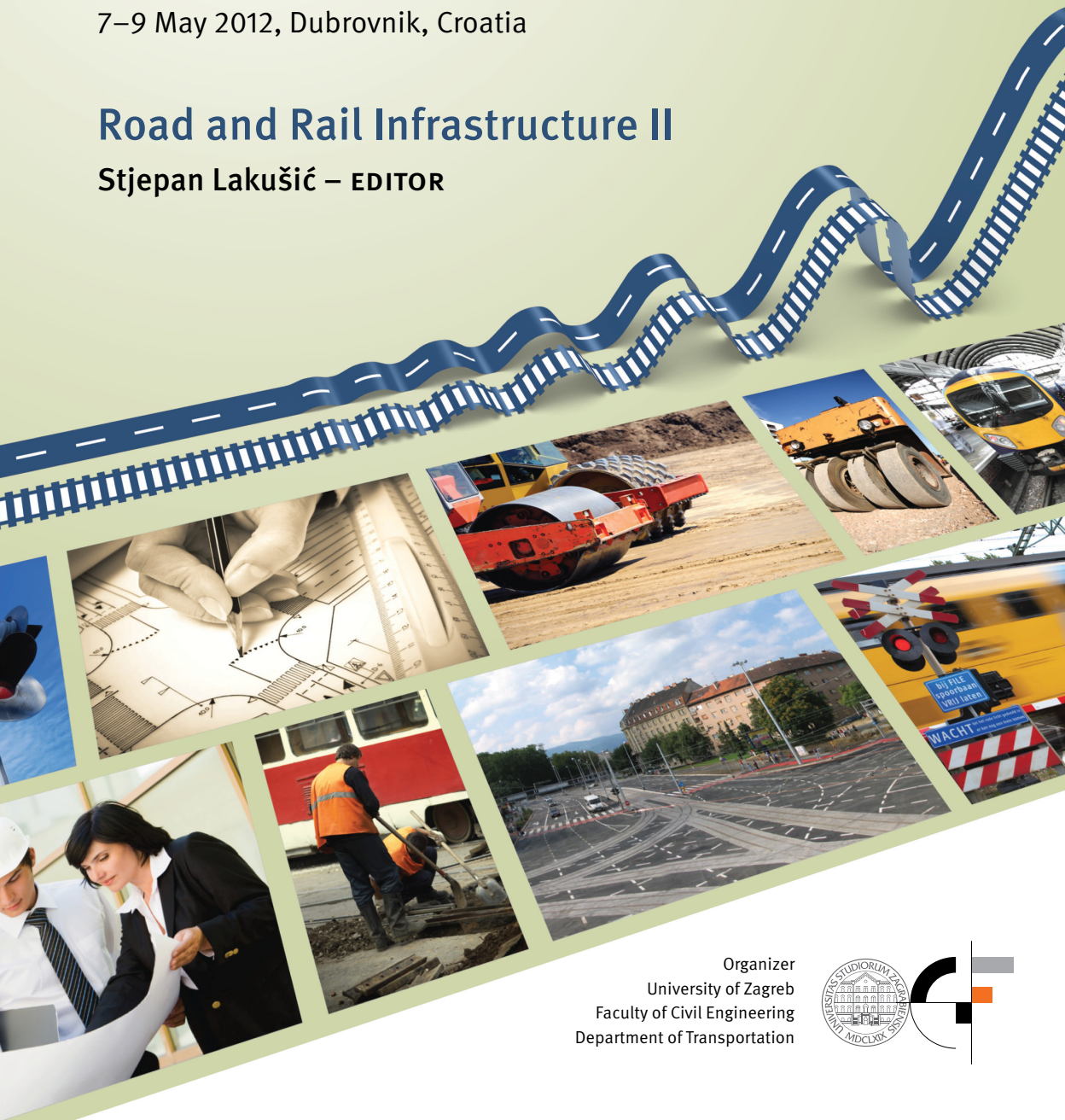
CETRA 2012

2nd International Conference on Road and Rail Infrastructure
7–9 May 2012, Dubrovnik, Croatia

Road and Rail Infrastructure II

Stjepan Lakušić – EDITOR



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UNDERSTANDABLE, VISIBLE AND CLEAR INFORMATION TO THE DRIVER – DO WE KNOW HOW TO PROVIDE IT?

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Abstract

Participants in road traffic perceive their road and transport environment according to their abilities and motivation. Here, we must not forget that human organism has adopted to certain way of living and to the speed. In the last few decades we have been witnessing a radical progress; life is becoming faster, humans have trouble following this and it is not surprising that many fail - this is known as the human factor.
We are facing an increased drivers' visual information overload of the road space; also with traffic signals, a multitude of important and less important information for the driver. Many times, there is an adverse effect achieved due to the excessive number of traffic signals, their inconsistency and unsystematic installation - the drivers are unable to perceive the whole information or they do not understand it. Consequently, this causes confusion and additional psycho-physical burden. The traffic safety of participants is thus decreased.
Since the driver's cognitive and perceptive abilities are rather limited, he should only be 'burdened' by as many information as are necessary and essential for safe driving. Above all, attention should be paid that the perceived information from the driver is consistent with his expectations, that it draws his attention and can be easily read and understood.
Finally, we should not ignore the fact that people live longer, the elderly are healthier and consequently more active. By this, a proportion of older drivers has been increasing and their psycho-physical abilities decline significantly with age.

Keywords: human factor, visual information, space perception, traffic safety

1 Perception of traffic signs and road environment

Considering that humans receive about 90% of all information in traffic through eyes, the visual quality of road environment is very important. As human brain has limited capacity for processing the information received, too much distraction or unnecessary information on and alongside the roads overloads drivers processing capacities and abilities to understand the information and act upon it.
Our goal must be (from traffic and environmental point of view) not to overload drivers mental capabilities with too much and/or unnecessary information.

Figure 1 Information overload of the road space

2 4-C's Rule

The road users can not do everything at same time so road engineers must therefore design roads and signage in the way the road users will be informed about what is strictly necessary to them. Information provided along the road must stand out, be legible and understandable. In road engineering we are familiar with 4 sometimes 5 E's: Education, Engineering, Enforcement, Environment and sometimes Emergency services or care. But, when we are dealing with information for road users, we must consider 4 C's: Conspicuous, Clear, Consistent and Credible, regarding the information provided.

2.1 Conspicuous

The driver must notice the road layout and signs – it must be conspicuous. Driver must be physically able to see what is coming up, the visible information must be noticeable and eye-catching to encourage the driver to act correspondently to the information provided The objective is to provide noticeable early warning of the need for drivers to be alert to obstructions and/or deviations on the road.

Figure 2 Conspicuous: Is the approaching sign and work zone obvious, noticeable and eye-catching?

2.2 Clear

If we want the driver to act accordantly to the provided information guiding and other instructions must be clear. The driver needs to be absolutely certain about what is required. Signs must be visible from a sufficient distance, regarding approaching speed, so the driver can be able to understand what is required from him.
Human beings are only able to process a limited amount of information so care must be taken not to overload the drivers. Too many signs and/or information will overload the driver's

mental capabilities and will produce a form of 'sign blindness' - driver sees all the information but is unable to process them and act in a safe way.

Figure 3 Clear: Does the driver know what to do? Which direction? What lane? Are the signs and lane markings correct? Does the driver have all the necessary information? Traffic signs among themselves and with road markings are not consistent.

2.3 Consistent

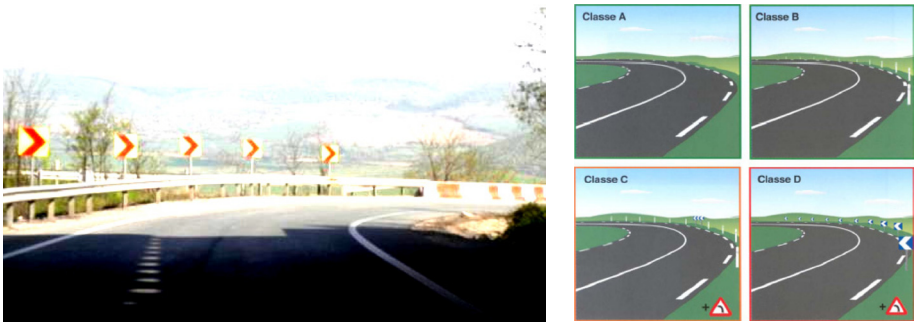

Figure 4 Consistent: Does the curve warning signs feel like others the driver has encountered in the past (depending on curve geometric design)?

Drivers behave and act in a certain way in accordance with a consistent design of traffic signs and road layout. But if drivers encounter differing standards, layouts and arrangements in different areas they become confused and uncertain how to proceed. This can lead to poor driving and a failure to act in the required way.
The basic rule of having consistency is to provide the user with the correct expectation of what will occur ahead. By using consistent designs, we can assist the drivers in making appropriate and safe decisions.

2.4 Credible

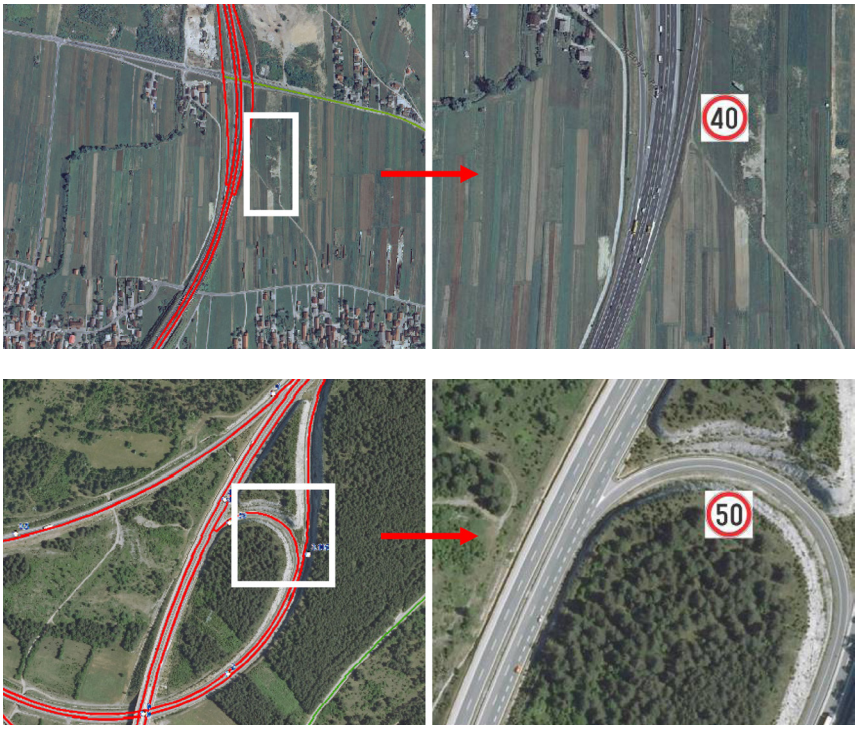

Figure 5 Credible: Does the driver believe that speed reductions are necessary and are believable?

Drivers must believe that what they are told (e.g. dangerous curve ahead) and that the messages they are given are a true representation of what will occur ahead. This involves the credibility or 'believability' of the information provided.
Take a situation where speed limit signs (40 km/h) are generally set up at majority of the exiting ramps of motorway. Because the speed limit is not given accordingly to the road layout (ramp geometric design) the drivers can drive with much higher speed when exiting the motorways. So the next time they are given the same speed limit they do not believe the information (credibility), which may be this time actually crucial for safe driving in the curve or road ahead.

3 Common mistakes regarding '4C'

If the information provided to the road users is not what they expect, if the information does not grab their attention, if they cannot read the information, if they can not understand the information, than they are ill-informed. With that, they will become insecure and mislead, with that the chance for making mistakes increases and potential accidents are more likely to occur. Also the road user who gets too much information at the same time, or is constantly bombarded with information, will probably not process the traffic information in the expected way (what we are trying to say to him) or will not see it at all because of other commercial information. So there is a great probability that the driver (because of the visual overload) will choose the wrong information in a critical situation, and this could resolve in an accident. When designing the road, the designer often takes into account the border defined by the project and does not consider the traffic situation outside that border, which often has a signi-

ficant impact on the traffic situation in the overall area. That way we get some very confusing, insufficient or even faulty information to the driver.
Also road operator, to legally-formally protect its responsibility, will set up a line of traffic signs to 'inform' the driver of all sorts of things the driver should be aware of or take special care of. Of course the driver does not understand the information and does not respond correctly, he just takes all the responsibility.

Figure 6 Misleading information: signs vs. road markings (horizontal line gives the illusion of right-of-way driving strait ahead)

Figure 7 Information does not grab road users attention (driver does not see the pedestrian crossing, no zebra marking, road layout is not appropriate and the sign is not visible enough)

Figure 8 The Road user cannot read the information (too much information at once and/or distraction)

Figure 9 The Road user cannot understand the information (contradicting information)

Figure 10 Typical transference of responsibility from road operator to the driver

4 How to provide the information using the '4C'

When we are dealing with an existing road or we are designing a new one, we must take into account the 4Cs'. The presumption for a designer and/or road operator, must be a 'safe driver'. So if you have a driving license you must be aware and understand traffic rules and obligations. With that in mind we can reduce the amount of traffic information needed for safe driving.

If the situation on the road is 'normal' than additional information is not necessary. But if we need to give an important information to the driver, than this information must be: Conspicuous, Clear, Consistent and Credible. 4Cs' mean visible and recognizable information from a sufficient distance, so the driver will have enough time to see, understand and (re)act accordantly to the information.

So in other words the information must be visible (must stand out), must be legible (large enough - specially letters, symbols and pictograms), understandable (not confusing) and uniform (it's always the same everywhere).

Especially we must take into consideration the ageing population, the number of older drivers is increasing and they usually drive longer. Symbols on traffic signs are more or less uniform, but we have to be very careful when designing new or uncommon information to the driver. Also we should consider of reviewing the existing letters symbols, to make them more readable and therefore understandable to the user, especially to the ageing population.

Figure 11 Visual information process

Figure 12 Example of letter improvement on traffic signs

5 Conclusion

It is crucial, that we understand and start to implement the human factor – knowledge into the road design. The road engineers must provide safe technical elements and provide safe road environment (self explaining road and forgiving road sides).
When choosing the tool to communicate with the driver (road signs and markings), we must understand the visual limitation of the human eye and limitations of ability to process the information (psycho-physical abilities).

Figure 13 'No comment' commercial billboard 'ŠTOF'

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